PORTLAND HARBOR RI/FS

APPENDIX G

DETAILED ANALYSIS COST ESTIMATES

FEASIBILITY STUDY

June 2016

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Detailed Analysis Cost Estimates

The cost spreadsheets included in this appendix were developed in accordance with EPA 540-R-00-002 (OSWER 9355.0-75) July 2000.

These costs should be used to compare alternative relative costs. Costs for project management, remedial design, and construction management were determined as percentages of capital cost per the guidance. Costs for these work items may not reflect costs for implementation. These costs are determined based on specific client requirements during implementation.

Remedial Alternatives
Cost Summary

Note: Costs presented herein are specific to DMM Scenario 2. Costs for DMM Scenario 1 can be found in Attachment B of this appendix.

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TABLE CS-ALT

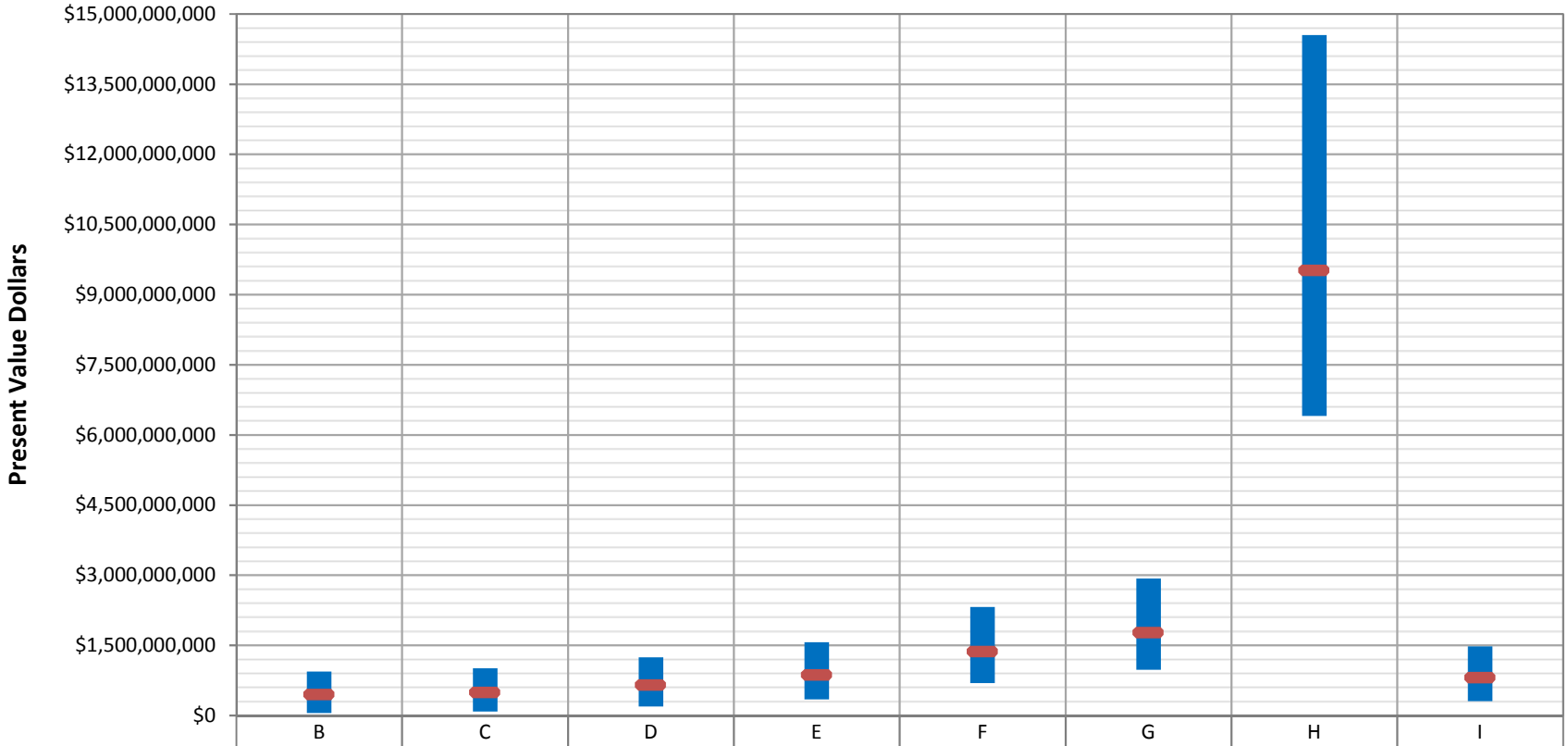
ALTERNATIVE COST SUMMARY

Site: Portland Harbor Superfund Site
Location: Portland, Oregon
Phase: Feasibility Study (-30% to +50%)
Base Year: 2016

Alternative	Total Capital Cost	Total Annual O&M Cost	Total Periodic Cost	Total Non-Discounted Cost	Present Value Cost	Minus 30% Plus 50% Range
A	$0	$0	$0	$0	$0	$0
B	$352,097,000	$0	$290,324,000	$642,421,000	$451,460,000	$316,022,000 to $677,190,000
C	$400,933,000	$0	$317,464,000	$718,397,000	$496,760,000	$347,732,000 to $745,140,000
D	$556,004,000	$0	$397,028,000	$953,032,000	$653,700,000	$457,590,000 to $980,550,000
E	$827,465,000	$0	$412,332,000	$1,239,797,000	$869,530,000	$608,671,000 to $1,304,295,000
F	$1,629,407,000	$0	$549,512,000	$2,178,919,000	$1,371,170,000	$959,819,000 to $2,056,755,000
G	$2,500,545,000	$0	$708,114,000	$3,208,659,000	$1,777,320,000	$1,244,124,000 to $2,665,980,000
H	$8,948,573,000	$0	$1,284,174,000	$10,232,747,000	$9,524,940,000	$6,667,458,000 to $14,287,410,000
I	$751,359,000	$0	$421,940,000	$1,173,299,000	$811,290,000	$567,903,000 to $1,216,935,000

Notes:
1 - Capital costs, annual costs, and periodic costs are presented on Tables CS-A through CS-I. Capital costs are based on Disposed Material Management (DMM) Scenario 2.
2 - Estimated remedial timeframes and associated present value analysis for each remedial alternative are provided on Tables PV-A through PV-I.
3 - The total present value cost demonstrates the impact of a discount rate on the total non-discounted cost and the relative amount of future annual expenditures.
Non-discounted costs are presented for comparison purposes only and should not be used in place of present value costs in the CERCLA remedy selection process.
4 - Costs presented for this alternative are expected to have an accuracy between -30% to +50% of actual costs, based on the scope presented. They are prepared solely to facilitate relative comparisons between alternatives for feasibility study level evaluation purposes.

Exhibit CS-ALT
Alternative Cost Estimate Accuracy Ranges



	B	C	D	E	F	G	H	I
Present Value (-30%)	$316,022,000	$347,732,000	$457,590,000	$608,671,000	$959,819,000	$1,244,124,000	$6,667,458,000	$567,903,000
Present Value	$451,460,000	$496,760,000	$653,700,000	$869,530,000	$1,371,170,000	$1,777,320,000	$9,524,940,000	$811,290,000
Present Value (+50%)	$677,190,000	$745,140,000	$980,550,000	$1,304,295,000	$2,056,755,000	$2,665,980,000	$14,287,410,000	$1,216,935,000

Alternative

Present Value Analysis and Detailed Cost Estimate Summary Alternative A

Note: Costs presented in this present value analysis and detailed cost estimate summary are specific to DMM Scenario 2. Costs for DMM Scenario 1 can be found in Attachment B of this appendix.

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TABLE PV-A

PRESENT VALUE ANALYSIS

Alternative **A**

Site: **Portland Harbor Superfund Site**
Location: **Portland, Oregon**
Phase: **Feasibility Study (-30% to +50%)**
Base Year: **2016**

Year[1]	Capital Costs (Institutional Controls)[2]	Capital Costs (Monitored Natural Recovery)[2]	Capital Costs (Technology Assignments)[2]	Periodic Costs (Long Term Monitoring and Monitored Natural Recovery)	Periodic Costs (Institutional Controls)	Periodic Costs (Five-Year Site Reviews)	Total Annual Expenditure[3]	Discount Factor (7.0%)	Present Value[4]
0	$0	$0	$0	$0	$0	$0	$0	1.0000	$0
1	$0	$0	$0	$0	$0	$0	$0	0.9346	$0
2	$0	$0	$0	$0	$0	$0	$0	0.8734	$0
3	$0	$0	$0	$0	$0	$0	$0	0.8163	$0
4	$0	$0	$0	$0	$0	$0	$0	0.7629	$0
5	$0	$0	$0	$0	$0	$0	$0	0.7130	$0
6	$0	$0	$0	$0	$0	$0	$0	0.6663	$0
7	$0	$0	$0	$0	$0	$0	$0	0.6227	$0
8	$0	$0	$0	$0	$0	$0	$0	0.5820	$0
9	$0	$0	$0	$0	$0	$0	$0	0.5439	$0
10	$0	$0	$0	$0	$0	$0	$0	0.5083	$0
11	$0	$0	$0	$0	$0	$0	$0	0.4751	$0
12	$0	$0	$0	$0	$0	$0	$0	0.4440	$0
13	$0	$0	$0	$0	$0	$0	$0	0.4150	$0
14	$0	$0	$0	$0	$0	$0	$0	0.3878	$0
15	$0	$0	$0	$0	$0	$0	$0	0.3624	$0
16	$0	$0	$0	$0	$0	$0	$0	0.3387	$0
17	$0	$0	$0	$0	$0	$0	$0	0.3166	$0
18	$0	$0	$0	$0	$0	$0	$0	0.2959	$0
19	$0	$0	$0	$0	$0	$0	$0	0.2765	$0
20	$0	$0	$0	$0	$0	$0	$0	0.2584	$0
21	$0	$0	$0	$0	$0	$0	$0	0.2415	$0
22	$0	$0	$0	$0	$0	$0	$0	0.2257	$0
23	$0	$0	$0	$0	$0	$0	$0	0.2109	$0
24	$0	$0	$0	$0	$0	$0	$0	0.1971	$0
25	$0	$0	$0	$0	$0	$0	$0	0.1842	$0
26	$0	$0	$0	$0	$0	$0	$0	0.1722	$0
27	$0	$0	$0	$0	$0	$0	$0	0.1609	$0
28	$0	$0	$0	$0	$0	$0	$0	0.1504	$0
29	$0	$0	$0	$0	$0	$0	$0	0.1406	$0
30	$0	$0	$0	$0	$0	$0	$0	0.1314	$0
TOTALS:	$0	$0	$0	$0	$0	$0	$0		$0
TOTAL PRESENT VALUE OF ALTERNATIVE A[5]									**$0**

Notes:

[1] The alternative is expected to require cost expenditures for perpetuity since some contamination within the sediment bed and associated riverbank soils would remain in-place that do not allow for unrestricted use or unlimited exposure to human or ecological receptors. However the period of analysis was assumed to be 30 yrs beyond the start of construction in Year 0.

[2] Capital costs, for purposes of this analysis, are assumed to be distributed as indicated on Table CS-A.

[3] Total annual expenditure is the total cost per year with no discounting.

[4] Present value is the total cost per year including a 7.0% discount factor for that year. See Table PV-ADRFT for details.

[5] Total present value is rounded to the nearest $10,000. Inflation and depreciation are excluded from the present value cost.

Costs presented for this alternative are expected to have an accuracy between -30% to +50% of actual costs, based on the scope presented.

They are prepared solely to facilitate relative comparisons between alternatives for FS evaluation purposes.

TABLE CS-A

Alternative A

DETAILED COST ESTIMATE SUMMARY

Site:	Portland Harbor Superfund Site	Description:	Description:	The No Action Alternative does not include any dredging, capping, disposal, or treatment of contaminated sediments beyond the early actions that took place at the Gasco and Terminal 4 sites in 2005 and 2008, respectively. The Oregon Health Authority (OHA) would be expected to continue the fish consumption advisories already in place under State legal authorities, but the No Action Alternative does not include implementation of any new ICs or monitoring as a part of a CERCLA action for the Site.
Location:	Portland, Oregon			
Phase:	Feasibility Study (-30% to +50%)			
Base Year:	2016			
Date:	5/24/2016			

CAPITAL COSTS:		
TOTAL CAPITAL COST	**$0**	No capital costs are included for No Further Action alternative.
ANNUAL O&M COSTS:		
TOTAL ANNUAL O&M COST	**$0**	No annual O&M costs are included for No Further Action alternative.
PERIODIC COSTS		
TOTAL PERIODIC COST	**$0**	No periodic costs are included for No Further Action alternative.

Notes:

Percentages used for contingency and professional/technical services costs are based on guidance from Section 5.0 of "A Guide to Developing and Documenting Cost Estimates During the Feasibility Study", EPA 2000. Modifications to the percentages applied for contingency and professional/technical services are documented in Attachment A.

Costs presented for this alternative are expected to have an accuracy between -30% to +50% of actual costs, based on the scope presented. They are prepared solely to facilitate relative comparisons between alternatives for FS evaluation purposes.

Abbreviations:

AC	Acre
CY	Cubic Yard
LS	Lump Sum
QTY	Quantity
SF	Square Foot
TON	Ton

Present Value Analysis and Detailed Cost Estimate Summary Alternative B

Note: Costs presented in this present value analysis and detailed cost estimate summary are specific to DMM Scenario 2. Costs for DMM Scenario 1 can be found in Attachment B of this appendix.

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TABLE PV-B

PRESENT VALUE ANALYSIS

Alternative **B**

Site: **Portland Harbor Superfund Site**
Location: **Portland, Oregon**
Phase: **Feasibility Study (-30% to +50%)**
Base Year: **2016**

Year[1]	Capital Costs (Institutional Controls)[2]	Capital Costs (Monitored Natural Recovery)[2]	Capital Costs (Technology Assignments)[2]	Annual O&M Costs	Periodic Costs (Long Term Monitoring and Monitored Natural Recovery)	Periodic Costs (Long Term Operations and Maintenance and Institutional Controls)	Periodic Costs (Five-Year Site Reviews)	Total Annual Expenditure[3]	Discount Factor (7.0%)	Present Value[4]
0	$620,250	$10,912,000	$84,676,000	$0	$0	$0	$0	$96,208,250	1.0000	$96,208,250
1	$620,250	$0	$84,676,000	$0	$0	$0	$0	$85,296,250	0.9346	$79,717,875
2	$620,250	$0	$84,676,000	$0	$26,744,000	$0	$0	$112,040,250	0.8734	$97,855,954
3	$620,250	$0	$84,676,000	$0	$0	$0	$0	$85,296,250	0.8163	$69,627,329
4	$0	$0	$0	$0	$26,744,000	$0	$0	$26,744,000	0.7629	$20,402,998
5	$0	$0	$0	$0	$0	$3,506,000	$308,000	$3,814,000	0.7130	$2,719,382
6	$0	$0	$0	$0	$26,744,000	$0	$0	$26,744,000	0.6663	$17,819,527
7	$0	$0	$0	$0	$0	$0	$0	$0	0.6227	$0
8	$0	$0	$0	$0	$26,744,000	$0	$0	$26,744,000	0.5820	$15,565,008
9	$0	$0	$0	$0	$0	$0	$0	$0	0.5439	$0
10	$0	$0	$0	$0	$26,744,000	$3,506,000	$308,000	$30,558,000	0.5083	$15,532,631
11	$0	$0	$0	$0	$0	$0	$0	$0	0.4751	$0
12	$0	$0	$0	$0	$0	$0	$0	$0	0.4440	$0
13	$0	$0	$0	$0	$0	$0	$0	$0	0.4150	$0
14	$0	$0	$0	$0	$26,744,000	$0	$0	$26,744,000	0.3878	$10,371,323
15	$0	$0	$0	$0	$0	$3,506,000	$308,000	$3,814,000	0.3624	$1,382,194
16	$0	$0	$0	$0	$0	$0	$0	$0	0.3387	$0
17	$0	$0	$0	$0	$0	$0	$0	$0	0.3166	$0
18	$0	$0	$0	$0	$26,744,000	$0	$0	$26,744,000	0.2959	$7,913,550
19	$0	$0	$0	$0	$0	$0	$0	$0	0.2765	$0
20	$0	$0	$0	$0	$0	$3,506,000	$308,000	$3,814,000	0.2584	$985,538
21	$0	$0	$0	$0	$0	$0	$0	$0	0.2415	$0
22	$0	$0	$0	$0	$26,744,000	$0	$0	$26,744,000	0.2257	$6,036,121
23	$0	$0	$0	$0	$0	$0	$0	$0	0.2109	$0
24	$0	$0	$0	$0	$0	$0	$0	$0	0.1971	$0
25	$0	$0	$0	$0	$0	$3,506,000	$308,000	$3,814,000	0.1842	$702,539
26	$0	$0	$0	$0	$26,744,000	$0	$0	$26,744,000	0.1722	$4,605,317
27	$0	$0	$0	$0	$0	$0	$0	$0	0.1609	$0
28	$0	$0	$0	$0	$0	$0	$0	$0	0.1504	$0
29	$0	$0	$0	$0	$0	$0	$0	$0	0.1406	$0
30	$0	$0	$0	$0	$26,744,000	$3,506,000	$308,000	$30,558,000	0.1314	$4,015,321
TOTALS:	$2,481,000	$10,912,000	$338,704,000	$0	$267,440,000	$21,036,000	$1,848,000	$642,421,000		$451,460,857
TOTAL PRESENT VALUE OF ALTERNATIVE B[5]										**$451,460,000**

Notes:

[1] The alternative is expected to require cost expenditures for perpetuity since some contamination within the sediment bed and associated riverbank soils would remain in-place that do not allow for unrestricted use or unlimited exposure to human or ecological receptors. However the period of analysis was assumed to be 30 yrs beyond the start of construction in Year 0.

[2] Capital costs, for purposes of this analysis, are assumed to be distributed as indicated on Table CS-B.

[3] Total annual expenditure is the total cost per year with no discounting.

[4] Present value is the total cost per year including a 7.0% discount factor for that year. See Table PV-ADRFT for details.

[5] Total present value is rounded to the nearest $10,000. Inflation and depreciation are excluded from the present value cost.

Costs presented for this alternative are expected to have an accuracy between -30% to +50% of actual costs, based on the scope presented.

They are prepared solely to facilitate relative comparisons between alternatives for FS evaluation purposes.

TABLE CS-B

Alternative **B**

DETAILED COST ESTIMATE SUMMARY

Site: Portland Harbor Superfund Site
Location: Portland, Oregon
Phase: Feasibility Study (-30% to +50%)
Base Year: 2016
Date: 5/24/2016

Description: This alternative evaluates a remedy that would involve dredging of contaminated sediments, disposal of contaminated sediment at offsite facilities (Subtitle D and Subtitle C/TSCA), capping, enhanced natural recovery (ENR), in-situ treatment, and monitored natural recovery (MNR).Capital costs are based on Disposed Material Management (DMM) Scenario 2.

INSTITUTIONAL CONTROLS CAPITAL COSTS: (Assumed to be Incurred During Years 0 through 3)

DESCRIPTION	WORKSHEET	QTY	UNIT(S)	UNIT COST	TOTAL	NOTES
Initial Establishment of Institutional Controls	CW-B2	1	LS	$2,016,443	$2,016,443	
SUBTOTAL					$2,016,443	
Contingency (Scope and Bid)		15%			$302,466	10% Scope, 5% Bid as documented in Attachment A.
SUBTOTAL					$2,318,909	
Project Management		2%			$46,378	Percentage modified as documented in Attachment A.
Remedial Design		2%			$46,378	Percentage modified as documented in Attachment A.
Construction Management		3%			$69,567	Percentage modified as documented in Attachment A.
TOTAL					$2,481,232	
TOTAL CAPITAL COST					**$2,481,000**	Total capital cost is rounded to the nearest $1,000.

MONITORED NATURAL RECOVERY CAPITAL COSTS: (Assumed to be Incurred During Year 0)

DESCRIPTION	WORKSHEET	QTY	UNIT(S)	UNIT COST	TOTAL	NOTES
Monitored Natural Recovery (MNR) for MNR/Enhanced Natural Recovery (ENR) and Broadcast GAC Areas	CW-B22	2,073	AC	$3,686	$7,641,756	Quantity represents dredge, MNR/ENR and in situ treatment areas.
SUBTOTAL					$7,641,756	
Contingency (Scope and Bid)		20%			$1,528,351	10% Scope, 10% Bid (Low end of the recommended range in EPA 540-R-00-002).
SUBTOTAL					$9,170,107	
Project Management		5%			$458,505	Percentage from Exhibit 5-8 in EPA 540-R-00-002 was used.
Remedial Design		8%			$733,609	Percentage from Exhibit 5-8 in EPA 540-R-00-002 was used.
Construction Management		6%			$550,206	Percentage from Exhibit 5-8 in EPA 540-R-00-002 was used.
TOTAL					$10,912,427	
TOTAL CAPITAL COST					**$10,912,000**	Total capital cost is rounded to the nearest $1,000.

TABLE CS-B

Alternative B

DETAILED COST ESTIMATE SUMMARY

Site: Portland Harbor Superfund Site
Location: Portland, Oregon
Phase: Feasibility Study (-30% to +50%)
Base Year: 2016
Date: 5/24/2016

Description: This alternative evaluates a remedy that would involve dredging of contaminated sediments, disposal of contaminated sediment at offsite facilities (Subtitle D and Subtitle C/TSCA), capping, enhanced natural recovery (ENR), in-situ treatment, and monitored natural recovery (MNR).Capital costs are based on Disposed Material Management (DMM) Scenario 2.

TECHNOLOGY ASSIGNMENTS MEASURES CAPITAL CONSTRUCTION COSTS: (Assumed to be Incurred During Years 0 through 3)

DESCRIPTION	WORKSHEET	QTY	UNIT(S)	UNIT COST	TOTAL	NOTES
Mobilization / Demobilization	CW-B1	1	LS	$4,155,000	$4,155,000	
Transload Facility Development	CW-B21	1	LS	$7,967,890	$7,967,890	
Debris Removal and Disposal	CW-B5	202	AC	$13,107	$2,647,616	
Obstruction Removal and Relocation	CW-B6	1	LS	$3,907,503	$3,907,503	
Erosion/Residual Control Measures	CW-B7	1	LS	$22,320,235	$22,320,235	
Dredging of Contaminated Sediments (Open Water)	CW-B8	513,841	CY	$24.53	$12,604,520	
Dredging of Contaminated Sediments (Confined)	CW-B9	63,042	CY	$31.10	$1,960,606	
Excavation of Riverbanks	CW-B10	50,769	CY	$5.19	$263,490	
Dewatering and Water Treatment for Dredging Operations	CW-B11	1	LS	$2,595,467	$2,595,467	Includes collection and treatment of water from sediment dewatering during dredging operations
Subtitle C/TSCA Disposal (Handling, Transportation, Treatment of Select PTW Materials, and Disposal)	CW-B12	358,888	TON	$191	$68,535,729	Includes waste going to offsite Subtitle C/TSCA facility for disposal, including the volume of NRC/NAPL PTW that would require treatment
Subtitle D Disposal (Handling, Transportation, and Disposal)	CW-B13	693,843	TON	$111	$76,847,281	Includes waste going to offsite Subtitle D facility for disposal without treatment, including the volume of non-PTW contaminated sediments/riverbank soils as well as the volume of highly toxic PTW
Mitigation	CW-B14	15	AC	$1,070,827	$16,062,405	
Sand Placement for Technology Assignments	CW-B15	342,033	CY	$33.89	$11,591,596	
Beach Mix Placement for Technology Assignments	CW-B16	18,563	CY	$74.24	$1,378,163	
Armor Placement for Technology Assignments	CW-B17	29,533	CY	$72.42	$2,138,814	
Reactive/GAC Placement for Technology Assignments	CW-B18	1	LS	$27,488,372	$27,488,372	
Geofabric for Riverbanks	CW-B19	10.5	AC	$14,311	$150,268	
Organoclay Mat Placement for Technology Assignments	CW-B20	174,300	SF	$6.73	$1,173,039	
SUBTOTAL					$263,787,994	
Contingency (Scope and Bid)		20%			$52,757,599	10% Scope, 10% Bid (Low end of the recommended range in EPA 540-R-00-002).
SUBTOTAL					$316,545,593	
Project Management		2%			$6,330,912	Percentage modified as documented in Attachment A.
Remedial Design		2%			$6,330,912	Percentage modified as documented in Attachment A.
Construction Management		3%			$9,496,368	Percentage modified as documented in Attachment A.
TOTAL					$338,703,785	
TOTAL CAPITAL COST					**$338,704,000**	Total capital cost is rounded to the nearest $1,000.

TABLE CS-B

Alternative B

DETAILED COST ESTIMATE SUMMARY

Site: Portland Harbor Superfund Site
Location: Portland, Oregon
Phase: Feasibility Study (-30% to +50%)
Base Year: 2016
Date: 5/24/2016

Description: This alternative evaluates a remedy that would involve dredging of contaminated sediments, disposal of contaminated sediment at offsite facilities (Subtitle D and Subtitle C/TSCA), capping, enhanced natural recovery (ENR), in-situ treatment, and monitored natural recovery (MNR).Capital costs are based on Disposed Material Management (DMM) Scenario 2.

SITE-WIDE MONITORING AND MONITORED NATURAL RECOVERY PERIODIC COSTS: (Assumed to be Incurred at Years 2, 4, 6, 8, 10 and Every 4 Years through Period of Analysis)

DESCRIPTION	WORKSHEET	QTY	UNIT(S)	UNIT COST	TOTAL	NOTES
Monitored Natural Recovery (MNR) for MNR/Enhanced Natural Recovery (ENR) and Broadcast GAC Areas	CW-B22	2,073	AC	$3,686	$7,641,756	
Site-Wide Monitoring	CW-B23	1	LS	$957,659	$957,659	
Cap Area Monitoring and Reactive Layer Monitoring	CW-B24	1	LS	$12,228,875	$12,228,875	
SUBTOTAL					$20,828,290	
Contingency (Scope and Bid)		20%			$4,165,658	10% Scope, 10% Bid (Low end of the recommended range in EPA 540-R-00-002).
SUBTOTAL					$24,993,948	
Project Management		2%			$499,879	Percentage modified as documented in Attachment A.
Technical Support		5%			$1,249,697	Percentage modified as documented in Attachment A.
TOTAL					$26,743,524	
TOTAL PERIODIC COST					**$26,744,000**	Total periodic cost is rounded to the nearest $1,000.

LONG TERM OPERATIONS AND MAINTENANCE PERIODIC COSTS: (Assumed to be Incurred at Year 5 and Every 5 Years through Period of Analysis)

DESCRIPTION	WORKSHEET	QTY	UNIT(S)	UNIT COST	TOTAL	NOTES
Long-Term Maintenance for Capping, ENR, and In Situ Treatment	CW-B25	1	LS	$2,230,955	$2,230,955	Assume 5% of placement of additional material for capping, ENR and In Situ Treatment. Includes mobilization and demobilization costs.
SUBTOTAL					$2,230,955	
Contingency (Scope and Bid)		20%			$446,191	10% Scope, 10% Bid (Low end of the recommended range in EPA 540-R-00-002).
SUBTOTAL					$2,677,146	
Project Management		5%			$133,857	Low end of the recommended range in EPA 540-R-00-002 was used.
Technical Support		10%			$267,715	Low end of the recommended range in EPA 540-R-00-002 was used.
TOTAL					$3,078,718	
TOTAL PERIODIC COST					**$3,079,000**	Total periodic cost is rounded to the nearest $1,000.

TABLE CS-B

Alternative B

DETAILED COST ESTIMATE SUMMARY

Site: Portland Harbor Superfund Site
Location: Portland, Oregon
Phase: Feasibility Study (-30% to +50%)
Base Year: 2016
Date: 5/24/2016

Description: This alternative evaluates a remedy that would involve dredging of contaminated sediments, disposal of contaminated sediment at offsite facilities (Subtitle D and Subtitle C/TSCA), capping, enhanced natural recovery (ENR), in-situ treatment, and monitored natural recovery (MNR).Capital costs are based on Disposed Material Management (DMM) Scenario 2.

INSTITUTIONAL CONTROLS PERIODIC COSTS: (Assumed to be Incurred at Year 5 and Every 5 Years through Period of Analysis)

DESCRIPTION	WORKSHEET	QTY	UNIT(S)	UNIT COST	TOTAL	NOTES
Evaluating and Updating Institutional Controls	CW-B3	1	LS	$337,883	$337,883	
SUBTOTAL					$337,883	
Contingency (Scope and Bid)		10%			$33,788	10% Scope, 0% Bid as documented in Attachment A.
SUBTOTAL					$371,671	
Project Management		5%			$18,584	Low end of the recommended range in EPA 540-R-00-002 was used.
Technical Support		10%			$37,167	Low end of the recommended range in EPA 540-R-00-002 was used.
TOTAL					$427,422	
TOTAL PERIODIC COST					**$427,000**	Total periodic cost is rounded to the nearest $1,000.

5-YEAR SITE REVIEW PERIODIC COSTS: (Assumed to be Incurred at Year 5 and Every 5 Years through Period of Analysis)

DESCRIPTION	WORKSHEET	QTY	UNIT(S)	UNIT COST	TOTAL	NOTES
5-Year Site Review	CW-B26	1	LS	$243,687	$243,687	
SUBTOTAL					$243,687	
Contingency (Scope and Bid)		10%			$24,369	10% Scope, 0% Bid as documented in Attachment A.
SUBTOTAL					$268,056	
Project Management		5%			$13,403	Low end of the recommended range in EPA 540-R-00-002 was used.
Technical Support		10%			$26,806	Low end of the recommended range in EPA 540-R-00-002 was used.
TOTAL					$308,265	
TOTAL PERIODIC COST					**$308,000**	Total periodic cost is rounded to the nearest $1,000.

Notes:
Percentages used for contingency and professional/technical services costs are based on guidance from Section 5.0 of "A Guide to Developing and Documenting Cost Estimates During the Feasibility Study", EPA 2000. Modifications to the percentages applied for contingency and professional/technical services are documented in Attachment A.
Costs presented for this alternative are expected to have an accuracy between -30% to +50% of actual costs, based on the scope presented. They are prepared solely to facilitate relative comparisons between alternatives for FS evaluation purposes.

Abbreviations:

AC	Acre
CY	Cubic Yard
LS	Lump Sum
QTY	Quantity
SF	Square Foot
TON	Ton

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Present Value Analysis and Detailed Cost Estimate Summary Alternative C

Note: Costs presented in this present value analysis and detailed cost estimate summary are specific to DMM Scenario 2. Costs for DMM Scenario 1 can be found in Attachment B of this appendix.

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TABLE PV-C

PRESENT VALUE ANALYSIS

Alternative **C**

Site: **Portland Harbor Superfund Site**
Location: **Portland, Oregon**
Phase: **Feasibility Study (-30% to +50%)**
Base Year: **2016**

Year[1]	Capital Costs (Institutional Controls)[2]	Capital Costs (Monitored Natural Recovery)[2]	Capital Costs (Technology Assignments)[2]	Annual O&M Costs	Periodic Costs (Long Term Monitoring and Monitored Natural Recovery)	Periodic Costs (Long Term Operations and Maintenance and Institutional Controls)	Periodic Costs (Five-Year Site Reviews)	Total Annual Expenditure[3]	Discount Factor (7.0%)	Present Value[4]
0	$520,200	$10,797,000	$77,507,000	$0	$0	$0	$0	$88,824,200	1.0000	$88,824,200
1	$520,200	$0	$77,507,000	$0	$0	$0	$0	$78,027,200	0.9346	$72,924,221
2	$520,200	$0	$77,507,000	$0	$29,188,000	$0	$0	$107,215,200	0.8734	$93,641,756
3	$520,200	$0	$77,507,000	$0	$0	$0	$0	$78,027,200	0.8163	$63,693,603
4	$520,200	$0	$77,507,000	$0	$29,188,000	$0	$0	$107,215,200	0.7629	$81,794,476
5	$0	$0	$0	$0	$0	$3,956,000	$308,000	$4,264,000	0.7130	$3,040,232
6	$0	$0	$0	$0	$29,188,000	$0	$0	$29,188,000	0.6663	$19,447,964
7	$0	$0	$0	$0	$0	$0	$0	$0	0.6227	$0
8	$0	$0	$0	$0	$29,188,000	$0	$0	$29,188,000	0.5820	$16,987,416
9	$0	$0	$0	$0	$0	$0	$0	$0	0.5439	$0
10	$0	$0	$0	$0	$29,188,000	$3,956,000	$308,000	$33,452,000	0.5083	$17,003,652
11	$0	$0	$0	$0	$0	$0	$0	$0	0.4751	$0
12	$0	$0	$0	$0	$0	$0	$0	$0	0.4440	$0
13	$0	$0	$0	$0	$0	$0	$0	$0	0.4150	$0
14	$0	$0	$0	$0	$29,188,000	$0	$0	$29,188,000	0.3878	$11,319,106
15	$0	$0	$0	$0	$0	$3,956,000	$308,000	$4,264,000	0.3624	$1,545,274
16	$0	$0	$0	$0	$0	$0	$0	$0	0.3387	$0
17	$0	$0	$0	$0	$0	$0	$0	$0	0.3166	$0
18	$0	$0	$0	$0	$29,188,000	$0	$0	$29,188,000	0.2959	$8,636,729
19	$0	$0	$0	$0	$0	$0	$0	$0	0.2765	$0
20	$0	$0	$0	$0	$0	$3,956,000	$308,000	$4,264,000	0.2584	$1,101,818
21	$0	$0	$0	$0	$0	$0	$0	$0	0.2415	$0
22	$0	$0	$0	$0	$29,188,000	$0	$0	$29,188,000	0.2257	$6,587,732
23	$0	$0	$0	$0	$0	$0	$0	$0	0.2109	$0
24	$0	$0	$0	$0	$0	$0	$0	$0	0.1971	$0
25	$0	$0	$0	$0	$0	$3,956,000	$308,000	$4,264,000	0.1842	$785,429
26	$0	$0	$0	$0	$29,188,000	$0	$0	$29,188,000	0.1722	$5,026,174
27	$0	$0	$0	$0	$0	$0	$0	$0	0.1609	$0
28	$0	$0	$0	$0	$0	$0	$0	$0	0.1504	$0
29	$0	$0	$0	$0	$0	$0	$0	$0	0.1406	$0
30	$0	$0	$0	$0	$29,188,000	$3,956,000	$308,000	$33,452,000	0.1314	$4,395,593
TOTALS:	$2,601,000	$10,797,000	$387,535,000	$0	$291,880,000	$23,736,000	$1,848,000	$718,397,000		$496,755,375
TOTAL PRESENT VALUE OF ALTERNATIVE C[5]										**$496,760,000**

Notes:

[1] The alternative is expected to require cost expenditures for perpetuity since some contamination within the sediment bed and associated riverbank soils would remain in-place that do not allow for unrestricted use or unlimited exposure to human or ecological receptors. However the period of analysis was assumed to be 30 yrs beyond the start of construction in Year 0.

[2] Capital costs, for purposes of this analysis, are assumed to be distributed as indicated on Table CS-C.

[3] Total annual expenditure is the total cost per year with no discounting.

[4] Present value is the total cost per year including a 7.0% discount factor for that year. See Table PV-ADRFT for details.

[5] Total present value is rounded to the nearest $10,000. Inflation and depreciation are excluded from the present value cost.

Costs presented for this alternative are expected to have an accuracy between -30% to +50% of actual costs, based on the scope presented.

They are prepared solely to facilitate relative comparisons between alternatives for FS evaluation purposes.

TABLE CS-C

Alternative C

DETAILED COST ESTIMATE SUMMARY

Site: Portland Harbor Superfund Site
Location: Portland, Oregon
Phase: Feasibility Study (-30% to +50%)
Base Year: 2016
Date: 5/24/2016

Description: This alternative evaluates a remedy that would involve dredging of contaminated sediments, disposal of contaminated sediment at offsite facilities (Subtitle D and Subtitle C/TSCA), capping, enhanced natural recovery (ENR), in-situ treatment, and monitored natural recovery (MNR).Capital costs are based on Disposed Material Management (DMM) Scenario 2.

INSTITUTIONAL CONTROLS CAPITAL COSTS: (Assumed to be Incurred During Years 0 through 4)

DESCRIPTION	WORKSHEET	QTY	UNIT(S)	UNIT COST	TOTAL	NOTES
Initial Establishment of Institutional Controls	CW-C2	1	LS	$2,113,635	$2,113,635	
SUBTOTAL					$2,113,635	
Contingency (Scope and Bid)		15%			$317,045	10% Scope, 5% Bid as documented in Attachment A.
SUBTOTAL					$2,430,680	
Project Management		2%			$48,614	Percentage modified as documented in Attachment A.
Remedial Design		2%			$48,614	Percentage modified as documented in Attachment A.
Construction Management		3%			$72,920	Percentage modified as documented in Attachment A.
TOTAL					$2,600,828	
TOTAL CAPITAL COST					**$2,601,000**	Total capital cost is rounded to the nearest $1,000.

MONITORED NATURAL RECOVERY CAPITAL COSTS: (Assumed to be Incurred During Year 0)

DESCRIPTION	WORKSHEET	QTY	UNIT(S)	UNIT COST	TOTAL	NOTES
Monitored Natural Recovery (MNR) for MNR/Enhanced Natural Recovery (ENR) and Broadcast GAC Areas	CW-C22	2,051	AC	$3,686	$7,560,656	Quantity represents dredge, MNR/ENR and in situ treatment areas.
SUBTOTAL					$7,560,656	
Contingency (Scope and Bid)		20%			$1,512,131	10% Scope, 10% Bid (Low end of the recommended range in EPA 540-R-00-002).
SUBTOTAL					$9,072,787	
Project Management		5%			$453,639	Percentage from Exhibit 5-8 in EPA 540-R-00-002 was used.
Remedial Design		8%			$725,823	Percentage from Exhibit 5-8 in EPA 540-R-00-002 was used.
Construction Management		6%			$544,367	Percentage from Exhibit 5-8 in EPA 540-R-00-002 was used.
TOTAL					$10,796,616	
TOTAL CAPITAL COST					**$10,797,000**	Total capital cost is rounded to the nearest $1,000.

TABLE CS-C

Alternative C

DETAILED COST ESTIMATE SUMMARY

Site: Portland Harbor Superfund Site
Location: Portland, Oregon
Phase: Feasibility Study (-30% to +50%)
Base Year: 2016
Date: 5/24/2016

Description: This alternative evaluates a remedy that would involve dredging of contaminated sediments, disposal of contaminated sediment at offsite facilities (Subtitle D and Subtitle C/TSCA), capping, enhanced natural recovery (ENR), in-situ treatment, and monitored natural recovery (MNR).Capital costs are based on Disposed Material Management (DMM) Scenario 2.

TECHNOLOGY ASSIGNMENTS MEASURES CAPITAL CONSTRUCTION COSTS: (Assumed to be Incurred During Years 0 through 4)

DESCRIPTION	WORKSHEET	QTY	UNIT(S)	UNIT COST	TOTAL	NOTES
Mobilization / Demobilization	CW-C1	1	LS	$4,754,000	$4,754,000	
Transload Facility Development	CW-C21	1	LS	$8,821,593	$8,821,593	
Debris Removal and Disposal	CW-C5	220	AC	$13,107	$2,883,542	
Obstruction Removal and Relocation	CW-C6	1	LS	$4,417,721	$4,417,721	
Erosion/Residual Control Measures	CW-C7	1	LS	$23,531,760	$23,531,760	
Dredging of Contaminated Sediments (Open Water)	CW-C8	624,376	CY	$24.53	$15,315,943	
Dredging of Contaminated Sediments (Confined)	CW-C9	66,532	CY	$31.10	$2,069,145	
Excavation of Riverbanks	CW-C10	58,221	CY	$5.19	$302,169	
Dewatering and Water Treatment for Dredging Operations	CW-C11	1	LS	$3,117,117	$3,117,117	Includes collection and treatment of water from sediment dewatering during dredging operations
Subtitle C/TSCA Disposal (Handling, Transportation, Treatment of Select PTW Materials, and Disposal)	CW-C12	358,888	TON	$191	$68,535,729	Includes waste going to offsite Subtitle C/TSCA facility for disposal, including the volume of NRC/NAPL PTW that would require treatment
Subtitle D Disposal (Handling, Transportation, and Disposal)	CW-C13	893,003	TON	$111	$98,905,522	Includes waste going to offsite Subtitle D facility for disposal without treatment, including the volume of non-PTW contaminated sediments/riverbank soils as well as the volume of highly toxic PTW
Mitigation	CW-C14	18	AC	$1,070,827	$19,274,886	
Sand Placement for Technology Assignments	CW-C15	384,021	CY	$33.87	$13,006,276	
Beach Mix Placement for Technology Assignments	CW-C16	22,675	CY	$74.02	$1,678,395	
Armor Placement for Technology Assignments	CW-C17	37,218	CY	$72.24	$2,688,735	
Reactive/GAC Placement for Technology Assignments	CW-C18	1	LS	$31,171,329	$31,171,329	
Geofabric for Riverbanks	CW-C19	12.0	AC	$14,311	$171,735	
Organoclay Mat Placement for Technology Assignments	CW-C20	174,300	SF	$6.73	$1,173,039	
SUBTOTAL					$301,818,636	
Contingency (Scope and Bid)		20%			$60,363,727	10% Scope, 10% Bid (Low end of the recommended range in EPA 540-R-00-002).
SUBTOTAL					$362,182,363	
Project Management		2%			$7,243,647	Percentage modified as documented in Attachment A.
Remedial Design		2%			$7,243,647	Percentage modified as documented in Attachment A.
Construction Management		3%			$10,865,471	Percentage modified as documented in Attachment A.
TOTAL					$387,535,128	
TOTAL CAPITAL COST					**$387,535,000**	Total capital cost is rounded to the nearest $1,000.

TABLE CS-C

Alternative C

DETAILED COST ESTIMATE SUMMARY

Site: Portland Harbor Superfund Site
Location: Portland, Oregon
Phase: Feasibility Study (-30% to +50%)
Base Year: 2016
Date: 5/24/2016

Description: This alternative evaluates a remedy that would involve dredging of contaminated sediments, disposal of contaminated sediment at offsite facilities (Subtitle D and Subtitle C/TSCA), capping, enhanced natural recovery (ENR), in-situ treatment, and monitored natural recovery (MNR).Capital costs are based on Disposed Material Management (DMM) Scenario 2.

SITE-WIDE MONITORING AND MONITORED NATURAL RECOVERY PERIODIC COSTS: (Assumed to be Incurred at Years 2, 4, 6, 8, 10 and Every 4 Years through Period of Analysis)

DESCRIPTION	WORKSHEET	QTY	UNIT(S)	UNIT COST	TOTAL	NOTES
Monitored Natural Recovery (MNR) for MNR/Enhanced Natural Recovery (ENR) and Broadcast GAC Areas	CW-C22	2,051	AC	$3,686	$7,560,656	
Site-Wide Monitoring	CW-C23	1	LS	$957,659	$957,659	
Cap Area Monitoring and Reactive Layer Monitoring	CW-C24	1	LS	$14,214,014	$14,214,014	
SUBTOTAL					$22,732,329	
Contingency (Scope and Bid)		20%			$4,546,466	10% Scope, 10% Bid (Low end of the recommended range in EPA 540-R-00-002).
SUBTOTAL					$27,278,795	
Project Management		2%			$545,576	Percentage modified as documented in Attachment A.
Technical Support		5%			$1,363,940	Percentage modified as documented in Attachment A.
TOTAL					$29,188,311	
TOTAL PERIODIC COST					**$29,188,000**	Total periodic cost is rounded to the nearest $1,000.

LONG TERM OPERATIONS AND MAINTENANCE PERIODIC COSTS: (Assumed to be Incurred at Year 5 and Every 5 Years through Period of Analysis)

DESCRIPTION	WORKSHEET	QTY	UNIT(S)	UNIT COST	TOTAL	NOTES
Long-Term Maintenance for Capping, ENR, and In Situ Treatment	CW-C25	1	LS	$2,534,429	$2,534,429	Assume 5% of placement of additional material for capping, ENR and In Situ Treatment. Includes mobilization and demobilization costs.
SUBTOTAL					$2,534,429	
Contingency (Scope and Bid)		20%			$506,886	10% Scope, 10% Bid (Low end of the recommended range in EPA 540-R-00-002).
SUBTOTAL					$3,041,315	
Project Management		5%			$152,066	Low end of the recommended range in EPA 540-R-00-002 was used.
Technical Support		10%			$304,132	Low end of the recommended range in EPA 540-R-00-002 was used.
TOTAL					$3,497,513	
TOTAL PERIODIC COST					**$3,498,000**	Total periodic cost is rounded to the nearest $1,000.

TABLE CS-C

Alternative C

DETAILED COST ESTIMATE SUMMARY

Site: Portland Harbor Superfund Site
Location: Portland, Oregon
Phase: Feasibility Study (-30% to +50%)
Base Year: 2016
Date: 5/24/2016

Description: This alternative evaluates a remedy that would involve dredging of contaminated sediments, disposal of contaminated sediment at offsite facilities (Subtitle D and Subtitle C/TSCA), capping, enhanced natural recovery (ENR), in-situ treatment, and monitored natural recovery (MNR).Capital costs are based on Disposed Material Management (DMM) Scenario 2.

INSTITUTIONAL CONTROLS PERIODIC COSTS: (Assumed to be Incurred at Year 5 and Every 5 Years through Period of Analysis)

DESCRIPTION	WORKSHEET	QTY	UNIT(S)	UNIT COST	TOTAL	NOTES
Evaluating and Updating Institutional Controls	CW-C3	1	LS	$361,858	$361,858	
SUBTOTAL					$361,858	
Contingency (Scope and Bid)		10%			$36,186	10% Scope, 0% Bid as documented in Attachment A.
SUBTOTAL					$398,044	
Project Management		5%			$19,902	Low end of the recommended range in EPA 540-R-00-002 was used.
Technical Support		10%			$39,804	Low end of the recommended range in EPA 540-R-00-002 was used.
TOTAL					$457,750	
TOTAL PERIODIC COST					**$458,000**	Total periodic cost is rounded to the nearest $1,000.

5-YEAR SITE REVIEW PERIODIC COSTS: (Assumed to be Incurred at Year 5 and Every 5 Years through Period of Analysis)

DESCRIPTION	WORKSHEET	QTY	UNIT(S)	UNIT COST	TOTAL	NOTES
5-Year Site Review	CW-C26	1	LS	$243,687	$243,687	
SUBTOTAL					$243,687	
Contingency (Scope and Bid)		10%			$24,369	10% Scope, 0% Bid as documented in Attachment A.
SUBTOTAL					$268,056	
Project Management		5%			$13,403	Low end of the recommended range in EPA 540-R-00-002 was used.
Technical Support		10%			$26,806	Low end of the recommended range in EPA 540-R-00-002 was used.
TOTAL					$308,265	
TOTAL PERIODIC COST					**$308,000**	Total periodic cost is rounded to the nearest $1,000.

Notes:
Percentages used for contingency and professional/technical services costs are based on guidance from Section 5.0 of "A Guide to Developing and Documenting Cost Estimates During the Feasibility Study", EPA 2000. Modifications to the percentages applied for contingency and professional/technical services are documented in Attachment A.
Costs presented for this alternative are expected to have an accuracy between -30% to +50% of actual costs, based on the scope presented. They are prepared solely to facilitate relative comparisons between alternatives for FS evaluation purposes.

Abbreviations:

AC	Acre
CY	Cubic Yard
LS	Lump Sum
QTY	Quantity
SF	Square Foot
TON	Ton

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Present Value Analysis and Detailed Cost Estimate Summary Alternative D

Note: Costs presented in this present value analysis and detailed cost estimate summary are specific to DMM Scenario 2. Costs for DMM Scenario 1 can be found in Attachment B of this appendix.

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TABLE PV-D

PRESENT VALUE ANALYSIS

Alternative **D**

Site: **Portland Harbor Superfund Site**
Location: **Portland, Oregon**
Phase: **Feasibility Study (-30% to +50%)**
Base Year: **2016**

Year[1]	Capital Costs (Institutional Controls)[2]	Capital Costs (Monitored Natural Recovery)[2]	Capital Costs (Technology Assignments)[2]	Annual O&M Costs	Periodic Costs (Long Term Monitoring and Monitored Natural Recovery)	Periodic Costs (Long Term Operations and Maintenance and Institutional Controls)	Periodic Costs (Five-Year Site Reviews)	Total Annual Expenditure[3]	Discount Factor (7.0%)	Present Value[4]
0	$517,500	$10,481,000	$90,403,000	$0	$0	$0	$0	$101,401,500	1.0000	$101,401,500
1	$517,500	$0	$90,403,000	$0	$0	$0	$0	$90,920,500	0.9346	$84,974,299
2	$517,500	$0	$90,403,000	$0	$36,374,000	$0	$0	$127,294,500	0.8734	$111,179,016
3	$517,500	$0	$90,403,000	$0	$0	$0	$0	$90,920,500	0.8163	$74,218,404
4	$517,500	$0	$90,403,000	$0	$36,374,000	$0	$0	$127,294,500	0.7629	$97,112,974
5	$517,500	$0	$90,403,000	$0	$0	$5,240,000	$308,000	$96,468,500	0.7130	$68,782,041
6	$0	$0	$0	$0	$36,374,000	$0	$0	$36,374,000	0.6663	$24,235,996
7	$0	$0	$0	$0	$0	$0	$0	$0	0.6227	$0
8	$0	$0	$0	$0	$36,374,000	$0	$0	$36,374,000	0.5820	$21,169,668
9	$0	$0	$0	$0	$0	$0	$0	$0	0.5439	$0
10	$0	$0	$0	$0	$36,374,000	$5,240,000	$308,000	$41,922,000	0.5083	$21,308,953
11	$0	$0	$0	$0	$0	$0	$0	$0	0.4751	$0
12	$0	$0	$0	$0	$0	$0	$0	$0	0.4440	$0
13	$0	$0	$0	$0	$0	$0	$0	$0	0.4150	$0
14	$0	$0	$0	$0	$36,374,000	$0	$0	$36,374,000	0.3878	$14,105,837
15	$0	$0	$0	$0	$0	$5,240,000	$308,000	$5,548,000	0.3624	$2,010,595
16	$0	$0	$0	$0	$0	$0	$0	$0	0.3387	$0
17	$0	$0	$0	$0	$0	$0	$0	$0	0.3166	$0
18	$0	$0	$0	$0	$36,374,000	$0	$0	$36,374,000	0.2959	$10,763,067
19	$0	$0	$0	$0	$0	$0	$0	$0	0.2765	$0
20	$0	$0	$0	$0	$0	$5,240,000	$308,000	$5,548,000	0.2584	$1,433,603
21	$0	$0	$0	$0	$0	$0	$0	$0	0.2415	$0
22	$0	$0	$0	$0	$36,374,000	$0	$0	$36,374,000	0.2257	$8,209,612
23	$0	$0	$0	$0	$0	$0	$0	$0	0.2109	$0
24	$0	$0	$0	$0	$0	$0	$0	$0	0.1971	$0
25	$0	$0	$0	$0	$0	$5,240,000	$308,000	$5,548,000	0.1842	$1,021,942
26	$0	$0	$0	$0	$36,374,000	$0	$0	$36,374,000	0.1722	$6,263,603
27	$0	$0	$0	$0	$0	$0	$0	$0	0.1609	$0
28	$0	$0	$0	$0	$0	$0	$0	$0	0.1504	$0
29	$0	$0	$0	$0	$0	$0	$0	$0	0.1406	$0
30	$0	$0	$0	$0	$36,374,000	$5,240,000	$308,000	$41,922,000	0.1314	$5,508,551
TOTALS:	$3,105,000	$10,481,000	$542,418,000	$0	$363,740,000	$31,440,000	$1,848,000	$953,032,000		$653,699,661
TOTAL PRESENT VALUE OF ALTERNATIVE D[5]										**$653,700,000**

Notes:

[1] The alternative is expected to require cost expenditures for perpetuity since some contamination within the sediment bed and associated riverbank soils would remain in-place that do not allow for unrestricted use or unlimited exposure to human or ecological receptors. However the period of analysis was assumed to be 30 yrs beyond the start of construction in Year 0.

[2] Capital costs, for purposes of this analysis, are assumed to be distributed as indicated on Table CS-D.

[3] Total annual expenditure is the total cost per year with no discounting.

[4] Present value is the total cost per year including a 7.0% discount factor for that year. See Table PV-ADRFT for details.

[5] Total present value is rounded to the nearest $10,000. Inflation and depreciation are excluded from the present value cost.

Costs presented for this alternative are expected to have an accuracy between -30% to +50% of actual costs, based on the scope presented.

They are prepared solely to facilitate relative comparisons between alternatives for FS evaluation purposes.

TABLE CS-D

Alternative D

DETAILED COST ESTIMATE SUMMARY

Site: Portland Harbor Superfund Site
Location: Portland, Oregon
Phase: Feasibility Study (-30% to +50%)
Base Year: 2016
Date: 5/24/2016

Description: This alternative evaluates a remedy that would involve dredging of contaminated sediments, disposal of contaminated sediment at offsite facilities (Subtitle D and Subtitle C/TSCA), capping, enhanced natural recovery (ENR), in-situ treatment, and monitored natural recovery (MNR). Capital costs are based on Disposed Material Management (DMM) Scenario 2.

INSTITUTIONAL CONTROLS CAPITAL COSTS: (Assumed to be Incurred During Years 0 through 5)

DESCRIPTION	WORKSHEET	QTY	UNIT(S)	UNIT COST	TOTAL	NOTES
Initial Establishment of Institutional Controls	CW-D2	1	LS	$2,523,020	$2,523,020	
SUBTOTAL					$2,523,020	
Contingency (Scope and Bid)		15%			$378,453	10% Scope, 5% Bid as documented in Attachment A.
SUBTOTAL					$2,901,473	
Project Management		2%			$58,029	Percentage modified as documented in Attachment A.
Remedial Design		2%			$58,029	Percentage modified as documented in Attachment A.
Construction Management		3%			$87,044	Percentage modified as documented in Attachment A.
TOTAL					$3,104,575	
TOTAL CAPITAL COST					**$3,105,000**	Total capital cost is rounded to the nearest $1,000.

MONITORED NATURAL RECOVERY CAPITAL COSTS: (Assumed to be Incurred During Year 0)

DESCRIPTION	WORKSHEET	QTY	UNIT(S)	UNIT COST	TOTAL	NOTES
Monitored Natural Recovery (MNR) for MNR/Enhanced Natural Recovery (ENR) and Broadcast GAC Areas	CW-D22	1,991	AC	$3,686	$7,339,477	Quantity represents dredge, MNR/ENR and in situ treatment areas.
SUBTOTAL					$7,339,477	
Contingency (Scope and Bid)		20%			$1,467,895	10% Scope, 10% Bid (Low end of the recommended range in EPA 540-R-00-002).
SUBTOTAL					$8,807,372	
Project Management		5%			$440,369	Percentage from Exhibit 5-8 in EPA 540-R-00-002 was used.
Remedial Design		8%			$704,590	Percentage from Exhibit 5-8 in EPA 540-R-00-002 was used.
Construction Management		6%			$528,442	Percentage from Exhibit 5-8 in EPA 540-R-00-002 was used.
TOTAL					$10,480,773	
TOTAL CAPITAL COST					**$10,481,000**	Total capital cost is rounded to the nearest $1,000.

TABLE CS-D

Alternative D

DETAILED COST ESTIMATE SUMMARY

Site: Portland Harbor Superfund Site
Location: Portland, Oregon
Phase: Feasibility Study (-30% to +50%)
Base Year: 2016
Date: 5/24/2016

Description: This alternative evaluates a remedy that would involve dredging of contaminated sediments, disposal of contaminated sediment at offsite facilities (Subtitle D and Subtitle C/TSCA), capping, enhanced natural recovery (ENR), in-situ treatment, and monitored natural recovery (MNR). Capital costs are based on Disposed Material Management (DMM) Scenario 2.

TECHNOLOGY ASSIGNMENTS MEASURES CAPITAL CONSTRUCTION COSTS: (Assumed to be Incurred During Years 0 through 5)

DESCRIPTION	WORKSHEET	QTY	UNIT(S)	UNIT COST	TOTAL	NOTES
Mobilization / Demobilization	CW-D1	1	LS	$6,653,000	$6,653,000	
Transload Facility Development	CW-D21	1	LS	$9,675,295	$9,675,295	
Debris Removal and Disposal	CW-D5	268	AC	$13,107	$3,512,679	
Obstruction Removal and Relocation	CW-D6	1	LS	$6,933,407	$6,933,407	
Erosion/Residual Control Measures	CW-D7	1	LS	$23,531,760	$23,531,760	
Dredging of Contaminated Sediments (Open Water)	CW-D8	1,035,580	CY	$24.53	$25,402,777	
Dredging of Contaminated Sediments (Confined)	CW-D9	72,466	CY	$31.10	$2,253,693	
Excavation of Riverbanks	CW-D10	73,192	CY	$5.19	$379,864	
Dewatering and Water Treatment for Dredging Operations	CW-D11	1	LS	$4,925,014	$4,925,014	Includes collection and treatment of water from sediment dewatering during dredging operations
Subtitle C/TSCA Disposal (Handling, Transportation, Treatment of Select PTW Materials, and Disposal)	CW-D12	358,888	TON	$191	$68,535,729	Includes waste going to offsite Subtitle C/TSCA facility for disposal, including the volume of NRC/NAPL PTW that would require treatment
Subtitle D Disposal (Handling, Transportation, and Disposal)	CW-D13	1,599,182	TON	$111	$177,119,261	Includes waste going to offsite Subtitle D facility for disposal without treatment, including the volume of non-PTW contaminated sediments/riverbank soils as well as the volume of highly toxic PTW
Mitigation	CW-D14	25	AC	$1,070,827	$26,770,675	
Sand Placement for Technology Assignments	CW-D15	475,860	CY	$33.82	$16,095,462	
Beach Mix Placement for Technology Assignments	CW-D16	32,441	CY	$73.59	$2,387,358	
Armor Placement for Technology Assignments	CW-D17	53,344	CY	$72.06	$3,844,036	
Reactive/GAC Placement for Technology Assignments	CW-D18	1	LS	$43,035,063	$43,035,063	
Geofabric for Riverbanks	CW-D19	15.1	AC	$14,311	$216,100	
Organoclay Mat Placement for Technology Assignments	CW-D20	174,300	SF	$6.73	$1,173,039	
SUBTOTAL					$422,444,212	
Contingency (Scope and Bid)		20%			$84,488,842	10% Scope, 10% Bid (Low end of the recommended range in EPA 540-R-00-002).
SUBTOTAL					$506,933,054	
Project Management		2%			$10,138,661	Percentage modified as documented in Attachment A.
Remedial Design		2%			$10,138,661	Percentage modified as documented in Attachment A.
Construction Management		3%			$15,207,992	Percentage modified as documented in Attachment A.
TOTAL					$542,418,368	
TOTAL CAPITAL COST					**$542,418,000**	Total capital cost is rounded to the nearest $1,000.

TABLE CS-D

Alternative D

DETAILED COST ESTIMATE SUMMARY

Site: Portland Harbor Superfund Site
Location: Portland, Oregon
Phase: Feasibility Study (-30% to +50%)
Base Year: 2016
Date: 5/24/2016

Description: This alternative evaluates a remedy that would involve dredging of contaminated sediments, disposal of contaminated sediment at offsite facilities (Subtitle D and Subtitle C/TSCA), capping, enhanced natural recovery (ENR), in-situ treatment, and monitored natural recovery (MNR). Capital costs are based on Disposed Material Management (DMM) Scenario 2.

SITE-WIDE MONITORING AND MONITORED NATURAL RECOVERY PERIODIC COSTS: (Assumed to be Incurred at Years 2, 4, 6, 8, 10 and Every 4 Years through Period of Analysis)

DESCRIPTION	WORKSHEET	QTY	UNIT(S)	UNIT COST	TOTAL	NOTES
Monitored Natural Recovery (MNR) for MNR/Enhanced Natural Recovery (ENR) and Broadcast GAC Areas	CW-D22	1,991	AC	$3,686	$7,339,477	
Site-Wide Monitoring	CW-D23	1	LS	$957,659	$957,659	
Cap Area Monitoring and Reactive Layer Monitoring	CW-D24	1	LS	$20,031,523	$20,031,523	
SUBTOTAL					$28,328,659	
Contingency (Scope and Bid)		20%			$5,665,732	10% Scope, 10% Bid (Low end of the recommended range in EPA 540-R-00-002).
SUBTOTAL					$33,994,391	
Project Management		2%			$679,888	Percentage modified as documented in Attachment A.
Technical Support		5%			$1,699,720	Percentage modified as documented in Attachment A.
TOTAL					$36,373,999	
TOTAL PERIODIC COST					**$36,374,000**	Total periodic cost is rounded to the nearest $1,000.

LONG TERM OPERATIONS AND MAINTENANCE PERIODIC COSTS: (Assumed to be Incurred at Year 5 and Every 5 Years through Period of Analysis)

DESCRIPTION	WORKSHEET	QTY	UNIT(S)	UNIT COST	TOTAL	NOTES
Long-Term Maintenance for Capping, ENR, and In Situ Treatment	CW-D25	1	LS	$3,391,669	$3,391,669	Assume 5% of placement of additional material for capping, ENR and In Situ Treatment. Includes mobilization and demobilization costs.
SUBTOTAL					$3,391,669	
Contingency (Scope and Bid)		20%			$678,334	10% Scope, 10% Bid (Low end of the recommended range in EPA 540-R-00-002).
SUBTOTAL					$4,070,003	
Project Management		5%			$203,500	Low end of the recommended range in EPA 540-R-00-002 was used.
Technical Support		10%			$407,000	Low end of the recommended range in EPA 540-R-00-002 was used.
TOTAL					$4,680,503	
TOTAL PERIODIC COST					**$4,681,000**	Total periodic cost is rounded to the nearest $1,000.

TABLE CS-D

Alternative D

DETAILED COST ESTIMATE SUMMARY

Site: Portland Harbor Superfund Site
Location: Portland, Oregon
Phase: Feasibility Study (-30% to +50%)
Base Year: 2016
Date: 5/24/2016

Description: This alternative evaluates a remedy that would involve dredging of contaminated sediments, disposal of contaminated sediment at offsite facilities (Subtitle D and Subtitle C/TSCA), capping, enhanced natural recovery (ENR), in-situ treatment, and monitored natural recovery (MNR). Capital costs are based on Disposed Material Management (DMM) Scenario 2.

INSTITUTIONAL CONTROLS PERIODIC COSTS: (Assumed to be Incurred at Year 5 and Every 5 Years through Period of Analysis)

DESCRIPTION	WORKSHEET	QTY	UNIT(S)	UNIT COST	TOTAL	NOTES
Evaluating and Updating Institutional Controls	CW-D3	1	LS	$441,761	$441,761	
SUBTOTAL					$441,761	
Contingency (Scope and Bid)		10%			$44,176	10% Scope, 0% Bid as documented in Attachment A.
SUBTOTAL					$485,937	
Project Management		5%			$24,297	Low end of the recommended range in EPA 540-R-00-002 was used.
Technical Support		10%			$48,594	Low end of the recommended range in EPA 540-R-00-002 was used.
TOTAL					$558,828	
TOTAL PERIODIC COST					**$559,000**	Total periodic cost is rounded to the nearest $1,000.

5-YEAR SITE REVIEW PERIODIC COSTS: (Assumed to be Incurred at Year 5 and Every 5 Years through Period of Analysis)

DESCRIPTION	WORKSHEET	QTY	UNIT(S)	UNIT COST	TOTAL	NOTES
5-Year Site Review	CW-D26	1	LS	$243,687	$243,687	
SUBTOTAL					$243,687	
Contingency (Scope and Bid)		10%			$24,369	10% Scope, 0% Bid as documented in Attachment A.
SUBTOTAL					$268,056	
Project Management		5%			$13,403	Low end of the recommended range in EPA 540-R-00-002 was used.
Technical Support		10%			$26,806	Low end of the recommended range in EPA 540-R-00-002 was used.
TOTAL					$308,265	
TOTAL PERIODIC COST					**$308,000**	Total periodic cost is rounded to the nearest $1,000.

Notes:
Percentages used for contingency and professional/technical services costs are based on guidance from Section 5.0 of "A Guide to Developing and Documenting Cost Estimates During the Feasibility Study", EPA 2000. Modifications to the percentages applied for contingency and professional/technical services are documented in Attachment A.
Costs presented for this alternative are expected to have an accuracy between -30% to +50% of actual costs, based on the scope presented. They are prepared solely to facilitate relative comparisons between alternatives for FS evaluation purposes.

Abbreviations:

AC	Acre
CY	Cubic Yard
LS	Lump Sum
QTY	Quantity
SF	Square Foot
TON	Ton

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Present Value Analysis and Detailed Cost Estimate Summary Alternative E

Note: Costs presented in this present value analysis and detailed cost estimate summary are specific to DMM Scenario 2. Costs for DMM Scenario 1 can be found in Attachment B of this appendix.

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TABLE PV-E

PRESENT VALUE ANALYSIS

Alternative **E**

Site: **Portland Harbor Superfund Site**
Location: **Portland, Oregon**
Phase: **Feasibility Study (-30% to +50%)**
Base Year: **2016**

Year[1]	Capital Costs (Institutional Controls)[2]	Capital Costs (Monitored Natural Recovery)[2]	Capital Costs (Technology Assignments)[2]	Annual O&M Costs	Periodic Costs (Long Term Monitoring and Monitored Natural Recovery)	Periodic Costs (Long Term Operations and Maintenance and Institutional Controls)	Periodic Costs (Five-Year Site Reviews)	Total Annual Expenditure[3]	Discount Factor (7.0%)	Present Value[4]
0	$524,714	$9,991,000	$116,257,286	$0	$0	$0	$0	$126,773,000	1.0000	$126,773,000
1	$524,714	$0	$116,257,286	$0	$0	$0	$0	$116,782,000	0.9346	$109,144,457
2	$524,714	$0	$116,257,286	$0	$37,467,000	$0	$0	$154,249,000	0.8734	$134,721,077
3	$524,714	$0	$116,257,286	$0	$0	$0	$0	$116,782,000	0.8163	$95,329,147
4	$524,714	$0	$116,257,286	$0	$37,467,000	$0	$0	$154,249,000	0.7629	$117,676,562
5	$524,714	$0	$116,257,286	$0	$0	$5,969,000	$308,000	$123,059,000	0.7130	$87,741,067
6	$524,714	$0	$116,257,286	$0	$37,467,000	$0	$0	$154,249,000	0.6663	$102,776,109
7	$0	$0	$0	$0	$0	$0	$0	$0	0.6227	$0
8	$0	$0	$0	$0	$37,467,000	$0	$0	$37,467,000	0.5820	$21,805,794
9	$0	$0	$0	$0	$0	$0	$0	$0	0.5439	$0
10	$0	$0	$0	$0	$37,467,000	$5,969,000	$308,000	$43,744,000	0.5083	$22,235,075
11	$0	$0	$0	$0	$0	$0	$0	$0	0.4751	$0
12	$0	$0	$0	$0	$0	$0	$0	$0	0.4440	$0
13	$0	$0	$0	$0	$0	$0	$0	$0	0.4150	$0
14	$0	$0	$0	$0	$37,467,000	$0	$0	$37,467,000	0.3878	$14,529,703
15	$0	$0	$0	$0	$0	$5,969,000	$308,000	$6,277,000	0.3624	$2,274,785
16	$0	$0	$0	$0	$0	$0	$0	$0	0.3387	$0
17	$0	$0	$0	$0	$0	$0	$0	$0	0.3166	$0
18	$0	$0	$0	$0	$37,467,000	$0	$0	$37,467,000	0.2959	$11,086,485
19	$0	$0	$0	$0	$0	$0	$0	$0	0.2765	$0
20	$0	$0	$0	$0	$0	$5,969,000	$308,000	$6,277,000	0.2584	$1,621,977
21	$0	$0	$0	$0	$0	$0	$0	$0	0.2415	$0
22	$0	$0	$0	$0	$37,467,000	$0	$0	$37,467,000	0.2257	$8,456,302
23	$0	$0	$0	$0	$0	$0	$0	$0	0.2109	$0
24	$0	$0	$0	$0	$0	$0	$0	$0	0.1971	$0
25	$0	$0	$0	$0	$0	$5,969,000	$308,000	$6,277,000	0.1842	$1,156,223
26	$0	$0	$0	$0	$37,467,000	$0	$0	$37,467,000	0.1722	$6,451,817
27	$0	$0	$0	$0	$0	$0	$0	$0	0.1609	$0
28	$0	$0	$0	$0	$0	$0	$0	$0	0.1504	$0
29	$0	$0	$0	$0	$0	$0	$0	$0	0.1406	$0
30	$0	$0	$0	$0	$37,467,000	$5,969,000	$308,000	$43,744,000	0.1314	$5,747,962
TOTALS:	$3,673,000	$9,991,000	$813,801,000	$0	$374,670,000	$35,814,000	$1,848,000	$1,239,797,000		$869,527,542
TOTAL PRESENT VALUE OF ALTERNATIVE E[5]										**$869,530,000**

Notes:

[1] The alternative is expected to require cost expenditures for perpetuity since some contamination within the sediment bed and associated riverbank soils would remain in-place that do not allow for unrestricted use or unlimited exposure to human or ecological receptors. However the period of analysis was assumed to be 30 yrs beyond the start of construction in Year 0.

[2] Capital costs, for purposes of this analysis, are assumed to be distributed as indicated on Table CS-E.

[3] Total annual expenditure is the total cost per year with no discounting.

[4] Present value is the total cost per year including a 7.0% discount factor for that year. See Table PV-ADRFT for details.

[5] Total present value is rounded to the nearest $10,000. Inflation and depreciation are excluded from the present value cost.

Costs presented for this alternative are expected to have an accuracy between -30% to +50% of actual costs, based on the scope presented.

They are prepared solely to facilitate relative comparisons between alternatives for FS evaluation purposes.

TABLE CS-E

Alternative **E**

DETAILED COST ESTIMATE SUMMARY

Site: Portland Harbor Superfund Site
Location: Portland, Oregon
Phase: Feasibility Study (-30% to +50%)
Base Year: 2016
Date: 5/24/2016

Description: This alternative evaluates a remedy that would involve dredging of contaminated sediments, disposal of contaminated sediment at offsite facilities (Subtitle D and Subtitle C/TSCA), capping, enhanced natural recovery (ENR), in-situ treatment, and monitored natural recovery (MNR). Capital costs are based on Disposed Material Management (DMM) Scenario 2.

INSTITUTIONAL CONTROLS CAPITAL COSTS: (Assumed to be Incurred During Years 0 through 6)

DESCRIPTION	WORKSHEET	QTY	UNIT(S)	UNIT COST	TOTAL	NOTES
Initial Establishment of Institutional Controls	CW-E2	1	LS	$2,985,246	$2,985,246	
SUBTOTAL					$2,985,246	
Contingency (Scope and Bid)		15%			$447,787	10% Scope, 5% Bid as documented in Attachment A.
SUBTOTAL					$3,433,033	
Project Management		2%			$68,661	Percentage modified as documented in Attachment A.
Remedial Design		2%			$68,661	Percentage modified as documented in Attachment A.
Construction Management		3%			$102,991	Percentage modified as documented in Attachment A.
TOTAL					$3,673,346	
TOTAL CAPITAL COST					**$3,673,000**	Total capital cost is rounded to the nearest $1,000.

MONITORED NATURAL RECOVERY CAPITAL COSTS: (Assumed to be Incurred During Year 0)

DESCRIPTION	WORKSHEET	QTY	UNIT(S)	UNIT COST	TOTAL	NOTES
Monitored Natural Recovery (MNR) for MNR/Enhanced Natural Recovery (ENR) and Broadcast GAC Areas	CW-E22	1,898	AC	$3,686	$6,996,648	Quantity represents dredge, MNR/ENR and in situ treatment areas.
SUBTOTAL					$6,996,648	
Contingency (Scope and Bid)		20%			$1,399,330	10% Scope, 10% Bid (Low end of the recommended range in EPA 540-R-00-002).
SUBTOTAL					$8,395,978	
Project Management		5%			$419,799	Percentage from Exhibit 5-8 in EPA 540-R-00-002 was used.
Remedial Design		8%			$671,678	Percentage from Exhibit 5-8 in EPA 540-R-00-002 was used.
Construction Management		6%			$503,759	Percentage from Exhibit 5-8 in EPA 540-R-00-002 was used.
TOTAL					$9,991,214	
TOTAL CAPITAL COST					**$9,991,000**	Total capital cost is rounded to the nearest $1,000.

TABLE CS-E

Alternative **E**

DETAILED COST ESTIMATE SUMMARY

Site: Portland Harbor Superfund Site
Location: Portland, Oregon
Phase: Feasibility Study (-30% to +50%)
Base Year: 2016
Date: 5/24/2016

Description: This alternative evaluates a remedy that would involve dredging of contaminated sediments, disposal of contaminated sediment at offsite facilities (Subtitle D and Subtitle C/TSCA), capping, enhanced natural recovery (ENR), in-situ treatment, and monitored natural recovery (MNR). Capital costs are based on Disposed Material Management (DMM) Scenario 2.

TECHNOLOGY ASSIGNMENTS MEASURES CAPITAL CONSTRUCTION COSTS: (Assumed to be Incurred During Years 0 through 6)

DESCRIPTION	WORKSHEET	QTY	UNIT(S)	UNIT COST	TOTAL	NOTES
Mobilization / Demobilization	CW-E1	1	LS	$9,982,000	$9,982,000	
Transload Facility Development	CW-E21	1	LS	$10,528,998	$10,528,998	
Debris Removal and Disposal	CW-E5	330	AC	$13,107	$4,325,313	
Obstruction Removal and Relocation	CW-E6	1	LS	$15,701,434	$15,701,434	
Erosion/Residual Control Measures	CW-E7	1	LS	$24,743,285	$24,743,285	
Dredging of Contaminated Sediments (Open Water)	CW-E8	1,835,521	CY	$24.53	$45,025,330	
Dredging of Contaminated Sediments (Confined)	CW-E9	92,616	CY	$31.10	$2,880,358	
Excavation of Riverbanks	CW-E10	96,086	CY	$5.19	$498,687	
Dewatering and Water Treatment for Dredging Operations	CW-E11	1	LS	$8,443,577	$8,443,577	Includes collection and treatment of water from sediment dewatering during dredging operations
Subtitle C/TSCA Disposal (Handling, Transportation, Treatment of Select PTW Materials, and Disposal)	CW-E12	358,888	TON	$191	$68,535,729	Includes waste going to offsite Subtitle C/TSCA facility for disposal, including the volume of NRC/NAPL PTW that would require treatment
Subtitle D Disposal (Handling, Transportation, and Disposal)	CW-E13	2,975,613	TON	$111	$329,567,250	Includes waste going to offsite Subtitle D facility for disposal without treatment, including the volume of non-PTW contaminated sediments/riverbank soils as well as the volume of highly toxic PTW
Mitigation	CW-E14	35	AC	$1,070,827	$37,478,945	
Sand Placement for Technology Assignments	CW-E15	665,248	CY	$33.73	$22,437,471	
Beach Mix Placement for Technology Assignments	CW-E16	48,189	CY	$73.34	$3,534,049	
Armor Placement for Technology Assignments	CW-E17	79,256	CY	$72.14	$5,717,178	
Reactive/GAC Placement for Technology Assignments	CW-E18	1	LS	$42,943,721	$42,943,721	
Geofabric for Riverbanks	CW-E19	19.9	AC	$14,311	$284,794	
Organoclay Mat Placement for Technology Assignments	CW-E20	174,300	SF	$6.73	$1,173,039	
SUBTOTAL					$633,801,158	
Contingency (Scope and Bid)		20%			$126,760,232	10% Scope, 10% Bid (Low end of the recommended range in EPA 540-R-00-002).
SUBTOTAL					$760,561,390	
Project Management		2%			$15,211,228	Percentage modified as documented in Attachment A.
Remedial Design		2%			$15,211,228	Percentage modified as documented in Attachment A.
Construction Management		3%			$22,816,842	Percentage modified as documented in Attachment A.
TOTAL					$813,800,688	
TOTAL CAPITAL COST					**$813,801,000**	Total capital cost is rounded to the nearest $1,000.

TABLE CS-E

Alternative E

DETAILED COST ESTIMATE SUMMARY

Site: Portland Harbor Superfund Site
Location: Portland, Oregon
Phase: Feasibility Study (-30% to +50%)
Base Year: 2016
Date: 5/24/2016

Description: This alternative evaluates a remedy that would involve dredging of contaminated sediments, disposal of contaminated sediment at offsite facilities (Subtitle D and Subtitle C/TSCA), capping, enhanced natural recovery (ENR), in-situ treatment, and monitored natural recovery (MNR). Capital costs are based on Disposed Material Management (DMM) Scenario 2.

SITE-WIDE MONITORING AND MONITORED NATURAL RECOVERY PERIODIC COSTS: (Assumed to be Incurred at Years 2, 4, 6, 8, 10 and Every 4 Years through Period of Analysis)

DESCRIPTION	WORKSHEET	QTY	UNIT(S)	UNIT COST	TOTAL	NOTES
Monitored Natural Recovery (MNR) for MNR/Enhanced Natural Recovery (ENR) and Broadcast GAC Areas	CW-E22	1,898	AC	$3,686	$6,996,648	
Site-Wide Monitoring	CW-E23	1	LS	$957,659	$957,659	
Cap Area Monitoring and Reactive Layer Monitoring	CW-E24	1	LS	$21,225,951	$21,225,951	
SUBTOTAL					$29,180,258	
Contingency (Scope and Bid)		20%			$5,836,052	10% Scope, 10% Bid (Low end of the recommended range in EPA 540-R-00-002).
SUBTOTAL					$35,016,310	
Project Management		2%			$700,326	Percentage modified as documented in Attachment A.
Technical Support		5%			$1,750,816	Percentage modified as documented in Attachment A.
TOTAL					$37,467,452	
TOTAL PERIODIC COST					**$37,467,000**	Total periodic cost is rounded to the nearest $1,000.

LONG TERM OPERATIONS AND MAINTENANCE PERIODIC COSTS: (Assumed to be Incurred at Year 5 and Every 5 Years through Period of Analysis)

DESCRIPTION	WORKSHEET	QTY	UNIT(S)	UNIT COST	TOTAL	NOTES
Long-Term Maintenance for Capping, ENR, and In Situ Treatment	CW-E25	1	LS	$3,865,618	$3,865,618	Assume 5% of placement of additional material for capping, ENR and In Situ Treatment. Includes mobilization and demobilization costs.
SUBTOTAL					$3,865,618	
Contingency (Scope and Bid)		20%			$773,124	10% Scope, 10% Bid (Low end of the recommended range in EPA 540-R-00-002).
SUBTOTAL					$4,638,742	
Project Management		5%			$231,937	Low end of the recommended range in EPA 540-R-00-002 was used.
Technical Support		10%			$463,874	Low end of the recommended range in EPA 540-R-00-002 was used.
TOTAL					$5,334,553	
TOTAL PERIODIC COST					**$5,335,000**	Total periodic cost is rounded to the nearest $1,000.

TABLE CS-E

Alternative **E**

DETAILED COST ESTIMATE SUMMARY

Site: Portland Harbor Superfund Site
Location: Portland, Oregon
Phase: Feasibility Study (-30% to +50%)
Base Year: 2016
Date: 5/24/2016

Description: This alternative evaluates a remedy that would involve dredging of contaminated sediments, disposal of contaminated sediment at offsite facilities (Subtitle D and Subtitle C/TSCA), capping, enhanced natural recovery (ENR), in-situ treatment, and monitored natural recovery (MNR). Capital costs are based on Disposed Material Management (DMM) Scenario 2.

INSTITUTIONAL CONTROLS PERIODIC COSTS: (Assumed to be Incurred at Year 5 and Every 5 Years through Period of Analysis)

DESCRIPTION	WORKSHEET	QTY	UNIT(S)	UNIT COST	TOTAL	NOTES
Evaluating and Updating Institutional Controls	CW-E3	1	LS	$501,289	$501,289	
SUBTOTAL					$501,289	
Contingency (Scope and Bid)		10%			$50,129	10% Scope, 0% Bid as documented in Attachment A.
SUBTOTAL					$551,418	
Project Management		5%			$27,571	Low end of the recommended range in EPA 540-R-00-002 was used.
Technical Support		10%			$55,142	Low end of the recommended range in EPA 540-R-00-002 was used.
TOTAL					$634,131	
TOTAL PERIODIC COST					**$634,000**	Total periodic cost is rounded to the nearest $1,000.

5-YEAR SITE REVIEW PERIODIC COSTS: (Assumed to be Incurred at Year 5 and Every 5 Years through Period of Analysis)

DESCRIPTION	WORKSHEET	QTY	UNIT(S)	UNIT COST	TOTAL	NOTES
5-Year Site Review	CW-E26	1	LS	$243,687	$243,687	
SUBTOTAL					$243,687	
Contingency (Scope and Bid)		10%			$24,369	10% Scope, 0% Bid as documented in Attachment A.
SUBTOTAL					$268,056	
Project Management		5%			$13,403	Low end of the recommended range in EPA 540-R-00-002 was used.
Technical Support		10%			$26,806	Low end of the recommended range in EPA 540-R-00-002 was used.
TOTAL					$308,265	
TOTAL PERIODIC COST					**$308,000**	Total periodic cost is rounded to the nearest $1,000.

Notes:
Percentages used for contingency and professional/technical services costs are based on guidance from Section 5.0 of "A Guide to Developing and Documenting Cost Estimates During the Feasibility Study", EPA 2000. Modifications to the percentages applied for contingency and professional/technical services are documented in Attachment A.
Costs presented for this alternative are expected to have an accuracy between -30% to +50% of actual costs, based on the scope presented. They are prepared solely to facilitate relative comparisons between alternatives for FS evaluation purposes.

Abbreviations:

AC	Acre
CY	Cubic Yard
LS	Lump Sum
QTY	Quantity
SF	Square Foot
TON	Ton

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Present Value Analysis and Detailed Cost Estimate Summary Alternative F

Note: Costs presented in this present value analysis and detailed cost estimate summary are specific to DMM Scenario 2. Costs for DMM Scenario 1 can be found in Attachment B of this appendix.

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TABLE PV-F

PRESENT VALUE ANALYSIS

Alternative **F**

Site: **Portland Harbor Superfund Site**
Location: **Portland, Oregon**
Phase: **Feasibility Study (-30% to +50%)**
Base Year: **2016**

Year[1]	Capital Costs (Institutional Controls)[2]	Capital Costs (Monitored Natural Recovery)[2]	Capital Costs (Technology Assignments)[2]	Annual O&M Costs	Periodic Costs (Long Term Monitoring and Monitored Natural Recovery)	Periodic Costs (Long Term Operations and Maintenance and Institutional Controls)	Periodic Costs (Five-Year Site Reviews)	Total Annual Expenditure[3]	Discount Factor (7.0%)	Present Value[4]
0	$353,000	$8,749,000	$124,313,000	$0	$0	$0	$0	$133,415,000	1.0000	$133,415,000
1	$353,000	$0	$124,313,000	$0	$0	$0	$0	$124,666,000	0.9346	$116,512,844
2	$353,000	$0	$124,313,000	$0	$49,499,000	$0	$0	$174,165,000	0.8734	$152,115,711
3	$353,000	$0	$124,313,000	$0	$0	$0	$0	$124,666,000	0.8163	$101,764,856
4	$353,000	$0	$124,313,000	$0	$49,499,000	$0	$0	$174,165,000	0.7629	$132,870,479
5	$353,000	$0	$124,313,000	$0	$0	$8,779,000	$308,000	$133,753,000	0.7130	$95,365,889
6	$353,000	$0	$124,313,000	$0	$49,499,000	$0	$0	$174,165,000	0.6663	$116,046,140
7	$353,000	$0	$124,313,000	$0	$0	$0	$0	$124,666,000	0.6227	$77,629,518
8	$353,000	$0	$124,313,000	$0	$49,499,000	$0	$0	$174,165,000	0.5820	$101,364,030
9	$353,000	$0	$124,313,000	$0	$0	$0	$0	$124,666,000	0.5439	$67,805,837
10	$353,000	$0	$124,313,000	$0	$49,499,000	$8,779,000	$308,000	$183,252,000	0.5083	$93,146,992
11	$353,000	$0	$124,313,000	$0	$0	$0	$0	$124,666,000	0.4751	$59,228,817
12	$353,000	$0	$124,313,000	$0	$0	$0	$0	$124,666,000	0.4440	$55,351,704
13	$0	$0	$0	$0	$0	$0	$0	$0	0.4150	$0
14	$0	$0	$0	$0	$49,499,000	$0	$0	$49,499,000	0.3878	$19,195,712
15	$0	$0	$0	$0	$0	$8,779,000	$308,000	$9,087,000	0.3624	$3,293,129
16	$0	$0	$0	$0	$0	$0	$0	$0	0.3387	$0
17	$0	$0	$0	$0	$0	$0	$0	$0	0.3166	$0
18	$0	$0	$0	$0	$49,499,000	$0	$0	$49,499,000	0.2959	$14,646,754
19	$0	$0	$0	$0	$0	$0	$0	$0	0.2765	$0
20	$0	$0	$0	$0	$0	$8,779,000	$308,000	$9,087,000	0.2584	$2,348,081
21	$0	$0	$0	$0	$0	$0	$0	$0	0.2415	$0
22	$0	$0	$0	$0	$49,499,000	$0	$0	$49,499,000	0.2257	$11,171,924
23	$0	$0	$0	$0	$0	$0	$0	$0	0.2109	$0
24	$0	$0	$0	$0	$0	$0	$0	$0	0.1971	$0
25	$0	$0	$0	$0	$0	$8,779,000	$308,000	$9,087,000	0.1842	$1,673,825
26	$0	$0	$0	$0	$49,499,000	$0	$0	$49,499,000	0.1722	$8,523,728
27	$0	$0	$0	$0	$0	$0	$0	$0	0.1609	$0
28	$0	$0	$0	$0	$0	$0	$0	$0	0.1504	$0
29	$0	$0	$0	$0	$0	$0	$0	$0	0.1406	$0
30	$0	$0	$0	$0	$49,499,000	$8,779,000	$308,000	$58,586,000	0.1314	$7,698,200
TOTALS:	$4,589,000	$8,749,000	$1,616,069,000	$0	$494,990,000	$52,674,000	$1,848,000	$2,178,919,000		$1,371,169,170
TOTAL PRESENT VALUE OF ALTERNATIVE F[5]										**$1,371,170,000**

Notes:

[1] The alternative is expected to require cost expenditures for perpetuity since some contamination within the sediment bed and associated riverbank soils would remain in-place that do not allow for unrestricted use or unlimited exposure to human or ecological receptors. However the period of analysis was assumed to be 30 yrs beyond the start of construction in Year 0.

[2] Capital costs, for purposes of this analysis, are assumed to be distributed as indicated on Table CS-F.

[3] Total annual expenditure is the total cost per year with no discounting.

[4] Present value is the total cost per year including a 7.0% discount factor for that year. See Table PV-ADRFT for details.

[5] Total present value is rounded to the nearest $10,000. Inflation and depreciation are excluded from the present value cost.

Costs presented for this alternative are expected to have an accuracy between -30% to +50% of actual costs, based on the scope presented.

They are prepared solely to facilitate relative comparisons between alternatives for FS evaluation purposes.

TABLE CS-F

Alternative **F**

DETAILED COST ESTIMATE SUMMARY

Site: Portland Harbor Superfund Site
Location: Portland, Oregon
Phase: Feasibility Study (-30% to +50%)
Base Year: 2016
Date: 5/24/2016

Description: This alternative evaluates a remedy that would involve dredging of contaminated sediments, disposal of the remaining contaminated sediment at offsite facilities (Subtitle D and Subtitle C/TSCA), capping, enhanced natural recovery (ENR), in-situ treatment, and monitored natural recovery (MNR). Capital costs are based on Disposed Material Management (DMM) Scenario 2.

INSTITUTIONAL CONTROLS CAPITAL COSTS: (Assumed to be Incurred During Years 0 through 12)

DESCRIPTION	WORKSHEET	QTY	UNIT(S)	UNIT COST	TOTAL	NOTES
Institutional Controls	CW-F2	1	LS	$3,728,996	$3,728,996	
SUBTOTAL					$3,728,996	
Contingency (Scope and Bid)		15%			$559,349	10% Scope, 5% Bid as documented in Attachment A.
SUBTOTAL					$4,288,345	
Project Management		2%			$85,767	Percentage modified as documented in Attachment A.
Remedial Design		2%			$85,767	Percentage modified as documented in Attachment A.
Construction Management		3%			$128,650	Percentage modified as documented in Attachment A.
TOTAL					$4,588,529	
TOTAL CAPITAL COST					**$4,589,000**	Total capital cost is rounded to the nearest $1,000.

MONITORED NATURAL RECOVERY CAPITAL COSTS: (Assumed to be Incurred During Year 0)

DESCRIPTION	WORKSHEET	QTY	UNIT(S)	UNIT COST	TOTAL	NOTES
Monitored Natural Recovery (MNR) for MNR/Enhanced Natural Recovery (ENR) and Broadcast GAC Areas	CW-F22	1,662	AC	$3,686	$6,126,675	Quantity represents dredge, MNR/ENR and in situ treatment areas.
SUBTOTAL					$6,126,675	
Contingency (Scope and Bid)		20%			$1,225,335	10% Scope, 10% Bid (Low end of the recommended range in EPA 540-R-00-002).
SUBTOTAL					$7,352,010	
Project Management		5%			$367,601	Percentage from Exhibit 5-8 in EPA 540-R-00-002 was used.
Remedial Design		8%			$588,161	Percentage from Exhibit 5-8 in EPA 540-R-00-002 was used.
Construction Management		6%			$441,121	Percentage from Exhibit 5-8 in EPA 540-R-00-002 was used.
TOTAL					$8,748,893	
TOTAL CAPITAL COST					**$8,749,000**	Total capital cost is rounded to the nearest $1,000.

TABLE CS-F

Alternative **F**

DETAILED COST ESTIMATE SUMMARY

Site: Portland Harbor Superfund Site
Location: Portland, Oregon
Phase: Feasibility Study (-30% to +50%)
Base Year: 2016
Date: 5/24/2016

Description: This alternative evaluates a remedy that would involve dredging of contaminated sediments, disposal of the remaining contaminated sediment at offsite facilities (Subtitle D and Subtitle C/TSCA), capping, enhanced natural recovery (ENR), in-situ treatment, and monitored natural recovery (MNR). Capital costs are based on Disposed Material Management (DMM) Scenario 2.

TECHNOLOGY ASSIGNMENTS MEASURES CAPITAL CONSTRUCTION COSTS: (Assumed to be Incurred During Years 0 through 12)

DESCRIPTION	WORKSHEET	QTY	UNIT(S)	UNIT COST	TOTAL	NOTES
Mobilization / Demobilization	CW-F1	1	LS	$19,821,000	$19,821,000	
Transload Facility Development	CW-F21	1	LS	$15,651,213	$15,651,213	
Debris Removal and Disposal	CW-F5	534	AC	$13,107	$6,999,143	
Obstruction Removal and Relocation	CW-F6	1	LS	$20,718,583	$20,718,583	
Erosion/Residual Control Measures	CW-F7	1	LS	$27,166,335	$27,166,335	
Dredging of Contaminated Sediments (Open Water)	CW-F8	4,339,288	CY	$24.53	$106,442,735	
Dredging of Contaminated Sediments (Confined)	CW-F9	123,286	CY	$31.10	$3,834,195	
Excavation of Riverbanks	CW-F10	122,827	CY	$5.19	$637,472	
Dewatering and Water Treatment for Dredging Operations	CW-F11	1	LS	$19,423,050	$19,423,050	Includes collection and treatment of water from sediment dewatering during dredging operations
Subtitle C/TSCA Disposal (Handling, Transportation, Treatment of Select PTW Materials, and Disposal)	CW-F12	358,888	TON	$191	$68,535,729	Includes waste going to offsite Subtitle C/TSCA facility for disposal, including the volume of NRC/NAPL PTW that would require treatment
Subtitle D Disposal (Handling, Transportation, and Disposal)	CW-F13	7,149,152	TON	$111	$791,812,106	Includes waste going to offsite Subtitle D facility for disposal without treatment, including the volume of non-PTW contaminated sediments/riverbank soils as well as the volume of highly toxic PTW
Mitigation	CW-F14	60	AC	$1,070,827	$64,249,620	
Sand Placement for Technology Assignments	CW-F15	1,119,996	CY	$33.48	$37,494,727	
Beach Mix Placement for Technology Assignments	CW-F16	69,510	CY	$72.97	$5,071,863	
Armor Placement for Technology Assignments	CW-F17	151,909	CY	$71.97	$10,932,677	
Reactive/GAC Placement for Technology Assignments	CW-F18	1	LS	$58,294,110	$58,294,110	
Geofabric for Riverbanks	CW-F19	25.4	AC	$14,311	$363,505	
Organoclay Mat Placement for Technology Assignments	CW-F20	174,300	SF	$6.73	$1,173,039	
SUBTOTAL					$1,258,621,102	
Contingency (Scope and Bid)		20%			$251,724,220	10% Scope, 10% Bid (Low end of the recommended range in EPA 540-R-00-002).
SUBTOTAL					$1,510,345,322	
Project Management		2%			$30,206,906	Percentage modified as documented in Attachment A.
Remedial Design		2%			$30,206,906	Percentage modified as documented in Attachment A.
Construction Management		3%			$45,310,360	Percentage modified as documented in Attachment A.
TOTAL					$1,616,069,494	
TOTAL CAPITAL COST					**$1,616,069,000**	Total capital cost is rounded to the nearest $1,000.

TABLE CS-F

Alternative F

DETAILED COST ESTIMATE SUMMARY

Site: Portland Harbor Superfund Site
Location: Portland, Oregon
Phase: Feasibility Study (-30% to +50%)
Base Year: 2016
Date: 5/24/2016

Description: This alternative evaluates a remedy that would involve dredging of contaminated sediments, disposal of the remaining contaminated sediment at offsite facilities (Subtitle D and Subtitle C/TSCA), capping, enhanced natural recovery (ENR), in-situ treatment, and monitored natural recovery (MNR). Capital costs are based on Disposed Material Management (DMM) Scenario 2.

SITE-WIDE MONITORING AND MONITORED NATURAL RECOVERY PERIODIC COSTS: (Assumed to be Incurred at Years 2, 4, 6, 8, 10 and Every 4 Years through Period of Analysis)

DESCRIPTION	WORKSHEET	QTY	UNIT(S)	UNIT COST	TOTAL	NOTES
Monitored Natural Recovery (MNR) for MNR/Enhanced Natural Recovery (ENR) and Broadcast GAC Areas	CW-F22	1,662	AC	$3,686	$6,126,675	
Site-Wide Monitoring	CW-F23	1	LS	$957,659	$957,659	
Cap Area Monitoring and Reactive Layer Monitoring	CW-F24	1	LS	$31,466,392	$31,466,392	
SUBTOTAL					$38,550,726	
Contingency (Scope and Bid)		20%			$7,710,145	10% Scope, 10% Bid (Low end of the recommended range in EPA 540-R-00-002).
SUBTOTAL					$46,260,871	
Project Management		2%			$925,217	Percentage modified as documented in Attachment A.
Technical Support		5%			$2,313,044	Percentage modified as documented in Attachment A.
TOTAL					$49,499,132	
TOTAL PERIODIC COST					**$49,499,000**	Total periodic cost is rounded to the nearest $1,000.

LONG TERM OPERATIONS AND MAINTENANCE PERIODIC COSTS: (Assumed to be Incurred at Year 5 and Every 5 Years through Period of Analysis)

DESCRIPTION	WORKSHEET	QTY	UNIT(S)	UNIT COST	TOTAL	NOTES
Long-Term Maintenance for Capping, ENR, and In Situ Treatment	CW-F25	1	LS	$5,757,416	$5,757,416	Assume 5% of placement of additional material for capping, ENR and In Situ Treatment. Includes mobilization and demobilization costs
SUBTOTAL					$5,757,416	
Contingency (Scope and Bid)		20%			$1,151,483	10% Scope, 10% Bid (Low end of the recommended range in EPA 540-R-00-002).
SUBTOTAL					$6,908,899	
Project Management		5%			$345,445	Low end of the recommended range in EPA 540-R-00-002 was used.
Technical Support		10%			$690,890	Low end of the recommended range in EPA 540-R-00-002 was used.
TOTAL					$7,945,234	
TOTAL PERIODIC COST					**$7,945,000**	Total periodic cost is rounded to the nearest $1,000.

TABLE CS-F

Alternative **F**

DETAILED COST ESTIMATE SUMMARY

Site: Portland Harbor Superfund Site
Location: Portland, Oregon
Phase: Feasibility Study (-30% to +50%)
Base Year: 2016
Date: 5/24/2016

Description: This alternative evaluates a remedy that would involve dredging of contaminated sediments, disposal of the remaining contaminated sediment at offsite facilities (Subtitle D and Subtitle C/TSCA), capping, enhanced natural recovery (ENR), in-situ treatment, and monitored natural recovery (MNR). Capital costs are based on Disposed Material Management (DMM) Scenario 2.

INSTITUTIONAL CONTROLS PERIODIC COSTS: (Assumed to be Incurred at Year 5 and Every 5 Years through Period of Analysis)

DESCRIPTION	WORKSHEET	QTY	UNIT(S)	UNIT COST	TOTAL	NOTES
Evaluating and Updating Institutional Controls	CW-F3	1	LS	$659,296	$659,296	
SUBTOTAL					$659,296	
Contingency (Scope and Bid)		10%			$65,930	10% Scope, 0% Bid as documented in Attachment A.
SUBTOTAL					$725,226	
Project Management		5%			$36,261	Low end of the recommended range in EPA 540-R-00-002 was used.
Technical Support		10%			$72,523	Low end of the recommended range in EPA 540-R-00-002 was used.
TOTAL					$834,010	
TOTAL PERIODIC COST					**$834,000**	Total periodic cost is rounded to the nearest $1,000.

5-YEAR SITE REVIEW PERIODIC COSTS: (Assumed to be Incurred at Year 5 and Every 5 Years through Period of Analysis)

DESCRIPTION	WORKSHEET	QTY	UNIT(S)	UNIT COST	TOTAL	NOTES
5-Year Site Review	CW-F26	1	LS	$243,687	$243,687	
SUBTOTAL					$243,687	
Contingency (Scope and Bid)		10%			$24,369	10% Scope, 0% Bid as documented in Attachment A.
SUBTOTAL					$268,056	
Project Management		5%			$13,403	Low end of the recommended range in EPA 540-R-00-002 was used.
Technical Support		10%			$26,806	Low end of the recommended range in EPA 540-R-00-002 was used.
TOTAL					$308,265	
TOTAL PERIODIC COST					**$308,000**	Total periodic cost is rounded to the nearest $1,000.

Notes:
Percentages used for contingency and professional/technical services costs are based on guidance from Section 5.0 of "A Guide to Developing and Documenting Cost Estimates During the Feasibility Study", EPA 2000. Modifications to the percentages applied for contingency and professional/technical services are documented in Attachment A.
Costs presented for this alternative are expected to have an accuracy between -30% to +50% of actual costs, based on the scope presented. They are prepared solely to facilitate relative comparisons between alternatives for FS evaluation purposes.

Abbreviations:

AC	Acre
CY	Cubic Yard
LS	Lump Sum
QTY	Quantity
SF	Square Foot
TON	Ton

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Present Value Analysis and Detailed Cost Estimate Summary Alternative G

Note: Costs presented in this present value analysis and detailed cost estimate summary are specific to DMM Scenario 2. Costs for DMM Scenario 1 can be found in Attachment B of this appendix.

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TABLE PV-G

PRESENT VALUE ANALYSIS

Alternative G

Site: Portland Harbor Superfund Site
Location: Portland, Oregon
Phase: Feasibility Study (-30% to +50%)
Base Year: 2016

Year[1]	Capital Costs (Institutional Controls)[2]	Capital Costs (Monitored Natural Recovery)[2]	Capital Costs (Technology Assignments)[2]	Annual O&M Costs	Periodic Costs (Long Term Monitoring and Monitored Natural Recovery)	Periodic Costs (Long Term Operations and Maintenance and Institutional Controls)	Periodic Costs (Five-Year Site Reviews)	Total Annual Expenditure[3]	Discount Factor (7.0%)	Present Value[4]
0	$264,579	$7,428,000	$130,952,105	$0	$0	$0	$0	$138,644,684	1.0000	$138,644,684
1	$264,579	$0	$130,952,105	$0	$0	$0	$0	$131,216,684	0.9346	$122,635,113
2	$264,579	$0	$130,952,105	$0	$63,513,000	$0	$0	$194,729,684	0.8734	$170,076,906
3	$264,579	$0	$130,952,105	$0	$0	$0	$0	$131,216,684	0.8163	$107,112,179
4	$264,579	$0	$130,952,105	$0	$63,513,000	$0	$0	$194,729,684	0.7629	$148,559,276
5	$264,579	$0	$130,952,105	$0	$0	$11,856,000	$308,000	$143,380,684	0.7130	$102,230,428
6	$264,579	$0	$130,952,105	$0	$63,513,000	$0	$0	$194,729,684	0.6663	$129,748,388
7	$264,579	$0	$130,952,105	$0	$0	$0	$0	$131,216,684	0.6227	$81,708,629
8	$264,579	$0	$130,952,105	$0	$63,513,000	$0	$0	$194,729,684	0.5820	$113,332,676
9	$264,579	$0	$130,952,105	$0	$0	$0	$0	$131,216,684	0.5439	$71,368,754
10	$264,579	$0	$130,952,105	$0	$63,513,000	$11,856,000	$308,000	$206,893,684	0.5083	$105,164,060
11	$264,579	$0	$130,952,105	$0	$0	$0	$0	$131,216,684	0.4751	$62,341,047
12	$264,579	$0	$130,952,105	$0	$0	$0	$0	$131,216,684	0.4440	$58,260,208
13	$264,579	$0	$130,952,105	$0	$0	$0	$0	$131,216,684	0.4150	$54,454,924
14	$264,579	$0	$130,952,105	$0	$63,513,000	$0	$0	$194,729,684	0.3878	$75,516,171
15	$264,579	$0	$130,952,105	$0	$0	$11,856,000	$308,000	$143,380,684	0.3624	$51,961,160
16	$264,579	$0	$130,952,105	$0	$0	$0	$0	$131,216,684	0.3387	$44,443,091
17	$264,579	$0	$130,952,105	$0	$0	$0	$0	$131,216,684	0.3166	$41,543,202
18	$264,579	$0	$130,952,105	$0	$63,513,000	$0	$0	$194,729,684	0.2959	$57,620,513
19	$0	$0	$0	$0	$0	$0	$0	$0	0.2765	$0
20	$0	$0	$0	$0	$0	$11,856,000	$308,000	$12,164,000	0.2584	$3,143,178
21	$0	$0	$0	$0	$0	$0	$0	$0	0.2415	$0
22	$0	$0	$0	$0	$63,513,000	$0	$0	$63,513,000	0.2257	$14,334,884
23	$0	$0	$0	$0	$0	$0	$0	$0	0.2109	$0
24	$0	$0	$0	$0	$0	$0	$0	$0	0.1971	$0
25	$0	$0	$0	$0	$0	$11,856,000	$308,000	$12,164,000	0.1842	$2,240,609
26	$0	$0	$0	$0	$63,513,000	$0	$0	$63,513,000	0.1722	$10,936,939
27	$0	$0	$0	$0	$0	$0	$0	$0	0.1609	$0
28	$0	$0	$0	$0	$0	$0	$0	$0	0.1504	$0
29	$0	$0	$0	$0	$0	$0	$0	$0	0.1406	$0
30	$0	$0	$0	$0	$63,513,000	$11,856,000	$308,000	$75,677,000	0.1314	$9,943,958
TOTALS:	$5,027,000	$7,428,000	$2,488,090,000	$0	$635,130,000	$71,136,000	$1,848,000	$3,208,659,000		$1,777,320,977
TOTAL PRESENT VALUE OF ALTERNATIVE G[5]										**$1,777,320,000**

Notes:

[1] The alternative is expected to require cost expenditures for perpetuity since some contamination within the sediment bed and associated riverbank soils would remain in-place that do not allow for unrestricted use or unlimited exposure to human or ecological receptors. However the period of analysis was assumed to be 30 yrs beyond the start of construction in Year 0.

[2] Capital costs, for purposes of this analysis, are assumed to be distributed as indicated on Table CS-G.

[3] Total annual expenditure is the total cost per year with no discounting.

[4] Present value is the total cost per year including a 7.0% discount factor for that year. See Table PV-ADRFT for details.

[5] Total present value is rounded to the nearest $10,000. Inflation and depreciation are excluded from the present value cost.

Costs presented for this alternative are expected to have an accuracy between -30% to +50% of actual costs, based on the scope presented.

They are prepared solely to facilitate relative comparisons between alternatives for FS evaluation purposes.

TABLE CS-G

Alternative **G**

DETAILED COST ESTIMATE SUMMARY

Site: Portland Harbor Superfund Site
Location: Portland, Oregon
Phase: Feasibility Study (-30% to +50%)
Base Year: 2016
Date: 5/24/2016

Description: This alternative evaluates a remedy that would involve dredging of contaminated sediments, disposal of the remaining contaminated sediment at offsite facilities (Subtitle D and Subtitle C/TSCA), capping, enhanced natural recovery (ENR), in-situ treatment, and monitored natural recovery (MNR). Capital costs are based on Disposed Material Management (DMM) Scenario 2.

INSTITUTIONAL CONTROLS CAPITAL COSTS: (Assumed to be Incurred During Years 0 through 18)

DESCRIPTION	WORKSHEET	QTY	UNIT(S)	UNIT COST	TOTAL	NOTES
Initial Establishment of Institutional Controls	CW-G2	1	LS	$4,084,988	$4,084,988	
SUBTOTAL					$4,084,988	
Contingency (Scope and Bid)		15%			$612,748	10% Scope, 5% Bid as documented in Attachment A.
SUBTOTAL					$4,697,736	
Project Management		2%			$93,955	Percentage modified as documented in Attachment A.
Remedial Design		2%			$93,955	Percentage modified as documented in Attachment A.
Construction Management		3%			$140,932	Percentage modified as documented in Attachment A.
TOTAL					$5,026,578	
TOTAL CAPITAL COST					**$5,027,000**	Total capital cost is rounded to the nearest $1,000.

MONITORED NATURAL RECOVERY CAPITAL COSTS: (Assumed to be Incurred During Year 0)

DESCRIPTION	WORKSHEET	QTY	UNIT(S)	UNIT COST	TOTAL	NOTES
Monitored Natural Recovery (MNR) for MNR/Enhanced Natural Recovery (ENR) and Broadcast GAC Areas	CW-G22	1,411	AC	$3,686	$5,201,407	Quantity represents dredge, MNR/ENR and in situ treatment areas.
SUBTOTAL					$5,201,407	
Contingency (Scope and Bid)		20%			$1,040,281	10% Scope, 10% Bid (Low end of the recommended range in EPA 540-R-00-002).
SUBTOTAL					$6,241,688	
Project Management		5%			$312,084	Percentage from Exhibit 5-8 in EPA 540-R-00-002 was used.
Remedial Design		8%			$499,335	Percentage from Exhibit 5-8 in EPA 540-R-00-002 was used.
Construction Management		6%			$374,501	Percentage from Exhibit 5-8 in EPA 540-R-00-002 was used.
TOTAL					$7,427,608	
TOTAL CAPITAL COST					**$7,428,000**	Total capital cost is rounded to the nearest $1,000.

TABLE CS-G

Alternative G

DETAILED COST ESTIMATE SUMMARY

Site: Portland Harbor Superfund Site
Location: Portland, Oregon
Phase: Feasibility Study (-30% to +50%)
Base Year: 2016
Date: 5/24/2016

Description: This alternative evaluates a remedy that would involve dredging of contaminated sediments, disposal of the remaining contaminated sediment at offsite facilities (Subtitle D and Subtitle C/TSCA), capping, enhanced natural recovery (ENR), in-situ treatment, and monitored natural recovery (MNR). Capital costs are based on Disposed Material Management (DMM) Scenario 2.

TECHNOLOGY ASSIGNMENTS MEASURES CAPITAL CONSTRUCTION COSTS: (Assumed to be Incurred During Years 0 through 18)

DESCRIPTION	WORKSHEET	QTY	UNIT(S)	UNIT COST	TOTAL	NOTES
Mobilization / Demobilization	CW-G1	1	LS	$30,516,000	$30,516,000	
Transload Facility Development	CW-G21	1	LS	$20,773,428	$20,773,428	
Debris Removal and Disposal	CW-G5	776	AC	$13,107	$10,171,040	
Obstruction Removal and Relocation	CW-G6	1	LS	$22,638,241	$22,638,241	
Erosion/Residual Control Measures	CW-G7	1	LS	$28,135,555	$28,135,555	
Dredging of Contaminated Sediments (Open Water)	CW-G8	7,110,364	CY	$24.53	$174,417,229	
Dredging of Contaminated Sediments (Confined)	CW-G9	147,293	CY	$31.10	$4,580,812	
Excavation of Riverbanks	CW-G10	138,942	CY	$5.19	$721,107	
Dewatering and Water Treatment for Dredging Operations	CW-G11	1	LS	$31,511,207	$31,511,207	Includes collection and treatment of water from sediment dewatering during dredging operations
Subtitle C/TSCA Disposal (Handling, Transportation, Treatment of Select PTW Materials, and Disposal)	CW-G12	358,888	TON	$191	$68,535,729	Includes waste going to offsite Subtitle C/TSCA facility for disposal, including the volume of NRC/NAPL PTW that would require treatment
Subtitle D Disposal (Handling, Transportation, and Disposal)	CW-G13	11,727,524	TON	$111	$1,298,894,643	Includes waste going to offsite Subtitle D facility for disposal without treatment, including the volume of non-PTW contaminated sediments/riverbank soils as well as the volume of highly toxic PTW
Mitigation	CW-G14	86	AC	$1,070,827	$92,091,122	
Sand Placement for Technology Assignments	CW-G15	1,634,210	CY	$33.23	$54,304,680	
Beach Mix Placement for Technology Assignments	CW-G16	90,647	CY	$72.65	$6,585,212	
Armor Placement for Technology Assignments	CW-G17	245,586	CY	$71.57	$17,577,027	
Reactive/GAC Placement for Technology Assignments	CW-G18	1	LS	$74,728,183	$74,728,183	
Geofabric for Riverbanks	CW-G19	28.7	AC	$14,311	$410,732	
Organoclay Mat Placement for Technology Assignments	CW-G20	174,300	SF	$6.73	$1,173,039	
SUBTOTAL					$1,937,764,986	
Contingency (Scope and Bid)		20%			$387,552,997	10% Scope, 10% Bid (Low end of the recommended range in EPA 540-R-00-002).
SUBTOTAL					$2,325,317,983	
Project Management		2%			$46,506,360	Percentage modified as documented in Attachment A.
Remedial Design		2%			$46,506,360	Percentage modified as documented in Attachment A.
Construction Management		3%			$69,759,539	Percentage modified as documented in Attachment A.
TOTAL					$2,488,090,242	
TOTAL CAPITAL COST					**$2,488,090,000**	Total capital cost is rounded to the nearest $1,000.

TABLE CS-G

Alternative G

DETAILED COST ESTIMATE SUMMARY

Site: Portland Harbor Superfund Site
Location: Portland, Oregon
Phase: Feasibility Study (-30% to +50%)
Base Year: 2016
Date: 5/24/2016

Description: This alternative evaluates a remedy that would involve dredging of contaminated sediments, disposal of the remaining contaminated sediment at offsite facilities (Subtitle D and Subtitle C/TSCA), capping, enhanced natural recovery (ENR), in-situ treatment, and monitored natural recovery (MNR). Capital costs are based on Disposed Material Management (DMM) Scenario 2.

SITE-WIDE MONITORING AND MONITORED NATURAL RECOVERY PERIODIC COSTS: (Assumed to be Incurred at Years 2, 4, 6, 8, 10 and Every 4 Years through Period of Analysis)

DESCRIPTION	WORKSHEET	QTY	UNIT(S)	UNIT COST	TOTAL	NOTES
Monitored Natural Recovery (MNR) for MNR/Enhanced Natural Recovery (ENR) and Broadcast GAC Areas	CW-G22	1,411	AC	$3,686	$5,201,407	Quantity represents dredge, MNR/ENR and in situ treatment areas.
Site-Wide Monitoring	CW-G23	1	LS	$957,659	$957,659	
Cap Area Monitoring and Reactive Layer Monitoring	CW-G24	1	LS	$43,306,076	$43,306,076	
SUBTOTAL					$49,465,142	
Contingency (Scope and Bid)		20%			$9,893,028	10% Scope, 10% Bid (Low end of the recommended range in EPA 540-R-00-002).
SUBTOTAL					$59,358,170	
Project Management		2%			$1,187,163	Percentage modified as documented in Attachment A.
Technical Support		5%			$2,967,909	Percentage modified as documented in Attachment A.
TOTAL					$63,513,242	
TOTAL PERIODIC COST					**$63,513,000**	Total periodic cost is rounded to the nearest $1,000.

LONG TERM OPERATIONS AND MAINTENANCE PERIODIC COSTS: (Assumed to be Incurred at Year 5 and Every 5 Years through Period of Analysis)

DESCRIPTION	WORKSHEET	QTY	UNIT(S)	UNIT COST	TOTAL	NOTES
Long-Term Maintenance for Capping, ENR, and In Situ Treatment	CW-G25	1	LS	$7,862,382	$7,862,382	Assume 5% of placement of additional material for capping, ENR and In Situ Treatment. Includes mobilization and demobilization costs.
SUBTOTAL					$7,862,382	
Contingency (Scope and Bid)		20%			$1,572,476	10% Scope, 10% Bid (Low end of the recommended range in EPA 540-R-00-002).
SUBTOTAL					$9,434,858	
Project Management		5%			$471,743	Low end of the recommended range in EPA 540-R-00-002 was used.
Technical Support		10%			$943,486	Low end of the recommended range in EPA 540-R-00-002 was used.
TOTAL					$10,850,087	
TOTAL PERIODIC COST					**$10,850,000**	Total periodic cost is rounded to the nearest $1,000.

TABLE CS-G

Alternative G

DETAILED COST ESTIMATE SUMMARY

Site: Portland Harbor Superfund Site
Location: Portland, Oregon
Phase: Feasibility Study (-30% to +50%)
Base Year: 2016
Date: 5/24/2016

Description: This alternative evaluates a remedy that would involve dredging of contaminated sediments, disposal of the remaining contaminated sediment at offsite facilities (Subtitle D and Subtitle C/TSCA), capping, enhanced natural recovery (ENR), in-situ treatment, and monitored natural recovery (MNR). Capital costs are based on Disposed Material Management (DMM) Scenario 2.

INSTITUTIONAL CONTROLS PERIODIC COSTS: (Assumed to be Incurred at Year 5 and Every 5 Years through Period of Analysis)

DESCRIPTION	WORKSHEET	QTY	UNIT(S)	UNIT COST	TOTAL	NOTES
Evaluating and Updating Institutional Controls	CW-G3	1	LS	$795,634	$795,634	
SUBTOTAL					$795,634	
Contingency (Scope and Bid)		10%			$79,563	10% Scope, 0% Bid as documented in Attachment A.
SUBTOTAL					$875,197	
Project Management		5%			$43,760	Low end of the recommended range in EPA 540-R-00-002 was used.
Technical Support		10%			$87,520	Low end of the recommended range in EPA 540-R-00-002 was used.
TOTAL					$1,006,477	
TOTAL PERIODIC COST					**$1,006,000**	Total periodic cost is rounded to the nearest $1,000.

5-YEAR SITE REVIEW PERIODIC COSTS: (Assumed to be Incurred at Year 5 and Every 5 Years through Period of Analysis)

DESCRIPTION	WORKSHEET	QTY	UNIT(S)	UNIT COST	TOTAL	NOTES
5-Year Site Review	CW-G26	1	LS	$243,687	$243,687	
SUBTOTAL					$243,687	
Contingency (Scope and Bid)		10%			$24,369	10% Scope, 0% Bid as documented in Attachment A.
SUBTOTAL					$268,056	
Project Management		5%			$13,403	Low end of the recommended range in EPA 540-R-00-002 was used.
Technical Support		10%			$26,806	Low end of the recommended range in EPA 540-R-00-002 was used.
TOTAL					$308,265	
TOTAL PERIODIC COST					**$308,000**	Total periodic cost is rounded to the nearest $1,000.

Notes:
Percentages used for contingency and professional/technical services costs are based on guidance from Section 5.0 of "A Guide to Developing and Documenting Cost Estimates During the Feasibility Study", EPA 2000. Modifications to the percentages applied for contingency and professional/technical services are documented in Attachment A.
Costs presented for this alternative are expected to have an accuracy between -30% to +50% of actual costs, based on the scope presented. They are prepared solely to facilitate relative comparisons between alternatives for FS evaluation purposes.

Abbreviations:

AC	Acre
CY	Cubic Yard
LS	Lump Sum
QTY	Quantity
SF	Square Foot
TON	Ton

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Present Value Analysis and Detailed Cost Estimate Summary Alternative H

Note: Costs presented in this present value analysis and detailed cost estimate summary are specific to DMM Scenario 2. Costs for DMM Scenario 1 can be found in Attachment B of this appendix.

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TABLE PV-H

PRESENT VALUE ANALYSIS

Alternative **H**

Site: **Portland Harbor Superfund Site**
Location: **Portland, Oregon**
Phase: **Feasibility Study (-30% to +50%)**
Base Year: **2016**

Year[1]	Capital Costs (Institutional Controls)[2]	Capital Costs (Monitored Natural Recovery)[2]	Capital Costs (Technology Assignments)[2]	Annual O&M Costs	Periodic Costs (Long Term Monitoring and Monitored Natural Recovery)	Periodic Costs (Long Term Operations and Maintenance and Institutional Controls)	Periodic Costs (Five-Year Site Reviews)	Total Annual Expenditure[3]	Discount Factor (7.0%)	Present Value[4]
0	$6,033,000	$0	$8,942,540,000	$0	$0	$0	$0	$8,948,573,000	1.0000	$8,948,573,000
1	$0	$0	$0	$0	$0	$0	$0	$0	0.9346	$0
2	$0	$0	$0	$0	$113,448,000	$0	$0	$113,448,000	0.8734	$99,085,483
3	$0	$0	$0	$0	$0	$0	$0	$0	0.8163	$0
4	$0	$0	$0	$0	$113,448,000	$0	$0	$113,448,000	0.7629	$86,549,479
5	$0	$0	$0	$0	$0	$24,641,000	$308,000	$24,949,000	0.7130	$17,788,637
6	$0	$0	$0	$0	$113,448,000	$0	$0	$113,448,000	0.6663	$75,590,402
7	$0	$0	$0	$0	$0	$0	$0	$0	0.6227	$0
8	$0	$0	$0	$0	$113,448,000	$0	$0	$113,448,000	0.5820	$66,026,736
9	$0	$0	$0	$0	$0	$0	$0	$0	0.5439	$0
10	$0	$0	$0	$0	$113,448,000	$24,641,000	$308,000	$138,397,000	0.5083	$70,347,195
11	$0	$0	$0	$0	$0	$0	$0	$0	0.4751	$0
12	$0	$0	$0	$0	$0	$0	$0	$0	0.4440	$0
13	$0	$0	$0	$0	$0	$0	$0	$0	0.4150	$0
14	$0	$0	$0	$0	$113,448,000	$0	$0	$113,448,000	0.3878	$43,995,134
15	$0	$0	$0	$0	$0	$24,641,000	$308,000	$24,949,000	0.3624	$9,041,518
16	$0	$0	$0	$0	$0	$0	$0	$0	0.3387	$0
17	$0	$0	$0	$0	$0	$0	$0	$0	0.3166	$0
18	$0	$0	$0	$0	$113,448,000	$0	$0	$113,448,000	0.2959	$33,569,263
19	$0	$0	$0	$0	$0	$0	$0	$0	0.2765	$0
20	$0	$0	$0	$0	$0	$24,641,000	$308,000	$24,949,000	0.2584	$6,446,822
21	$0	$0	$0	$0	$0	$0	$0	$0	0.2415	$0
22	$0	$0	$0	$0	$113,448,000	$0	$0	$113,448,000	0.2257	$25,605,214
23	$0	$0	$0	$0	$0	$0	$0	$0	0.2109	$0
24	$0	$0	$0	$0	$0	$0	$0	$0	0.1971	$0
25	$0	$0	$0	$0	$0	$24,641,000	$308,000	$24,949,000	0.1842	$4,595,606
26	$0	$0	$0	$0	$113,448,000	$0	$0	$113,448,000	0.1722	$19,535,746
27	$0	$0	$0	$0	$0	$0	$0	$0	0.1609	$0
28	$0	$0	$0	$0	$0	$0	$0	$0	0.1504	$0
29	$0	$0	$0	$0	$0	$0	$0	$0	0.1406	$0
30	$0	$0	$0	$0	$113,448,000	$24,641,000	$308,000	$138,397,000	0.1314	$18,185,366
TOTALS:	$6,033,000	$0	$8,942,540,000	$0	$1,134,480,000	$147,846,000	$1,848,000	$10,232,747,000		$9,524,935,601
TOTAL PRESENT VALUE OF ALTERNATIVE H[5]										**$9,524,940,000**

Notes:

[1] The alternative is expected to require cost expenditures for perpetuity since some contamination within the sediment bed and associated riverbank soils would remain in-place that do not allow for unrestricted use or unlimited exposure to human or ecological receptors. However the period of analysis was assumed to be 30 yrs beyond the start of construction in Year 0.

[2] Capital costs, for purposes of this analysis, are assumed to be distributed as indicated on Table CS-H.

[3] Total annual expenditure is the total cost per year with no discounting.

[4] Present value is the total cost per year including a 7.0% discount factor for that year. See Table PV-ADRFT for details.

[5] Total present value is rounded to the nearest $10,000. Inflation and depreciation are excluded from the present value cost.

Costs presented for this alternative are expected to have an accuracy between -30% to +50% of actual costs, based on the scope presented.

They are prepared solely to facilitate relative comparisons between alternatives for FS evaluation purposes.

TABLE CS-H

Alternative **H**

DETAILED COST ESTIMATE SUMMARY

Site: Portland Harbor Superfund Site
Location: Portland, Oregon
Phase: Feasibility Study (-30% to +50%)
Base Year: 2016
Date: 5/24/2016

Description: This alternative evaluates a remedy that would involve dredging of contaminated sediments, disposal of the remaining contaminated sediment at offsite facilities (Subtitle D and Subtitle C/TSCA), capping, enhanced natural recovery (ENR), in-situ treatment, and monitored natural recovery (MNR). Capital costs are based on Disposed Material Management (DMM) Scenario 2.

INSTITUTIONAL CONTROLS CAPITAL COSTS: (Assumed to be Incurred During Year 0)

DESCRIPTION	WORKSHEET	QTY	UNIT(S)	UNIT COST	TOTAL	NOTES
Initial Establishment of Institutional Controls	CW-H2	1	LS	$4,902,480	$4,902,480	
SUBTOTAL					$4,902,480	
Contingency (Scope and Bid)		15%			$735,372	10% Scope, 5% Bid as documented in Attachment A.
SUBTOTAL					$5,637,852	
Project Management		2%			$112,757	Percentage modified as documented in Attachment A.
Remedial Design		2%			$112,757	Percentage modified as documented in Attachment A.
Construction Management		3%			$169,136	Percentage modified as documented in Attachment A.
TOTAL					$6,032,502	
TOTAL CAPITAL COST					**$6,033,000**	Total capital cost is rounded to the nearest $1,000.

MONITORED NATURAL RECOVERY CAPITAL COSTS: (Assumed to be Incurred During Year 0)

DESCRIPTION	WORKSHEET	QTY	UNIT(S)	UNIT COST	TOTAL	NOTES
Monitored Natural Recovery (MNR) for MNR/Enhanced Natural Recovery (ENR) and Broadcast GAC Areas	CW-H22	0	AC	$0	$0	Quantity represents dredge, MNR/ENR and in situ treatment areas.
SUBTOTAL					$0	
Contingency (Scope and Bid)		20%			$0	10% Scope, 10% Bid (Low end of the recommended range in EPA 540-R-00-002).
SUBTOTAL					$0	
Project Management		10%			$0	Percentage from Exhibit 5-8 in EPA 540-R-00-002 was used.
Remedial Design		20%			$0	Percentage from Exhibit 5-8 in EPA 540-R-00-002 was used.
Construction Management		15%			$0	Percentage from Exhibit 5-8 in EPA 540-R-00-002 was used.
TOTAL					$0	
TOTAL CAPITAL COST					**$0**	Total capital cost is rounded to the nearest $1,000.

TABLE CS-H

Alternative **H**

DETAILED COST ESTIMATE SUMMARY

Site: Portland Harbor Superfund Site
Location: Portland, Oregon
Phase: Feasibility Study (-30% to +50%)
Base Year: 2016
Date: 5/24/2016

Description: This alternative evaluates a remedy that would involve dredging of contaminated sediments, disposal of the remaining contaminated sediment at offsite facilities (Subtitle D and Subtitle C/TSCA), capping, enhanced natural recovery (ENR), in-situ treatment, and monitored natural recovery (MNR). Capital costs are based on Disposed Material Management (DMM) Scenario 2.

TECHNOLOGY ASSIGNMENTS MEASURES CAPITAL CONSTRUCTION COSTS: (Assumed to be Incurred During Year 0)

DESCRIPTION	WORKSHEET	QTY	UNIT(S)	UNIT COST	TOTAL	NOTES
Mobilization / Demobilization	CW-H1	1	LS	$109,679,000	$109,679,000	
Transload Facility Development	CW-H21	1	LS	$57,482,635	$57,482,635	
Debris Removal and Disposal	CW-H5	2,168	AC	$13,107	$28,415,998	
Obstruction Removal and Relocation	CW-H6	1	LS	$30,652,381	$30,652,381	
Erosion/Residual Control Measures	CW-H7	1	LS	$32,012,435	$32,012,435	
Dredging of Contaminated Sediments (Open Water)	CW-H8	29,111,838	CY	$24.53	$714,113,386	
Dredging of Contaminated Sediments (Confined)	CW-H9	189,478	CY	$31.10	$5,892,766	
Excavation of Riverbanks	CW-H10	158,368	CY	$5.19	$821,932	
Dewatering and Water Treatment for Dredging Operations	CW-H11	1	LS	$126,680,092	$126,680,092	Includes collection and treatment of water from sediment dewatering during dredging operations
Subtitle C/TSCA Disposal (Handling, Transportation, Treatment of Select PTW Materials, and Disposal)	CW-H12	358,888	TON	$191	$68,535,729	Includes waste going to offsite Subtitle C/TSCA facility for disposal, including the volume of NRC/NAPL PTW that would require treatment
Subtitle D Disposal (Handling, Transportation, and Disposal)	CW-H13	47,638,989	TON	$111	$5,276,307,500	Includes waste going to offsite Subtitle D facility for disposal without treatment, including the volume of non-PTW contaminated sediments/riverbank soils as well as the volume of highly toxic PTW
Mitigation	CW-H14	174	AC	$1,070,827	$186,323,898	
Sand Placement for Technology Assignments	CW-H15	4,641,736	CY	$32.61	$151,374,012	
Beach Mix Placement for Technology Assignments	CW-H16	162,557	CY	$71.75	$11,663,371	
Armor Placement for Technology Assignments	CW-H17	760,401	CY	$70.73	$53,785,475	
Reactive/GAC Placement for Technology Assignments	CW-H18	1	LS	$109,213,285	$109,213,285	
Geofabric for Riverbanks	CW-H19	32.7	AC	$14,311	$467,977	
Organoclay Mat Placement for Technology Assignments	CW-H20	174,300	SF	$6.73	$1,173,039	
SUBTOTAL					$6,964,594,911	
Contingency (Scope and Bid)		20%			$1,392,918,982	10% Scope, 10% Bid (Low end of the recommended range in EPA 540-R-00-002).
SUBTOTAL					$8,357,513,893	
Project Management		2%			$167,150,278	Percentage modified as documented in Attachment A.
Remedial Design		2%			$167,150,278	Percentage modified as documented in Attachment A.
Construction Management		3%			$250,725,417	Percentage modified as documented in Attachment A.
TOTAL					$8,942,539,866	
TOTAL CAPITAL COST					**$8,942,540,000**	Total capital cost is rounded to the nearest $1,000.

TABLE CS-H

Alternative H

DETAILED COST ESTIMATE SUMMARY

Site: Portland Harbor Superfund Site
Location: Portland, Oregon
Phase: Feasibility Study (-30% to +50%)
Base Year: 2016
Date: 5/24/2016

Description: This alternative evaluates a remedy that would involve dredging of contaminated sediments, disposal of the remaining contaminated sediment at offsite facilities (Subtitle D and Subtitle C/TSCA), capping, enhanced natural recovery (ENR), in-situ treatment, and monitored natural recovery (MNR). Capital costs are based on Disposed Material Management (DMM) Scenario 2.

SITE-WIDE MONITORING AND MONITORED NATURAL RECOVERY PERIODIC COSTS: (Assumed to be Incurred at Years 2, 4, 6, 8, 10 and Every 4 Years through Period of Analysis)

DESCRIPTION	WORKSHEET	QTY	UNIT(S)	UNIT COST	TOTAL	NOTES
Monitored Natural Recovery (MNR) for MNR/Enhanced Natural Recovery (ENR) and Broadcast GAC Areas	CW-H22	0	AC	$0	$0	Quantity represents dredge, MNR/ENR and in situ treatment areas.
Site-Wide Monitoring	CW-H23	1	LS	$957,659	$957,659	
Cap Area Monitoring and Reactive Layer Monitoring	CW-H24	1	LS	$87,397,498	$87,397,498	
SUBTOTAL					$88,355,157	
Contingency (Scope and Bid)		20%			$17,671,031	10% Scope, 10% Bid (Low end of the recommended range in EPA 540-R-00-002).
SUBTOTAL					$106,026,188	
Project Management		2%			$2,120,524	Percentage modified as documented in Attachment A.
Technical Support		5%			$5,301,309	Percentage modified as documented in Attachment A.
TOTAL					$113,448,021	
TOTAL PERIODIC COST					**$113,448,000**	Total periodic cost is rounded to the nearest $1,000.

LONG TERM OPERATIONS AND MAINTENANCE PERIODIC COSTS: (Assumed to be Incurred at Year 5 and Every 5 Years through Period of Analysis)

DESCRIPTION	WORKSHEET	QTY	UNIT(S)	UNIT COST	TOTAL	NOTES
Long-Term Maintenance for Capping, ENR, and In Situ Treatment	CW-H25	1	LS	$16,645,396	$16,645,396	Assume 5% of placement of additional material for capping, ENR and In Situ Treatment. Includes mobilization and demobilization costs.
SUBTOTAL					$16,645,396	
Contingency (Scope and Bid)		20%			$3,329,079	10% Scope, 10% Bid (Low end of the recommended range in EPA 540-R-00-002).
SUBTOTAL					$19,974,475	
Project Management		5%			$998,724	Low end of the recommended range in EPA 540-R-00-002 was used.
Technical Support		10%			$1,997,448	Low end of the recommended range in EPA 540-R-00-002 was used.
TOTAL					$22,970,647	
TOTAL PERIODIC COST					**$22,971,000**	Total periodic cost is rounded to the nearest $1,000.

TABLE CS-H

Alternative **H**

DETAILED COST ESTIMATE SUMMARY

Site: Portland Harbor Superfund Site
Location: Portland, Oregon
Phase: Feasibility Study (-30% to +50%)
Base Year: 2016
Date: 5/24/2016

Description: This alternative evaluates a remedy that would involve dredging of contaminated sediments, disposal of the remaining contaminated sediment at offsite facilities (Subtitle D and Subtitle C/TSCA), capping, enhanced natural recovery (ENR), in-situ treatment, and monitored natural recovery (MNR). Capital costs are based on Disposed Material Management (DMM) Scenario 2.

INSTITUTIONAL CONTROLS PERIODIC COSTS: (Assumed to be Incurred at Year 5 and Every 5 Years through Period of Analysis)

DESCRIPTION	WORKSHEET	QTY	UNIT(S)	UNIT COST	TOTAL	NOTES
Evaluating and Updating Institutional Controls	CW-H3	1	LS	$1,320,255	$1,320,255	
SUBTOTAL					$1,320,255	
Contingency (Scope and Bid)		10%			$132,026	10% Scope, 0% Bid as documented in Attachment A.
SUBTOTAL					$1,452,281	
Project Management		5%			$72,614	Low end of the recommended range in EPA 540-R-00-002 was used.
Technical Support		10%			$145,228	Low end of the recommended range in EPA 540-R-00-002 was used.
TOTAL					$1,670,123	
TOTAL PERIODIC COST					**$1,670,000**	Total periodic cost is rounded to the nearest $1,000.

5-YEAR SITE REVIEW PERIODIC COSTS: (Assumed to be Incurred at Year 5 and Every 5 Years through Period of Analysis)

DESCRIPTION	WORKSHEET	QTY	UNIT(S)	UNIT COST	TOTAL	NOTES
5-Year Site Review	CW-H26	1	LS	$243,687	$243,687	
SUBTOTAL					$243,687	
Contingency (Scope and Bid)		10%			$24,369	10% Scope, 0% Bid as documented in Attachment A.
SUBTOTAL					$268,056	
Project Management		5%			$13,403	Low end of the recommended range in EPA 540-R-00-002 was used.
Technical Support		10%			$26,806	Low end of the recommended range in EPA 540-R-00-002 was used.
TOTAL					$308,265	
TOTAL PERIODIC COST					**$308,000**	Total periodic cost is rounded to the nearest $1,000.

Notes:
Percentages used for contingency and professional/technical services costs are based on guidance from Section 5.0 of "A Guide to Developing and Documenting Cost Estimates During the Feasibility Study", EPA 2000. Modifications to the percentages applied for contingency and professional/technical services are documented in Attachment A.
Costs presented for this alternative are expected to have an accuracy between -30% to +50% of actual costs, based on the scope presented. They are prepared solely to facilitate relative comparisons between alternatives for FS evaluation purposes.

Abbreviations:

AC	Acre
CY	Cubic Yard
LS	Lump Sum
QTY	Quantity
SF	Square Foot
TON	Ton

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Present Value Analysis and Detailed Cost Estimate Summary Alternative I

Note: Costs presented in this present value analysis and detailed cost estimate summary are specific to DMM Scenario 2. Costs for DMM Scenario 1 can be found in Attachment B of this appendix.

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TABLE PV-I

PRESENT VALUE ANALYSIS

Alternative **I**

Site: **Portland Harbor Superfund Site**
Location: **Portland, Oregon**
Phase: **Feasibility Study (-30% to +50%)**
Base Year: **2016**

Year[1]	Capital Costs (Institutional Controls)[2]	Capital Costs (Monitored Natural Recovery)[2]	Capital Costs (Technology Assignments)[2]	Annual O&M Costs	Periodic Costs (Long Term Monitoring and Monitored Natural Recovery)	Periodic Costs (Long Term Operations and Maintenance and Institutional Controls)	Periodic Costs (Five-Year Site Reviews)	Total Annual Expenditure[3]	Discount Factor (7.0%)	Present Value[4]
0	$532,286	$10,197,000	$105,348,000	$0	$0	$0	$0	$116,077,286	1.0000	$116,077,286
1	$532,286	$0	$105,348,000	$0	$0	$0	$0	$105,880,286	0.9346	$98,955,715
2	$532,286	$0	$105,348,000	$0	$38,426,000	$0	$0	$144,306,286	0.8734	$126,037,110
3	$532,286	$0	$105,348,000	$0	$0	$0	$0	$105,880,286	0.8163	$86,430,077
4	$532,286	$0	$105,348,000	$0	$38,426,000	$0	$0	$144,306,286	0.7629	$110,091,266
5	$532,286	$0	$105,348,000	$0	$0	$5,972,000	$308,000	$112,160,286	0.7130	$79,970,284
6	$532,286	$0	$105,348,000	$0	$38,426,000	$0	$0	$144,306,286	0.6663	$96,151,278
7	$0	$0	$0	$0	$0	$0	$0	$0	0.6227	$0
8	$0	$0	$0	$0	$38,426,000	$0	$0	$38,426,000	0.5820	$22,363,932
9	$0	$0	$0	$0	$0	$0	$0	$0	0.5439	$0
10	$0	$0	$0	$0	$38,426,000	$5,972,000	$308,000	$44,706,000	0.5083	$22,724,060
11	$0	$0	$0	$0	$0	$0	$0	$0	0.4751	$0
12	$0	$0	$0	$0	$0	$0	$0	$0	0.4440	$0
13	$0	$0	$0	$0	$0	$0	$0	$0	0.4150	$0
14	$0	$0	$0	$0	$38,426,000	$0	$0	$38,426,000	0.3878	$14,901,603
15	$0	$0	$0	$0	$0	$5,972,000	$308,000	$6,280,000	0.3624	$2,275,872
16	$0	$0	$0	$0	$0	$0	$0	$0	0.3387	$0
17	$0	$0	$0	$0	$0	$0	$0	$0	0.3166	$0
18	$0	$0	$0	$0	$38,426,000	$0	$0	$38,426,000	0.2959	$11,370,253
19	$0	$0	$0	$0	$0	$0	$0	$0	0.2765	$0
20	$0	$0	$0	$0	$0	$5,972,000	$308,000	$6,280,000	0.2584	$1,622,752
21	$0	$0	$0	$0	$0	$0	$0	$0	0.2415	$0
22	$0	$0	$0	$0	$38,426,000	$0	$0	$38,426,000	0.2257	$8,672,748
23	$0	$0	$0	$0	$0	$0	$0	$0	0.2109	$0
24	$0	$0	$0	$0	$0	$0	$0	$0	0.1971	$0
25	$0	$0	$0	$0	$0	$5,972,000	$308,000	$6,280,000	0.1842	$1,156,776
26	$0	$0	$0	$0	$38,426,000	$0	$0	$38,426,000	0.1722	$6,616,957
27	$0	$0	$0	$0	$0	$0	$0	$0	0.1609	$0
28	$0	$0	$0	$0	$0	$0	$0	$0	0.1504	$0
29	$0	$0	$0	$0	$0	$0	$0	$0	0.1406	$0
30	$0	$0	$0	$0	$38,426,000	$5,972,000	$308,000	$44,706,000	0.1314	$5,874,368
TOTALS:	$3,726,000	$10,197,000	$737,436,000	$0	$384,260,000	$35,832,000	$1,848,000	$1,173,299,000		$811,292,337
TOTAL PRESENT VALUE OF ALTERNATIVE I[5]										**$811,290,000**

Notes:

[1] The alternative is expected to require cost expenditures for perpetuity since some contamination within the sediment bed and associated riverbank soils would remain in-place that do not allow for unrestricted use or unlimited exposure to human or ecological receptors. However the period of analysis was assumed to be 30 yrs beyond the start of construction in Year 0.

[2] Capital costs, for purposes of this analysis, are assumed to be distributed as indicated on Table CS-I.

[3] Total annual expenditure is the total cost per year with no discounting.

[4] Present value is the total cost per year including a 7.0% discount factor for that year. See Table PV-ADRFT for details.

[5] Total present value is rounded to the nearest $10,000. Inflation and depreciation are excluded from the present value cost.

Costs presented for this alternative are expected to have an accuracy between -30% to +50% of actual costs, based on the scope presented.

They are prepared solely to facilitate relative comparisons between alternatives for FS evaluation purposes.

TABLE CS-I

Alternative I

DETAILED COST ESTIMATE SUMMARY

Site: Portland Harbor Superfund Site
Location: Portland, Oregon
Phase: Feasibility Study (-30% to +50%)
Base Year: 2016
Date: 5/24/2016

Description: This alternative evaluates a remedy that would involve dredging of contaminated sediments, disposal of the remaining contaminated sediment at offsite facilities (Subtitle D and Subtitle C/TSCA), capping, enhanced natural recovery (ENR), in-situ treatment, and monitored natural recovery (MNR). Capital costs are based on Disposed Material Management (DMM) Scenario 2.

INSTITUTIONAL CONTROLS CAPITAL COSTS: (Assumed to be Incurred During Years 0 through 6)

DESCRIPTION	WORKSHEET	QTY	UNIT(S)	UNIT COST	TOTAL	NOTES
Initial Establishment of Institutional Controls	CW-I2	1	LS	$3,028,033	$3,028,033	
SUBTOTAL					$3,028,033	
Contingency (Scope and Bid)		15%			$454,205	10% Scope, 5% Bid as documented in Attachment A.
SUBTOTAL					$3,482,238	
Project Management		2%			$69,645	Percentage modified as documented in Attachment A.
Remedial Design		2%			$69,645	Percentage modified as documented in Attachment A.
Construction Management		3%			$104,467	Percentage modified as documented in Attachment A.
TOTAL					$3,725,995	
TOTAL CAPITAL COST					**$3,726,000**	Total capital cost is rounded to the nearest $1,000.

MONITORED NATURAL RECOVERY CAPITAL COSTS: (Assumed to be Incurred During Year 0)

DESCRIPTION	WORKSHEET	QTY	UNIT(S)	UNIT COST	TOTAL	NOTES
Monitored Natural Recovery (MNR) for MNR/Enhanced Natural Recovery (ENR) and Broadcast GAC Areas	CW-I22	1937	AC	$3,686	$7,140,415	Quantity represents dredge, MNR/ENR and in situ treatment areas.
SUBTOTAL					$7,140,415	
Contingency (Scope and Bid)		20%			$1,428,083	10% Scope, 10% Bid (Low end of the recommended range in EPA 540-R-00-002).
SUBTOTAL					$8,568,498	
Project Management		5%			$428,425	Percentage from Exhibit 5-8 in EPA 540-R-00-002 was used.
Remedial Design		8%			$685,480	Percentage from Exhibit 5-8 in EPA 540-R-00-002 was used.
Construction Management		6%			$514,110	Percentage from Exhibit 5-8 in EPA 540-R-00-002 was used.
TOTAL					$10,196,513	
TOTAL CAPITAL COST					**$10,197,000**	Total capital cost is rounded to the nearest $1,000.

TABLE CS-I

Alternative I

DETAILED COST ESTIMATE SUMMARY

Site: Portland Harbor Superfund Site
Location: Portland, Oregon
Phase: Feasibility Study (-30% to +50%)
Base Year: 2016
Date: 5/24/2016

Description: This alternative evaluates a remedy that would involve dredging of contaminated sediments, disposal of the remaining contaminated sediment at offsite facilities (Subtitle D and Subtitle C/TSCA), capping, enhanced natural recovery (ENR), in-situ treatment, and monitored natural recovery (MNR). Capital costs are based on Disposed Material Management (DMM) Scenario 2.

TECHNOLOGY ASSIGNMENTS MEASURES CAPITAL CONSTRUCTION COSTS: (Assumed to be Incurred During Years 0 through 6)

DESCRIPTION	WORKSHEET	QTY	UNIT(S)	UNIT COST	TOTAL	NOTES
Mobilization / Demobilization	CW-I1	1	LS	$9,045,000	$9,045,000	
Transload Facility Development	CW-I21	1	LS	$10,528,998	$10,528,998	
Debris Removal and Disposal	CW-I5	292	AC	$13,107	$3,827,247	
Obstruction Removal and Relocation	CW-I6	1	LS	$15,146,379	$15,146,379	
Erosion/Residual Control Measures	CW-I7	1	LS	$25,227,895	$25,227,895	
Dredging of Contaminated Sediments (Open Water)	CW-I8	1,556,599	CY	$24.53	$38,183,373	
Dredging of Contaminated Sediments (Confined)	CW-I9	93,151	CY	$31.10	$2,896,996	
Excavation of Riverbanks	CW-I10	102,624	CY	$5.19	$532,618	
Dewatering and Water Treatment for Dredging Operations	CW-I11	1	LS	$7,261,269	$7,261,269	Includes collection and treatment of water from sediment dewatering during dredging operations
Subtitle C/TSCA Disposal (Handling, Transportation, Treatment of Select PTW Materials, and Disposal)	CW-I12	358,888	TON	$191	$68,535,729	Includes waste going to offsite Subtitle C/TSCA facility for disposal, including the volume of NRC/NAPL PTW that would require treatment
Subtitle D Disposal (Handling, Transportation, and Disposal)	CW-I13	2,534,454	TON	$111	$280,706,119	Includes waste going to offsite Subtitle D facility for disposal without treatment, including the volume of non-PTW contaminated sediments/riverbank soils as well as the volume of highly toxic PTW
Mitigation	CW-I14	34	AC	$1,070,827	$36,408,118	
Sand Placement for Technology Assignments	CW-I15	598,578	CY	$34.00	$20,353,254	
Beach Mix Placement for Technology Assignments	CW-I16	49,511	CY	$73.43	$3,635,422	
Armor Placement for Technology Assignments	CW-I17	80,297	CY	$72.27	$5,802,915	
Reactive/GAC Placement for Technology Assignments	CW-I18	1	LS	$44,759,377	$44,759,377	
Geofabric for Riverbanks	CW-I19	21.2	AC	$14,311	$303,398	
Organoclay Mat Placement for Technology Assignments	CW-I20	174,300	SF	$6.73	$1,173,039	
SUBTOTAL					$574,327,146	
Contingency (Scope and Bid)		20%			$114,865,429	10% Scope, 10% Bid (Low end of the recommended range in EPA 540-R-00-002).
SUBTOTAL					$689,192,575	
Project Management		2%			$13,783,852	Percentage modified as documented in Attachment A.
Remedial Design		2%			$13,783,852	Percentage modified as documented in Attachment A.
Construction Management		3%			$20,675,777	Percentage modified as documented in Attachment A.
TOTAL					$737,436,056	
TOTAL CAPITAL COST					**$737,436,000**	Total capital cost is rounded to the nearest $1,000.

TABLE CS-I

Alternative I

DETAILED COST ESTIMATE SUMMARY

Site: Portland Harbor Superfund Site
Location: Portland, Oregon
Phase: Feasibility Study (-30% to +50%)
Base Year: 2016
Date: 5/24/2016

Description: This alternative evaluates a remedy that would involve dredging of contaminated sediments, disposal of the remaining contaminated sediment at offsite facilities (Subtitle D and Subtitle C/TSCA), capping, enhanced natural recovery (ENR), in-situ treatment, and monitored natural recovery (MNR). Capital costs are based on Disposed Material Management (DMM) Scenario 2.

SITE-WIDE MONITORING AND MONITORED NATURAL RECOVERY PERIODIC COSTS: (Assumed to be Incurred at Years 2, 4, 6, 8, 10 and Every 4 Years through Period of Analysis)

DESCRIPTION	WORKSHEET	QTY	UNIT(S)	UNIT COST	TOTAL	NOTES
Monitored Natural Recovery (MNR) for MNR/Enhanced Natural Recovery (ENR) and Broadcast GAC Areas	CW-I22	1937	AC	$3,686	$7,140,415	Quantity represents dredge, MNR/ENR and in situ treatment areas.
Site-Wide Monitoring	CW-I23	1	LS	$957,659	$957,659	
Cap Area Monitoring and Reactive Layer Monitoring	CW-I24	1	LS	$21,828,717	$21,828,717	
SUBTOTAL					$29,926,791	
Contingency (Scope and Bid)		20%			$5,985,358	10% Scope, 10% Bid (Low end of the recommended range in EPA 540-R-00-002).
SUBTOTAL					$35,912,149	
Project Management		2%			$718,243	Percentage modified as documented in Attachment A.
Technical Support		5%			$1,795,607	Percentage modified as documented in Attachment A.
TOTAL					$38,425,999	
TOTAL PERIODIC COST					**$38,426,000**	Total periodic cost is rounded to the nearest $1,000.

LONG TERM OPERATIONS AND MAINTENANCE PERIODIC COSTS: (Assumed to be Incurred at Year 5 and Every 5 Years through Period of Analysis)

DESCRIPTION	WORKSHEET	QTY	UNIT(S)	UNIT COST	TOTAL	NOTES
Long-Term Maintenance for Capping, ENR, and In Situ Treatment	CW-I25	1	LS	$3,862,654	$3,862,654	Assume 5% of placement of additional material for capping, ENR and In Situ Treatment. Includes mobilization and demobilization costs.
SUBTOTAL					$3,862,654	
Contingency (Scope and Bid)		20%			$772,531	10% Scope, 10% Bid (Low end of the recommended range in EPA 540-R-00-002).
SUBTOTAL					$4,635,185	
Project Management		5%			$231,759	Low end of the recommended range in EPA 540-R-00-002 was used.
Technical Support		10%			$463,519	Low end of the recommended range in EPA 540-R-00-002 was used.
TOTAL					$5,330,463	
TOTAL PERIODIC COST					**$5,330,000**	Total periodic cost is rounded to the nearest $1,000.

TABLE CS-I

Alternative I

DETAILED COST ESTIMATE SUMMARY

Site: Portland Harbor Superfund Site
Location: Portland, Oregon
Phase: Feasibility Study (-30% to +50%)
Base Year: 2016
Date: 5/24/2016

Description: This alternative evaluates a remedy that would involve dredging of contaminated sediments, disposal of the remaining contaminated sediment at offsite facilities (Subtitle D and Subtitle C/TSCA), capping, enhanced natural recovery (ENR), in-situ treatment, and monitored natural recovery (MNR). Capital costs are based on Disposed Material Management (DMM) Scenario 2.

INSTITUTIONAL CONTROLS PERIODIC COSTS: (Assumed to be Incurred at Year 5 and Every 5 Years through Period of Analysis)

DESCRIPTION	WORKSHEET	QTY	UNIT(S)	UNIT COST	TOTAL	NOTES
Evaluating and Updating Institutional Controls	CW-I3	1	LS	$507,467	$507,467	
SUBTOTAL					$507,467	
Contingency (Scope and Bid)		10%			$50,747	10% Scope, 0% Bid as documented in Attachment A.
SUBTOTAL					$558,214	
Project Management		5%			$27,911	Low end of the recommended range in EPA 540-R-00-002 was used.
Technical Support		10%			$55,821	Low end of the recommended range in EPA 540-R-00-002 was used.
TOTAL					$641,946	
TOTAL PERIODIC COST					**$642,000**	Total periodic cost is rounded to the nearest $1,000.

5-YEAR SITE REVIEW PERIODIC COSTS: (Assumed to be Incurred at Year 5 and Every 5 Years through Period of Analysis)

DESCRIPTION	WORKSHEET	QTY	UNIT(S)	UNIT COST	TOTAL	NOTES
5-Year Site Review	CW-I26	1	LS	$243,687	$243,687	
SUBTOTAL					$243,687	
Contingency (Scope and Bid)		10%			$24,369	10% Scope, 0% Bid as documented in Attachment A.
SUBTOTAL					$268,056	
Project Management		5%			$13,403	Low end of the recommended range in EPA 540-R-00-002 was used.
Technical Support		10%			$26,806	Low end of the recommended range in EPA 540-R-00-002 was used.
TOTAL					$308,265	
TOTAL PERIODIC COST					**$308,000**	Total periodic cost is rounded to the nearest $1,000.

Notes:
Percentages used for contingency and professional/technical services costs are based on guidance from Section 5.0 of "A Guide to Developing and Documenting Cost Estimates During the Feasibility Study", EPA 2000. Modifications to the percentages applied for contingency and professional/technical services are documented in Attachment A.
Costs presented for this alternative are expected to have an accuracy between -30% to +50% of actual costs, based on the scope presented. They are prepared solely to facilitate relative comparisons between alternatives for FS evaluation purposes.

Abbreviations:

AC	Acre
CY	Cubic Yard
LS	Lump Sum
QTY	Quantity
SF	Square Foot
TON	Ton

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Cost Worksheets
Alternative B

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TABLE CW-B1

Alternative B **Cost Worksheet:** **CW-B1**
Capital Cost Sub-Element
Mobilization / Demobilization

COST WORKSHEET

Site: Portland Harbor Superfund Site
Location: Portland, Oregon
Phase: Feasibility Study
Base Year: 2016

Prepared By: JN **Date:** 3/4/2016
Checked By: AB **Date:** 3/7/2016

Work Statement:
This sub-element involves mobilization and demobilization of all the required equipment to and from the site respectively.

Cost Analysis:
Cost for Mobilization/Demobilization (Lump Sum)

COST DATABASE CODE	DESCRIPTION	QTY	UNIT(S)	HPF	LABOR	ADJ LABOR	EQUIP	ADJ EQUIP	MATL	OTHER	UNMOD UC	UNMOD LIC	PC OH	PC PF	BUR LIC	COST SOURCE CITATION	COMMENTS
O1	Mobilization/Demobilization	1	LS	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$4,155,000.00	$4,155,000.00	$4,155,000.00	0%	0%	$4,155,000	LD Lower Duwamish	Assumes 1.6% of total capital costs per Lower Duwamish Feasibility Study. See Calculations for derivation.
												TOTAL COST:			$4,155,000		

	Representative Unit Quantity	Unit(s)	Total Cost	Unit Cost
COST WORKSHEET SUMMARY	1	LS	$4,155,000	$4,155,000

Notes:
Further information about the development of cost worksheets can be found in Attachment A - Methodology and Organization of Detailed Cost Estimates.
The quantity bolded in the QTY column is the quantity selected as the representative unit quantity for this cost worksheet. If multiple quantities are bolded, the representative unit quantity is the sum of those quantities. When the LS unit is utilized, the default representative unit quantity is 1.
HTRW productivity factor is from Exhibit B-3 or B-4 of "A Guide to Developing and Documenting Cost Estimates During the Feasibility Study", EPA 2000
EPA developed project-specific unit costs using the Micro Computer Aided Cost Engineering System (MCACES) Second Generation (MII) software version 4.2, build 3

Cost Database Code:
The Cost Database Code is a reference code for linking with line item cost information with the cost source database and is not otherwise used within these cost worksheets. The following cost source database prefixes apply:
L (EPA-Derived Labor Unit Costs), M (Project-Specific Vendor Unit Costs), P (Previously Developed Unit Costs by Anchor QEA for Portland Harbor), A (EPA-Derived MII Unit Costs), O (Unit Costs from Other Projects/Sources)

Source of Cost Data:
For citation references, the following sources apply:
ALL (Allowance), FLC (www.flcdatacenter.com), LD (Costs Derived from Lower Duwamish Waterway Final Feasibility Study), MII (MII), O (Other), P (Previously Developed by Anchor QEA for Portland Harbor), and V (Vendor Quote)

Abbreviations:

QTY	Quantity	AC	Acres
EQUIP	Equipment	CLF	100 Linear Foot
MATL	Material	CY	Cubic Yard
HPF	HTRW Productivity Factor	DY	Days
ADJ LABOR	Adjusted Labor for HFP	EA	Each
ADJ EQUIP	Adjusted Equipment for HFP	FTE	Full Time Equivalent
UNMOD UC	Unmodified Unit Cost	HR	Hours
UNMOD LIC	Unmodified Line Item Cost	LB	Pounds
UNBUR LIC	Unburdened Line Item Cost	LCY	Loose Cubic Yard
PC OH	Prime Contractor Overhead	LF	Linear Foot
PC PF	Prime Contractor Profit	LS	Lump Sum
BUR LIC	Burdened Line Item Cost	MO	Month
		SF	Square Foot
		SY	Square Yard
		TON	Tons
		YR	Years

Cost Adjustment Checklist:	NOTES:
FACTOR:	Field work will be in Level "D" PPE.
H&S Productivity (labor and equipment only)	MII assembly costs include HPF adjustments.
Escalation to Base Year	2016 cost sources are not escalated (EF=1.00). All other costs are escalated based on the USACE CWCCIS, EM 1110-2-1304, Sept 2015.
Area Cost Factor	An AF of 1.05 is used for Oregon, except that an AF of 1.00 (national unmodified average) is used for MII assembly costs and local vendor quotes.
Subcontractor Overhead and Profit	It is assumed that home office OH is 8% and profit is 9% for the Prime Contractor. Professional labor overhead is 100%.
Prime Contractor Overhead and Profit	Allowances and items with mandated costs such as per diem do not have overhead and profit applied.
	Items previously developed by Anchor QEA already include contractor markups, therefore overhead and profit were not applied to those items.
	It is assumed that OH is 1% and profit is 0% for vendor quotes for treatment and disposal at offsite disposal facilities. It is assumed that OH is 5% and profit is 0% for quotes for all other material vendor quotes.
	Items developed using MII already include contractor markups such as overhead and profit, therefore additional overhead and profit were not applied in the PC OH and PC PF to those items.

TABLE CW-B2

Alternative B **Cost Worksheet:** **CW-B2**

Capital Cost Sub-Element

Initial Establishment of Institutional Controls

COST WORKSHEET

Site: Portland Harbor Superfund Site
Location: Portland, Oregon
Phase: Feasibility Study
Base Year: 2016

Prepared By: JN **Date:** 3/4/2016
Checked By: AB **Date:** 3/7/2016

Work Statement:
This sub-element involves implementation of institutional controls for the site. The following cost includes labor and materials to develop legal documents for institutional controls and cost for document submission and recording.
Quantity development presented in Appendix D.

Cost Analysis:
Cost for Initial Establishment of Institutional Controls (Lump Sum)

COST DATABASE CODE	DESCRIPTION	QTY	UNIT(S)	HPF	LABOR	ADJ LABOR	EQUIP	ADJ EQUIP	MATL	OTHER	UNMOD UC	UNMOD LIC	PC OH	PC PF	BUR LIC	COST SOURCE CITATION	COMMENTS
	Informational Devices - Fish Consumption Advisory																
L11	Project Manager	2,080	HR	1.00	$82.17	$82.17	$0.00	$0.00	$0.00	$0.00	$82.17	$170,913.60	100%	9%	$372,592	FLC FLCDataCenter	Assumes 1 FTE for implementation of fish advisory
L4	Environmental Engineer	1,040	HR	1.00	$48.91	$48.91	$0.00	$0.00	$0.00	$0.00	$48.91	$50,866.40	100%	9%	$110,889	FLC FLCDataCenter	Assumes 0.5 FTE for implementation of fish advisory
L6	Environmental Scientist	1,040	HR	1.00	$37.70	$37.70	$0.00	$0.00	$0.00	$0.00	$37.70	$39,208.00	100%	9%	$85,473	FLC FLCDataCenter	Assumes 0.5 FTE for implementation of fish advisory
L3	Clerks, Typist, Bookkeeper & Receptionist	520	HR	1.00	$19.89	$19.89	$0.00	$0.00	$0.00	$0.00	$19.89	$10,342.80	100%	9%	$22,547	FLC FLCDataCenter	Assumes 0.25 FTE for implementation of fish advisory
L5	Environmental Lawyer	260	HR	1.00	$71.72	$71.72	$0.00	$0.00	$0.00	$0.00	$71.72	$18,647.20	100%	9%	$40,651	FLC FLCDataCenter	Assumes 0.125 FTE for implementation of fish advisory
L13	Paralegal	260	HR	1.00	$29.56	$29.56	$0.00	$0.00	$0.00	$0.00	$29.56	$7,685.60	100%	9%	$16,755	FLC FLCDataCenter	Assumes 0.125 FTE for implementation of fish advisory
M26	Signage	50	EA	1.00	$0.00	$0.00	$0.00	$0.00	$165.75	$0.00	$165.75	$8,287.50	5%	0%	$8,702	V Vendor Quote	Project-specific vendor quote - Allstate Sign & Plaque, 2016. 36" x 36" Signs
L8	Field Technician	50	HR	1.00	$31.42	$31.42	$0.00	$0.00	$0.00	$0.00	$31.42	$1,571.00	100%	9%	$3,425	FLC FLCDataCenter	Assumes 1 hr/sign for sign placement (2 technician crew)
O5	Allowance for Production & Copies for Advisories	1	LS	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$1,000.00	$1,000.00	$1,000.00	0%	0%	$1,000	ALL Allowance	
	Informational Devices - Regulated Navigation Area (RNA) Setup																
L11	Project Manager	200	HR	1.00	$82.17	$82.17	$0.00	$0.00	$0.00	$0.00	$82.17	$16,434.00	100%	9%	$35,826	FLC FLCDataCenter	Project-specific unit cost developed by EPA.
L4	Environmental Engineer	150	HR	1.00	$48.91	$48.91	$0.00	$0.00	$0.00	$0.00	$48.91	$7,336.50	100%	9%	$15,994	FLC FLCDataCenter	Project-specific unit cost developed by EPA.
L3	Clerks, Typist, Bookkeeper & Receptionist	40	HR	1.00	$19.89	$19.89	$0.00	$0.00	$0.00	$0.00	$19.89	$795.60	100%	9%	$1,734	FLC FLCDataCenter	Project-specific unit cost developed by EPA.
A1	18' Boat	152	HR	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$25.42	$25.42	$3,863.84	0%	0%	$3,864	MII MII	Assumes 2 hr/buoy for buoy setup
L17	Boat Operator	152	HR	1.00	$33.16	$33.16	$0.00	$0.00	$0.00	$0.00	$33.16	$5,040.32	100%	9%	$10,988	FLC FLCDataCenter	Assumes 2 hr/buoy for buoy setup
L8	Field Technician	304	HR	1.00	$31.42	$31.42	$0.00	$0.00	$0.00	$0.00	$31.42	$9,551.68	100%	9%	$20,823	FLC FLCDataCenter	Assumes 4 hrs/buoy for buoy setup (2 technician crew)
M21	Buoy	76	EA	1.00	$0.00	$0.00	$0.00	$0.00	$558.63	$0.00	$558.63	$42,455.88	5%	0%	$44,579	V Vendor Quote	Project-specific vendor quote - Go2Marine, 2016.
	Proprietary Controls																
L5	Environmental Lawyer	2,100	HR	1.00	$71.72	$71.72	$0.00	$0.00	$0.00	$0.00	$71.72	$150,612.00	100%	9%	$328,334	FLC FLCDataCenter	Assumes 150 hrs per dock/structure
L13	Paralegal	2,800	HR	1.00	$29.56	$29.56	$0.00	$0.00	$0.00	$0.00	$29.56	$82,768.00	100%	9%	$180,434	FLC FLCDataCenter	Assumes 200 hrs per dock/structure
L3	Clerks, Typist, Bookkeeper & Receptionist	1,400	HR	1.00	$19.89	$19.89	$0.00	$0.00	$0.00	$0.00	$19.89	$27,846.00	100%	9%	$60,704	FLC FLCDataCenter	Assumes 100 hrs per dock/structure
	Enforcement Tools																
L11	Project Manager	260	HR	1.00	$82.17	$82.17	$0.00	$0.00	$0.00	$0.00	$82.17	$21,364.20	100%	9%	$46,574	FLC FLCDataCenter	Assumes 0.125 FTE for implementation of enforcement tools
L5	Environmental Lawyer	2,080	HR	1.00	$71.72	$71.72	$0.00	$0.00	$0.00	$0.00	$71.72	$149,177.60	100%	9%	$325,207	FLC FLCDataCenter	Assumes 1 FTE for implementation of enforcement tools
L13	Paralegal	4,160	HR	1.00	$29.56	$29.56	$0.00	$0.00	$0.00	$0.00	$29.56	$122,969.60	100%	9%	$268,074	FLC FLCDataCenter	Assumes 2 FTE for implementation of enforcement tools
L3	Clerks, Typist, Bookkeeper & Receptionist	260	HR	1.00	$19.89	$19.89	$0.00	$0.00	$0.00	$0.00	$19.89	$5,171.40	100%	9%	$11,274	FLC FLCDataCenter	Assumes 0.125 FTE for implementation of enforcement tools
												TOTAL COST:			$2,016,443		

	Representative Unit Quantity	Unit(s)	Total Cost	Unit Cost
COST WORKSHEET SUMMARY	1	LS	$2,016,443	$2,016,443

TABLE CW-B2

Alternative B **Cost Worksheet:** **CW-B2**
Capital Cost Sub-Element
Initial Establishment of Institutional Controls

COST WORKSHEET

Site: Portland Harbor Superfund Site
Location: Portland, Oregon
Phase: Feasibility Study
Base Year: 2016

Prepared By: JN **Date:** 3/4/2016
Checked By: AB **Date:** 3/7/2016

Notes:

Further information about the development of cost worksheets can be found in Attachment A - Methodology and Organization of Detailed Cost Estimates.
The quantity bolded in the QTY column is the quantity selected as the representative unit quantity for this cost worksheet. If multiple quantities are bolded, the representative unit quantity is the sum of those quantities. When the LS unit is utilized, the default representative unit quantity is 1.
HTRW productivity factor is from Exhibit B-3 or B-4 of "A Guide to Developing and Documenting Cost Estimates During the Feasibility Study", EPA 2000
EPA developed project-specific unit costs using the Micro Computer Aided Cost Engineering System (MCACES) Second Generation (MII) software version 4.2, build 3

Cost Database Code:

The Cost Database Code is a reference code for linking with line item cost information with the cost source database and is not otherwise used within these cost worksheets. The following cost source database prefixes apply:

L (EPA-Derived Labor Unit Costs), M (Project-Specific Vendor Unit Costs), P (Previously Developed Unit Costs by Anchor QEA for Portland Harbor), A (EPA-Derived MII Unit Costs), O (Unit Costs from Other Projects/Sources)

Source of Cost Data:

For citation references, the following sources apply:

ALL (Allowance), FLC (www.flcdatacenter.com), LD (Costs Derived from Lower Duwamish Waterway Final Feasibility Study), MII (MII), O (Other), P (Previously Developed by Anchor QEA for Portland Harbor), and V (Vendor Quote)

Abbreviations:

QTY	Quantity
EQUIP	Equipment
MATL	Material
HPF	HTRW Productivity Factor
ADJ LABOR	Adjusted Labor for HFP
ADJ EQUIP	Adjusted Equipment for HFP
UNMOD UC	Unmodified Unit Cost
UNMOD LIC	Unmodified Line Item Cost
UNBUR LIC	Unburdened Line Item Cost
PC OH	Prime Contractor Overhead
PC PF	Prime Contractor Profit
BUR LIC	Burdened Line Item Cost
AC	Acres
CLF	100 Linear Foot
CY	Cubic Yard
DY	Days
EA	Each
FTE	Full Time Equivalent
HR	Hours
LB	Pounds
LCY	Loose Cubic Yard
LF	Linear Foot
LS	Lump Sum
MO	Month
SF	Square Foot
SY	Square Yard
TON	Tons
YR	Years

Cost Adjustment Checklist:	**NOTES:**
FACTOR:	Field work will be in Level "D" PPE.
H&S Productivity (labor and equipment only)	MII assembly costs include HPF adjustments.
Escalation to Base Year	2016 cost sources are not escalated (EF=1.00). All other costs are escalated based on the USACE CWCCIS, EM 1110-2-1304, Sept 2015.
Area Cost Factor	An AF of 1.05 is used for Oregon, except that an AF of 1.00 (national unmodified average) is used for MII assembly costs and local vendor quotes.
Subcontractor Overhead and Profit	It is assumed that home office OH is 8% and profit is 9% for the Prime Contractor. Professional labor overhead is 100%.
Prime Contractor Overhead and Profit	Allowances and items with mandated costs such as per diem do not have overhead and profit applied.
	Items previously developed by Anchor QEA already include contractor markups, therefore overhead and profit were not applied to those items.
	It is assumed that OH is 1% and profit is 0% for vendor quotes for treatment and disposal at offsite disposal facilities. It is assumed that OH is 5% and profit is 0% for quotes for all other material vendor quotes.
	Items developed using MII already include contractor markups such as overhead and profit, therefore additional overhead and profit were not applied in the PC OH and PC PF to those items.

TABLE CW-B3

Alternative B **Cost Worksheet:** **CW-B3**

Periodic Cost Sub-Element

Evaluating and Updating Institutional Controls

COST WORKSHEET

Site: Portland Harbor Superfund Site
Location: Portland, Oregon
Phase: Feasibility Study
Base Year: 2016

Prepared By: JN **Date:** 3/4/2016
Checked By: AB **Date:** 3/7/2016

Work Statement:
This sub-element involves evaluating and updating of institutional controls for the site. The following cost includes labor and materials to required for evaluating and updating institutional controls every 5 years.
Quantity development presented in Appendix D.

Cost Analysis:
Cost for Evaluating and Updating Institutional Controls (Lump Sum)

COST DATABASE CODE	DESCRIPTION	QTY	UNIT(S)	HPF	LABOR	ADJ LABOR	EQUIP	ADJ EQUIP	MATL	OTHER	UNMOD UC	UNMOD LIC	PC OH	PC PF	BUR LIC	COST SOURCE CITATION	COMMENTS
	Informational Devices - Fish Consumption Advisory																
L11	Project Manager	208	HR	1.00	$82.17	$82.17	$0.00	$0.00	$0.00	$0.00	$82.17	$17,091.36	100%	9%	$37,259	FLC FLCDataCenter	Assumes 10% of initial costs for updating periodically
L4	Environmental Engineer	104	HR	1.00	$48.91	$48.91	$0.00	$0.00	$0.00	$0.00	$48.91	$5,086.64	100%	9%	$11,089	FLC FLCDataCenter	Assumes 10% of initial costs for updating periodically
L6	Environmental Scientist	104	HR	1.00	$37.70	$37.70	$0.00	$0.00	$0.00	$0.00	$37.70	$3,920.80	100%	9%	$8,547	FLC FLCDataCenter	Assumes 10% of initial costs for updating periodically
L3	Clerks, Typist, Bookkeeper & Receptionist	52	HR	1.00	$19.89	$19.89	$0.00	$0.00	$0.00	$0.00	$19.89	$1,034.28	100%	9%	$2,255	FLC FLCDataCenter	Assumes 10% of initial costs for updating periodically
L5	Environmental Lawyer	26	HR	1.00	$71.72	$71.72	$0.00	$0.00	$0.00	$0.00	$71.72	$1,864.72	100%	9%	$4,065	FLC FLCDataCenter	Assumes 10% of initial costs for updating periodically
L13	Paralegal	26	HR	1.00	$29.56	$29.56	$0.00	$0.00	$0.00	$0.00	$29.56	$768.56	100%	9%	$1,675	FLC FLCDataCenter	Assumes 10% of initial costs for updating periodically
M26	Signage	50	EA	1.00	$0.00	$0.00	$0.00	$0.00	$165.75	$0.00	$165.75	$8,287.50	5%	0%	$8,702	V Vendor Quote	Assumes 100% replacement of signs every 5 years
L8	Field Technician	50	HR	1.00	$31.42	$31.42	$0.00	$0.00	$0.00	$0.00	$31.42	$1,571.00	100%	9%	$3,425	FLC FLCDataCenter	Assumes 1 hr/sign for sign placement (2 technician crew)
O5	Allowance for Production & Copies for Advisories	5	LS	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$1,000.00	$1,000.00	$5,000.00	0%	0%	$5,000	ALL Allowance	Assumes yearly allowance for production and copies during 5-yr periodic updates
	Informational Devices - Regulated Navigation Area (RNA) Setup																
L11	Project Manager	200	HR	1.00	$82.17	$82.17	$0.00	$0.00	$0.00	$0.00	$82.17	$16,434.00	100%	9%	$35,826	FLC FLCDataCenter	Project-specific unit cost developed by EPA.
L4	Environmental Engineer	150	HR	1.00	$48.91	$48.91	$0.00	$0.00	$0.00	$0.00	$48.91	$7,336.50	100%	9%	$15,994	FLC FLCDataCenter	Project-specific unit cost developed by EPA.
L3	Clerks, Typist, Bookkeeper & Receptionist	40	HR	1.00	$19.89	$19.89	$0.00	$0.00	$0.00	$0.00	$19.89	$795.60	100%	9%	$1,734	FLC FLCDataCenter	Project-specific unit cost developed by EPA.
A1	18' Boat	152	HR	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$25.42	$25.42	$3,863.84	0%	0%	$3,864	MII MII	Assumes 2 hr/buoy for buoy setup
L17	Boat Operator	152	HR	1.00	$33.16	$33.16	$0.00	$0.00	$0.00	$0.00	$33.16	$5,040.32	100%	9%	$10,988	FLC FLCDataCenter	Assumes 2 hr/buoy for buoy setup
L8	Field Technician	304	HR	1.00	$31.42	$31.42	$0.00	$0.00	$0.00	$0.00	$31.42	$9,551.68	100%	9%	$20,823	FLC FLCDataCenter	Assumes 4 hrs/buoy for buoy setup (2 technician crew)
M21	Buoy	76	EA	1.00	$0.00	$0.00	$0.00	$0.00	$558.63	$0.00	$558.63	$42,455.88	5%	0%	$44,579	V Vendor Quote	Assumes 100% replacement of buoys every 5 years. Quote - Go2Marine 2016.
	Proprietary Controls																
L5	Environmental Lawyer	210	HR	1.00	$71.72	$71.72	$0.00	$0.00	$0.00	$0.00	$71.72	$15,061.20	100%	9%	$32,833	FLC FLCDataCenter	Assumes 10% of initial costs for updating periodically
L13	Paralegal	280	HR	1.00	$29.56	$29.56	$0.00	$0.00	$0.00	$0.00	$29.56	$8,276.80	100%	9%	$18,043	FLC FLCDataCenter	Assumes 10% of initial costs for updating periodically
L3	Clerks, Typist, Bookkeeper & Receptionist	140	HR	1.00	$19.89	$19.89	$0.00	$0.00	$0.00	$0.00	$19.89	$2,784.60	100%	9%	$6,070	FLC FLCDataCenter	Assumes 10% of initial costs for updating periodically
	Enforcement Tools																
L11	Project Manager	26	HR	1.00	$82.17	$82.17	$0.00	$0.00	$0.00	$0.00	$82.17	$2,136.42	100%	9%	$4,657	FLC FLCDataCenter	Assumes 10% of initial costs for updating periodically
L5	Environmental Lawyer	208	HR	1.00	$71.72	$71.72	$0.00	$0.00	$0.00	$0.00	$71.72	$14,917.76	100%	9%	$32,521	FLC FLCDataCenter	Assumes 10% of initial costs for updating periodically
L13	Paralegal	416	HR	1.00	$29.56	$29.56	$0.00	$0.00	$0.00	$0.00	$29.56	$12,296.96	100%	9%	$26,807	FLC FLCDataCenter	Assumes 10% of initial costs for updating periodically
L3	Clerks, Typist, Bookkeeper & Receptionist	26	HR	1.00	$19.89	$19.89	$0.00	$0.00	$0.00	$0.00	$19.89	$517.14	100%	9%	$1,127	FLC FLCDataCenter	Assumes 10% of initial costs for updating periodically
												TOTAL COST:			$337,883		

	Representative Unit Quantity	Unit(s)	Total Cost	Unit Cost
COST WORKSHEET SUMMARY	1	LS	$337,883	$337,883

TABLE CW-B3

Alternative B **Cost Worksheet:** **CW-B3**
Periodic Cost Sub-Element
Evaluating and Updating Institutional Controls

COST WORKSHEET

Site: Portland Harbor Superfund Site
Location: Portland, Oregon
Phase: Feasibility Study
Base Year: 2016

Prepared By: JN **Date:** 3/4/2016
Checked By: AB **Date:** 3/7/2016

Notes:

Further information about the development of cost worksheets can be found in Attachment A - Methodology and Organization of Detailed Cost Estimates.
The quantity bolded in the QTY column is the quantity selected as the representative unit quantity for this cost worksheet. If multiple quantities are bolded, the representative unit quantity is the sum of those quantities. When the LS unit is utilized, the default representative unit quantity is 1.
HTRW productivity factor is from Exhibit B-3 or B-4 of "A Guide to Developing and Documenting Cost Estimates During the Feasibility Study", EPA 2000
EPA developed project-specific unit costs using the Micro Computer Aided Cost Engineering System (MCACES) Second Generation (MII) software version 4.2, build 3

Cost Database Code:

The Cost Database Code is a reference code for linking with line item cost information with the cost source database and is not otherwise used within these cost worksheets. The following cost source database prefixes apply:

L (EPA-Derived Labor Unit Costs), M (Project-Specific Vendor Unit Costs), P (Previously Developed Unit Costs by Anchor QEA for Portland Harbor), A (EPA-Derived MII Unit Costs), O (Unit Costs from Other Projects/Sources)

Source of Cost Data:

For citation references, the following sources apply:

ALL (Allowance), FLC (www.flcdatacenter.com), LD (Costs Derived from Lower Duwamish Waterway Final Feasibility Study), MII (MII), O (Other), P (Previously Developed by Anchor QEA for Portland Harbor), and V (Vendor Quote)

Abbreviations:

QTY	Quantity	AC	Acres
EQUIP	Equipment	CLF	100 Linear Foot
MATL	Material	CY	Cubic Yard
HPF	HTRW Productivity Factor	DY	Days
ADJ LABOR	Adjusted Labor for HFP	EA	Each
ADJ EQUIP	Adjusted Equipment for HFP	FTE	Full Time Equivalent
UNMOD UC	Unmodified Unit Cost	HR	Hours
UNMOD LIC	Unmodified Line Item Cost	LB	Pounds
UNBUR LIC	Unburdened Line Item Cost	LCY	Loose Cubic Yard
PC OH	Prime Contractor Overhead	LF	Linear Foot
PC PF	Prime Contractor Profit	LS	Lump Sum
BUR LIC	Burdened Line Item Cost	MO	Month
		SF	Square Foot
		SY	Square Yard
		TON	Tons
		YR	Years

Cost Adjustment Checklist:	**NOTES:**
FACTOR:	Field work will be in Level "D" PPE.
H&S Productivity (labor and equipment only)	MII assembly costs include HPF adjustments.
Escalation to Base Year	2016 cost sources are not escalated (EF=1.00). All other costs are escalated based on the USACE CWCCIS, EM 1110-2-1304, Sept 2015.
Area Cost Factor	An AF of 1.05 is used for Oregon, except that an AF of 1.00 (national unmodified average) is used for MII assembly costs and local vendor quotes.
Subcontractor Overhead and Profit	It is assumed that home office OH is 8% and profit is 9% for the Prime Contractor. Professional labor overhead is 100%.
Prime Contractor Overhead and Profit	Allowances and items with mandated costs such as per diem do not have overhead and profit applied.
	Items previously developed by Anchor QEA already include contractor markups, therefore overhead and profit were not applied to those items.
	It is assumed that OH is 1% and profit is 0% for vendor quotes for treatment and disposal at offsite disposal facilities. It is assumed that OH is 5% and profit is 0% for quotes for all other material vendor quotes.
	Items developed using MII already include contractor markups such as overhead and profit, therefore additional overhead and profit were not applied in the PC OH and PC PF to those items.

TABLE CW-B5

Alternative B **Cost Worksheet:** **CW-B5**
Capital Cost Sub-Element
Debris Removal and Disposal

COST WORKSHEET

Site: Portland Harbor Superfund Site
Location: Portland, Oregon
Phase: Feasibility Study
Base Year: 2016

Prepared By: JN **Date:** 3/4/2016
Checked By: AB **Date:** 3/7/2016

Work Statement:
This sub-element involves removal and disposal of debris for all areas prior to remedial activities. It includes costs for on-site labor, equipment, and materials developed from previous work.
Quantity development presented in Appendix D.

Cost Analysis:
Cost for Debris Removal and Disposal (Lump Sum)

COST DATABASE CODE	DESCRIPTION	QTY	UNIT(S)	HPF	LABOR	ADJ LABOR	EQUIP	ADJ EQUIP	MATL	OTHER	UNMOD UC	UNMOD LIC	PC OH	PC PF	BUR LIC	COST SOURCE CITATION	COMMENTS
P9	Debris Removal and Disposal	**202**	AC	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$13,107.01	$13,107.01	$2,647,616.02	0%	0%	$2,647,616	P Anchor QEA	Project-specific cost developed by Anchor QEA (2010) - see Backup Table 2.
												TOTAL COST:			$2,647,616		

	Representative Unit Quantity	Unit(s)	Total Cost	Unit Cost
COST WORKSHEET SUMMARY	202	AC	$2,647,616	$13,107

Notes:
Further information about the development of cost worksheets can be found in Attachment A - Methodology and Organization of Detailed Cost Estimates.
The quantity bolded in the QTY column is the quantity selected as the representative unit quantity for this cost worksheet. If multiple quantities are bolded, the representative unit quantity is the sum of those quantities. When the LS unit is utilized, the default representative unit quantity is 1.
HTRW productivity factor is from Exhibit B-3 or B-4 of "A Guide to Developing and Documenting Cost Estimates During the Feasibility Study", EPA 2000
EPA developed project-specific unit costs using the Micro Computer Aided Cost Engineering System (MCACES) Second Generation (MII) software version 4.2, build 3

Cost Database Code:
The Cost Database Code is a reference code for linking with line item cost information with the cost source database and is not otherwise used within these cost worksheets. The following cost source database prefixes apply:
L (EPA-Derived Labor Unit Costs), M (Project-Specific Vendor Unit Costs), P (Previously Developed Unit Costs by Anchor QEA for Portland Harbor), A (EPA-Derived MII Unit Costs), O (Unit Costs from Other Projects/Sources)

Source of Cost Data:
For citation references, the following sources apply:
ALL (Allowance), FLC (www.flcdatacenter.com), LD (Costs Derived from Lower Duwamish Waterway Final Feasibility Study), MII (MII), O (Other), P (Previously Developed by Anchor QEA for Portland Harbor), and V (Vendor Quote)

Abbreviations:

QTY	Quantity	AC	Acres
EQUIP	Equipment	CLF	100 Linear Foot
MATL	Material	CY	Cubic Yard
HPF	HTRW Productivity Factor	DY	Days
ADJ LABOR	Adjusted Labor for HFP	EA	Each
ADJ EQUIP	Adjusted Equipment for HFP	FTE	Full Time Equivalent
UNMOD UC	Unmodified Unit Cost	HR	Hours
UNMOD LIC	Unmodified Line Item Cost	LB	Pounds
UNBUR LIC	Unburdened Line Item Cost	LCY	Loose Cubic Yard
PC OH	Prime Contractor Overhead	LF	Linear Foot
PC PF	Prime Contractor Profit	LS	Lump Sum
BUR LIC	Burdened Line Item Cost	MO	Month
		SF	Square Foot
		SY	Square Yard
		TON	Tons
		YR	Years

Cost Adjustment Checklist:	**NOTES:**
FACTOR:	Field work will be in Level "D" PPE.
H&S Productivity (labor and equipment only)	MII assembly costs include HPF adjustments.
Escalation to Base Year	2016 cost sources are not escalated (EF=1.00). All other costs are escalated based on the USACE CWCCIS, EM 1110-2-1304, Sept 2015.
Area Cost Factor	An AF of 1.05 is used for Oregon, except that an AF of 1.00 (national unmodified average) is used for MII assembly costs and local vendor quotes.
Subcontractor Overhead and Profit	It is assumed that home office OH is 8% and profit is 9% for the Prime Contractor. Professional labor overhead is 100%.
Prime Contractor Overhead and Profit	Allowances and items with mandated costs such as per diem do not have overhead and profit applied.
	Items previously developed by Anchor QEA already include contractor markups, therefore overhead and profit were not applied to those items.
	It is assumed that OH is 1% and profit is 0% for vendor quotes for treatment and disposal at offsite disposal facilities. It is assumed that OH is 5% and profit is 0% for quotes for all other material vendor quotes.
	Items developed using MII already include contractor markups such as overhead and profit, therefore additional overhead and profit were not applied in the PC OH and PC PF to those items.

TABLE CW-B6

Alternative B **Cost Worksheet:** **CW-B6**
Capital Cost Sub-Element
Obstruction Removal and Relocation

COST WORKSHEET

Site: Portland Harbor Superfund Site
Location: Portland, Oregon
Phase: Feasibility Study
Base Year: 2016

Prepared By: JN **Date:** 3/4/2016
Checked By: AB **Date:** 3/7/2016

Work Statement:
This sub-element involves all work related to obstructions removal, relocation, and disposal. It includes all costs for labor, equipment and materials developed from previous work for pile removal and disposal, pile replacement, and temporary dock relocation.
Quantity development presented in Appendix D.

Cost Analysis:
Cost for Obstructions (Lump Sum)

COST DATABASE CODE	DESCRIPTION	QTY	UNIT(S)	HPF	LABOR	ADJ LABOR	EQUIP	ADJ EQUIP	MATL	OTHER	UNMOD UC	UNMOD LIC	PC OH	PC PF	BUR LIC	COST SOURCE CITATION	COMMENTS
P10	Pile Removal and Disposal	391	EA	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$715.65	$715.65	$279,817.20	0%	0%	$279,817	P Anchor QEA	Project-specific cost developed by Anchor QEA (2010) - see Backup Table 3.
P11	Pile Replacement	391	EA	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$7,478.77	$7,478.77	$2,924,199.85	0%	0%	$2,924,200	P Anchor QEA	Project-specific cost developed by Anchor QEA (2010) - see Backup Table 4.
P12	Temporary Dock Relocation	7	EA	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$100,497.97	$100,497.97	$703,485.80	0%	0%	$703,486	P Anchor QEA	Project-specific cost developed by Anchor QEA (2010) - see Backup Table 5.
												TOTAL COST:			$3,907,503		

	Representative Unit Quantity	Unit(s)	Total Cost	Unit Cost
COST WORKSHEET SUMMARY	1	LS	$3,907,503	$3,907,503

Notes:
Further information about the development of cost worksheets can be found in Attachment A - Methodology and Organization of Detailed Cost Estimates.
The quantity bolded in the QTY column is the quantity selected as the representative unit quantity for this cost worksheet. If multiple quantities are bolded, the representative unit quantity is the sum of those quantities. When the LS unit is utilized, the default representative unit quantity is 1.
HTRW productivity factor is from Exhibit B-3 or B-4 of "A Guide to Developing and Documenting Cost Estimates During the Feasibility Study", EPA 2000
EPA developed project-specific unit costs using the Micro Computer Aided Cost Engineering System (MCACES) Second Generation (MII) software version 4.2, build 3

Cost Database Code:
The Cost Database Code is a reference code for linking with line item cost information with the cost source database and is not otherwise used within these cost worksheets. The following cost source database prefixes apply:
L (EPA-Derived Labor Unit Costs), M (Project-Specific Vendor Unit Costs), P (Previously Developed Unit Costs by Anchor QEA for Portland Harbor), A (EPA-Derived MII Unit Costs), O (Unit Costs from Other Projects/Sources)

Source of Cost Data:
For citation references, the following sources apply:
ALL (Allowance), FLC (www.flcdatacenter.com), LD (Costs Derived from Lower Duwamish Waterway Final Feasibility Study), MII (MII), O (Other), P (Previously Developed by Anchor QEA for Portland Harbor), and V (Vendor Quote)

Abbreviations:

QTY	Quantity	AC	Acres
EQUIP	Equipment	CLF	100 Linear Foot
MATL	Material	CY	Cubic Yard
HPF	HTRW Productivity Factor	DY	Days
ADJ LABOR	Adjusted Labor for HFP	EA	Each
ADJ EQUIP	Adjusted Equipment for HFP	FTE	Full Time Equivalent
UNMOD UC	Unmodified Unit Cost	HR	Hours
UNMOD LIC	Unmodified Line Item Cost	LB	Pounds
UNBUR LIC	Unburdened Line Item Cost	LCY	Loose Cubic Yard
PC OH	Prime Contractor Overhead	LF	Linear Foot
PC PF	Prime Contractor Profit	LS	Lump Sum
BUR LIC	Burdened Line Item Cost	MO	Month
		SF	Square Foot
		SY	Square Yard
		TON	Tons
		YR	Years

Cost Adjustment Checklist:	**NOTES:**
FACTOR:	Field work will be in Level "D" PPE.
H&S Productivity (labor and equipment only)	MII assembly costs include HPF adjustments.
Escalation to Base Year	2016 cost sources are not escalated (EF=1.00). All other costs are escalated based on the USACE CWCCIS, EM 1110-2-1304, Sept 2015.
Area Cost Factor	An AF of 1.05 is used for Oregon, except that an AF of 1.00 (national unmodified average) is used for MII assembly costs and local vendor quotes.
Subcontractor Overhead and Profit	It is assumed that home office OH is 8% and profit is 9% for the Prime Contractor. Professional labor overhead is 100%.
Prime Contractor Overhead and Profit	Allowances and items with mandated costs such as per diem do not have overhead and profit applied.
	Items previously developed by Anchor QEA already include contractor markups, therefore overhead and profit were not applied to those items.
	It is assumed that OH is 1% and profit is 0% for vendor quotes for treatment and disposal at offsite disposal facilities. It is assumed that OH is 5% and profit is 0% for quotes for all other material vendor quotes.
	Items developed using MII already include contractor markups such as overhead and profit, therefore additional overhead and profit were not applied in the PC OH and PC PF to those items.

TABLE CW-B7

Alternative B **Cost Worksheet:** **CW-B7**
Capital Cost Sub-Element
Erosion/Residual Control Measures

COST WORKSHEET

Site: Portland Harbor Superfund Site
Location: Portland, Oregon
Phase: Feasibility Study
Base Year: 2016

Prepared By: JN **Date:** 3/4/2016
Checked By: AB **Date:** 3/7/2016

Work Statement:
This sub-element involves the installation, maintainance, and removal of silt curtains and sheet pile walls for erosion and residual control. It includes costs for on-site labor, equipment, and materials developed from previous work.
Quantity development presented in Appendix D.

Cost Analysis:
Cost for Erosion/Residual Control Measures (Lump Sum)

COST DATABASE CODE	DESCRIPTION	QTY	UNIT(S)	HPF	LABOR	ADJ LABOR	EQUIP	ADJ EQUIP	MATL	OTHER	UNMOD UC	UNMOD LIC	PC OH	PC PF	BUR LIC	COST SOURCE CITATION	COMMENTS
P13	Purchase, Install and Maintain Silt Curtains	17,500	LF	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$96.92	$96.92	$1,696,135.00	0%	0%	$1,696,135	P Anchor QEA	Project-specific cost developed by Anchor QEA (2010) - see Backup Table 7.
P14	Purchase, Install and Remove Sheet Pile Walls	7,500	LF	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$2,749.88	$2,749.88	$20,624,100.00	0%	0%	$20,624,100	P Anchor QEA	Project-specific cost developed by Anchor QEA (2010) - see Backup Table 6.
												TOTAL COST:			$22,320,235		

	Representative Unit Quantity	Unit(s)	Total Cost	Unit Cost
COST WORKSHEET SUMMARY	1	LS	$22,320,235	$22,320,235

Notes:
Further information about the development of cost worksheets can be found in Attachment A - Methodology and Organization of Detailed Cost Estimates.
The quantity bolded in the QTY column is the quantity selected as the representative unit quantity for this cost worksheet. If multiple quantities are bolded, the representative unit quantity is the sum of those quantities. When the LS unit is utilized, the default representative unit quantity is 1.
HTRW productivity factor is from Exhibit B-3 or B-4 of "A Guide to Developing and Documenting Cost Estimates During the Feasibility Study", EPA 2000
EPA developed project-specific unit costs using the Micro Computer Aided Cost Engineering System (MCACES) Second Generation (MII) software version 4.2, build 3

Cost Database Code:
The Cost Database Code is a reference code for linking with line item cost information with the cost source database and is not otherwise used within these cost worksheets. The following cost source database prefixes apply:
L (EPA-Derived Labor Unit Costs), M (Project-Specific Vendor Unit Costs), P (Previously Developed Unit Costs by Anchor QEA for Portland Harbor), A (EPA-Derived MII Unit Costs), O (Unit Costs from Other Projects/Sources)

Source of Cost Data:
For citation references, the following sources apply:
ALL (Allowance), FLC (www.flcdatacenter.com), LD (Costs Derived from Lower Duwamish Waterway Final Feasibility Study), MII (MII), O (Other), P (Previously Developed by Anchor QEA for Portland Harbor), and V (Vendor Quote)

Abbreviations:

QTY	Quantity	AC	Acres
EQUIP	Equipment	CLF	100 Linear Foot
MATL	Material	CY	Cubic Yard
HPF	HTRW Productivity Factor	DY	Days
ADJ LABOR	Adjusted Labor for HFP	EA	Each
ADJ EQUIP	Adjusted Equipment for HFP	FTE	Full Time Equivalent
UNMOD UC	Unmodified Unit Cost	HR	Hours
UNMOD LIC	Unmodified Line Item Cost	LB	Pounds
UNBUR LIC	Unburdened Line Item Cost	LCY	Loose Cubic Yard
PC OH	Prime Contractor Overhead	LF	Linear Foot
PC PF	Prime Contractor Profit	LS	Lump Sum
BUR LIC	Burdened Line Item Cost	MO	Month
		SF	Square Foot
		SY	Square Yard
		TON	Tons
		YR	Years

Cost Adjustment Checklist:	NOTES:
FACTOR:	Field work will be in Level "D" PPE.
H&S Productivity (labor and equipment only)	MII assembly costs include HPF adjustments.
Escalation to Base Year	2016 cost sources are not escalated (EF=1.00). All other costs are escalated based on the USACE CWCCIS, EM 1110-2-1304, Sept 2015.
Area Cost Factor	An AF of 1.05 is used for Oregon, except that an AF of 1.00 (national unmodified average) is used for MII assembly costs and local vendor quotes.
Subcontractor Overhead and Profit	It is assumed that home office OH is 8% and profit is 9% for the Prime Contractor. Professional labor overhead is 100%.
Prime Contractor Overhead and Profit	Allowances and items with mandated costs such as per diem do not have overhead and profit applied.
	Items previously developed by Anchor QEA already include contractor markups, therefore overhead and profit were not applied to those items.
	It is assumed that OH is 1% and profit is 0% for vendor quotes for treatment and disposal at offsite disposal facilities. It is assumed that OH is 5% and profit is 0% for quotes for all other material vendor quotes.
	Items developed using MII already include contractor markups such as overhead and profit, therefore additional overhead and profit were not applied in the PC OH and PC PF to those items.

TABLE CW-B8

Alternative B **Cost Worksheet:** **CW-B8**
Capital Cost Sub-Element
Dredging of Contaminated Sediments (Open Water)

COST WORKSHEET

Site: Portland Harbor Superfund Site
Location: Portland, Oregon
Phase: Feasibility Study
Base Year: 2016

Prepared By: JN **Date:** 3/4/2016
Checked By: AB **Date:** 3/7/2016

Work Statement:
This sub-element involves mechanical dredging of contaminated sediments in open water areas and transport to dewatering/stabilization area. It includes costs for on-site labor, equipment, and materials for open water dredging, assuming a 10 CY barge mounted crane and clamshell.
Quantity development presented in Appendix D.

Cost Analysis:
Cost for Open Water Dredging (Lump Sum)

COST DATABASE CODE	DESCRIPTION	QTY	UNIT(S)	HPF	LABOR	ADJ LABOR	EQUIP	ADJ EQUIP	MATL	OTHER	UNMOD UC	UNMOD LIC	PC OH	PC PF	BUR LIC	COST SOURCE CITATION	COMMENTS
A6	Open Water Dredging	**513,841**	CY	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$24.53	$24.53	$12,604,519.73	0%	0%	$12,604,520	MII MII	Project-specific unit cost developed in MII.
												TOTAL COST:			$12,604,520		

	Representative Unit Quantity	Unit(s)	Total Cost	Unit Cost
COST WORKSHEET SUMMARY	513,841	CY	$12,604,520	$24.53

Notes:
Further information about the development of cost worksheets can be found in Attachment A - Methodology and Organization of Detailed Cost Estimates.
The quantity bolded in the QTY column is the quantity selected as the representative unit quantity for this cost worksheet. If multiple quantities are bolded, the representative unit quantity is the sum of those quantities. When the LS unit is utilized, the default representative unit quantity is 1.
HTRW productivity factor is from Exhibit B-3 or B-4 of "A Guide to Developing and Documenting Cost Estimates During the Feasibility Study", EPA 2000
EPA developed project-specific unit costs using the Micro Computer Aided Cost Engineering System (MCACES) Second Generation (MII) software version 4.2, build 3

Cost Database Code:
The Cost Database Code is a reference code for linking with line item cost information with the cost source database and is not otherwise used within these cost worksheets. The following cost source database prefixes apply:
L (EPA-Derived Labor Unit Costs), M (Project-Specific Vendor Unit Costs), P (Previously Developed Unit Costs by Anchor QEA for Portland Harbor), A (EPA-Derived MII Unit Costs), O (Unit Costs from Other Projects/Sources)

Source of Cost Data:
For citation references, the following sources apply:
ALL (Allowance), FLC (www.flcdatacenter.com), LD (Costs Derived from Lower Duwamish Waterway Final Feasibility Study), MII (MII), O (Other), P (Previously Developed by Anchor QEA for Portland Harbor), and V (Vendor Quote)

Abbreviations:

QTY	Quantity	AC	Acres
EQUIP	Equipment	CLF	100 Linear Foot
MATL	Material	CY	Cubic Yard
HPF	HTRW Productivity Factor	DY	Days
ADJ LABOR	Adjusted Labor for HFP	EA	Each
ADJ EQUIP	Adjusted Equipment for HFP	FTE	Full Time Equivalent
UNMOD UC	Unmodified Unit Cost	HR	Hours
UNMOD LIC	Unmodified Line Item Cost	LB	Pounds
UNBUR LIC	Unburdened Line Item Cost	LCY	Loose Cubic Yard
PC OH	Prime Contractor Overhead	LF	Linear Foot
PC PF	Prime Contractor Profit	LS	Lump Sum
BUR LIC	Burdened Line Item Cost	MO	Month
		SF	Square Foot
		SY	Square Yard
		TON	Tons
		YR	Years

Cost Adjustment Checklist:	**NOTES:**
FACTOR:	Field work will be in Level "D" PPE.
H&S Productivity (labor and equipment only)	MII assembly costs include HPF adjustments.
Escalation to Base Year	2016 cost sources are not escalated (EF=1.00). All other costs are escalated based on the USACE CWCCIS, EM 1110-2-1304, Sept 2015.
Area Cost Factor	An AF of 1.05 is used for Oregon, except that an AF of 1.00 (national unmodified average) is used for MII assembly costs and local vendor quotes.
Subcontractor Overhead and Profit	It is assumed that home office OH is 8% and profit is 9% for the Prime Contractor. Professional labor overhead is 100%.
Prime Contractor Overhead and Profit	Allowances and items with mandated costs such as per diem do not have overhead and profit applied.
	Items previously developed by Anchor QEA already include contractor markups, therefore overhead and profit were not applied to those items.
	It is assumed that OH is 1% and profit is 0% for vendor quotes for treatment and disposal at offsite disposal facilities. It is assumed that OH is 5% and profit is 0% for quotes for all other material vendor quotes.
	Items developed using MII already include contractor markups such as overhead and profit, therefore additional overhead and profit were not applied in the PC OH and PC PF to those items.

TABLE CW-B9

Alternative B **Cost Worksheet:** **CW-B9**
Capital Cost Sub-Element
Dredging of Contaminated Sediments (Confined)

COST WORKSHEET

Site: Portland Harbor Superfund Site
Location: Portland, Oregon
Phase: Feasibility Study
Base Year: 2016

Prepared By: JN **Date:** 3/4/2016
Checked By: AB **Date:** 3/7/2016

Work Statement:
This sub-element involves mechanical dredging of contaminated sediments in confined areas and transport to dewatering/stabilization area. It includes costs for on-site labor, equipment, and materials for confined dredging, assuming a 4 CY barge mounted excavator.
Quantity development presented in Appendix D.

Cost Analysis:
Cost for Confined Dredging (Lump Sum)

COST DATABASE CODE	DESCRIPTION	QTY	UNIT(S)	HPF	LABOR	ADJ LABOR	EQUIP	ADJ EQUIP	MATL	OTHER	UNMOD UC	UNMOD LIC	PC OH	PC PF	BUR LIC	COST SOURCE CITATION	COMMENTS
A7	Confined Dredging	**63,042**	CY	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$31.10	$31.10	$1,960,606.20	0%	0%	$1,960,606	MII MII	Project-specific unit cost developed in MII.
												TOTAL COST:			$1,960,606		

	Representative Unit Quantity	Unit(s)	Total Cost	Unit Cost
COST WORKSHEET SUMMARY	63,042	CY	$1,960,606	$31.10

Notes:
Further information about the development of cost worksheets can be found in Attachment A - Methodology and Organization of Detailed Cost Estimates.
The quantity bolded in the QTY column is the quantity selected as the representative unit quantity for this cost worksheet. If multiple quantities are bolded, the representative unit quantity is the sum of those quantities. When the LS unit is utilized, the default representative unit quantity is 1.
HTRW productivity factor is from Exhibit B-3 or B-4 of "A Guide to Developing and Documenting Cost Estimates During the Feasibility Study", EPA 2000
EPA developed project-specific unit costs using the Micro Computer Aided Cost Engineering System (MCACES) Second Generation (MII) software version 4.2, build 3

Cost Database Code:
The Cost Database Code is a reference code for linking with line item cost information with the cost source database and is not otherwise used within these cost worksheets. The following cost source database prefixes apply:
L (EPA-Derived Labor Unit Costs), M (Project-Specific Vendor Unit Costs), P (Previously Developed Unit Costs by Anchor QEA for Portland Harbor), A (EPA-Derived MII Unit Costs), O (Unit Costs from Other Projects/Sources)

Source of Cost Data:
For citation references, the following sources apply:
ALL (Allowance), FLC (www.flcdatacenter.com), LD (Costs Derived from Lower Duwamish Waterway Final Feasibility Study), MII (MII), O (Other), P (Previously Developed by Anchor QEA for Portland Harbor), and V (Vendor Quote)

Abbreviations:

QTY	Quantity	AC	Acres
EQUIP	Equipment	CLF	100 Linear Foot
MATL	Material	CY	Cubic Yard
HPF	HTRW Productivity Factor	DY	Days
ADJ LABOR	Adjusted Labor for HFP	EA	Each
ADJ EQUIP	Adjusted Equipment for HFP	FTE	Full Time Equivalent
UNMOD UC	Unmodified Unit Cost	HR	Hours
UNMOD LIC	Unmodified Line Item Cost	LB	Pounds
UNBUR LIC	Unburdened Line Item Cost	LCY	Loose Cubic Yard
PC OH	Prime Contractor Overhead	LF	Linear Foot
PC PF	Prime Contractor Profit	LS	Lump Sum
BUR LIC	Burdened Line Item Cost	MO	Month
		SF	Square Foot
		SY	Square Yard
		TON	Tons
		YR	Years

Cost Adjustment Checklist:	**NOTES:**
FACTOR:	Field work will be in Level "D" PPE.
H&S Productivity (labor and equipment only)	MII assembly costs include HPF adjustments.
Escalation to Base Year	2016 cost sources are not escalated (EF=1.00). All other costs are escalated based on the USACE CWCCIS, EM 1110-2-1304, Sept 2015.
Area Cost Factor	An AF of 1.05 is used for Oregon, except that an AF of 1.00 (national unmodified average) is used for MII assembly costs and local vendor quotes.
Subcontractor Overhead and Profit	It is assumed that home office OH is 8% and profit is 9% for the Prime Contractor. Professional labor overhead is 100%.
Prime Contractor Overhead and Profit	Allowances and items with mandated costs such as per diem do not have overhead and profit applied.
	Items previously developed by Anchor QEA already include contractor markups, therefore overhead and profit were not applied to those items.
	It is assumed that OH is 1% and profit is 0% for vendor quotes for treatment and disposal at offsite disposal facilities. It is assumed that OH is 5% and profit is 0% for quotes for all other material vendor quotes.
	Items developed using MII already include contractor markups such as overhead and profit, therefore additional overhead and profit were not applied in the PC OH and PC PF to those items.

TABLE CW-B10

Alternative B
Capital Cost Sub-Element
Excavation of Riverbanks

Cost Worksheet: **CW-B10**

COST WORKSHEET

Site: Portland Harbor Superfund Site
Location: Portland, Oregon
Phase: Feasibility Study
Base Year: 2016

Prepared By: JN **Date:** 3/4/2016
Checked By: AB **Date:** 3/7/2016

Work Statement:
This sub-element involves mechanical excavation of riverbank materials and transport to dewatering/stabilization area. It includes costs for on-site labor, equipment, and materials for riverbank excavation, assuming a 4 CY long-arm excavator.
Quantity development presented in Appendix D.

Cost Analysis:
Cost for Excavation from Shore for Riverbanks (Lump Sum)

COST DATABASE CODE	DESCRIPTION	QTY	UNIT(S)	HPF	LABOR	ADJ LABOR	EQUIP	ADJ EQUIP	MATL	OTHER	UNMOD UC	UNMOD LIC	PC OH	PC PF	BUR LIC	COST SOURCE CITATION	COMMENTS
A8	Riverbank Excavation	**50,769**	CY	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$5.19	$5.19	$263,489.84	0%	0%	$263,490	MII MII	Project-specific unit cost developed in MII.
												TOTAL COST:			$263,490		

	Representative Unit Quantity	Unit(s)	Total Cost	Unit Cost
COST WORKSHEET SUMMARY	50,769	CY	$263,490	$5.19

Notes:
Further information about the development of cost worksheets can be found in Attachment A - Methodology and Organization of Detailed Cost Estimates.
The quantity bolded in the QTY column is the quantity selected as the representative unit quantity for this cost worksheet. If multiple quantities are bolded, the representative unit quantity is the sum of those quantities. When the LS unit is utilized, the default representative unit quantity is 1.
HTRW productivity factor is from Exhibit B-3 or B-4 of "A Guide to Developing and Documenting Cost Estimates During the Feasibility Study", EPA 2000
EPA developed project-specific unit costs using the Micro Computer Aided Cost Engineering System (MCACES) Second Generation (MII) software version 4.2, build 3

Cost Database Code:
The Cost Database Code is a reference code for linking with line item cost information with the cost source database and is not otherwise used within these cost worksheets. The following cost source database prefixes apply:
L (EPA-Derived Labor Unit Costs), M (Project-Specific Vendor Unit Costs), P (Previously Developed Unit Costs by Anchor QEA for Portland Harbor), A (EPA-Derived MII Unit Costs), O (Unit Costs from Other Projects/Sources)

Source of Cost Data:
For citation references, the following sources apply:
ALL (Allowance), FLC (www.flcdatacenter.com), LD (Costs Derived from Lower Duwamish Waterway Final Feasibility Study), MII (MII), O (Other), P (Previously Developed by Anchor QEA for Portland Harbor), and V (Vendor Quote)

Abbreviations:

QTY	Quantity	AC	Acres
EQUIP	Equipment	CLF	100 Linear Foot
MATL	Material	CY	Cubic Yard
HPF	HTRW Productivity Factor	DY	Days
ADJ LABOR	Adjusted Labor for HFP	EA	Each
ADJ EQUIP	Adjusted Equipment for HFP	FTE	Full Time Equivalent
UNMOD UC	Unmodified Unit Cost	HR	Hours
UNMOD LIC	Unmodified Line Item Cost	LB	Pounds
UNBUR LIC	Unburdened Line Item Cost	LCY	Loose Cubic Yard
PC OH	Prime Contractor Overhead	LF	Linear Foot
PC PF	Prime Contractor Profit	LS	Lump Sum
BUR LIC	Burdened Line Item Cost	MO	Month
		SF	Square Foot
		SY	Square Yard
		TON	Tons
		YR	Years

Cost Adjustment Checklist:	**NOTES:**
FACTOR:	Field work will be in Level "D" PPE.
H&S Productivity (labor and equipment only)	MII assembly costs include HPF adjustments.
Escalation to Base Year	2016 cost sources are not escalated (EF=1.00). All other costs are escalated based on the USACE CWCCIS, EM 1110-2-1304, Sept 2015.
Area Cost Factor	An AF of 1.05 is used for Oregon, except that an AF of 1.00 (national unmodified average) is used for MII assembly costs and local vendor quotes.
Subcontractor Overhead and Profit	It is assumed that home office OH is 8% and profit is 9% for the Prime Contractor. Professional labor overhead is 100%.
Prime Contractor Overhead and Profit	Allowances and items with mandated costs such as per diem do not have overhead and profit applied.
	Items previously developed by Anchor QEA already include contractor markups, therefore overhead and profit were not applied to those items.
	It is assumed that OH is 1% and profit is 0% for vendor quotes for treatment and disposal at offsite disposal facilities. It is assumed that OH is 5% and profit is 0% for quotes for all other material vendor quotes.
	Items developed using MII already include contractor markups such as overhead and profit, therefore additional overhead and profit were not applied in the PC OH and PC PF to those items.

TABLE CW-B11

Alternative B **Cost Worksheet:** **CW-B11**
Capital Cost Sub-Element
Dewatering and Water Treatment for Dredging Operations

COST WORKSHEET

Site: Portland Harbor Superfund Site
Location: Portland, Oregon
Phase: Feasibility Study
Base Year: 2016

Prepared By: JN **Date:** 3/4/2016
Checked By: AB **Date:** 3/7/2016

Work Statement:
This sub-element involves the dewatering and water treatment for dredging operations. Assumes a temporary water treatment plant will be utilized for treatment of water generated from dewatering of sediments. It includes costs for labor, equipment, and materials for treatment of water generated from dredged sediments. Quantity development presented in Appendix D.

Cost Analysis:
Cost for Dewatering and Water Treatment for Dredging Operations (Lump Sum)

COST DATABASE CODE	DESCRIPTION	QTY	UNIT(S)	HPF	LABOR	ADJ LABOR	EQUIP	ADJ EQUIP	MATL	OTHER	UNMOD UC	UNMOD LIC	PC OH	PC PF	BUR LIC	COST SOURCE CITATION	COMMENTS
A9	Mobilization/Demobilization of Temporary Water Treatment System	4	EA	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$36,600.00	$36,600.00	$146,400.00	0%	0%	$146,400	MII MII	Project-specific unit cost developed in MII. Assumes mob/demob of treatment system will be required for each construction season
A10	Dewatering and Temporary Water Treatment System Operations	113	DY	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$21,654.00	$21,654.00	$2,449,067.40	0%	0%	$2,449,067	MII MII	Project-specific unit cost developed in MII.
												TOTAL COST:			$2,595,467		

	Representative Unit Quantity	Unit(s)	Total Cost	Unit Cost
COST WORKSHEET SUMMARY	1	LS	$2,595,467	$2,595,467

Notes:
Further information about the development of cost worksheets can be found in Attachment A - Methodology and Organization of Detailed Cost Estimates.
The quantity bolded in the QTY column is the quantity selected as the representative unit quantity for this cost worksheet. If multiple quantities are bolded, the representative unit quantity is the sum of those quantities. When the LS unit is utilized, the default representative unit quantity is 1.
HTRW productivity factor is from Exhibit B-3 or B-4 of "A Guide to Developing and Documenting Cost Estimates During the Feasibility Study", EPA 2000
EPA developed project-specific unit costs using the Micro Computer Aided Cost Engineering System (MCACES) Second Generation (MII) software version 4.2, build 3

Cost Database Code:
The Cost Database Code is a reference code for linking with line item cost information with the cost source database and is not otherwise used within these cost worksheets. The following cost source database prefixes apply:
L (EPA-Derived Labor Unit Costs), M (Project-Specific Vendor Unit Costs), P (Previously Developed Unit Costs by Anchor QEA for Portland Harbor), A (EPA-Derived MII Unit Costs), O (Unit Costs from Other Projects/Sources)

Source of Cost Data:
For citation references, the following sources apply:
ALL (Allowance), FLC (www.flcdatacenter.com), LD (Costs Derived from Lower Duwamish Waterway Final Feasibility Study), MII (MII), O (Other), P (Previously Developed by Anchor QEA for Portland Harbor), and V (Vendor Quote)

Abbreviations:

QTY	Quantity	AC	Acres
EQUIP	Equipment	CLF	100 Linear Foot
MATL	Material	CY	Cubic Yard
HPF	HTRW Productivity Factor	DY	Days
ADJ LABOR	Adjusted Labor for HFP	EA	Each
ADJ EQUIP	Adjusted Equipment for HFP	FTE	Full Time Equivalent
UNMOD UC	Unmodified Unit Cost	HR	Hours
UNMOD LIC	Unmodified Line Item Cost	LB	Pounds
UNBUR LIC	Unburdened Line Item Cost	LCY	Loose Cubic Yard
PC OH	Prime Contractor Overhead	LF	Linear Foot
PC PF	Prime Contractor Profit	LS	Lump Sum
BUR LIC	Burdened Line Item Cost	MO	Month
		SF	Square Foot
		SY	Square Yard
		TON	Tons
		YR	Years

Cost Adjustment Checklist:	**NOTES:**
FACTOR:	Field work will be in Level "D" PPE.
H&S Productivity (labor and equipment only)	MII assembly costs include HPF adjustments.
Escalation to Base Year	2016 cost sources are not escalated (EF=1.00). All other costs are escalated based on the USACE CWCCIS, EM 1110-2-1304, Sept 2015.
Area Cost Factor	An AF of 1.05 is used for Oregon, except that an AF of 1.00 (national unmodified average) is used for MII assembly costs and local vendor quotes.
Subcontractor Overhead and Profit	It is assumed that home office OH is 8% and profit is 9% for the Prime Contractor. Professional labor overhead is 100%.
Prime Contractor Overhead and Profit	Allowances and items with mandated costs such as per diem do not have overhead and profit applied.
	Items previously developed by Anchor QEA already include contractor markups, therefore overhead and profit were not applied to those items.
	It is assumed that OH is 1% and profit is 0% for vendor quotes for treatment and disposal at offsite disposal facilities. It is assumed that OH is 5% and profit is 0% for quotes for all other material vendor quotes.
	Items developed using MII already include contractor markups such as overhead and profit, therefore additional overhead and profit were not applied in the PC OH and PC PF to those items.

TABLE CW-B12

Alternative B **Cost Worksheet: CW-B12**
Capital Cost Sub-Element
Subtitle C/TSCA Disposal (Handling, Transportation, Treatment of Select PTW Materials, and Disposal)

COST WORKSHEET

Site: Portland Harbor Superfund Site
Location: Portland, Oregon
Phase: Feasibility Study
Base Year: 2016

Prepared By: JN **Date:** 5/20/2016
Checked By: AB **Date:** 5/23/2016

Work Statement:
This sub-element involves the disposal of contaminated sediments at a Subtitle C/TSCA landfill, including in-barge mixing of amendments, barge transportation of materials to a transload facility, materials handling from the barge to truck, transportation of the sediments to the Subtitle C/TSCA landfill, and disposal of contaminated sediments (including thermal treatment at the landfill facility for a portion of the volume). It includes costs for labor, equipment, and materials as well as recent vendor quotes. Costs for development of a transload facility are included in a separate cost worksheet.
Quantity development presented in Appendix D.

Cost Analysis:
Cost for Subtitle C/TSCA Disposal (Lump Sum)

COST DATABASE CODE	DESCRIPTION	QTY	UNIT(S)	HPF	LABOR	ADJ LABOR	EQUIP	ADJ EQUIP	MATL	OTHER	UNMOD UC	UNMOD LIC	PC OH	PC PF	BUR LIC	COST SOURCE CITATION	COMMENTS
Area 6W NRC/NAPL PTW																	
	Transportation																
A13	Barging to Transload Facility	218,332	CY	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$13.66	$13.66	$2,982,415.12	0%	0%	$2,982,415	MII MII	Project-specific unit cost developed in MII.
A5	Hauling Waste from Transload Facility to Landfill	218,332	CY	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$16.70	$16.70	$3,646,144.40	0%	0%	$3,646,144	MII MII	Project-specific unit cost developed in MII.
	Materials Handling at Transload Facility																
A14	Offloading of Sediments	218,332	CY	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$9.70	$9.70	$2,117,820.40	0%	0%	$2,117,820	MII MII	Project-specific unit cost developed in MII. Assumes mechanical offloading of sediments at the transload facility.
A4	Loading Trucks at Transload Facility	218,332	CY	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$2.68	$2.68	$585,129.76	0%	0%	$585,130	MII MII	Project-specific unit cost developed in MII.
	Treatment																
A11	In-Barge Stabilization / Mixing of Amendments	218,332	CY	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$24.50	$24.50	$5,349,134.00	0%	0%	$5,349,134	MII MII	Project-specific unit cost developed in MII.
P5	Diatomaceous Earth	12,655	TON	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$105.94	$105.94	$1,340,670.70	0%	0%	$1,340,671	P Anchor QEA	Project-specific cost developed by Anchor QEA (2010) - see Backup Table 24.
M25	Quicklime	17,463	TON	1.00	$0.00	$0.00	$0.00	$0.00	$239.00	$0.00	$239.00	$4,173,657.00	5%	0%	$4,382,340	V Vendor Quote	Project-specific vendor quote - Graymont, 2016.
A2	Hauling - Quicklime to Site	17,463	TON	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$5.71	$5.71	$99,713.73	0%	0%	$99,714	MII MII	Project-specific unit cost developed in MII. Assumes 10 mile one-way haul.
	Disposal at Subtitle C/TSCA Landfill																
M10	Tipping Fee at Subtitle C/TSCA Landfill	**283,209**	TON	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$86.19	$86.19	$24,409,783.71	1%	0%	$24,653,882	V Vendor Quote	Project-specific vendor quote - CWM of the Northwest, 2015.
Area 7W NRC/NAPL PTW																	
	Transportation																
A13	Barging to Transload Facility	66,633	CY	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$13.66	$13.66	$910,206.78	0%	0%	$910,207	MII MII	Project-specific unit cost developed in MII.
A5	Hauling Waste from Transload Facility to Landfill	66,633	CY	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$16.70	$16.70	$1,112,771.10	0%	0%	$1,112,771	MII MII	Project-specific unit cost developed in MII.
	Materials Handling at Transload Facility																
A14	Offloading of Sediments	66,633	CY	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$9.70	$9.70	$646,340.10	0%	0%	$646,340	MII MII	Project-specific unit cost developed in MII. Assumes mechanical offloading of sediments at the transload facility.
A4	Loading Trucks at Transload Facility	66,633	CY	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$2.68	$2.68	$178,576.44	0%	0%	$178,576	MII MII	Project-specific unit cost developed in MII.
	Treatment																
A11	In-Barge Stabilization / Mixing of Amendments	66,633	CY	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$24.50	$24.50	$1,632,508.50	0%	0%	$1,632,509	MII MII	Project-specific unit cost developed in MII.
P5	Diatomaceous Earth	5,700	TON	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$105.94	$105.94	$603,858.00	0%	0%	$603,858	P Anchor QEA	Project-specific cost developed by Anchor QEA (2010) - see Backup Table 24.
M25	Quicklime	1,573	TON	1.00	$0.00	$0.00	$0.00	$0.00	$239.00	$0.00	$239.00	$375,947.00	5%	0%	$394,744	V Vendor Quote	Project-specific vendor quote - Graymont, 2016.
A2	Hauling - Quicklime to Site	1,573	TON	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$5.71	$5.71	$8,981.83	0%	0%	$8,982	MII MII	Project-specific unit cost developed in MII. Assumes 10 mile one-way haul.
M20	Thermal Desorption Treatment at Subtitle C/TSCA Landfill (Low End of Treatment Cost Range)	12,541	TON	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$319.41	$319.41	$4,005,720.81	1%	0%	$4,045,778	V Vendor Quote	Project-specific vendor quote - CWM of the Northwest, 2015.
M9	Thermal Desorption Treatment at Subtitle C/TSCA Landfill (High End of Treatment Cost Range)	12,541	TON	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$572.91	$572.91	$7,184,864.31	1%	0%	$7,256,713	V Vendor Quote	Project-specific vendor quote - CWM of the Northwest, 2015.
	Disposal at Subtitle C/TSCA Landfill																
M10	Tipping Fee at Subtitle C/TSCA Landfill	**75,679**	TON	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$86.19	$86.19	$6,522,773.01	1%	0%	$6,588,001	V Vendor Quote	Project-specific vendor quote - CWM of the Northwest, 2015.
												TOTAL COST:			$68,535,729		

	Representative Unit Quantity	Unit(s)	Total Cost	Unit Cost
COST WORKSHEET SUMMARY	358,888	TON	$68,535,729	$191

TABLE CW-B12

Alternative B **Cost Worksheet: CW-B12**
Capital Cost Sub-Element
Subtitle C/TSCA Disposal (Handling, Transportation, Treatment of Select PTW Materials, and Disposal)

COST WORKSHEET

Site: Portland Harbor Superfund Site
Location: Portland, Oregon
Phase: Feasibility Study
Base Year: 2016

Prepared By: JN **Date:** 5/20/2016
Checked By: AB **Date:** 5/23/2016

Notes:

Further information about the development of cost worksheets can be found in Attachment A - Methodology and Organization of Detailed Cost Estimates.
The quantity bolded in the QTY column is the quantity selected as the representative unit quantity for this cost worksheet. If multiple quantities are bolded, the representative unit quantity is the sum of those quantities. When the LS unit is utilized, the default representative unit quantity is 1.
HTRW productivity factor is from Exhibit B-3 or B-4 of "A Guide to Developing and Documenting Cost Estimates During the Feasibility Study", EPA 2000
EPA developed project-specific unit costs using the Micro Computer Aided Cost Engineering System (MCACES) Second Generation (MII) software version 4.2, build 3

Cost Database Code:

The Cost Database Code is a reference code for linking with line item cost information with the cost source database and is not otherwise used within these cost worksheets. The following cost source database prefixes apply:

L (EPA-Derived Labor Unit Costs), M (Project-Specific Vendor Unit Costs), P (Previously Developed Unit Costs by Anchor QEA for Portland Harbor), A (EPA-Derived MII Unit Costs), O (Unit Costs from Other Projects/Sources)

Source of Cost Data:

For citation references, the following sources apply:

ALL (Allowance), FLC (www.flcdatacenter.com), LD (Costs Derived from Lower Duwamish Waterway Final Feasibility Study), MII (MII), O (Other), P (Previously Developed by Anchor QEA for Portland Harbor), and V (Vendor Quote)

Abbreviations:

QTY	Quantity	AC	Acres
EQUIP	Equipment	CLF	100 Linear Foot
MATL	Material	CY	Cubic Yard
HPF	HTRW Productivity Factor	DY	Days
ADJ LABOR	Adjusted Labor for HFP	EA	Each
ADJ EQUIP	Adjusted Equipment for HFP	FTE	Full Time Equivalent
UNMOD UC	Unmodified Unit Cost	HR	Hours
UNMOD LIC	Unmodified Line Item Cost	LB	Pounds
UNBUR LIC	Unburdened Line Item Cost	LCY	Loose Cubic Yard
PC OH	Prime Contractor Overhead	LF	Linear Foot
PC PF	Prime Contractor Profit	LS	Lump Sum
BUR LIC	Burdened Line Item Cost	MO	Month
		SF	Square Foot
		SY	Square Yard
		TON	Tons
		YR	Years

Cost Adjustment Checklist:	**NOTES:**
FACTOR:	Field work will be in Level "D" PPE.
H&S Productivity (labor and equipment only)	MII assembly costs include HPF adjustments.
Escalation to Base Year	2016 cost sources are not escalated (EF=1.00). All other costs are escalated based on the USACE CWCCIS, EM 1110-2-1304, Sept 2015.
Area Cost Factor	An AF of 1.05 is used for Oregon, except that an AF of 1.00 (national unmodified average) is used for MII assembly costs and local vendor quotes.
Subcontractor Overhead and Profit	It is assumed that home office OH is 8% and profit is 9% for the Prime Contractor. Professional labor overhead is 100%.
Prime Contractor Overhead and Profit	Allowances and items with mandated costs such as per diem do not have overhead and profit applied.
	Items previously developed by Anchor QEA already include contractor markups, therefore overhead and profit were not applied to those items.
	It is assumed that OH is 1% and profit is 0% for vendor quotes for treatment and disposal at offsite disposal facilities. It is assumed that OH is 5% and profit is 0% for quotes for all other material vendor quotes.
	Items developed using MII already include contractor markups such as overhead and profit, therefore additional overhead and profit were not applied in the PC OH and PC PF to those items.

TABLE CW-B13

Alternative B **Cost Worksheet:** **CW-B13**
Capital Cost Sub-Element
Subtitle D Disposal (Handling, Transportation, and Disposal)

COST WORKSHEET

Site: Portland Harbor Superfund Site
Location: Portland, Oregon
Phase: Feasibility Study
Base Year: 2016

Prepared By: JN **Date:** 3/4/2016
Checked By: AB **Date:** 3/7/2016

Work Statement:
This sub-element involves the disposal of contaminated sediments at a Subtitle D landfill, including barge transportation of materials to a transload facility, materials handling from the barge to truck, transportation of the sediments to the Subtitle C/TSCA landfill, and disposal of contaminated sediments (including thermal treatment at the landfill facility for a portion of the volume). It includes costs for labor, equipment, and materials as well as recent vendor quotes.
Quantity development presented in Appendix D.

Cost Analysis:
Cost for Subtitle D Disposal (Lump Sum)

COST DATABASE CODE	DESCRIPTION	QTY	UNIT(S)	HPF	LABOR	ADJ LABOR	EQUIP	ADJ EQUIP	MATL	OTHER	UNMOD UC	UNMOD LIC	PC OH	PC PF	BUR LIC	COST SOURCE CITATION	COMMENTS
	Diatomaceous Earth Amendment																
A11	In-Barge Stabilization / Mixing of Amendments	553,401	CY	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$24.50	$24.50	$13,558,324.50	0%	0%	$13,558,325	MII MII	Project-specific unit cost developed in MII.
P5	Diatomaceous Earth	33,040	TON	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$105.94	$105.94	$3,500,257.60	0%	0%	$3,500,258	P Anchor QEA	Project-specific cost developed by Anchor QEA (2010) - see Backup Table 24.
	Transportation to Transload Facility																
A13	Barging to Transload Facility	553,401	CY	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$13.66	$13.66	$7,559,457.66	0%	0%	$7,559,458	MII MII	Project-specific unit cost developed in MII.
	Transportation and Disposal at Subtitle D Landfill																
M11	Transportation and Disposal at Subtitle D Landfill	**693,843**	TON	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$74.53	$74.53	$51,712,118.79	1%	0%	$52,229,240	V Vendor Quote	Project-specific vendor quote - Republic Services (Roosevelt Landfill), 2015. Includes transloading of the sediments, truck transportation from the transload facility to the landfill, and disposal at the landfill.
													TOTAL COST:		$76,847,281		

	Representative Unit Quantity	Unit(s)	Total Cost	Unit Cost
COST WORKSHEET SUMMARY	693,843	TON	$76,847,281	$111

Notes:
Further information about the development of cost worksheets can be found in Attachment A - Methodology and Organization of Detailed Cost Estimates.
The quantity bolded in the QTY column is the quantity selected as the representative unit quantity for this cost worksheet. If multiple quantities are bolded, the representative unit quantity is the sum of those quantities. When the LS unit is utilized, the default representative unit quantity is 1.
HTRW productivity factor is from Exhibit B-3 or B-4 of "A Guide to Developing and Documenting Cost Estimates During the Feasibility Study", EPA 2000
EPA developed project-specific unit costs using the Micro Computer Aided Cost Engineering System (MCACES) Second Generation (MII) software version 4.2, build 3

Cost Database Code:
The Cost Database Code is a reference code for linking with line item cost information with the cost source database and is not otherwise used within these cost worksheets. The following cost source database prefixes apply:
L (EPA-Derived Labor Unit Costs), M (Project-Specific Vendor Unit Costs), P (Previously Developed Unit Costs by Anchor QEA for Portland Harbor), A (EPA-Derived MII Unit Costs), O (Unit Costs from Other Projects/Sources)

Source of Cost Data:
For citation references, the following sources apply:
ALL (Allowance), FLC (www.flcdatacenter.com), LD (Costs Derived from Lower Duwamish Waterway Final Feasibility Study), MII (MII), O (Other), P (Previously Developed by Anchor QEA for Portland Harbor), and V (Vendor Quote)

Abbreviations:

QTY	Quantity	AC	Acres
EQUIP	Equipment	CLF	100 Linear Foot
MATL	Material	CY	Cubic Yard
HPF	HTRW Productivity Factor	DY	Days
ADJ LABOR	Adjusted Labor for HFP	EA	Each
ADJ EQUIP	Adjusted Equipment for HFP	FTE	Full Time Equivalent
UNMOD UC	Unmodified Unit Cost	HR	Hours
UNMOD LIC	Unmodified Line Item Cost	LB	Pounds
UNBUR LIC	Unburdened Line Item Cost	LCY	Loose Cubic Yard
PC OH	Prime Contractor Overhead	LF	Linear Foot
PC PF	Prime Contractor Profit	LS	Lump Sum
BUR LIC	Burdened Line Item Cost	MO	Month
		SF	Square Foot
		SY	Square Yard
		TON	Tons
		YR	Years

Cost Adjustment Checklist:	**NOTES:**
FACTOR:	Field work will be in Level "D" PPE.
H&S Productivity (labor and equipment only)	MII assembly costs include HPF adjustments.
Escalation to Base Year	2016 cost sources are not escalated (EF=1.00). All other costs are escalated based on the USACE CWCCIS, EM 1110-2-1304, Sept 2015.
Area Cost Factor	An AF of 1.05 is used for Oregon, except that an AF of 1.00 (national unmodified average) is used for MII assembly costs and local vendor quotes.
Subcontractor Overhead and Profit	It is assumed that home office OH is 8% and profit is 9% for the Prime Contractor. Professional labor overhead is 100%.
Prime Contractor Overhead and Profit	Allowances and items with mandated costs such as per diem do not have overhead and profit applied.
	Items previously developed by Anchor QEA already include contractor markups, therefore overhead and profit were not applied to those items.
	It is assumed that OH is 1% and profit is 0% for vendor quotes for treatment and disposal at offsite disposal facilities. It is assumed that OH is 5% and profit is 0% for quotes for all other material vendor quotes.
	Items developed using MII already include contractor markups such as overhead and profit, therefore additional overhead and profit were not applied in the PC OH and PC PF to those items.

TABLE CW-B14

Alternative B
Capital Cost Sub-Element
Mitigation

Cost Worksheet: **CW-B14**

COST WORKSHEET

Site: Portland Harbor Superfund Site
Location: Portland, Oregon
Phase: Feasibility Study
Base Year: 2016

Prepared By: JN **Date:** 3/4/2016
Checked By: AB **Date:** 3/7/2016

Work Statement:
This sub-element involves mitigation of shallow water and riverbank areas. It includes costs for on-site labor, equipment, and materials developed from previous work.
Quantity development presented in Appendix D.

Cost Analysis:
Cost for Mitigation (Lump Sum)

COST DATABASE CODE	DESCRIPTION	QTY	UNIT(S)	HPF	LABOR	ADJ LABOR	EQUIP	ADJ EQUIP	MATL	OTHER	UNMOD UC	UNMOD LIC	PC OH	PC PF	BUR LIC	COST SOURCE CITATION	COMMENTS
O3	Mitigation	**15**	AC	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$1,070,827.00	$1,070,827.00	$16,062,405.00	0%	0%	$16,062,405	O Other	Average cost of projects presented in Tables 6.1-1 and 6.1-4 of the Appendix M, Attachment 1, Anchor QEA FS (2010) as well as select other projects. See Calculations for derivation.
												TOTAL COST:			$16,062,405		

	Representative Unit Quantity	Unit(s)	Total Cost	Unit Cost
COST WORKSHEET SUMMARY	15	AC	$16,062,405	$1,070,827

Notes:
Further information about the development of cost worksheets can be found in Attachment A - Methodology and Organization of Detailed Cost Estimates.
The quantity bolded in the QTY column is the quantity selected as the representative unit quantity for this cost worksheet. If multiple quantities are bolded, the representative unit quantity is the sum of those quantities. When the LS unit is utilized, the default representative unit quantity is 1.
HTRW productivity factor is from Exhibit B-3 or B-4 of "A Guide to Developing and Documenting Cost Estimates During the Feasibility Study", EPA 2000
EPA developed project-specific unit costs using the Micro Computer Aided Cost Engineering System (MCACES) Second Generation (MII) software version 4.2, build 3

Cost Database Code:
The Cost Database Code is a reference code for linking with line item cost information with the cost source database and is not otherwise used within these cost worksheets. The following cost source database prefixes apply:
L (EPA-Derived Labor Unit Costs), M (Project-Specific Vendor Unit Costs), P (Previously Developed Unit Costs by Anchor QEA for Portland Harbor), A (EPA-Derived MII Unit Costs), O (Unit Costs from Other Projects/Sources)

Source of Cost Data:
For citation references, the following sources apply:
ALL (Allowance), FLC (www.flcdatacenter.com), LD (Costs Derived from Lower Duwamish Waterway Final Feasibility Study), MII (MII), O (Other), P (Previously Developed by Anchor QEA for Portland Harbor), and V (Vendor Quote)

Abbreviations:

QTY	Quantity	AC	Acres
EQUIP	Equipment	CLF	100 Linear Foot
MATL	Material	CY	Cubic Yard
HPF	HTRW Productivity Factor	DY	Days
ADJ LABOR	Adjusted Labor for HFP	EA	Each
ADJ EQUIP	Adjusted Equipment for HFP	FTE	Full Time Equivalent
UNMOD UC	Unmodified Unit Cost	HR	Hours
UNMOD LIC	Unmodified Line Item Cost	LB	Pounds
UNBUR LIC	Unburdened Line Item Cost	LCY	Loose Cubic Yard
PC OH	Prime Contractor Overhead	LF	Linear Foot
PC PF	Prime Contractor Profit	LS	Lump Sum
BUR LIC	Burdened Line Item Cost	MO	Month
		SF	Square Foot
		SY	Square Yard
		TON	Tons
		YR	Years

Cost Adjustment Checklist:	**NOTES:**
FACTOR:	Field work will be in Level "D" PPE.
H&S Productivity (labor and equipment only)	MII assembly costs include HPF adjustments.
Escalation to Base Year	2016 cost sources are not escalated (EF=1.00). All other costs are escalated based on the USACE CWCCIS, EM 1110-2-1304, Sept 2015.
Area Cost Factor	An AF of 1.05 is used for Oregon, except that an AF of 1.00 (national unmodified average) is used for MII assembly costs and local vendor quotes.
Subcontractor Overhead and Profit	It is assumed that home office OH is 8% and profit is 9% for the Prime Contractor. Professional labor overhead is 100%.
Prime Contractor Overhead and Profit	Allowances and items with mandated costs such as per diem do not have overhead and profit applied.
	Items previously developed by Anchor QEA already include contractor markups, therefore overhead and profit were not applied to those items.
	It is assumed that OH is 1% and profit is 0% for vendor quotes for treatment and disposal at offsite disposal facilities. It is assumed that OH is 5% and profit is 0% for quotes for all other material vendor quotes.
	Items developed using MII already include contractor markups such as overhead and profit, therefore additional overhead and profit were not applied in the PC OH and PC PF to those items.

TABLE CW-B15

Alternative B **Cost Worksheet:** **CW-B15**
Capital Cost Sub-Element
Sand Placement for Technology Assignments

COST WORKSHEET

Site: Portland Harbor Superfund Site
Location: Portland, Oregon
Phase: Feasibility Study
Base Year: 2016

Prepared By: JN **Date:** 3/4/2016
Checked By: AB **Date:** 3/7/2016

Work Statement:
This sub-element involves the placement of sand for the construction of capping areas. It includes placement of sand within confined areas, open areas, and riverbanks. It includes costs for on-site labor, equipment, and materials as well as recent vendor quotes.
Quantity development presented in Appendix D.

Cost Analysis:
Cost for Sand Placement for Technology Assignments (Lump Sum)

COST DATABASE CODE	DESCRIPTION	QTY	UNIT(S)	HPF	LABOR	ADJ LABOR	EQUIP	ADJ EQUIP	MATL	OTHER	UNMOD UC	UNMOD LIC	PC OH	PC PF	BUR LIC	COST SOURCE CITATION	COMMENTS
P1	Sand	**342,033**	LCY	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$19.75	$19.75	$6,755,151.75	0%	0%	$6,755,152	P Anchor QEA	Project-specific cost developed by Anchor QEA (2010) - see Backup Table 29A. Includes conversion from TON to LCY.
	Sand Placement (Riverbanks)																
A16	Material Placement (Confined)	42,045	CY	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$20.39	$20.39	$857,297.55	0%	0%	$857,298	MII MII	Project-specific unit cost developed in MII.
	Sand Placement (Confined)																
A16	Material Placement (Confined)	31,781	CY	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$20.39	$20.39	$648,014.59	0%	0%	$648,015	MII MII	Project-specific unit cost developed in MII.
	Sand Placement (Open Water)																
A15	Material Placement (Open)	268,207	CY	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$12.42	$12.42	$3,331,130.94	0%	0%	$3,331,131	MII MII	Project-specific unit cost developed in MII.
												TOTAL COST:			$11,591,596		

	Representative Unit Quantity	Unit(s)	Total Cost	Unit Cost
COST WORKSHEET SUMMARY	342,033	CY	$11,591,596	$33.89

Notes:
Further information about the development of cost worksheets can be found in Attachment A - Methodology and Organization of Detailed Cost Estimates.
The quantity bolded in the QTY column is the quantity selected as the representative unit quantity for this cost worksheet. If multiple quantities are bolded, the representative unit quantity is the sum of those quantities. When the LS unit is utilized, the default representative unit quantity is 1.
HTRW productivity factor is from Exhibit B-3 or B-4 of "A Guide to Developing and Documenting Cost Estimates During the Feasibility Study", EPA 2000
EPA developed project-specific unit costs using the Micro Computer Aided Cost Engineering System (MCACES) Second Generation (MII) software version 4.2, build 3

Cost Database Code:
The Cost Database Code is a reference code for linking with line item cost information with the cost source database and is not otherwise used within these cost worksheets. The following cost source database prefixes apply:
L (EPA-Derived Labor Unit Costs), M (Project-Specific Vendor Unit Costs), P (Previously Developed Unit Costs by Anchor QEA for Portland Harbor), A (EPA-Derived MII Unit Costs), O (Unit Costs from Other Projects/Sources)

Source of Cost Data:
For citation references, the following sources apply:
ALL (Allowance), FLC (www.flcdatacenter.com), LD (Costs Derived from Lower Duwamish Waterway Final Feasibility Study), MII (MII), O (Other), P (Previously Developed by Anchor QEA for Portland Harbor), and V (Vendor Quote)

Abbreviations:

QTY	Quantity	AC	Acres
EQUIP	Equipment	CLF	100 Linear Foot
MATL	Material	CY	Cubic Yard
HPF	HTRW Productivity Factor	DY	Days
ADJ LABOR	Adjusted Labor for HFP	EA	Each
ADJ EQUIP	Adjusted Equipment for HFP	FTE	Full Time Equivalent
UNMOD UC	Unmodified Unit Cost	HR	Hours
UNMOD LIC	Unmodified Line Item Cost	LB	Pounds
UNBUR LIC	Unburdened Line Item Cost	LCY	Loose Cubic Yard
PC OH	Prime Contractor Overhead	LF	Linear Foot
PC PF	Prime Contractor Profit	LS	Lump Sum
BUR LIC	Burdened Line Item Cost	MO	Month
		SF	Square Foot
		SY	Square Yard
		TON	Tons
		YR	Years

Cost Adjustment Checklist:	**NOTES:**
FACTOR:	Field work will be in Level "D" PPE.
H&S Productivity (labor and equipment only)	MII assembly costs include HPF adjustments.
Escalation to Base Year	2016 cost sources are not escalated (EF=1.00). All other costs are escalated based on the USACE CWCCIS, EM 1110-2-1304, Sept 2015.
Area Cost Factor	An AF of 1.05 is used for Oregon, except that an AF of 1.00 (national unmodified average) is used for MII assembly costs and local vendor quotes.
Subcontractor Overhead and Profit	It is assumed that home office OH is 8% and profit is 9% for the Prime Contractor. Professional labor overhead is 100%.
Prime Contractor Overhead and Profit	Allowances and items with mandated costs such as per diem do not have overhead and profit applied.
	Items previously developed by Anchor QEA already include contractor markups, therefore overhead and profit were not applied to those items.
	It is assumed that OH is 1% and profit is 0% for vendor quotes for treatment and disposal at offsite disposal facilities. It is assumed that OH is 5% and profit is 0% for quotes for all other material vendor quotes.
	Items developed using MII already include contractor markups such as overhead and profit, therefore additional overhead and profit were not applied in the PC OH and PC PF to those items.

TABLE CW-B16

Alternative B **Cost Worksheet:** **CW-B16**
Capital Cost Sub-Element
Beach Mix Placement for Technology Assignments

COST WORKSHEET

Site: Portland Harbor Superfund Site
Location: Portland, Oregon
Phase: Feasibility Study
Base Year: 2016

Prepared By: JN **Date:** 3/4/2016
Checked By: AB **Date:** 3/7/2016

Work Statement:
This sub-element involves the placement of beach mix for the construction of capping areas. It includes placement of beach mix within confined areas, open areas, and riverbanks. It includes costs for on-site labor, equipment, and materials as well as recent vendor quotes.
Quantity development presented in Appendix D.

Cost Analysis:
Cost for Beach Mix Placement for Technology Assignments (Lump Sum)

COST DATABASE CODE	DESCRIPTION	QTY	UNIT(S)	HPF	LABOR	ADJ LABOR	EQUIP	ADJ EQUIP	MATL	OTHER	UNMOD UC	UNMOD LIC	PC OH	PC PF	BUR LIC	COST SOURCE CITATION	COMMENTS
P3	ODOT 100 Beach Mix	**18,563**	LCY	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$57.69	$57.69	$1,070,899.47	0%	0%	$1,070,899	P Anchor QEA	Project-specific cost developed by Anchor QEA (2010) - see Backup Table 29A. Includes conversion from TON to LCY.
	Beach Mix Placement (Riverbanks)																
A16	Material Placement (Confined)	6,886	CY	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$20.39	$20.39	$140,405.54	0%	0%	$140,406	MII MII	Project-specific unit cost developed in MII.
	Beach Mix Placement (Confined)																
A16	Material Placement (Confined)	2,739	CY	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$20.39	$20.39	$55,848.21	0%	0%	$55,848	MII MII	Project-specific unit cost developed in MII.
	Beach Mix Placement (Open Water)																
A15	Material Placement (Open)	8,938	CY	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$12.42	$12.42	$111,009.96	0%	0%	$111,010	MII MII	Project-specific unit cost developed in MII.
												TOTAL COST:			$1,378,163		

	Representative Unit Quantity	Unit(s)	Total Cost	Unit Cost
COST WORKSHEET SUMMARY	18,563	CY	$1,378,163	$74.24

Notes:
Further information about the development of cost worksheets can be found in Attachment A - Methodology and Organization of Detailed Cost Estimates.
The quantity bolded in the QTY column is the quantity selected as the representative unit quantity for this cost worksheet. If multiple quantities are bolded, the representative unit quantity is the sum of those quantities. When the LS unit is utilized, the default representative unit quantity is 1.
HTRW productivity factor is from Exhibit B-3 or B-4 of "A Guide to Developing and Documenting Cost Estimates During the Feasibility Study", EPA 2000
EPA developed project-specific unit costs using the Micro Computer Aided Cost Engineering System (MCACES) Second Generation (MII) software version 4.2, build 3

Cost Database Code:
The Cost Database Code is a reference code for linking with line item cost information with the cost source database and is not otherwise used within these cost worksheets. The following cost source database prefixes apply:
L (EPA-Derived Labor Unit Costs), M (Project-Specific Vendor Unit Costs), P (Previously Developed Unit Costs by Anchor QEA for Portland Harbor), A (EPA-Derived MII Unit Costs), O (Unit Costs from Other Projects/Sources)

Source of Cost Data:
For citation references, the following sources apply:
ALL (Allowance), FLC (www.flcdatacenter.com), LD (Costs Derived from Lower Duwamish Waterway Final Feasibility Study), MII (MII), O (Other), P (Previously Developed by Anchor QEA for Portland Harbor), and V (Vendor Quote)

Abbreviations:

QTY	Quantity	AC	Acres
EQUIP	Equipment	CLF	100 Linear Foot
MATL	Material	CY	Cubic Yard
HPF	HTRW Productivity Factor	DY	Days
ADJ LABOR	Adjusted Labor for HFP	EA	Each
ADJ EQUIP	Adjusted Equipment for HFP	FTE	Full Time Equivalent
UNMOD UC	Unmodified Unit Cost	HR	Hours
UNMOD LIC	Unmodified Line Item Cost	LB	Pounds
UNBUR LIC	Unburdened Line Item Cost	LCY	Loose Cubic Yard
PC OH	Prime Contractor Overhead	LF	Linear Foot
PC PF	Prime Contractor Profit	LS	Lump Sum
BUR LIC	Burdened Line Item Cost	MO	Month
		SF	Square Foot
		SY	Square Yard
		TON	Tons
		YR	Years

Cost Adjustment Checklist:	**NOTES:**
FACTOR:	Field work will be in Level "D" PPE.
H&S Productivity (labor and equipment only)	MII assembly costs include HPF adjustments.
Escalation to Base Year	2016 cost sources are not escalated (EF=1.00). All other costs are escalated based on the USACE CWCCIS, EM 1110-2-1304, Sept 2015.
Area Cost Factor	An AF of 1.05 is used for Oregon, except that an AF of 1.00 (national unmodified average) is used for MII assembly costs and local vendor quotes.
Subcontractor Overhead and Profit	It is assumed that home office OH is 8% and profit is 9% for the Prime Contractor. Professional labor overhead is 100%.
Prime Contractor Overhead and Profit	Allowances and items with mandated costs such as per diem do not have overhead and profit applied.
	Items previously developed by Anchor QEA already include contractor markups, therefore overhead and profit were not applied to those items.
	It is assumed that OH is 1% and profit is 0% for vendor quotes for treatment and disposal at offsite disposal facilities. It is assumed that OH is 5% and profit is 0% for quotes for all other material vendor quotes.
	Items developed using MII already include contractor markups such as overhead and profit, therefore additional overhead and profit were not applied in the PC OH and PC PF to those items.

TABLE CW-B17

Alternative B **Cost Worksheet:** **CW-B17**
Capital Cost Sub-Element
Armor Placement for Technology Assignments

COST WORKSHEET

Site: Portland Harbor Superfund Site
Location: Portland, Oregon
Phase: Feasibility Study
Base Year: 2016

Prepared By: JN **Date:** 3/4/2016
Checked By: AB **Date:** 3/7/2016

Work Statement:
This sub-element involves the placement of armor for the construction of capping areas. It includes placement of armor within confined areas, open areas, and riverbanks. It includes costs for on-site labor, equipment, and materials as well as recent vendor quotes.
Quantity development presented in Appendix D.

Cost Analysis:
Cost for Armor Placement for Technology Assignments (Lump Sum)

COST DATABASE CODE	DESCRIPTION	QTY	UNIT(S)	HPF	LABOR	ADJ LABOR	EQUIP	ADJ EQUIP	MATL	OTHER	UNMOD UC	UNMOD LIC	PC OH	PC PF	BUR LIC	COST SOURCE CITATION	COMMENTS
P2	ODOT 200 Armor	**29,533**	LCY	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$57.69	$57.69	$1,703,758.77	0%	0%	$1,703,759	P Anchor QEA	Project-specific cost developed by Anchor QEA (2010) - see Backup Table 29A. Includes conversion from TON to LCY.
	Armor Placement (Riverbanks)																
A16	Material Placement (Confined)	1,576	CY	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$20.39	$20.39	$32,134.64	0%	0%	$32,135	MII MII	Project-specific unit cost developed in MII.
	Armor Placement (Confined)																
A16	Material Placement (Confined)	6,988	CY	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$20.39	$20.39	$142,485.32	0%	0%	$142,485	MII MII	Project-specific unit cost developed in MII.
	Armor Placement (Open Water)																
A15	Material Placement (Open)	20,969	CY	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$12.42	$12.42	$260,434.98	0%	0%	$260,435	MII MII	Project-specific unit cost developed in MII.
												TOTAL COST:			$2,138,814		

	Representative Unit Quantity	Unit(s)	Total Cost	Unit Cost
COST WORKSHEET SUMMARY	29,533	CY	$2,138,814	$72.42

Notes:
Further information about the development of cost worksheets can be found in Attachment A - Methodology and Organization of Detailed Cost Estimates.
The quantity bolded in the QTY column is the quantity selected as the representative unit quantity for this cost worksheet. If multiple quantities are bolded, the representative unit quantity is the sum of those quantities. When the LS unit is utilized, the default representative unit quantity is 1.
HTRW productivity factor is from Exhibit B-3 or B-4 of "A Guide to Developing and Documenting Cost Estimates During the Feasibility Study", EPA 2000
EPA developed project-specific unit costs using the Micro Computer Aided Cost Engineering System (MCACES) Second Generation (MII) software version 4.2, build 3

Cost Database Code:
The Cost Database Code is a reference code for linking with line item cost information with the cost source database and is not otherwise used within these cost worksheets. The following cost source database prefixes apply:
L (EPA-Derived Labor Unit Costs), M (Project-Specific Vendor Unit Costs), P (Previously Developed Unit Costs by Anchor QEA for Portland Harbor), A (EPA-Derived MII Unit Costs), O (Unit Costs from Other Projects/Sources)

Source of Cost Data:
For citation references, the following sources apply:
ALL (Allowance), FLC (www.flcdatacenter.com), LD (Costs Derived from Lower Duwamish Waterway Final Feasibility Study), MII (MII), O (Other), P (Previously Developed by Anchor QEA for Portland Harbor), and V (Vendor Quote)

Abbreviations:

QTY	Quantity	AC	Acres
EQUIP	Equipment	CLF	100 Linear Foot
MATL	Material	CY	Cubic Yard
HPF	HTRW Productivity Factor	DY	Days
ADJ LABOR	Adjusted Labor for HFP	EA	Each
ADJ EQUIP	Adjusted Equipment for HFP	FTE	Full Time Equivalent
UNMOD UC	Unmodified Unit Cost	HR	Hours
UNMOD LIC	Unmodified Line Item Cost	LB	Pounds
UNBUR LIC	Unburdened Line Item Cost	LCY	Loose Cubic Yard
PC OH	Prime Contractor Overhead	LF	Linear Foot
PC PF	Prime Contractor Profit	LS	Lump Sum
BUR LIC	Burdened Line Item Cost	MO	Month
		SF	Square Foot
		SY	Square Yard
		TON	Tons
		YR	Years

Cost Adjustment Checklist:	**NOTES:**
FACTOR:	Field work will be in Level "D" PPE.
H&S Productivity (labor and equipment only)	MII assembly costs include HPF adjustments.
Escalation to Base Year	2016 cost sources are not escalated (EF=1.00). All other costs are escalated based on the USACE CWCCIS, EM 1110-2-1304, Sept 2015.
Area Cost Factor	An AF of 1.05 is used for Oregon, except that an AF of 1.00 (national unmodified average) is used for MII assembly costs and local vendor quotes.
Subcontractor Overhead and Profit	It is assumed that home office OH is 8% and profit is 9% for the Prime Contractor. Professional labor overhead is 100%.
Prime Contractor Overhead and Profit	Allowances and items with mandated costs such as per diem do not have overhead and profit applied.
	Items previously developed by Anchor QEA already include contractor markups, therefore overhead and profit were not applied to those items.
	It is assumed that OH is 1% and profit is 0% for vendor quotes for treatment and disposal at offsite disposal facilities. It is assumed that OH is 5% and profit is 0% for quotes for all other material vendor quotes.
	Items developed using MII already include contractor markups such as overhead and profit, therefore additional overhead and profit were not applied in the PC OH and PC PF to those items.

TABLE CW-B18

Alternative B **Cost Worksheet:** **CW-B18**
Capital Cost Sub-Element
Reactive/GAC Placement for Technology Assignments

COST WORKSHEET

Site: Portland Harbor Superfund Site
Location: Portland, Oregon
Phase: Feasibility Study
Base Year: 2016

Prepared By: JN **Date:** 3/4/2016
Checked By: AB **Date:** 3/7/2016

Work Statement:
This sub-element involves the placement of the reactive layers for the construction of capping areas. It includes placement of the reactive layer within confined areas, open areas, and riverbanks. It includes costs for on-site labor, equipment, and materials as well as recent vendor quotes.
Quantity development presented in Appendix D.

Cost Analysis:
Cost for Reactive/GAC Placement for Technology Assignments (Lump Sum)

COST DATABASE CODE	DESCRIPTION	QTY	UNIT(S)	HPF	LABOR	ADJ LABOR	EQUIP	ADJ EQUIP	MATL	OTHER	UNMOD UC	UNMOD LIC	PC OH	PC PF	BUR LIC	COST SOURCE CITATION	COMMENTS
	AquaGate Reactive Layer																
M4	Carbon (AquaGate + PAC 10%)	50,435	TON	1.00	$0.00	$0.00	$0.00	$0.00	$456.30	$0.00	$456.30	$23,013,490.50	5%	0%	$24,164,165	V Vendor Quote	Project-specific vendor quote - AquaBlok 2015. Material cost is $/TON.
P1	Sand	53,394	LCY	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$19.75	$19.75	$1,054,531.50	0%	0%	$1,054,532	P Anchor QEA	Project-specific cost developed by Anchor QEA (2010) - see Backup Table 29A. Includes conversion from TON to LCY.
A3	Mixing Sand & Carbon for Reactive Layer	103,881	CY	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$4.76	$4.76	$494,473.56	0%	0%	$494,474	MII MII	Project-specific unit cost developed in MII.
A16	Material Placement (Confined)	13,524	CY	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$20.39	$20.39	$275,754.36	0%	0%	$275,754	MII MII	Project-specific unit cost developed in MII.
A15	Material Placement (Open)	90,357	CY	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$12.42	$12.42	$1,122,233.94	0%	0%	$1,122,234	MII MII	Project-specific unit cost developed in MII.
	AquaBlock																
M3	Carbon (AquaBlok)	1,635	TON	1.00	$0.00	$0.00	$0.00	$0.00	$202.80	$0.00	$202.80	$331,578.00	5%	0%	$348,157	V Vendor Quote	Project-specific vendor quote - AquaBlok 2015. Material cost is $/TON.
A16	Material Placement (Confined)	1,425	CY	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$20.39	$20.39	$29,055.75	0%	0%	$29,056	MII MII	Project-specific unit cost developed in MII.
												TOTAL COST:			$27,488,372		

	Representative Unit Quantity	Unit(s)	Total Cost	Unit Cost
COST WORKSHEET SUMMARY	1	LS	$27,488,372	$27,488,372

Notes:
Further information about the development of cost worksheets can be found in Attachment A - Methodology and Organization of Detailed Cost Estimates.
The quantity bolded in the QTY column is the quantity selected as the representative unit quantity for this cost worksheet. If multiple quantities are bolded, the representative unit quantity is the sum of those quantities. When the LS unit is utilized, the default representative unit quantity is 1.
HTRW productivity factor is from Exhibit B-3 or B-4 of "A Guide to Developing and Documenting Cost Estimates During the Feasibility Study", EPA 2000
EPA developed project-specific unit costs using the Micro Computer Aided Cost Engineering System (MCACES) Second Generation (MII) software version 4.2, build 3

Cost Database Code:
The Cost Database Code is a reference code for linking with line item cost information with the cost source database and is not otherwise used within these cost worksheets. The following cost source database prefixes apply:
L (EPA-Derived Labor Unit Costs), M (Project-Specific Vendor Unit Costs), P (Previously Developed Unit Costs by Anchor QEA for Portland Harbor), A (EPA-Derived MII Unit Costs), O (Unit Costs from Other Projects/Sources)

Source of Cost Data:
For citation references, the following sources apply:
ALL (Allowance), FLC (www.flcdatacenter.com), LD (Costs Derived from Lower Duwamish Waterway Final Feasibility Study), MII (MII), O (Other), P (Previously Developed by Anchor QEA for Portland Harbor), and V (Vendor Quote)

Abbreviations:

QTY	Quantity	AC	Acres
EQUIP	Equipment	CLF	100 Linear Foot
MATL	Material	CY	Cubic Yard
HPF	HTRW Productivity Factor	DY	Days
ADJ LABOR	Adjusted Labor for HFP	EA	Each
ADJ EQUIP	Adjusted Equipment for HFP	FTE	Full Time Equivalent
UNMOD UC	Unmodified Unit Cost	HR	Hours
UNMOD LIC	Unmodified Line Item Cost	LB	Pounds
UNBUR LIC	Unburdened Line Item Cost	LCY	Loose Cubic Yard
PC OH	Prime Contractor Overhead	LF	Linear Foot
PC PF	Prime Contractor Profit	LS	Lump Sum
BUR LIC	Burdened Line Item Cost	MO	Month
		SF	Square Foot
		SY	Square Yard
		TON	Tons
		YR	Years

Cost Adjustment Checklist:	**NOTES:**
FACTOR:	Field work will be in Level "D" PPE.
H&S Productivity (labor and equipment only)	MII assembly costs include HPF adjustments.
Escalation to Base Year	2016 cost sources are not escalated (EF=1.00). All other costs are escalated based on the USACE CWCCIS, EM 1110-2-1304, Sept 2015.
Area Cost Factor	An AF of 1.05 is used for Oregon, except that an AF of 1.00 (national unmodified average) is used for MII assembly costs and local vendor quotes.
Subcontractor Overhead and Profit	It is assumed that home office OH is 8% and profit is 9% for the Prime Contractor. Professional labor overhead is 100%.
Prime Contractor Overhead and Profit	Allowances and items with mandated costs such as per diem do not have overhead and profit applied.
	Items previously developed by Anchor QEA already include contractor markups, therefore overhead and profit were not applied to those items.
	It is assumed that OH is 1% and profit is 0% for vendor quotes for treatment and disposal at offsite disposal facilities. It is assumed that OH is 5% and profit is 0% for quotes for all other material vendor quotes.
	Items developed using MII already include contractor markups such as overhead and profit, therefore additional overhead and profit were not applied in the PC OH and PC PF to those items.

TABLE CW-B19

Alternative B **Cost Worksheet:** **CW-B19**
Capital Cost Sub-Element
Geofabric for Riverbanks

COST WORKSHEET

Site: Portland Harbor Superfund Site
Location: Portland, Oregon
Phase: Feasibility Study
Base Year: 2016

Prepared By: JN **Date:** 3/4/2016
Checked By: AB **Date:** 3/7/2016

Work Statement:
This sub-element involves the installation of geofabric along the riverbanks. It includes costs for on-site labor, equipment, and materials from recent vendor quotes.
Quantity development presented in Appendix D.

Cost Analysis:
Cost for Geofabric for Riverbanks (Lump Sum)

COST DATABASE CODE	DESCRIPTION	QTY	UNIT(S)	HPF	LABOR	ADJ LABOR	EQUIP	ADJ EQUIP	MATL	OTHER	UNMOD UC	UNMOD LIC	PC OH	PC PF	BUR LIC	COST SOURCE CITATION	COMMENTS
O7	Geotextile Installation	**10.5**	AC	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$7,074.14	$7,074.14	$74,278.51	8%	9%	$87,441	V Vendor Quote	Vendor Quote - Geo-Synthetics (2014). Includes labor and equipment for installation
O6	Geotextile Material	10.5	AC	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$5,698.62	$5,698.62	$59,835.47	5%	0%	$62,827	V Vendor Quote	Vendor quote obtained for project of similar scope - Geo-Synthetics, 2014.
												TOTAL COST:			$150,268		

	Representative Unit Quantity	Unit(s)	Total Cost	Unit Cost
COST WORKSHEET SUMMARY	10.5	AC	$150,268	$14,311

Notes:
Further information about the development of cost worksheets can be found in Attachment A - Methodology and Organization of Detailed Cost Estimates.
The quantity bolded in the QTY column is the quantity selected as the representative unit quantity for this cost worksheet. If multiple quantities are bolded, the representative unit quantity is the sum of those quantities. When the LS unit is utilized, the default representative unit quantity is 1.
HTRW productivity factor is from Exhibit B-3 or B-4 of "A Guide to Developing and Documenting Cost Estimates During the Feasibility Study", EPA 2000
EPA developed project-specific unit costs using the Micro Computer Aided Cost Engineering System (MCACES) Second Generation (MII) software version 4.2, build 3

Cost Database Code:
The Cost Database Code is a reference code for linking with line item cost information with the cost source database and is not otherwise used within these cost worksheets. The following cost source database prefixes apply:
L (EPA-Derived Labor Unit Costs), M (Project-Specific Vendor Unit Costs), P (Previously Developed Unit Costs by Anchor QEA for Portland Harbor), A (EPA-Derived MII Unit Costs), O (Unit Costs from Other Projects/Sources)

Source of Cost Data:
For citation references, the following sources apply:
ALL (Allowance), FLC (www.flcdatacenter.com), LD (Costs Derived from Lower Duwamish Waterway Final Feasibility Study), MII (MII), O (Other), P (Previously Developed by Anchor QEA for Portland Harbor), and V (Vendor Quote)

Abbreviations:

QTY	Quantity	AC	Acres
EQUIP	Equipment	CLF	100 Linear Foot
MATL	Material	CY	Cubic Yard
HPF	HTRW Productivity Factor	DY	Days
ADJ LABOR	Adjusted Labor for HFP	EA	Each
ADJ EQUIP	Adjusted Equipment for HFP	FTE	Full Time Equivalent
UNMOD UC	Unmodified Unit Cost	HR	Hours
UNMOD LIC	Unmodified Line Item Cost	LB	Pounds
UNBUR LIC	Unburdened Line Item Cost	LCY	Loose Cubic Yard
PC OH	Prime Contractor Overhead	LF	Linear Foot
PC PF	Prime Contractor Profit	LS	Lump Sum
BUR LIC	Burdened Line Item Cost	MO	Month
		SF	Square Foot
		SY	Square Yard
		TON	Tons
		YR	Years

Cost Adjustment Checklist:	**NOTES:**
FACTOR:	Field work will be in Level "D" PPE.
H&S Productivity (labor and equipment only)	MII assembly costs include HPF adjustments.
Escalation to Base Year	2016 cost sources are not escalated (EF=1.00). All other costs are escalated based on the USACE CWCCIS, EM 1110-2-1304, Sept 2015.
Area Cost Factor	An AF of 1.05 is used for Oregon, except that an AF of 1.00 (national unmodified average) is used for MII assembly costs and local vendor quotes.
Subcontractor Overhead and Profit	It is assumed that home office OH is 8% and profit is 9% for the Prime Contractor. Professional labor overhead is 100%.
Prime Contractor Overhead and Profit	Allowances and items with mandated costs such as per diem do not have overhead and profit applied.
	Items previously developed by Anchor QEA already include contractor markups, therefore overhead and profit were not applied to those items.
	It is assumed that OH is 1% and profit is 0% for vendor quotes for treatment and disposal at offsite disposal facilities. It is assumed that OH is 5% and profit is 0% for quotes for all other material vendor quotes.
	Items developed using MII already include contractor markups such as overhead and profit, therefore additional overhead and profit were not applied in the PC OH and PC PF to those items.

TABLE CW-B20

Alternative B **Cost Worksheet:** **CW-B20**
Capital Cost Sub-Element
Organoclay Mat Placement for Technology Assignments

COST WORKSHEET

Site: Portland Harbor Superfund Site
Location: Portland, Oregon
Phase: Feasibility Study
Base Year: 2016

Prepared By: JN **Date:** 3/4/2016
Checked By: AB **Date:** 3/7/2016

Work Statement:
This sub-element involves the placement of the organoclay mat for the construction of capping areas. It includes placement of the organoclay mat within confined areas, open areas, and riverbanks. It includes costs for on-site labor, equipment, and materials as well as recent vendor quotes.
Quantity development presented in Appendix D.

Cost Analysis:
Cost for Organoclay Mat Placement for Technology Assignments (Lump Sum)

COST DATABASE CODE	DESCRIPTION	QTY	UNIT(S)	HPF	LABOR	ADJ LABOR	EQUIP	ADJ EQUIP	MATL	OTHER	UNMOD UC	UNMOD LIC	PC OH	PC PF	BUR LIC	COST SOURCE CITATION	COMMENTS
A17	Organoclay Mat Placement	**174,300**	SF	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$3.35	$3.35	$583,905.00	0%	0%	$583,905	MII MII	Project-specific unit cost developed in MII.
P4	Organoclay Mat Material	174,300	SF	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$3.38	$3.38	$589,134.00	0%	0%	$589,134	P Anchor QEA	Project-specific cost developed by Anchor QEA (2010) - see Backup Table 29A.
												TOTAL COST:			$1,173,039		

	Representative Unit Quantity	Unit(s)	Total Cost	Unit Cost
COST WORKSHEET SUMMARY	174,300	SF	$1,173,039	$6.73

Notes:
Further information about the development of cost worksheets can be found in Attachment A - Methodology and Organization of Detailed Cost Estimates.
The quantity bolded in the QTY column is the quantity selected as the representative unit quantity for this cost worksheet. If multiple quantities are bolded, the representative unit quantity is the sum of those quantities. When the LS unit is utilized, the default representative unit quantity is 1.
HTRW productivity factor is from Exhibit B-3 or B-4 of "A Guide to Developing and Documenting Cost Estimates During the Feasibility Study", EPA 2000
EPA developed project-specific unit costs using the Micro Computer Aided Cost Engineering System (MCACES) Second Generation (MII) software version 4.2, build 3

Cost Database Code:
The Cost Database Code is a reference code for linking with line item cost information with the cost source database and is not otherwise used within these cost worksheets. The following cost source database prefixes apply:
L (EPA-Derived Labor Unit Costs), M (Project-Specific Vendor Unit Costs), P (Previously Developed Unit Costs by Anchor QEA for Portland Harbor), A (EPA-Derived MII Unit Costs), O (Unit Costs from Other Projects/Sources)

Source of Cost Data:
For citation references, the following sources apply:
ALL (Allowance), FLC (www.flcdatacenter.com), LD (Costs Derived from Lower Duwamish Waterway Final Feasibility Study), MII (MII), O (Other), P (Previously Developed by Anchor QEA for Portland Harbor), and V (Vendor Quote)

Abbreviations:

QTY	Quantity	AC	Acres
EQUIP	Equipment	CLF	100 Linear Foot
MATL	Material	CY	Cubic Yard
HPF	HTRW Productivity Factor	DY	Days
ADJ LABOR	Adjusted Labor for HFP	EA	Each
ADJ EQUIP	Adjusted Equipment for HFP	FTE	Full Time Equivalent
UNMOD UC	Unmodified Unit Cost	HR	Hours
UNMOD LIC	Unmodified Line Item Cost	LB	Pounds
UNBUR LIC	Unburdened Line Item Cost	LCY	Loose Cubic Yard
PC OH	Prime Contractor Overhead	LF	Linear Foot
PC PF	Prime Contractor Profit	LS	Lump Sum
BUR LIC	Burdened Line Item Cost	MO	Month
		SF	Square Foot
		SY	Square Yard
		TON	Tons
		YR	Years

Cost Adjustment Checklist:	**NOTES:**
FACTOR:	Field work will be in Level "D" PPE.
H&S Productivity (labor and equipment only)	MII assembly costs include HPF adjustments.
Escalation to Base Year	2016 cost sources are not escalated (EF=1.00). All other costs are escalated based on the USACE CWCCIS, EM 1110-2-1304, Sept 2015.
Area Cost Factor	An AF of 1.05 is used for Oregon, except that an AF of 1.00 (national unmodified average) is used for MII assembly costs and local vendor quotes.
Subcontractor Overhead and Profit	It is assumed that home office OH is 8% and profit is 9% for the Prime Contractor. Professional labor overhead is 100%.
Prime Contractor Overhead and Profit	Allowances and items with mandated costs such as per diem do not have overhead and profit applied.
	Items previously developed by Anchor QEA already include contractor markups, therefore overhead and profit were not applied to those items.
	It is assumed that OH is 1% and profit is 0% for vendor quotes for treatment and disposal at offsite disposal facilities. It is assumed that OH is 5% and profit is 0% for quotes for all other material vendor quotes.
	Items developed using MII already include contractor markups such as overhead and profit, therefore additional overhead and profit were not applied in the PC OH and PC PF to those items.

TABLE CW-B21

Alternative B **Cost Worksheet:** **CW-B21**
Capital Cost Sub-Element
Transload Facility Development

COST WORKSHEET

Site: Portland Harbor Superfund Site
Location: Portland, Oregon
Phase: Feasibility Study
Base Year: 2016

Prepared By: JN **Date:** 3/4/2016
Checked By: AB **Date:** 3/7/2016

Work Statement:
This sub-element involves the development of a transload facility for facilitating offsite disposal of contaminated sediments. It includes costs for on-site labor, equipment, and materials developed from previous work. Transload facility is expected to be operated for 4 years, based on estimated construction duration. Property lease quantity (20 acres) adjusted for construction duration. Labor for the annual inspections is assumed to be 2.5 times full time equivalent. Environmental monitoring is assumed to be once per quarter year for construction duration.

Cost Analysis:
Cost for Transload Facility Development (Lump Sum)

COST DATABASE CODE	DESCRIPTION	QTY	UNIT(S)	HPF	LABOR	ADJ LABOR	EQUIP	ADJ EQUIP	MATL	OTHER	UNMOD UC	UNMOD LIC	PC OH	PC PF	BUR LIC	COST SOURCE CITATION	COMMENTS
	Transload Facility Development																
P31	Transload Facility Permitting	1	LS	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$45,080.00	$45,080.00	$45,080.00	0%	0%	$45,080	P Anchor QEA	Project-specific cost developed by Anchor QEA (2010) - see Backup Table 24.
P32	Transload Facility Development	1	LS	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$4,508,000.00	$4,508,000.00	$4,508,000.00	0%	0%	$4,508,000	P Anchor QEA	Project-specific cost developed by Anchor QEA (2010) - see Backup Table 24.
P33	Yearly Property Lease	80	AC	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$26,484.50	$26,484.50	$2,118,760.00	0%	0%	$2,118,760	P Anchor QEA	Assumes leasing of 20 acres multiplied by estimated construction duration.
	Inspection and Monitoring of Transload Facility																
P34	Labor Inspections During Operations of Transload Facility	10.0	FTE	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$84,525.00	$84,525.00	$845,250.00	0%	0%	$845,250	P Anchor QEA	Developed by Anchor QEA (2010) - see Backup Table 24. Assumes 2.5 FTE/YR multiplied by estimated construction duration.
P35	Environmental Monitoring During Offloading at Transload Facility	16	MO	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$16,905.00	$16,905.00	$270,480.00	0%	0%	$270,480	P Anchor QEA	Developed by Anchor QEA (2010) - see Backup Table 24. Assumes 4 MO/YR multiplied by estimated construction duration.
P36	Inspection and Monitoring Reporting for Transload Facility	4	YR	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$45,080.00	$45,080.00	$180,320.00	0%	0%	$180,320	P Anchor QEA	Project-specific cost developed by Anchor QEA (2010) - see Backup Table 24.
												TOTAL COST:			$7,967,890		

	Representative Unit Quantity	Unit(s)	Total Cost	Unit Cost
COST WORKSHEET SUMMARY	1	LS	$7,967,890	$7,967,890

TABLE CW-B21

Alternative B **Cost Worksheet:** **CW-B21**
Capital Cost Sub-Element
Transload Facility Development

COST WORKSHEET

Site: Portland Harbor Superfund Site
Location: Portland, Oregon
Phase: Feasibility Study
Base Year: 2016

Prepared By: JN **Date:** 3/4/2016
Checked By: AB **Date:** 3/7/2016

Notes:

Further information about the development of cost worksheets can be found in Attachment A - Methodology and Organization of Detailed Cost Estimates.
The quantity bolded in the QTY column is the quantity selected as the representative unit quantity for this cost worksheet. If multiple quantities are bolded, the representative unit quantity is the sum of those quantities. When the LS unit is utilized, the default representative unit quantity is 1.
HTRW productivity factor is from Exhibit B-3 or B-4 of "A Guide to Developing and Documenting Cost Estimates During the Feasibility Study", EPA 2000
EPA developed project-specific unit costs using the Micro Computer Aided Cost Engineering System (MCACES) Second Generation (MII) software version 4.2, build 3

Cost Database Code:

The Cost Database Code is a reference code for linking with line item cost information with the cost source database and is not otherwise used within these cost worksheets. The following cost source database prefixes apply:

L (EPA-Derived Labor Unit Costs), M (Project-Specific Vendor Unit Costs), P (Previously Developed Unit Costs by Anchor QEA for Portland Harbor), A (EPA-Derived MII Unit Costs), O (Unit Costs from Other Projects/Sources)

Source of Cost Data:

For citation references, the following sources apply:

ALL (Allowance), FLC (www.flcdatacenter.com), LD (Costs Derived from Lower Duwamish Waterway Final Feasibility Study), MII (MII), O (Other), P (Previously Developed by Anchor QEA for Portland Harbor), and V (Vendor Quote)

Abbreviations:

QTY	Quantity	AC	Acres
EQUIP	Equipment	CLF	100 Linear Foot
MATL	Material	CY	Cubic Yard
HPF	HTRW Productivity Factor	DY	Days
ADJ LABOR	Adjusted Labor for HFP	EA	Each
ADJ EQUIP	Adjusted Equipment for HFP	FTE	Full Time Equivalent
UNMOD UC	Unmodified Unit Cost	HR	Hours
UNMOD LIC	Unmodified Line Item Cost	LB	Pounds
UNBUR LIC	Unburdened Line Item Cost	LCY	Loose Cubic Yard
PC OH	Prime Contractor Overhead	LF	Linear Foot
PC PF	Prime Contractor Profit	LS	Lump Sum
BUR LIC	Burdened Line Item Cost	MO	Month
		SF	Square Foot
		SY	Square Yard
		TON	Tons
		YR	Years

Cost Adjustment Checklist:	**NOTES:**
FACTOR:	Field work will be in Level "D" PPE.
H&S Productivity (labor and equipment only)	MII assembly costs include HPF adjustments.
Escalation to Base Year	2016 cost sources are not escalated (EF=1.00). All other costs are escalated based on the USACE CWCCIS, EM 1110-2-1304, Sept 2015.
Area Cost Factor	An AF of 1.05 is used for Oregon, except that an AF of 1.00 (national unmodified average) is used for MII assembly costs and local vendor quotes.
Subcontractor Overhead and Profit	It is assumed that home office OH is 8% and profit is 9% for the Prime Contractor. Professional labor overhead is 100%.
Prime Contractor Overhead and Profit	Allowances and items with mandated costs such as per diem do not have overhead and profit applied.
	Items previously developed by Anchor QEA already include contractor markups, therefore overhead and profit were not applied to those items.
	It is assumed that OH is 1% and profit is 0% for vendor quotes for treatment and disposal at offsite disposal facilities. It is assumed that OH is 5% and profit is 0% for quotes for all other material vendor quotes.
	Items developed using MII already include contractor markups such as overhead and profit, therefore additional overhead and profit were not applied in the PC OH and PC PF to those items.

TABLE CW-B22

Alternative B **Cost Worksheet:** **CW-B22**

Capital and Periodic Cost Sub-Element

Monitored Natural Recovery (MNR) for MNR/Enhanced Natural Recovery (ENR) and Broadcast GAC Areas

COST WORKSHEET

Site: Portland Harbor Superfund Site
Location: Portland, Oregon
Phase: Feasibility Study
Base Year: 2016

Prepared By: JN **Date:** 3/4/2016
Checked By: AB **Date:** 3/7/2016

Work Statement:
This sub-element involves sampling as part of monitored natural recovery for MNR, ENR, and Broadcast GAC areas. It includes costs for on-site labor, equipment, and materials developed from previous work.
Quantity development presented in Appendix D.

Cost Analysis:
Cost for Monitored Natural Recovery for MNR/ENR and Broadcast GAC Areas (Lump Sum)

COST DATABASE CODE	DESCRIPTION	QTY	UNIT(S)	HPF	LABOR	ADJ LABOR	EQUIP	ADJ EQUIP	MATL	OTHER	UNMOD UC	UNMOD LIC	PC OH	PC PF	BUR LIC	COST SOURCE CITATION	COMMENTS
P25	Monitored Natural Recovery	**2,073**	AC	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$3,686.33	$3,686.33	$7,641,755.54	0%	0%	$7,641,756	P Anchor QEA	Project-specific cost developed by Anchor QEA (2010) - based on Backup Table 2.
												TOTAL COST:			$7,641,756		

	Representative Unit Quantity	Unit(s)	Total Cost	Unit Cost
COST WORKSHEET SUMMARY	2,073	AC	$7,641,756	$3,686

Notes:
Further information about the development of cost worksheets can be found in Attachment A - Methodology and Organization of Detailed Cost Estimates.
The quantity bolded in the QTY column is the quantity selected as the representative unit quantity for this cost worksheet. If multiple quantities are bolded, the representative unit quantity is the sum of those quantities. When the LS unit is utilized, the default representative unit quantity is 1.
HTRW productivity factor is from Exhibit B-3 or B-4 of "A Guide to Developing and Documenting Cost Estimates During the Feasibility Study", EPA 2000
EPA developed project-specific unit costs using the Micro Computer Aided Cost Engineering System (MCACES) Second Generation (MII) software version 4.2, build 3

Cost Database Code:
The Cost Database Code is a reference code for linking with line item cost information with the cost source database and is not otherwise used within these cost worksheets. The following cost source database prefixes apply:
L (EPA-Derived Labor Unit Costs), M (Project-Specific Vendor Unit Costs), P (Previously Developed Unit Costs by Anchor QEA for Portland Harbor), A (EPA-Derived MII Unit Costs), O (Unit Costs from Other Projects/Sources)

Source of Cost Data:
For citation references, the following sources apply:
ALL (Allowance), FLC (www.flcdatacenter.com), LD (Costs Derived from Lower Duwamish Waterway Final Feasibility Study), MII (MII), O (Other), P (Previously Developed by Anchor QEA for Portland Harbor), and V (Vendor Quote)

Abbreviations:

QTY	Quantity	AC	Acres
EQUIP	Equipment	CLF	100 Linear Foot
MATL	Material	CY	Cubic Yard
HPF	HTRW Productivity Factor	DY	Days
ADJ LABOR	Adjusted Labor for HFP	EA	Each
ADJ EQUIP	Adjusted Equipment for HFP	FTE	Full Time Equivalent
UNMOD UC	Unmodified Unit Cost	HR	Hours
UNMOD LIC	Unmodified Line Item Cost	LB	Pounds
UNBUR LIC	Unburdened Line Item Cost	LCY	Loose Cubic Yard
PC OH	Prime Contractor Overhead	LF	Linear Foot
PC PF	Prime Contractor Profit	LS	Lump Sum
BUR LIC	Burdened Line Item Cost	MO	Month
		SF	Square Foot
		SY	Square Yard
		TON	Tons
		YR	Years

Cost Adjustment Checklist:	**NOTES:**
FACTOR:	Field work will be in Level "D" PPE.
H&S Productivity (labor and equipment only)	MII assembly costs include HPF adjustments.
Escalation to Base Year	2016 cost sources are not escalated (EF=1.00). All other costs are escalated based on the USACE CWCCIS, EM 1110-2-1304, Sept 2015.
Area Cost Factor	An AF of 1.05 is used for Oregon, except that an AF of 1.00 (national unmodified average) is used for MII assembly costs and local vendor quotes.
Subcontractor Overhead and Profit	It is assumed that home office OH is 8% and profit is 9% for the Prime Contractor. Professional labor overhead is 100%.
Prime Contractor Overhead and Profit	Allowances and items with mandated costs such as per diem do not have overhead and profit applied.
	Items previously developed by Anchor QEA already include contractor markups, therefore overhead and profit were not applied to those items.
	It is assumed that OH is 1% and profit is 0% for vendor quotes for treatment and disposal at offsite disposal facilities. It is assumed that OH is 5% and profit is 0% for quotes for all other material vendor quotes.
	Items developed using MII already include contractor markups such as overhead and profit, therefore additional overhead and profit were not applied in the PC OH and PC PF to those items.

TABLE CW-B23

Alternative B **Cost Worksheet:** **CW-B23**
Periodic Cost Sub-Element
Site-Wide Monitoring

COST WORKSHEET

Site: Portland Harbor Superfund Site
Location: Portland, Oregon
Phase: Feasibility Study
Base Year: 2016

Prepared By: JN **Date:** 3/4/2016
Checked By: AB **Date:** 3/7/2016

Work Statement:
This sub-element involves sampling, surveying, data management, and reporting as part of sitewide monitoring. It includes costs for on-site labor, equipment, and materials developed from previous work.

Cost Analysis:
Cost for Site-Wide Monitoring (Lump Sum)

COST DATABASE CODE	DESCRIPTION	QTY	UNIT(S)	HPF	LABOR	ADJ LABOR	EQUIP	ADJ EQUIP	MATL	OTHER	UNMOD UC	UNMOD LIC	PC OH	PC PF	BUR LIC	COST SOURCE CITATION	COMMENTS
	Site-Wide Monitoring																
P26	Sitewide Monitoring	1	LS	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$957,659.23	$957,659.23	$957,659.23	0%	0%	$957,659	P Anchor QEA	Project-specific cost developed by Anchor QEA (2010) - based on Backup Table 1.
												TOTAL COST:			$957,659		

	Representative Unit Quantity	Unit(s)	Total Cost	Unit Cost
COST WORKSHEET SUMMARY	1	LS	$957,659	$957,659

Notes:
Further information about the development of cost worksheets can be found in Attachment A - Methodology and Organization of Detailed Cost Estimates.
The quantity bolded in the QTY column is the quantity selected as the representative unit quantity for this cost worksheet. If multiple quantities are bolded, the representative unit quantity is the sum of those quantities. When the LS unit is utilized, the default representative unit quantity is 1.
HTRW productivity factor is from Exhibit B-3 or B-4 of "A Guide to Developing and Documenting Cost Estimates During the Feasibility Study", EPA 2000
EPA developed project-specific unit costs using the Micro Computer Aided Cost Engineering System (MCACES) Second Generation (MII) software version 4.2, build 3

Cost Database Code:
The Cost Database Code is a reference code for linking with line item cost information with the cost source database and is not otherwise used within these cost worksheets. The following cost source database prefixes apply:
L (EPA-Derived Labor Unit Costs), M (Project-Specific Vendor Unit Costs), P (Previously Developed Unit Costs by Anchor QEA for Portland Harbor), A (EPA-Derived MII Unit Costs), O (Unit Costs from Other Projects/Sources)

Source of Cost Data:
For citation references, the following sources apply:
ALL (Allowance), FLC (www.flcdatacenter.com), LD (Costs Derived from Lower Duwamish Waterway Final Feasibility Study), MII (MII), O (Other), P (Previously Developed by Anchor QEA for Portland Harbor), and V (Vendor Quote)

Abbreviations:

QTY	Quantity	AC	Acres
EQUIP	Equipment	CLF	100 Linear Foot
MATL	Material	CY	Cubic Yard
HPF	HTRW Productivity Factor	DY	Days
ADJ LABOR	Adjusted Labor for HFP	EA	Each
ADJ EQUIP	Adjusted Equipment for HFP	FTE	Full Time Equivalent
UNMOD UC	Unmodified Unit Cost	HR	Hours
UNMOD LIC	Unmodified Line Item Cost	LB	Pounds
UNBUR LIC	Unburdened Line Item Cost	LCY	Loose Cubic Yard
PC OH	Prime Contractor Overhead	LF	Linear Foot
PC PF	Prime Contractor Profit	LS	Lump Sum
BUR LIC	Burdened Line Item Cost	MO	Month
		SF	Square Foot
		SY	Square Yard
		TON	Tons
		YR	Years

Cost Adjustment Checklist:	**NOTES:**
FACTOR:	Field work will be in Level "D" PPE.
H&S Productivity (labor and equipment only)	MII assembly costs include HPF adjustments.
Escalation to Base Year	2016 cost sources are not escalated (EF=1.00). All other costs are escalated based on the USACE CWCCIS, EM 1110-2-1304, Sept 2015.
Area Cost Factor	An AF of 1.05 is used for Oregon, except that an AF of 1.00 (national unmodified average) is used for MII assembly costs and local vendor quotes.
Subcontractor Overhead and Profit	It is assumed that home office OH is 8% and profit is 9% for the Prime Contractor. Professional labor overhead is 100%.
Prime Contractor Overhead and Profit	Allowances and items with mandated costs such as per diem do not have overhead and profit applied.
	Items previously developed by Anchor QEA already include contractor markups, therefore overhead and profit were not applied to those items.
	It is assumed that OH is 1% and profit is 0% for vendor quotes for treatment and disposal at offsite disposal facilities. It is assumed that OH is 5% and profit is 0% for quotes for all other material vendor quotes.
	Items developed using MII already include contractor markups such as overhead and profit, therefore additional overhead and profit were not applied in the PC OH and PC PF to those items.

TABLE CW-B24

Alternative B **Cost Worksheet:** **CW-B24**
Periodic Cost Sub-Element
Cap Area Monitoring and Reactive Layer Monitoring

COST WORKSHEET

Site: Portland Harbor Superfund Site
Location: Portland, Oregon
Phase: Feasibility Study
Base Year: 2016

Prepared By: JN **Date:** 3/4/2016
Checked By: AB **Date:** 3/7/2016

Work Statement:
This sub-element involves sampling, surveying, data management, and reporting as part of cap and reactive layer monitoring. It includes costs for on-site labor, equipment, and materials developed from previous work.
Quantity development presented in Appendix D.

Cost Analysis:
Cost for Cap and Reactive Layer Monitoring (Lump Sum)

COST DATABASE CODE	DESCRIPTION	QTY	UNIT(S)	HPF	LABOR	ADJ LABOR	EQUIP	ADJ EQUIP	MATL	OTHER	UNMOD UC	UNMOD LIC	PC OH	PC PF	BUR LIC	COST SOURCE CITATION	COMMENTS
	Cap Area Monitoring																
P27	Cap Monitoring	76	AC	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$78,961.34	$78,961.34	$6,001,061.77	0%	0%	$6,001,062	P Anchor QEA	Project-specific cost developed by Anchor QEA (2010) - based on Backup Table 4.
	Reactive Layer Monitoring																
P28	Reactive Layer Monitoring	70	AC	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$88,968.76	$88,968.76	$6,227,813.27	0%	0%	$6,227,813	P Anchor QEA	Project-specific cost developed by Anchor QEA (2010) - based on Backup Table 3.
												TOTAL COST:			$12,228,875		

	Representative Unit Quantity	Unit(s)	Total Cost	Unit Cost
COST WORKSHEET SUMMARY	1	LS	$12,228,875	$12,228,875

Notes:
Further information about the development of cost worksheets can be found in Attachment A - Methodology and Organization of Detailed Cost Estimates.
The quantity bolded in the QTY column is the quantity selected as the representative unit quantity for this cost worksheet. If multiple quantities are bolded, the representative unit quantity is the sum of those quantities. When the LS unit is utilized, the default representative unit quantity is 1.
HTRW productivity factor is from Exhibit B-3 or B-4 of "A Guide to Developing and Documenting Cost Estimates During the Feasibility Study", EPA 2000
EPA developed project-specific unit costs using the Micro Computer Aided Cost Engineering System (MCACES) Second Generation (MII) software version 4.2, build 3

Cost Database Code:
The Cost Database Code is a reference code for linking with line item cost information with the cost source database and is not otherwise used within these cost worksheets. The following cost source database prefixes apply:
L (EPA-Derived Labor Unit Costs), M (Project-Specific Vendor Unit Costs), P (Previously Developed Unit Costs by Anchor QEA for Portland Harbor), A (EPA-Derived MII Unit Costs), O (Unit Costs from Other Projects/Sources)

Source of Cost Data:
For citation references, the following sources apply:
ALL (Allowance), FLC (www.flcdatacenter.com), LD (Costs Derived from Lower Duwamish Waterway Final Feasibility Study), MII (MII), O (Other), P (Previously Developed by Anchor QEA for Portland Harbor), and V (Vendor Quote)

Abbreviations:

QTY	Quantity	AC	Acres
EQUIP	Equipment	CLF	100 Linear Foot
MATL	Material	CY	Cubic Yard
HPF	HTRW Productivity Factor	DY	Days
ADJ LABOR	Adjusted Labor for HFP	EA	Each
ADJ EQUIP	Adjusted Equipment for HFP	FTE	Full Time Equivalent
UNMOD UC	Unmodified Unit Cost	HR	Hours
UNMOD LIC	Unmodified Line Item Cost	LB	Pounds
UNBUR LIC	Unburdened Line Item Cost	LCY	Loose Cubic Yard
PC OH	Prime Contractor Overhead	LF	Linear Foot
PC PF	Prime Contractor Profit	LS	Lump Sum
BUR LIC	Burdened Line Item Cost	MO	Month
		SF	Square Foot
		SY	Square Yard
		TON	Tons
		YR	Years

Cost Adjustment Checklist:	**NOTES:**
FACTOR:	Field work will be in Level "D" PPE.
H&S Productivity (labor and equipment only)	MII assembly costs include HPF adjustments.
Escalation to Base Year	2016 cost sources are not escalated (EF=1.00). All other costs are escalated based on the USACE CWCCIS, EM 1110-2-1304, Sept 2015.
Area Cost Factor	An AF of 1.05 is used for Oregon, except that an AF of 1.00 (national unmodified average) is used for MII assembly costs and local vendor quotes.
Subcontractor Overhead and Profit	It is assumed that home office OH is 8% and profit is 9% for the Prime Contractor. Professional labor overhead is 100%.
Prime Contractor Overhead and Profit	Allowances and items with mandated costs such as per diem do not have overhead and profit applied.
	Items previously developed by Anchor QEA already include contractor markups, therefore overhead and profit were not applied to those items.
	It is assumed that OH is 1% and profit is 0% for vendor quotes for treatment and disposal at offsite disposal facilities. It is assumed that OH is 5% and profit is 0% for quotes for all other material vendor quotes.
	Items developed using MII already include contractor markups such as overhead and profit, therefore additional overhead and profit were not applied in the PC OH and PC PF to those items.

TABLE CW-B25

Alternative B **Cost Worksheet:** **CW-B25**
Periodic Cost Sub-Element
Long-Term Maintenance for Capping, ENR, and In Situ Treatment

COST WORKSHEET

Site: Portland Harbor Superfund Site
Location: Portland, Oregon
Phase: Feasibility Study
Base Year: 2016

Prepared By: JN **Date:** 3/4/2016
Checked By: AB **Date:** 3/7/2016

Work Statement:
This sub-element involves replacement of 5% of the technology assignment layers as part of long-term maintenance. It includes costs for on-site labor, equipment, and materials developed from previous work.
Quantities represent 5% of material placement quantities which were developed and presented in Appendix D.

Cost Analysis:
Cost for Long-Term Maintenance (Lump Sum)

COST DATABASE CODE	DESCRIPTION	QTY	UNIT(S)	HPF	LABOR	ADJ LABOR	EQUIP	ADJ EQUIP	MATL	OTHER	UNMOD UC	UNMOD LIC	PC OH	PC PF	BUR LIC	COST SOURCE CITATION	COMMENTS
	Mobilization / Demobilization																
O2	Mobilization/Demobilization for Long Term Maintenance	1	LS	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$35,133.16	$35,133.16	$35,133.16	0%	0%	$35,133	LD Lower Duwamish	Assumes 1.6% of total capital costs per Lower Duwamish Feasibility Study. See Calculations for derivation.
	Sand Placement for Technology Assignments																
P1	Sand	17,102	LCY	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$19.75	$19.75	$337,764.50	0%	0%	$337,765	P Anchor QEA	Assume 5% of placement of additional material
	Sand Placement (Riverbanks)																
A16	Material Placement (Confined)	2,102	CY	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$20.39	$20.39	$42,859.78	0%	0%	$42,860	MII MII	Assume 5% of placement of additional material
	Sand Placement (Confined)																
A16	Material Placement (Confined)	1,589	CY	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$20.39	$20.39	$32,399.71	0%	0%	$32,400	MII MII	Assume 5% of placement of additional material
	Sand Placement (Open Water)																
A15	Material Placement (Open)	13,410	CY	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$12.42	$12.42	$166,552.20	0%	0%	$166,552	MII MII	Assume 5% of placement of additional material
	Beach Mix Placement for Technology Assignments																
P3	ODOT 100 Beach Mix	928	LCY	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$57.69	$57.69	$53,536.32	0%	0%	$53,536	P Anchor QEA	Assume 5% of placement of additional material
	Beach Mix Placement (Riverbanks)																
A16	Material Placement (Confined)	344	CY	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$20.39	$20.39	$7,014.16	0%	0%	$7,014	MII MII	Assume 5% of placement of additional material
	Beach Mix Placement (Confined)																
A16	Material Placement (Confined)	137	CY	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$20.39	$20.39	$2,793.43	0%	0%	$2,793	MII MII	Assume 5% of placement of additional material
	Beach Mix Placement (Open Water)																
A15	Material Placement (Open)	447	CY	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$12.42	$12.42	$5,551.74	0%	0%	$5,552	MII MII	Assume 5% of placement of additional material
	Armor Placement for Technology Assignments																
P2	ODOT 200 Armor	1,477	LCY	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$57.69	$57.69	$85,208.13	0%	0%	$85,208	P Anchor QEA	Assume 5% of placement of additional material
	Armor Placement (Riverbanks)																
A16	Material Placement (Confined)	79	CY	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$20.39	$20.39	$1,610.81	0%	0%	$1,611	MII MII	Assume 5% of placement of additional material
	Armor Placement (Confined)																
A16	Material Placement (Confined)	349	CY	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$20.39	$20.39	$7,116.11	0%	0%	$7,116	MII MII	Assume 5% of placement of additional material
	Armor Placement (Open Water)																
A15	Material Placement (Open)	1,048	CY	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$12.42	$12.42	$13,016.16	0%	0%	$13,016	MII MII	Assume 5% of placement of additional material
	Reactive/GAC Placement for Technology Assignments																
	AquaGate Reactive Layer																
M4	Carbon (AquaGate + PAC 10%)	2,522	TON	1.00	$0.00	$0.00	$0.00	$0.00	$456.30	$0.00	$456.30	$1,150,788.60	5%	0%	$1,208,328	V Vendor Quote	Assume 5% of placement of additional material
P1	Sand	2,670	LCY	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$19.75	$19.75	$52,732.50	0%	0%	$52,733	P Anchor QEA	Assume 5% of placement of additional material
A3	Mixing Sand & Carbon for Reactive Layer	5,194	CY	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$4.76	$4.76	$24,723.44	0%	0%	$24,723	MII MII	Assume 5% of placement of additional material
A16	Material Placement (Confined)	676	CY	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$20.39	$20.39	$13,783.64	0%	0%	$13,784	MII MII	Assume 5% of placement of additional material
A15	Material Placement (Open)	4,518	CY	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$12.42	$12.42	$56,113.56	0%	0%	$56,114	MII MII	Assume 5% of placement of additional material
	AquaBlock																
M3	Carbon (AquaBlok)	82	TON	1.00	$0.00	$0.00	$0.00	$0.00	$202.80	$0.00	$202.80	$16,629.60	5%	0%	$17,461	V Vendor Quote	Assume 5% of placement of additional material
A16	Material Placement (Confined)	71	CY	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$20.39	$20.39	$1,447.69	0%	0%	$1,448	MII MII	Assume 5% of placement of additional material

TABLE CW-B25

Alternative B **Cost Worksheet: CW-B25**
Periodic Cost Sub-Element
Long-Term Maintenance for Capping, ENR, and In Situ Treatment

COST WORKSHEET

Site: Portland Harbor Superfund Site
Location: Portland, Oregon
Phase: Feasibility Study
Base Year: 2016

Prepared By: JN **Date:** 3/4/2016
Checked By: AB **Date:** 3/7/2016

Work Statement:
This sub-element involves replacement of 5% of the technology assignment layers as part of long-term maintenance. It includes costs for on-site labor, equipment, and materials developed from previous work.
Quantities represent 5% of material placement quantities which were developed and presented in Appendix D.

Cost Analysis:
Cost for Long-Term Maintenance (Lump Sum)

COST DATABASE CODE	DESCRIPTION	QTY	UNIT(S)	HPF	LABOR	ADJ LABOR	EQUIP	ADJ EQUIP	MATL	OTHER	UNMOD UC	UNMOD LIC	PC OH	PC PF	BUR LIC	COST SOURCE CITATION	COMMENTS
	Geofabric for Riverbanks																
O7	Geotextile Installation	0.5	AC	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$7,074.14	$7,074.14	$3,537.07	8%	9%	$4,164	V Vendor Quote	Assume 5% of placement of additional material
O6	Geotextile Material	0.5	AC	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$5,698.62	$5,698.62	$2,849.31	5%	0%	$2,992	V Vendor Quote	Assume 5% of placement of additional material
	Organoclay Mat Placement for Technology Assignments																
A17	Organoclay Mat Placement	8,715	SF	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$3.35	$3.35	$29,195.25	0%	0%	$29,195	MII MII	Assume 5% of placement of additional material
P4	Organoclay Mat Material	8,715	SF	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$3.38	$3.38	$29,456.70	0%	0%	$29,457	P Anchor QEA	Assume 5% of placement of additional material
												TOTAL COST:			$2,230,955		

	Representative Unit Quantity	Unit(s)	Total Cost	Unit Cost
COST WORKSHEET SUMMARY	1	LS	$2,230,955	$2,230,955

Notes:
Further information about the development of cost worksheets can be found in Attachment A - Methodology and Organization of Detailed Cost Estimates.
The quantity bolded in the QTY column is the quantity selected as the representative unit quantity for this cost worksheet. If multiple quantities are bolded, the representative unit quantity is the sum of those quantities. When the LS unit is utilized, the default representative unit quantity is 1.
HTRW productivity factor is from Exhibit B-3 or B-4 of "A Guide to Developing and Documenting Cost Estimates During the Feasibility Study", EPA 2000
EPA developed project-specific unit costs using the Micro Computer Aided Cost Engineering System (MCACES) Second Generation (MII) software version 4.2, build 3

Cost Database Code:
The Cost Database Code is a reference code for linking with line item cost information with the cost source database and is not otherwise used within these cost worksheets. The following cost source database prefixes apply:
L (EPA-Derived Labor Unit Costs), M (Project-Specific Vendor Unit Costs), P (Previously Developed Unit Costs by Anchor QEA for Portland Harbor), A (EPA-Derived MII Unit Costs), O (Unit Costs from Other Projects/Sources)

Source of Cost Data:
For citation references, the following sources apply:
ALL (Allowance), FLC (www.flcdatacenter.com), LD (Costs Derived from Lower Duwamish Waterway Final Feasibility Study), MII (MII), O (Other), P (Previously Developed by Anchor QEA for Portland Harbor), and V (Vendor Quote)

Abbreviations:

QTY	Quantity	AC	Acres
EQUIP	Equipment	CLF	100 Linear Foot
MATL	Material	CY	Cubic Yard
HPF	HTRW Productivity Factor	DY	Days
ADJ LABOR	Adjusted Labor for HFP	EA	Each
ADJ EQUIP	Adjusted Equipment for HFP	FTE	Full Time Equivalent
UNMOD UC	Unmodified Unit Cost	HR	Hours
UNMOD LIC	Unmodified Line Item Cost	LB	Pounds
UNBUR LIC	Unburdened Line Item Cost	LCY	Loose Cubic Yard
PC OH	Prime Contractor Overhead	LF	Linear Foot
PC PF	Prime Contractor Profit	LS	Lump Sum
BUR LIC	Burdened Line Item Cost	MO	Month
		SF	Square Foot
		SY	Square Yard
		TON	Tons
		YR	Years

Cost Adjustment Checklist:	**NOTES:**
FACTOR:	Field work will be in Level "D" PPE.
H&S Productivity (labor and equipment only)	MII assembly costs include HPF adjustments.
Escalation to Base Year	2016 cost sources are not escalated (EF=1.00). All other costs are escalated based on the USACE CWCCIS, EM 1110-2-1304, Sept 2015.
Area Cost Factor	An AF of 1.05 is used for Oregon, except that an AF of 1.00 (national unmodified average) is used for MII assembly costs and local vendor quotes.
Subcontractor Overhead and Profit	It is assumed that home office OH is 8% and profit is 9% for the Prime Contractor. Professional labor overhead is 100%.
Prime Contractor Overhead and Profit	Allowances and items with mandated costs such as per diem do not have overhead and profit applied.
	Items previously developed by Anchor QEA already include contractor markups, therefore overhead and profit were not applied to those items.
	It is assumed that OH is 1% and profit is 0% for vendor quotes for treatment and disposal at offsite disposal facilities. It is assumed that OH is 5% and profit is 0% for quotes for all other material vendor quotes.
	Items developed using MII already include contractor markups such as overhead and profit, therefore additional overhead and profit were not applied in the PC OH and PC PF to those items.

TABLE CW-B26

Alternative B **Cost Worksheet:** **CW-B26**
Periodic Cost Sub-Element
5-Year Site Review

COST WORKSHEET

Site: Portland Harbor Superfund Site
Location: Portland, Oregon
Phase: Feasibility Study
Base Year: 2016

Prepared By: JN **Date:** 3/4/2016
Checked By: AB **Date:** 3/7/2016

Work Statement:
This sub-element involves the site visit and 5-year site review report. The following cost includes labor, material and shipping costs for site visits and 5-year site review reports.

Cost Analysis:
Cost for 5-Year Site Review (Lump Sum)

COST DATABASE CODE	DESCRIPTION	QTY	UNIT(S)	HPF	LABOR	ADJ LABOR	EQUIP	ADJ EQUIP	MATL	OTHER	UNMOD UC	UNMOD LIC	PC OH	PC PF	BUR LIC	COST SOURCE CITATION	COMMENTS
L11	Project Manager	300	HR	1.00	$82.17	$82.17	$0.00	$0.00	$0.00	$0.00	$82.17	$24,651.00	100%	9%	$53,739	FLC FLCDataCenter	Project-specific unit cost developed by EPA.
L4	Environmental Engineer	600	HR	1.00	$48.91	$48.91	$0.00	$0.00	$0.00	$0.00	$48.91	$29,346.00	100%	9%	$63,974	FLC FLCDataCenter	Project-specific unit cost developed by EPA.
L6	Environmental Scientist	900	HR	1.00	$37.70	$37.70	$0.00	$0.00	$0.00	$0.00	$37.70	$33,930.00	100%	9%	$73,967	FLC FLCDataCenter	Project-specific unit cost developed by EPA.
L12	Quality Control Engineer	120	HR	1.00	$64.99	$64.99	$0.00	$0.00	$0.00	$0.00	$64.99	$7,798.80	100%	9%	$17,001	FLC FLCDataCenter	Project-specific unit cost developed by EPA.
L1	CAD Drafter	300	HR	1.00	$31.31	$31.31	$0.00	$0.00	$0.00	$0.00	$31.31	$9,393.00	100%	9%	$20,477	FLC FLCDataCenter	Project-specific unit cost developed by EPA.
L3	Clerks, Typist, Bookkeeper & Receptionist	300	HR	1.00	$19.89	$19.89	$0.00	$0.00	$0.00	$0.00	$19.89	$5,967.00	100%	9%	$13,008	FLC FLCDataCenter	Project-specific unit cost developed by EPA.
O4	Copy and Shipping Allowance	1	LS	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$1,521.00	$1,521.00	$1,521.00	0%	0%	$1,521	ALL Allowance	
												TOTAL COST:			$243,687		

	Representative Unit Quantity	Unit(s)	Total Cost	Unit Cost
COST WORKSHEET SUMMARY	1	LS	$243,687	$243,687

Notes:
Further information about the development of cost worksheets can be found in Attachment A - Methodology and Organization of Detailed Cost Estimates.
The quantity bolded in the QTY column is the quantity selected as the representative unit quantity for this cost worksheet. If multiple quantities are bolded, the representative unit quantity is the sum of those quantities. When the LS unit is utilized, the default representative unit quantity is 1.
HTRW productivity factor is from Exhibit B-3 or B-4 of "A Guide to Developing and Documenting Cost Estimates During the Feasibility Study", EPA 2000
EPA developed project-specific unit costs using the Micro Computer Aided Cost Engineering System (MCACES) Second Generation (MII) software version 4.2, build 3

Cost Database Code:
The Cost Database Code is a reference code for linking with line item cost information with the cost source database and is not otherwise used within these cost worksheets. The following cost source database prefixes apply:
L (EPA-Derived Labor Unit Costs), M (Project-Specific Vendor Unit Costs), P (Previously Developed Unit Costs by Anchor QEA for Portland Harbor), A (EPA-Derived MII Unit Costs), O (Unit Costs from Other Projects/Sources)

Source of Cost Data:
For citation references, the following sources apply:
ALL (Allowance), FLC (www.flcdatacenter.com), LD (Costs Derived from Lower Duwamish Waterway Final Feasibility Study), MII (MII), O (Other), P (Previously Developed by Anchor QEA for Portland Harbor), and V (Vendor Quote)

Abbreviations:

QTY	Quantity	AC	Acres
EQUIP	Equipment	CLF	100 Linear Foot
MATL	Material	CY	Cubic Yard
HPF	HTRW Productivity Factor	DY	Days
ADJ LABOR	Adjusted Labor for HFP	EA	Each
ADJ EQUIP	Adjusted Equipment for HFP	FTE	Full Time Equivalent
UNMOD UC	Unmodified Unit Cost	HR	Hours
UNMOD LIC	Unmodified Line Item Cost	LB	Pounds
UNBUR LIC	Unburdened Line Item Cost	LCY	Loose Cubic Yard
PC OH	Prime Contractor Overhead	LF	Linear Foot
PC PF	Prime Contractor Profit	LS	Lump Sum
BUR LIC	Burdened Line Item Cost	MO	Month
		SF	Square Foot
		SY	Square Yard
		TON	Tons
		YR	Years

Cost Adjustment Checklist:	**NOTES:**
FACTOR:	Field work will be in Level "D" PPE.
H&S Productivity (labor and equipment only)	MII assembly costs include HPF adjustments.
Escalation to Base Year	2016 cost sources are not escalated (EF=1.00). All other costs are escalated based on the USACE CWCCIS, EM 1110-2-1304, Sept 2015.
Area Cost Factor	An AF of 1.05 is used for Oregon, except that an AF of 1.00 (national unmodified average) is used for MII assembly costs and local vendor quotes.
Subcontractor Overhead and Profit	It is assumed that home office OH is 8% and profit is 9% for the Prime Contractor. Professional labor overhead is 100%.
Prime Contractor Overhead and Profit	Allowances and items with mandated costs such as per diem do not have overhead and profit applied.
	Items previously developed by Anchor QEA already include contractor markups, therefore overhead and profit were not applied to those items.
	It is assumed that OH is 1% and profit is 0% for vendor quotes for treatment and disposal at offsite disposal facilities. It is assumed that OH is 5% and profit is 0% for quotes for all other material vendor quotes.
	Items developed using MII already include contractor markups such as overhead and profit, therefore additional overhead and profit were not applied in the PC OH and PC PF to those items.

Cost Worksheets
Alternative C

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TABLE CW-C1

Alternative C
Capital Cost Sub-Element
Mobilization / Demobilization

Cost Worksheet: **CW-C1**

COST WORKSHEET

Site: Portland Harbor Superfund Site
Location: Portland, Oregon
Phase: Feasibility Study
Base Year: 2016

Prepared By: JN **Date:** 3/4/2016
Checked By: AB **Date:** 3/7/2016

Work Statement:
This sub-element involves mobilization and demobilization of all the required equipment to and from the site respectively.

Cost Analysis:
Cost for Mobilization/Demobilization (Lump Sum)

COST DATABASE CODE	DESCRIPTION	QTY	UNIT(S)	HPF	LABOR	ADJ LABOR	EQUIP	ADJ EQUIP	MATL	OTHER	UNMOD UC	UNMOD LIC	PC OH	PC PF	BUR LIC	COST SOURCE CITATION	COMMENTS
O1	Mobilization/Demobilization	1	LS	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$4,754,000.00	$4,754,000.00	$4,754,000.00	0%	0%	$4,754,000	LD Lower Duwamish	Assumes 1.6% of total capital costs per Lower Duwamish Feasibility Study. See Calculations for derivation.
												TOTAL COST:			$4,754,000		

	Representative Unit Quantity	Unit(s)	Total Cost	Unit Cost
COST WORKSHEET SUMMARY	1	LS	$4,754,000	$4,754,000

Notes:
Further information about the development of cost worksheets can be found in Attachment A - Methodology and Organization of Detailed Cost Estimates.
The quantity bolded in the QTY column is the quantity selected as the representative unit quantity for this cost worksheet. If multiple quantities are bolded, the representative unit quantity is the sum of those quantities. When the LS unit is utilized, the default representative unit quantity is 1.
HTRW productivity factor is from Exhibit B-3 or B-4 of "A Guide to Developing and Documenting Cost Estimates During the Feasibility Study", EPA 2000
EPA developed project-specific unit costs using the Micro Computer Aided Cost Engineering System (MCACES) Second Generation (MII) software version 4.2, build 3

Cost Database Code:
The Cost Database Code is a reference code for linking with line item cost information with the cost source database and is not otherwise used within these cost worksheets. The following cost source database prefixes apply:
L (EPA-Derived Labor Unit Costs), M (Project-Specific Vendor Unit Costs), P (Previously Developed Unit Costs by Anchor QEA for Portland Harbor), A (EPA-Derived MII Unit Costs), O (Unit Costs from Other Projects/Sources)

Source of Cost Data:
For citation references, the following sources apply:
ALL (Allowance), FLC (www.flcdatacenter.com), LD (Costs Derived from Lower Duwamish Waterway Final Feasibility Study), MII (MII), O (Other), P (Previously Developed by Anchor QEA for Portland Harbor), and V (Vendor Quote)

Abbreviations:

QTY	Quantity	AC	Acres
EQUIP	Equipment	CLF	100 Linear Foot
MATL	Material	CY	Cubic Yard
HPF	HTRW Productivity Factor	DY	Days
ADJ LABOR	Adjusted Labor for HFP	EA	Each
ADJ EQUIP	Adjusted Equipment for HFP	FTE	Full Time Equivalent
UNMOD UC	Unmodified Unit Cost	HR	Hours
UNMOD LIC	Unmodified Line Item Cost	LB	Pounds
UNBUR LIC	Unburdened Line Item Cost	LCY	Loose Cubic Yard
PC OH	Prime Contractor Overhead	LF	Linear Foot
PC PF	Prime Contractor Profit	LS	Lump Sum
BUR LIC	Burdened Line Item Cost	MO	Month
		SF	Square Foot
		SY	Square Yard
		TON	Tons
		YR	Years

Cost Adjustment Checklist:	**NOTES:**
FACTOR:	Field work will be in Level "D" PPE.
H&S Productivity (labor and equipment only)	MII assembly costs include HPF adjustments.
Escalation to Base Year	2016 cost sources are not escalated (EF=1.00). All other costs are escalated based on the USACE CWCCIS, EM 1110-2-1304, Sept 2015.
Area Cost Factor	An AF of 1.05 is used for Oregon, except that an AF of 1.00 (national unmodified average) is used for MII assembly costs and local vendor quotes.
Subcontractor Overhead and Profit	It is assumed that home office OH is 8% and profit is 9% for the Prime Contractor. Professional labor overhead is 100%.
Prime Contractor Overhead and Profit	Allowances and items with mandated costs such as per diem do not have overhead and profit applied.
	Items previously developed by Anchor QEA already include contractor markups, therefore overhead and profit were not applied to those items.
	It is assumed that OH is 1% and profit is 0% for vendor quotes for treatment and disposal at offsite disposal facilities. It is assumed that OH is 5% and profit is 0% for quotes for all other material vendor quotes.
	Items developed using MII already include contractor markups such as overhead and profit, therefore additional overhead and profit were not applied in the PC OH and PC PF to those items.

TABLE CW-C2

Alternative C **Cost Worksheet:** **CW-C2**
Capital Cost Sub-Element
Initial Establishment of Institutional Controls

COST WORKSHEET

Site: Portland Harbor Superfund Site
Location: Portland, Oregon
Phase: Feasibility Study
Base Year: 2016

Prepared By: JN **Date:** 3/4/2016
Checked By: AB **Date:** 3/7/2016

Work Statement:
This sub-element involves implementation of institutional controls for the site. The following cost includes labor and materials to develop legal documents for institutional controls and cost for document submission and recording.
Quantity development presented in Appendix D.

Cost Analysis:
Cost for Initial Establishment of Institutional Controls (Lump Sum)

COST DATABASE CODE	DESCRIPTION	QTY	UNIT(S)	HPF	LABOR	ADJ LABOR	EQUIP	ADJ EQUIP	MATL	OTHER	UNMOD UC	UNMOD LIC	PC OH	PC PF	BUR LIC	COST SOURCE CITATION	COMMENTS
	Informational Devices - Fish Consumption Advisory																
L11	Project Manager	2,080	HR	1.00	$82.17	$82.17	$0.00	$0.00	$0.00	$0.00	$82.17	$170,913.60	100%	9%	$372,592	FLC FLCDataCenter	Assumes 1 FTE for implementation of fish advisory
L4	Environmental Engineer	1,040	HR	1.00	$48.91	$48.91	$0.00	$0.00	$0.00	$0.00	$48.91	$50,866.40	100%	9%	$110,889	FLC FLCDataCenter	Assumes 0.5 FTE for implementation of fish advisory
L6	Environmental Scientist	1,040	HR	1.00	$37.70	$37.70	$0.00	$0.00	$0.00	$0.00	$37.70	$39,208.00	100%	9%	$85,473	FLC FLCDataCenter	Assumes 0.5 FTE for implementation of fish advisory
L3	Clerks, Typist, Bookkeeper & Receptionist	520	HR	1.00	$19.89	$19.89	$0.00	$0.00	$0.00	$0.00	$19.89	$10,342.80	100%	9%	$22,547	FLC FLCDataCenter	Assumes 0.25 FTE for implementation of fish advisory
L5	Environmental Lawyer	260	HR	1.00	$71.72	$71.72	$0.00	$0.00	$0.00	$0.00	$71.72	$18,647.20	100%	9%	$40,651	FLC FLCDataCenter	Assumes 0.125 FTE for implementation of fish advisory
L13	Paralegal	260	HR	1.00	$29.56	$29.56	$0.00	$0.00	$0.00	$0.00	$29.56	$7,685.60	100%	9%	$16,755	FLC FLCDataCenter	Assumes 0.125 FTE for implementation of fish advisory
M26	Signage	50	EA	1.00	$0.00	$0.00	$0.00	$0.00	$165.75	$0.00	$165.75	$8,287.50	5%	0%	$8,702	V Vendor Quote	Project-specific vendor quote - Allstate Sign & Plaque, 2016. 36" x 36" Signs
L8	Field Technician	50	HR	1.00	$31.42	$31.42	$0.00	$0.00	$0.00	$0.00	$31.42	$1,571.00	100%	9%	$3,425	FLC FLCDataCenter	Assumes 1 hr/sign for sign placement (2 technician crew)
O5	Allowance for Production & Copies for Advisories	1	LS	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$1,000.00	$1,000.00	$1,000.00	0%	0%	$1,000	ALL Allowance	
	Informational Devices - Regulated Navigation Area (RNA) Setup																
L11	Project Manager	200	HR	1.00	$82.17	$82.17	$0.00	$0.00	$0.00	$0.00	$82.17	$16,434.00	100%	9%	$35,826	FLC FLCDataCenter	Project-specific unit cost developed by EPA.
L4	Environmental Engineer	150	HR	1.00	$48.91	$48.91	$0.00	$0.00	$0.00	$0.00	$48.91	$7,336.50	100%	9%	$15,994	FLC FLCDataCenter	Project-specific unit cost developed by EPA.
L3	Clerks, Typist, Bookkeeper & Receptionist	40	HR	1.00	$19.89	$19.89	$0.00	$0.00	$0.00	$0.00	$19.89	$795.60	100%	9%	$1,734	FLC FLCDataCenter	Project-specific unit cost developed by EPA.
A1	18' Boat	182	HR	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$25.42	$25.42	$4,626.44	0%	0%	$4,626	MII MII	Assumes 2 hr/buoy for buoy setup
L17	Boat Operator	182	HR	1.00	$33.16	$33.16	$0.00	$0.00	$0.00	$0.00	$33.16	$6,035.12	100%	9%	$13,157	FLC FLCDataCenter	Assumes 2 hr/buoy for buoy setup
L8	Field Technician	364	HR	1.00	$31.42	$31.42	$0.00	$0.00	$0.00	$0.00	$31.42	$11,436.88	100%	9%	$24,932	FLC FLCDataCenter	Assumes 4 hrs/buoy for buoy setup (2 technician crew)
M21	Buoy	91	EA	1.00	$0.00	$0.00	$0.00	$0.00	$558.63	$0.00	$558.63	$50,835.33	5%	0%	$53,377	V Vendor Quote	Project-specific vendor quote - Go2Marine, 2016.
	Proprietary Controls																
L5	Environmental Lawyer	2,400	HR	1.00	$71.72	$71.72	$0.00	$0.00	$0.00	$0.00	$71.72	$172,128.00	100%	9%	$375,239	FLC FLCDataCenter	Assumes 150 hrs per dock/structure
L13	Paralegal	3,200	HR	1.00	$29.56	$29.56	$0.00	$0.00	$0.00	$0.00	$29.56	$94,592.00	100%	9%	$206,211	FLC FLCDataCenter	Assumes 200 hrs per dock/structure
L3	Clerks, Typist, Bookkeeper & Receptionist	1,600	HR	1.00	$19.89	$19.89	$0.00	$0.00	$0.00	$0.00	$19.89	$31,824.00	100%	9%	$69,376	FLC FLCDataCenter	Assumes 100 hrs per dock/structure
	Enforcement Tools																
L11	Project Manager	260	HR	1.00	$82.17	$82.17	$0.00	$0.00	$0.00	$0.00	$82.17	$21,364.20	100%	9%	$46,574	FLC FLCDataCenter	Assumes 0.125 FTE for implementation of enforcement tools
L5	Environmental Lawyer	2,080	HR	1.00	$71.72	$71.72	$0.00	$0.00	$0.00	$0.00	$71.72	$149,177.60	100%	9%	$325,207	FLC FLCDataCenter	Assumes 1 FTE for implementation of enforcement tools
L13	Paralegal	4,160	HR	1.00	$29.56	$29.56	$0.00	$0.00	$0.00	$0.00	$29.56	$122,969.60	100%	9%	$268,074	FLC FLCDataCenter	Assumes 2 FTE for implementation of enforcement tools
L3	Clerks, Typist, Bookkeeper & Receptionist	260	HR	1.00	$19.89	$19.89	$0.00	$0.00	$0.00	$0.00	$19.89	$5,171.40	100%	9%	$11,274	FLC FLCDataCenter	Assumes 0.125 FTE for implementation of enforcement tools
												TOTAL COST:			$2,113,635		

	Representative Unit Quantity	Unit(s)	Total Cost	Unit Cost
COST WORKSHEET SUMMARY	1	LS	$2,113,635	$2,113,635

TABLE CW-C2

Alternative C **Cost Worksheet:** **CW-C2**
Capital Cost Sub-Element
Initial Establishment of Institutional Controls

COST WORKSHEET

Site: Portland Harbor Superfund Site
Location: Portland, Oregon
Phase: Feasibility Study
Base Year: 2016

Prepared By: JN **Date:** 3/4/2016
Checked By: AB **Date:** 3/7/2016

Notes:

Further information about the development of cost worksheets can be found in Attachment A - Methodology and Organization of Detailed Cost Estimates.
The quantity bolded in the QTY column is the quantity selected as the representative unit quantity for this cost worksheet. If multiple quantities are bolded, the representative unit quantity is the sum of those quantities. When the LS unit is utilized, the default representative unit quantity is 1.
HTRW productivity factor is from Exhibit B-3 or B-4 of "A Guide to Developing and Documenting Cost Estimates During the Feasibility Study", EPA 2000
EPA developed project-specific unit costs using the Micro Computer Aided Cost Engineering System (MCACES) Second Generation (MII) software version 4.2, build 3

Cost Database Code:

The Cost Database Code is a reference code for linking with line item cost information with the cost source database and is not otherwise used within these cost worksheets. The following cost source database prefixes apply:

L (EPA-Derived Labor Unit Costs), M (Project-Specific Vendor Unit Costs), P (Previously Developed Unit Costs by Anchor QEA for Portland Harbor), A (EPA-Derived MII Unit Costs), O (Unit Costs from Other Projects/Sources)

Source of Cost Data:

For citation references, the following sources apply:

ALL (Allowance), FLC (www.flcdatacenter.com), LD (Costs Derived from Lower Duwamish Waterway Final Feasibility Study), MII (MII), O (Other), P (Previously Developed by Anchor QEA for Portland Harbor), and V (Vendor Quote)

Abbreviations:

QTY	Quantity	AC	Acres
EQUIP	Equipment	CLF	100 Linear Foot
MATL	Material	CY	Cubic Yard
HPF	HTRW Productivity Factor	DY	Days
ADJ LABOR	Adjusted Labor for HFP	EA	Each
ADJ EQUIP	Adjusted Equipment for HFP	FTE	Full Time Equivalent
UNMOD UC	Unmodified Unit Cost	HR	Hours
UNMOD LIC	Unmodified Line Item Cost	LB	Pounds
UNBUR LIC	Unburdened Line Item Cost	LCY	Loose Cubic Yard
PC OH	Prime Contractor Overhead	LF	Linear Foot
PC PF	Prime Contractor Profit	LS	Lump Sum
BUR LIC	Burdened Line Item Cost	MO	Month
		SF	Square Foot
		SY	Square Yard
		TON	Tons
		YR	Years

Cost Adjustment Checklist:	**NOTES:**
FACTOR:	Field work will be in Level "D" PPE.
H&S Productivity (labor and equipment only)	MII assembly costs include HPF adjustments.
Escalation to Base Year	2016 cost sources are not escalated (EF=1.00). All other costs are escalated based on the USACE CWCCIS, EM 1110-2-1304, Sept 2015.
Area Cost Factor	An AF of 1.05 is used for Oregon, except that an AF of 1.00 (national unmodified average) is used for MII assembly costs and local vendor quotes.
Subcontractor Overhead and Profit	It is assumed that home office OH is 8% and profit is 9% for the Prime Contractor. Professional labor overhead is 100%.
Prime Contractor Overhead and Profit	Allowances and items with mandated costs such as per diem do not have overhead and profit applied.
	Items previously developed by Anchor QEA already include contractor markups, therefore overhead and profit were not applied to those items.
	It is assumed that OH is 1% and profit is 0% for vendor quotes for treatment and disposal at offsite disposal facilities. It is assumed that OH is 5% and profit is 0% for quotes for all other material vendor quotes.
	Items developed using MII already include contractor markups such as overhead and profit, therefore additional overhead and profit were not applied in the PC OH and PC PF to those items.

TABLE CW-C3

Alternative C **Cost Worksheet:** **CW-C3**

Periodic Cost Sub-Element

Evaluating and Updating Institutional Controls

COST WORKSHEET

Site: Portland Harbor Superfund Site
Location: Portland, Oregon
Phase: Feasibility Study
Base Year: 2016

Prepared By: JN **Date:** 3/4/2016
Checked By: AB **Date:** 3/7/2016

Work Statement:
This sub-element involves evaluating and updating of institutional controls for the site. The following cost includes labor and materials to required for evaluating and updating institutional controls every 5 years.
Quantity development presented in Appendix D.

Cost Analysis:
Cost for Evaluating and Updating Institutional Controls (Lump Sum)

COST DATABASE CODE	DESCRIPTION	QTY	UNIT(S)	HPF	LABOR	ADJ LABOR	EQUIP	ADJ EQUIP	MATL	OTHER	UNMOD UC	UNMOD LIC	PC OH	PC PF	BUR LIC	COST SOURCE CITATION	COMMENTS
	Informational Devices - Fish Consumption Advisory																
L11	Project Manager	208	HR	1.00	$82.17	$82.17	$0.00	$0.00	$0.00	$0.00	$82.17	$17,091.36	100%	9%	$37,259	FLC FLCDataCenter	Assumes 10% of initial costs for updating periodically
L4	Environmental Engineer	104	HR	1.00	$48.91	$48.91	$0.00	$0.00	$0.00	$0.00	$48.91	$5,086.64	100%	9%	$11,089	FLC FLCDataCenter	Assumes 10% of initial costs for updating periodically
L6	Environmental Scientist	104	HR	1.00	$37.70	$37.70	$0.00	$0.00	$0.00	$0.00	$37.70	$3,920.80	100%	9%	$8,547	FLC FLCDataCenter	Assumes 10% of initial costs for updating periodically
L3	Clerks, Typist, Bookkeeper & Receptionist	52	HR	1.00	$19.89	$19.89	$0.00	$0.00	$0.00	$0.00	$19.89	$1,034.28	100%	9%	$2,255	FLC FLCDataCenter	Assumes 10% of initial costs for updating periodically
L5	Environmental Lawyer	26	HR	1.00	$71.72	$71.72	$0.00	$0.00	$0.00	$0.00	$71.72	$1,864.72	100%	9%	$4,065	FLC FLCDataCenter	Assumes 10% of initial costs for updating periodically
L13	Paralegal	26	HR	1.00	$29.56	$29.56	$0.00	$0.00	$0.00	$0.00	$29.56	$768.56	100%	9%	$1,675	FLC FLCDataCenter	Assumes 10% of initial costs for updating periodically
M26	Signage	50	EA	1.00	$0.00	$0.00	$0.00	$0.00	$165.75	$0.00	$165.75	$8,287.50	5%	0%	$8,702	V Vendor Quote	Assumes 100% replacement of signs every 5 years
L8	Field Technician	50	HR	1.00	$31.42	$31.42	$0.00	$0.00	$0.00	$0.00	$31.42	$1,571.00	100%	9%	$3,425	FLC FLCDataCenter	Assumes 1 hr/sign for sign placement (2 technician crew)
O5	Allowance for Production & Copies for Advisories	5	LS	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$1,000.00	$1,000.00	$5,000.00	0%	0%	$5,000	ALL Allowance	Assumes yearly allowance for production and copies during 5-yr periodic updates
	Informational Devices - Regulated Navigation Area (RNA) Setup																
L11	Project Manager	200	HR	1.00	$82.17	$82.17	$0.00	$0.00	$0.00	$0.00	$82.17	$16,434.00	100%	9%	$35,826	FLC FLCDataCenter	Project-specific unit cost developed by EPA.
L4	Environmental Engineer	150	HR	1.00	$48.91	$48.91	$0.00	$0.00	$0.00	$0.00	$48.91	$7,336.50	100%	9%	$15,994	FLC FLCDataCenter	Project-specific unit cost developed by EPA.
L3	Clerks, Typist, Bookkeeper & Receptionist	40	HR	1.00	$19.89	$19.89	$0.00	$0.00	$0.00	$0.00	$19.89	$795.60	100%	9%	$1,734	FLC FLCDataCenter	Project-specific unit cost developed by EPA.
A1	18' Boat	182	HR	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$25.42	$25.42	$4,626.44	0%	0%	$4,626	MII MII	Assumes 2 hr/buoy for buoy setup
L17	Boat Operator	182	HR	1.00	$33.16	$33.16	$0.00	$0.00	$0.00	$0.00	$33.16	$6,035.12	100%	9%	$13,157	FLC FLCDataCenter	Assumes 2 hr/buoy for buoy setup
L8	Field Technician	364	HR	1.00	$31.42	$31.42	$0.00	$0.00	$0.00	$0.00	$31.42	$11,436.88	100%	9%	$24,932	FLC FLCDataCenter	Assumes 4 hrs/buoy for buoy setup (2 technician crew)
M21	Buoy	91	EA	1.00	$0.00	$0.00	$0.00	$0.00	$558.63	$0.00	$558.63	$50,835.33	5%	0%	$53,377	V Vendor Quote	Assumes 100% replacement of buoys every 5 years. Quote - Go2Marine 2016.
	Proprietary Controls																
L5	Environmental Lawyer	240	HR	1.00	$71.72	$71.72	$0.00	$0.00	$0.00	$0.00	$71.72	$17,212.80	100%	9%	$37,524	FLC FLCDataCenter	Assumes 10% of initial costs for updating periodically
L13	Paralegal	320	HR	1.00	$29.56	$29.56	$0.00	$0.00	$0.00	$0.00	$29.56	$9,459.20	100%	9%	$20,621	FLC FLCDataCenter	Assumes 10% of initial costs for updating periodically
L3	Clerks, Typist, Bookkeeper & Receptionist	160	HR	1.00	$19.89	$19.89	$0.00	$0.00	$0.00	$0.00	$19.89	$3,182.40	100%	9%	$6,938	FLC FLCDataCenter	Assumes 10% of initial costs for updating periodically
	Enforcement Tools																
L11	Project Manager	26	HR	1.00	$82.17	$82.17	$0.00	$0.00	$0.00	$0.00	$82.17	$2,136.42	100%	9%	$4,657	FLC FLCDataCenter	Assumes 10% of initial costs for updating periodically
L5	Environmental Lawyer	208	HR	1.00	$71.72	$71.72	$0.00	$0.00	$0.00	$0.00	$71.72	$14,917.76	100%	9%	$32,521	FLC FLCDataCenter	Assumes 10% of initial costs for updating periodically
L13	Paralegal	416	HR	1.00	$29.56	$29.56	$0.00	$0.00	$0.00	$0.00	$29.56	$12,296.96	100%	9%	$26,807	FLC FLCDataCenter	Assumes 10% of initial costs for updating periodically
L3	Clerks, Typist, Bookkeeper & Receptionist	26	HR	1.00	$19.89	$19.89	$0.00	$0.00	$0.00	$0.00	$19.89	$517.14	100%	9%	$1,127	FLC FLCDataCenter	Assumes 10% of initial costs for updating periodically
												TOTAL COST:			$361,858		

	Representative Unit Quantity	Unit(s)	Total Cost	Unit Cost
COST WORKSHEET SUMMARY	1	LS	$361,858	$361,858

TABLE CW-C3

Alternative C **Cost Worksheet:** **CW-C3**
Periodic Cost Sub-Element
Evaluating and Updating Institutional Controls

COST WORKSHEET

Site: Portland Harbor Superfund Site
Location: Portland, Oregon
Phase: Feasibility Study
Base Year: 2016

Prepared By: JN **Date:** 3/4/2016
Checked By: AB **Date:** 3/7/2016

Notes:

Further information about the development of cost worksheets can be found in Attachment A - Methodology and Organization of Detailed Cost Estimates.
The quantity bolded in the QTY column is the quantity selected as the representative unit quantity for this cost worksheet. If multiple quantities are bolded, the representative unit quantity is the sum of those quantities. When the LS unit is utilized, the default representative unit quantity is 1.
HTRW productivity factor is from Exhibit B-3 or B-4 of "A Guide to Developing and Documenting Cost Estimates During the Feasibility Study", EPA 2000
EPA developed project-specific unit costs using the Micro Computer Aided Cost Engineering System (MCACES) Second Generation (MII) software version 4.2, build 3

Cost Database Code:

The Cost Database Code is a reference code for linking with line item cost information with the cost source database and is not otherwise used within these cost worksheets. The following cost source database prefixes apply:

L (EPA-Derived Labor Unit Costs), M (Project-Specific Vendor Unit Costs), P (Previously Developed Unit Costs by Anchor QEA for Portland Harbor), A (EPA-Derived MII Unit Costs), O (Unit Costs from Other Projects/Sources)

Source of Cost Data:

For citation references, the following sources apply:

ALL (Allowance), FLC (www.flcdatacenter.com), LD (Costs Derived from Lower Duwamish Waterway Final Feasibility Study), MII (MII), O (Other), P (Previously Developed by Anchor QEA for Portland Harbor), and V (Vendor Quote)

Abbreviations:

QTY	Quantity	AC	Acres
EQUIP	Equipment	CLF	100 Linear Foot
MATL	Material	CY	Cubic Yard
HPF	HTRW Productivity Factor	DY	Days
ADJ LABOR	Adjusted Labor for HFP	EA	Each
ADJ EQUIP	Adjusted Equipment for HFP	FTE	Full Time Equivalent
UNMOD UC	Unmodified Unit Cost	HR	Hours
UNMOD LIC	Unmodified Line Item Cost	LB	Pounds
UNBUR LIC	Unburdened Line Item Cost	LCY	Loose Cubic Yard
PC OH	Prime Contractor Overhead	LF	Linear Foot
PC PF	Prime Contractor Profit	LS	Lump Sum
BUR LIC	Burdened Line Item Cost	MO	Month
		SF	Square Foot
		SY	Square Yard
		TON	Tons
		YR	Years

Cost Adjustment Checklist:	**NOTES:**
FACTOR:	Field work will be in Level "D" PPE.
H&S Productivity (labor and equipment only)	MII assembly costs include HPF adjustments.
Escalation to Base Year	2016 cost sources are not escalated (EF=1.00). All other costs are escalated based on the USACE CWCCIS, EM 1110-2-1304, Sept 2015.
Area Cost Factor	An AF of 1.05 is used for Oregon, except that an AF of 1.00 (national unmodified average) is used for MII assembly costs and local vendor quotes.
Subcontractor Overhead and Profit	It is assumed that home office OH is 8% and profit is 9% for the Prime Contractor. Professional labor overhead is 100%.
Prime Contractor Overhead and Profit	Allowances and items with mandated costs such as per diem do not have overhead and profit applied.
	Items previously developed by Anchor QEA already include contractor markups, therefore overhead and profit were not applied to those items.
	It is assumed that OH is 1% and profit is 0% for vendor quotes for treatment and disposal at offsite disposal facilities. It is assumed that OH is 5% and profit is 0% for quotes for all other material vendor quotes.
	Items developed using MII already include contractor markups such as overhead and profit, therefore additional overhead and profit were not applied in the PC OH and PC PF to those items.

TABLE CW-C5

Alternative C
Capital Cost Sub-Element
Debris Removal and Disposal

Cost Worksheet: **CW-C5**

COST WORKSHEET

Site: Portland Harbor Superfund Site
Location: Portland, Oregon
Phase: Feasibility Study
Base Year: 2016

Prepared By: JN **Date:** 3/4/2016
Checked By: AB **Date:** 3/7/2016

Work Statement:
This sub-element involves removal and disposal of debris for all areas prior to remedial activities. It includes costs for on-site labor, equipment, and materials developed from previous work.
Quantity development presented in Appendix D.

Cost Analysis:
Cost for Debris Removal and Disposal (Lump Sum)

COST DATABASE CODE	DESCRIPTION	QTY	UNIT(S)	HPF	LABOR	ADJ LABOR	EQUIP	ADJ EQUIP	MATL	OTHER	UNMOD UC	UNMOD LIC	PC OH	PC PF	BUR LIC	COST SOURCE CITATION	COMMENTS
P9	Debris Removal and Disposal	**220**	AC	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$13,107.01	$13,107.01	$2,883,542.20	0%	0%	$2,883,542	P Anchor QEA	Project-specific cost developed by Anchor QEA (2010) - see Backup Table 2.
												TOTAL COST:			$2,883,542		

	Representative Unit Quantity	Unit(s)	Total Cost	Unit Cost
COST WORKSHEET SUMMARY	220	AC	$2,883,542	$13,107

Notes:
Further information about the development of cost worksheets can be found in Attachment A - Methodology and Organization of Detailed Cost Estimates.
The quantity bolded in the QTY column is the quantity selected as the representative unit quantity for this cost worksheet. If multiple quantities are bolded, the representative unit quantity is the sum of those quantities. When the LS unit is utilized, the default representative unit quantity is 1.
HTRW productivity factor is from Exhibit B-3 or B-4 of "A Guide to Developing and Documenting Cost Estimates During the Feasibility Study", EPA 2000
EPA developed project-specific unit costs using the Micro Computer Aided Cost Engineering System (MCACES) Second Generation (MII) software version 4.2, build 3

Cost Database Code:
The Cost Database Code is a reference code for linking with line item cost information with the cost source database and is not otherwise used within these cost worksheets. The following cost source database prefixes apply:
L (EPA-Derived Labor Unit Costs), M (Project-Specific Vendor Unit Costs), P (Previously Developed Unit Costs by Anchor QEA for Portland Harbor), A (EPA-Derived MII Unit Costs), O (Unit Costs from Other Projects/Sources)

Source of Cost Data:
For citation references, the following sources apply:
ALL (Allowance), FLC (www.flcdatacenter.com), LD (Costs Derived from Lower Duwamish Waterway Final Feasibility Study), MII (MII), O (Other), P (Previously Developed by Anchor QEA for Portland Harbor), and V (Vendor Quote)

Abbreviations:

QTY	Quantity	AC	Acres
EQUIP	Equipment	CLF	100 Linear Foot
MATL	Material	CY	Cubic Yard
HPF	HTRW Productivity Factor	DY	Days
ADJ LABOR	Adjusted Labor for HFP	EA	Each
ADJ EQUIP	Adjusted Equipment for HFP	FTE	Full Time Equivalent
UNMOD UC	Unmodified Unit Cost	HR	Hours
UNMOD LIC	Unmodified Line Item Cost	LB	Pounds
UNBUR LIC	Unburdened Line Item Cost	LCY	Loose Cubic Yard
PC OH	Prime Contractor Overhead	LF	Linear Foot
PC PF	Prime Contractor Profit	LS	Lump Sum
BUR LIC	Burdened Line Item Cost	MO	Month
		SF	Square Foot
		SY	Square Yard
		TON	Tons
		YR	Years

Cost Adjustment Checklist:	**NOTES:**
FACTOR:	Field work will be in Level "D" PPE.
H&S Productivity (labor and equipment only)	MII assembly costs include HPF adjustments.
Escalation to Base Year	2016 cost sources are not escalated (EF=1.00). All other costs are escalated based on the USACE CWCCIS, EM 1110-2-1304, Sept 2015.
Area Cost Factor	An AF of 1.05 is used for Oregon, except that an AF of 1.00 (national unmodified average) is used for MII assembly costs and local vendor quotes.
Subcontractor Overhead and Profit	It is assumed that home office OH is 8% and profit is 9% for the Prime Contractor. Professional labor overhead is 100%.
Prime Contractor Overhead and Profit	Allowances and items with mandated costs such as per diem do not have overhead and profit applied.
	Items previously developed by Anchor QEA already include contractor markups, therefore overhead and profit were not applied to those items.
	It is assumed that OH is 1% and profit is 0% for vendor quotes for treatment and disposal at offsite disposal facilities. It is assumed that OH is 5% and profit is 0% for quotes for all other material vendor quotes.
	Items developed using MII already include contractor markups such as overhead and profit, therefore additional overhead and profit were not applied in the PC OH and PC PF to those items.

TABLE CW-C6

Alternative C **Cost Worksheet:** **CW-C6**
Capital Cost Sub-Element
Obstruction Removal and Relocation

COST WORKSHEET

Site: Portland Harbor Superfund Site
Location: Portland, Oregon
Phase: Feasibility Study
Base Year: 2016

Prepared By: JN **Date:** 3/4/2016
Checked By: AB **Date:** 3/7/2016

Work Statement:
This sub-element involves all work related to obstructions removal, relocation, and disposal. It includes all costs for labor, equipment and materials developed from previous work for pile removal and disposal, pile replacement, and temporary dock relocation.
Quantity development presented in Appendix D.

Cost Analysis:
Cost for Obstructions (Lump Sum)

COST DATABASE CODE	DESCRIPTION	QTY	UNIT(S)	HPF	LABOR	ADJ LABOR	EQUIP	ADJ EQUIP	MATL	OTHER	UNMOD UC	UNMOD LIC	PC OH	PC PF	BUR LIC	COST SOURCE CITATION	COMMENTS
P10	Pile Removal and Disposal	441	EA	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$715.65	$715.65	$315,599.45	0%	0%	$315,599	P Anchor QEA	Project-specific cost developed by Anchor QEA (2010) - see Backup Table 3.
P11	Pile Replacement	441	EA	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$7,478.77	$7,478.77	$3,298,138.45	0%	0%	$3,298,138	P Anchor QEA	Project-specific cost developed by Anchor QEA (2010) - see Backup Table 4.
P12	Temporary Dock Relocation	8	EA	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$100,497.97	$100,497.97	$803,983.77	0%	0%	$803,984	P Anchor QEA	Project-specific cost developed by Anchor QEA (2010) - see Backup Table 5.
												TOTAL COST:			$4,417,721		

	Representative Unit Quantity	Unit(s)	Total Cost	Unit Cost
COST WORKSHEET SUMMARY	1	LS	$4,417,721	$4,417,721

Notes:
Further information about the development of cost worksheets can be found in Attachment A - Methodology and Organization of Detailed Cost Estimates.
The quantity bolded in the QTY column is the quantity selected as the representative unit quantity for this cost worksheet. If multiple quantities are bolded, the representative unit quantity is the sum of those quantities. When the LS unit is utilized, the default representative unit quantity is 1.
HTRW productivity factor is from Exhibit B-3 or B-4 of "A Guide to Developing and Documenting Cost Estimates During the Feasibility Study", EPA 2000
EPA developed project-specific unit costs using the Micro Computer Aided Cost Engineering System (MCACES) Second Generation (MII) software version 4.2, build 3

Cost Database Code:
The Cost Database Code is a reference code for linking with line item cost information with the cost source database and is not otherwise used within these cost worksheets. The following cost source database prefixes apply:
L (EPA-Derived Labor Unit Costs), M (Project-Specific Vendor Unit Costs), P (Previously Developed Unit Costs by Anchor QEA for Portland Harbor), A (EPA-Derived MII Unit Costs), O (Unit Costs from Other Projects/Sources)

Source of Cost Data:
For citation references, the following sources apply:
ALL (Allowance), FLC (www.flcdatacenter.com), LD (Costs Derived from Lower Duwamish Waterway Final Feasibility Study), MII (MII), O (Other), P (Previously Developed by Anchor QEA for Portland Harbor), and V (Vendor Quote)

Abbreviations:

QTY	Quantity	AC	Acres
EQUIP	Equipment	CLF	100 Linear Foot
MATL	Material	CY	Cubic Yard
HPF	HTRW Productivity Factor	DY	Days
ADJ LABOR	Adjusted Labor for HFP	EA	Each
ADJ EQUIP	Adjusted Equipment for HFP	FTE	Full Time Equivalent
UNMOD UC	Unmodified Unit Cost	HR	Hours
UNMOD LIC	Unmodified Line Item Cost	LB	Pounds
UNBUR LIC	Unburdened Line Item Cost	LCY	Loose Cubic Yard
PC OH	Prime Contractor Overhead	LF	Linear Foot
PC PF	Prime Contractor Profit	LS	Lump Sum
BUR LIC	Burdened Line Item Cost	MO	Month
		SF	Square Foot
		SY	Square Yard
		TON	Tons
		YR	Years

Cost Adjustment Checklist:	**NOTES:**
FACTOR:	Field work will be in Level "D" PPE.
H&S Productivity (labor and equipment only)	MII assembly costs include HPF adjustments.
Escalation to Base Year	2016 cost sources are not escalated (EF=1.00). All other costs are escalated based on the USACE CWCCIS, EM 1110-2-1304, Sept 2015.
Area Cost Factor	An AF of 1.05 is used for Oregon, except that an AF of 1.00 (national unmodified average) is used for MII assembly costs and local vendor quotes.
Subcontractor Overhead and Profit	It is assumed that home office OH is 8% and profit is 9% for the Prime Contractor. Professional labor overhead is 100%.
Prime Contractor Overhead and Profit	Allowances and items with mandated costs such as per diem do not have overhead and profit applied.
	Items previously developed by Anchor QEA already include contractor markups, therefore overhead and profit were not applied to those items.
	It is assumed that OH is 1% and profit is 0% for vendor quotes for treatment and disposal at offsite disposal facilities. It is assumed that OH is 5% and profit is 0% for quotes for all other material vendor quotes.
	Items developed using MII already include contractor markups such as overhead and profit, therefore additional overhead and profit were not applied in the PC OH and PC PF to those items.

TABLE CW-C7

Alternative C
Capital Cost Sub-Element
Erosion/Residual Control Measures

Cost Worksheet: **CW-C7**

COST WORKSHEET

Site: Portland Harbor Superfund Site
Location: Portland, Oregon
Phase: Feasibility Study
Base Year: 2016

Prepared By: JN **Date:** 3/4/2016
Checked By: AB **Date:** 3/7/2016

Work Statement:
This sub-element involves the installation, maintainance, and removal of silt curtains and sheet pile walls for erosion and residual control. It includes costs for on-site labor, equipment, and materials developed from previous work.
Quantity development presented in Appendix D.

Cost Analysis:
Cost for Erosion/Residual Control Measures (Lump Sum)

COST DATABASE CODE	DESCRIPTION	QTY	UNIT(S)	HPF	LABOR	ADJ LABOR	EQUIP	ADJ EQUIP	MATL	OTHER	UNMOD UC	UNMOD LIC	PC OH	PC PF	BUR LIC	COST SOURCE CITATION	COMMENTS
P13	Purchase, Install and Maintain Silt Curtains	30,000	LF	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$96.92	$96.92	$2,907,660.00	0%	0%	$2,907,660	P Anchor QEA	Project-specific cost developed by Anchor QEA (2010) - see Backup Table 7.
P14	Purchase, Install and Remove Sheet Pile Walls	7,500	LF	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$2,749.88	$2,749.88	$20,624,100.00	0%	0%	$20,624,100	P Anchor QEA	Project-specific cost developed by Anchor QEA (2010) - see Backup Table 6.
												TOTAL COST:			$23,531,760		

	Representative Unit Quantity	Unit(s)	Total Cost	Unit Cost
COST WORKSHEET SUMMARY	1	LS	$23,531,760	$23,531,760

Notes:
Further information about the development of cost worksheets can be found in Attachment A - Methodology and Organization of Detailed Cost Estimates.
The quantity bolded in the QTY column is the quantity selected as the representative unit quantity for this cost worksheet. If multiple quantities are bolded, the representative unit quantity is the sum of those quantities. When the LS unit is utilized, the default representative unit quantity is 1.
HTRW productivity factor is from Exhibit B-3 or B-4 of "A Guide to Developing and Documenting Cost Estimates During the Feasibility Study", EPA 2000
EPA developed project-specific unit costs using the Micro Computer Aided Cost Engineering System (MCACES) Second Generation (MII) software version 4.2, build 3

Cost Database Code:
The Cost Database Code is a reference code for linking with line item cost information with the cost source database and is not otherwise used within these cost worksheets. The following cost source database prefixes apply:
L (EPA-Derived Labor Unit Costs), M (Project-Specific Vendor Unit Costs), P (Previously Developed Unit Costs by Anchor QEA for Portland Harbor), A (EPA-Derived MII Unit Costs), O (Unit Costs from Other Projects/Sources)

Source of Cost Data:
For citation references, the following sources apply:
ALL (Allowance), FLC (www.flcdatacenter.com), LD (Costs Derived from Lower Duwamish Waterway Final Feasibility Study), MII (MII), O (Other), P (Previously Developed by Anchor QEA for Portland Harbor), and V (Vendor Quote)

Abbreviations:

QTY	Quantity	AC	Acres
EQUIP	Equipment	CLF	100 Linear Foot
MATL	Material	CY	Cubic Yard
HPF	HTRW Productivity Factor	DY	Days
ADJ LABOR	Adjusted Labor for HFP	EA	Each
ADJ EQUIP	Adjusted Equipment for HFP	FTE	Full Time Equivalent
UNMOD UC	Unmodified Unit Cost	HR	Hours
UNMOD LIC	Unmodified Line Item Cost	LB	Pounds
UNBUR LIC	Unburdened Line Item Cost	LCY	Loose Cubic Yard
PC OH	Prime Contractor Overhead	LF	Linear Foot
PC PF	Prime Contractor Profit	LS	Lump Sum
BUR LIC	Burdened Line Item Cost	MO	Month
		SF	Square Foot
		SY	Square Yard
		TON	Tons
		YR	Years

Cost Adjustment Checklist:	**NOTES:**
FACTOR:	Field work will be in Level "D" PPE.
H&S Productivity (labor and equipment only)	MII assembly costs include HPF adjustments.
Escalation to Base Year	2016 cost sources are not escalated (EF=1.00). All other costs are escalated based on the USACE CWCCIS, EM 1110-2-1304, Sept 2015.
Area Cost Factor	An AF of 1.05 is used for Oregon, except that an AF of 1.00 (national unmodified average) is used for MII assembly costs and local vendor quotes.
Subcontractor Overhead and Profit	It is assumed that home office OH is 8% and profit is 9% for the Prime Contractor. Professional labor overhead is 100%.
Prime Contractor Overhead and Profit	Allowances and items with mandated costs such as per diem do not have overhead and profit applied.
	Items previously developed by Anchor QEA already include contractor markups, therefore overhead and profit were not applied to those items.
	It is assumed that OH is 1% and profit is 0% for vendor quotes for treatment and disposal at offsite disposal facilities. It is assumed that OH is 5% and profit is 0% for quotes for all other material vendor quotes.
	Items developed using MII already include contractor markups such as overhead and profit, therefore additional overhead and profit were not applied in the PC OH and PC PF to those items.

TABLE CW-C8

Alternative C **Cost Worksheet:** **CW-C8**
Capital Cost Sub-Element
Dredging of Contaminated Sediments (Open Water)

COST WORKSHEET

Site: Portland Harbor Superfund Site
Location: Portland, Oregon
Phase: Feasibility Study
Base Year: 2016

Prepared By: JN **Date:** 3/4/2016
Checked By: AB **Date:** 3/7/2016

Work Statement:
This sub-element involves mechanical dredging of contaminated sediments in open water areas and transport to dewatering/stabilization area. It includes costs for on-site labor, equipment, and materials for open water dredging, assuming a 10 CY barge mounted crane and clamshell.
Quantity development presented in Appendix D.

Cost Analysis:
Cost for Open Water Dredging (Lump Sum)

COST DATABASE CODE	DESCRIPTION	QTY	UNIT(S)	HPF	LABOR	ADJ LABOR	EQUIP	ADJ EQUIP	MATL	OTHER	UNMOD UC	UNMOD LIC	PC OH	PC PF	BUR LIC	COST SOURCE CITATION	COMMENTS
A6	Open Water Dredging	**624,376**	CY	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$24.53	$24.53	$15,315,943.28	0%	0%	$15,315,943	MII MII	Project-specific unit cost developed in MII.
												TOTAL COST:			$15,315,943		

	Representative Unit Quantity	Unit(s)	Total Cost	Unit Cost
COST WORKSHEET SUMMARY	624,376	CY	$15,315,943	$24.53

Notes:
Further information about the development of cost worksheets can be found in Attachment A - Methodology and Organization of Detailed Cost Estimates.
The quantity bolded in the QTY column is the quantity selected as the representative unit quantity for this cost worksheet. If multiple quantities are bolded, the representative unit quantity is the sum of those quantities. When the LS unit is utilized, the default representative unit quantity is 1.
HTRW productivity factor is from Exhibit B-3 or B-4 of "A Guide to Developing and Documenting Cost Estimates During the Feasibility Study", EPA 2000
EPA developed project-specific unit costs using the Micro Computer Aided Cost Engineering System (MCACES) Second Generation (MII) software version 4.2, build 3

Cost Database Code:
The Cost Database Code is a reference code for linking with line item cost information with the cost source database and is not otherwise used within these cost worksheets. The following cost source database prefixes apply:
L (EPA-Derived Labor Unit Costs), M (Project-Specific Vendor Unit Costs), P (Previously Developed Unit Costs by Anchor QEA for Portland Harbor), A (EPA-Derived MII Unit Costs), O (Unit Costs from Other Projects/Sources)

Source of Cost Data:
For citation references, the following sources apply:
ALL (Allowance), FLC (www.flcdatacenter.com), LD (Costs Derived from Lower Duwamish Waterway Final Feasibility Study), MII (MII), O (Other), P (Previously Developed by Anchor QEA for Portland Harbor), and V (Vendor Quote)

Abbreviations:

QTY	Quantity	AC	Acres
EQUIP	Equipment	CLF	100 Linear Foot
MATL	Material	CY	Cubic Yard
HPF	HTRW Productivity Factor	DY	Days
ADJ LABOR	Adjusted Labor for HFP	EA	Each
ADJ EQUIP	Adjusted Equipment for HFP	FTE	Full Time Equivalent
UNMOD UC	Unmodified Unit Cost	HR	Hours
UNMOD LIC	Unmodified Line Item Cost	LB	Pounds
UNBUR LIC	Unburdened Line Item Cost	LCY	Loose Cubic Yard
PC OH	Prime Contractor Overhead	LF	Linear Foot
PC PF	Prime Contractor Profit	LS	Lump Sum
BUR LIC	Burdened Line Item Cost	MO	Month
		SF	Square Foot
		SY	Square Yard
		TON	Tons
		YR	Years

Cost Adjustment Checklist:	**NOTES:**
FACTOR:	Field work will be in Level "D" PPE.
H&S Productivity (labor and equipment only)	MII assembly costs include HPF adjustments.
Escalation to Base Year	2016 cost sources are not escalated (EF=1.00). All other costs are escalated based on the USACE CWCCIS, EM 1110-2-1304, Sept 2015.
Area Cost Factor	An AF of 1.05 is used for Oregon, except that an AF of 1.00 (national unmodified average) is used for MII assembly costs and local vendor quotes.
Subcontractor Overhead and Profit	It is assumed that home office OH is 8% and profit is 9% for the Prime Contractor. Professional labor overhead is 100%.
Prime Contractor Overhead and Profit	Allowances and items with mandated costs such as per diem do not have overhead and profit applied.
	Items previously developed by Anchor QEA already include contractor markups, therefore overhead and profit were not applied to those items.
	It is assumed that OH is 1% and profit is 0% for vendor quotes for treatment and disposal at offsite disposal facilities. It is assumed that OH is 5% and profit is 0% for quotes for all other material vendor quotes.
	Items developed using MII already include contractor markups such as overhead and profit, therefore additional overhead and profit were not applied in the PC OH and PC PF to those items.

TABLE CW-C9

Alternative C **Cost Worksheet:** **CW-C9**
Capital Cost Sub-Element
Dredging of Contaminated Sediments (Confined)

COST WORKSHEET

Site: Portland Harbor Superfund Site
Location: Portland, Oregon
Phase: Feasibility Study
Base Year: 2016

Prepared By: JN **Date:** 3/4/2016
Checked By: AB **Date:** 3/7/2016

Work Statement:
This sub-element involves mechanical dredging of contaminated sediments in confined areas and transport to dewatering/stabilization area. It includes costs for on-site labor, equipment, and materials for confined dredging, assuming a 4 CY barge mounted excavator.
Quantity development presented in Appendix D.

Cost Analysis:
Cost for Confined Dredging (Lump Sum)

COST DATABASE CODE	DESCRIPTION	QTY	UNIT(S)	HPF	LABOR	ADJ LABOR	EQUIP	ADJ EQUIP	MATL	OTHER	UNMOD UC	UNMOD LIC	PC OH	PC PF	BUR LIC	COST SOURCE CITATION	COMMENTS
A7	Confined Dredging	**66,532**	CY	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$31.10	$31.10	$2,069,145.20	0%	0%	$2,069,145	MII MII	Project-specific unit cost developed in MII.
												TOTAL COST:			$2,069,145		

	Representative Unit Quantity	Unit(s)	Total Cost	Unit Cost
COST WORKSHEET SUMMARY	66,532	CY	$2,069,145	$31.10

Notes:
Further information about the development of cost worksheets can be found in Attachment A - Methodology and Organization of Detailed Cost Estimates.
The quantity bolded in the QTY column is the quantity selected as the representative unit quantity for this cost worksheet. If multiple quantities are bolded, the representative unit quantity is the sum of those quantities. When the LS unit is utilized, the default representative unit quantity is 1.
HTRW productivity factor is from Exhibit B-3 or B-4 of "A Guide to Developing and Documenting Cost Estimates During the Feasibility Study", EPA 2000
EPA developed project-specific unit costs using the Micro Computer Aided Cost Engineering System (MCACES) Second Generation (MII) software version 4.2, build 3

Cost Database Code:
The Cost Database Code is a reference code for linking with line item cost information with the cost source database and is not otherwise used within these cost worksheets. The following cost source database prefixes apply:
L (EPA-Derived Labor Unit Costs), M (Project-Specific Vendor Unit Costs), P (Previously Developed Unit Costs by Anchor QEA for Portland Harbor), A (EPA-Derived MII Unit Costs), O (Unit Costs from Other Projects/Sources)

Source of Cost Data:
For citation references, the following sources apply:
ALL (Allowance), FLC (www.flcdatacenter.com), LD (Costs Derived from Lower Duwamish Waterway Final Feasibility Study), MII (MII), O (Other), P (Previously Developed by Anchor QEA for Portland Harbor), and V (Vendor Quote)

Abbreviations:

QTY	Quantity	AC	Acres
EQUIP	Equipment	CLF	100 Linear Foot
MATL	Material	CY	Cubic Yard
HPF	HTRW Productivity Factor	DY	Days
ADJ LABOR	Adjusted Labor for HFP	EA	Each
ADJ EQUIP	Adjusted Equipment for HFP	FTE	Full Time Equivalent
UNMOD UC	Unmodified Unit Cost	HR	Hours
UNMOD LIC	Unmodified Line Item Cost	LB	Pounds
UNBUR LIC	Unburdened Line Item Cost	LCY	Loose Cubic Yard
PC OH	Prime Contractor Overhead	LF	Linear Foot
PC PF	Prime Contractor Profit	LS	Lump Sum
BUR LIC	Burdened Line Item Cost	MO	Month
		SF	Square Foot
		SY	Square Yard
		TON	Tons
		YR	Years

Cost Adjustment Checklist:	**NOTES:**
FACTOR:	Field work will be in Level "D" PPE.
H&S Productivity (labor and equipment only)	MII assembly costs include HPF adjustments.
Escalation to Base Year	2016 cost sources are not escalated (EF=1.00). All other costs are escalated based on the USACE CWCCIS, EM 1110-2-1304, Sept 2015.
Area Cost Factor	An AF of 1.05 is used for Oregon, except that an AF of 1.00 (national unmodified average) is used for MII assembly costs and local vendor quotes.
Subcontractor Overhead and Profit	It is assumed that home office OH is 8% and profit is 9% for the Prime Contractor. Professional labor overhead is 100%.
Prime Contractor Overhead and Profit	Allowances and items with mandated costs such as per diem do not have overhead and profit applied.
	Items previously developed by Anchor QEA already include contractor markups, therefore overhead and profit were not applied to those items.
	It is assumed that OH is 1% and profit is 0% for vendor quotes for treatment and disposal at offsite disposal facilities. It is assumed that OH is 5% and profit is 0% for quotes for all other material vendor quotes.
	Items developed using MII already include contractor markups such as overhead and profit, therefore additional overhead and profit were not applied in the PC OH and PC PF to those items.

TABLE CW-C10

Alternative C
Capital Cost Sub-Element
Excavation of Riverbanks

Cost Worksheet: **CW-C10**

COST WORKSHEET

Site: Portland Harbor Superfund Site
Location: Portland, Oregon
Phase: Feasibility Study
Base Year: 2016

Prepared By: JN **Date:** 3/4/2016
Checked By: AB **Date:** 3/7/2016

Work Statement:
This sub-element involves mechanical excavation of riverbank materials and transport to dewatering/stabilization area. It includes costs for on-site labor, equipment, and materials for riverbank excavation, assuming a 4 CY long-arm excavator.
Quantity development presented in Appendix D.

Cost Analysis:
Cost for Excavation from Shore for Riverbanks (Lump Sum)

COST DATABASE CODE	DESCRIPTION	QTY	UNIT(S)	HPF	LABOR	ADJ LABOR	EQUIP	ADJ EQUIP	MATL	OTHER	UNMOD UC	UNMOD LIC	PC OH	PC PF	BUR LIC	COST SOURCE CITATION	COMMENTS
A8	Riverbank Excavation	**58,221**	CY	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$5.19	$5.19	$302,169.37	0%	0%	$302,169	MII MII	Project-specific unit cost developed in MII.
												TOTAL COST:			$302,169		

	Representative Unit Quantity	Unit(s)	Total Cost	Unit Cost
COST WORKSHEET SUMMARY	58,221	CY	$302,169	$5.19

Notes:
Further information about the development of cost worksheets can be found in Attachment A - Methodology and Organization of Detailed Cost Estimates.
The quantity bolded in the QTY column is the quantity selected as the representative unit quantity for this cost worksheet. If multiple quantities are bolded, the representative unit quantity is the sum of those quantities. When the LS unit is utilized, the default representative unit quantity is 1.
HTRW productivity factor is from Exhibit B-3 or B-4 of "A Guide to Developing and Documenting Cost Estimates During the Feasibility Study", EPA 2000
EPA developed project-specific unit costs using the Micro Computer Aided Cost Engineering System (MCACES) Second Generation (MII) software version 4.2, build 3

Cost Database Code:
The Cost Database Code is a reference code for linking with line item cost information with the cost source database and is not otherwise used within these cost worksheets. The following cost source database prefixes apply:
L (EPA-Derived Labor Unit Costs), M (Project-Specific Vendor Unit Costs), P (Previously Developed Unit Costs by Anchor QEA for Portland Harbor), A (EPA-Derived MII Unit Costs), O (Unit Costs from Other Projects/Sources)

Source of Cost Data:
For citation references, the following sources apply:
ALL (Allowance), FLC (www.flcdatacenter.com), LD (Costs Derived from Lower Duwamish Waterway Final Feasibility Study), MII (MII), O (Other), P (Previously Developed by Anchor QEA for Portland Harbor), and V (Vendor Quote)

Abbreviations:

QTY	Quantity	AC	Acres
EQUIP	Equipment	CLF	100 Linear Foot
MATL	Material	CY	Cubic Yard
HPF	HTRW Productivity Factor	DY	Days
ADJ LABOR	Adjusted Labor for HFP	EA	Each
ADJ EQUIP	Adjusted Equipment for HFP	FTE	Full Time Equivalent
UNMOD UC	Unmodified Unit Cost	HR	Hours
UNMOD LIC	Unmodified Line Item Cost	LB	Pounds
UNBUR LIC	Unburdened Line Item Cost	LCY	Loose Cubic Yard
PC OH	Prime Contractor Overhead	LF	Linear Foot
PC PF	Prime Contractor Profit	LS	Lump Sum
BUR LIC	Burdened Line Item Cost	MO	Month
		SF	Square Foot
		SY	Square Yard
		TON	Tons
		YR	Years

Cost Adjustment Checklist:	**NOTES:**
FACTOR:	Field work will be in Level "D" PPE.
H&S Productivity (labor and equipment only)	MII assembly costs include HPF adjustments.
Escalation to Base Year	2016 cost sources are not escalated (EF=1.00). All other costs are escalated based on the USACE CWCCIS, EM 1110-2-1304, Sept 2015.
Area Cost Factor	An AF of 1.05 is used for Oregon, except that an AF of 1.00 (national unmodified average) is used for MII assembly costs and local vendor quotes.
Subcontractor Overhead and Profit	It is assumed that home office OH is 8% and profit is 9% for the Prime Contractor. Professional labor overhead is 100%.
Prime Contractor Overhead and Profit	Allowances and items with mandated costs such as per diem do not have overhead and profit applied.
	Items previously developed by Anchor QEA already include contractor markups, therefore overhead and profit were not applied to those items.
	It is assumed that OH is 1% and profit is 0% for vendor quotes for treatment and disposal at offsite disposal facilities. It is assumed that OH is 5% and profit is 0% for quotes for all other material vendor quotes.
	Items developed using MII already include contractor markups such as overhead and profit, therefore additional overhead and profit were not applied in the PC OH and PC PF to those items.

TABLE CW-C11

Alternative C **Cost Worksheet:** **CW-C11**
Capital Cost Sub-Element
Dewatering and Water Treatment for Dredging Operations

COST WORKSHEET

Site: Portland Harbor Superfund Site
Location: Portland, Oregon
Phase: Feasibility Study
Base Year: 2016

Prepared By: JN **Date:** 3/4/2016
Checked By: AB **Date:** 3/7/2016

Work Statement:
This sub-element involves the dewatering and water treatment for dredging operations. Assumes a temporary water treatment plant will be utilized for treatment of water generated from dewatering of sediments. It includes costs for labor, equipment, and materials for treatment of water generated from dredged sediments. Quantity development presented in Appendix D.

Cost Analysis:
Cost for Dewatering and Water Treatment for Dredging Operations (Lump Sum)

COST DATABASE CODE	DESCRIPTION	QTY	UNIT(S)	HPF	LABOR	ADJ LABOR	EQUIP	ADJ EQUIP	MATL	OTHER	UNMOD UC	UNMOD LIC	PC OH	PC PF	BUR LIC	COST SOURCE CITATION	COMMENTS
A9	Mobilization/Demobilization of Temporary Water Treatment System	5	EA	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$36,600.00	$36,600.00	$183,000.00	0%	0%	$183,000	MII MII	Project-specific unit cost developed in MII. Assumes mob/demob of treatment system will be required for each construction season
A10	Dewatering and Temporary Water Treatment System Operations	136	DY	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$21,654.00	$21,654.00	$2,934,117.00	0%	0%	$2,934,117	MII MII	Project-specific unit cost developed in MII.
													TOTAL COST:		$3,117,117		

	Representative Unit Quantity	Unit(s)	Total Cost	Unit Cost
COST WORKSHEET SUMMARY	1	LS	$3,117,117	$3,117,117

Notes:
Further information about the development of cost worksheets can be found in Attachment A - Methodology and Organization of Detailed Cost Estimates.
The quantity bolded in the QTY column is the quantity selected as the representative unit quantity for this cost worksheet. If multiple quantities are bolded, the representative unit quantity is the sum of those quantities. When the LS unit is utilized, the default representative unit quantity is 1.
HTRW productivity factor is from Exhibit B-3 or B-4 of "A Guide to Developing and Documenting Cost Estimates During the Feasibility Study", EPA 2000
EPA developed project-specific unit costs using the Micro Computer Aided Cost Engineering System (MCACES) Second Generation (MII) software version 4.2, build 3

Cost Database Code:
The Cost Database Code is a reference code for linking with line item cost information with the cost source database and is not otherwise used within these cost worksheets. The following cost source database prefixes apply:
L (EPA-Derived Labor Unit Costs), M (Project-Specific Vendor Unit Costs), P (Previously Developed Unit Costs by Anchor QEA for Portland Harbor), A (EPA-Derived MII Unit Costs), O (Unit Costs from Other Projects/Sources)

Source of Cost Data:
For citation references, the following sources apply:
ALL (Allowance), FLC (www.flcdatacenter.com), LD (Costs Derived from Lower Duwamish Waterway Final Feasibility Study), MII (MII), O (Other), P (Previously Developed by Anchor QEA for Portland Harbor), and V (Vendor Quote)

Abbreviations:

QTY	Quantity	AC	Acres
EQUIP	Equipment	CLF	100 Linear Foot
MATL	Material	CY	Cubic Yard
HPF	HTRW Productivity Factor	DY	Days
ADJ LABOR	Adjusted Labor for HFP	EA	Each
ADJ EQUIP	Adjusted Equipment for HFP	FTE	Full Time Equivalent
UNMOD UC	Unmodified Unit Cost	HR	Hours
UNMOD LIC	Unmodified Line Item Cost	LB	Pounds
UNBUR LIC	Unburdened Line Item Cost	LCY	Loose Cubic Yard
PC OH	Prime Contractor Overhead	LF	Linear Foot
PC PF	Prime Contractor Profit	LS	Lump Sum
BUR LIC	Burdened Line Item Cost	MO	Month
		SF	Square Foot
		SY	Square Yard
		TON	Tons
		YR	Years

Cost Adjustment Checklist:	NOTES:
FACTOR:	Field work will be in Level "D" PPE.
H&S Productivity (labor and equipment only)	MII assembly costs include HPF adjustments.
Escalation to Base Year	2016 cost sources are not escalated (EF=1.00). All other costs are escalated based on the USACE CWCCIS, EM 1110-2-1304, Sept 2015.
Area Cost Factor	An AF of 1.05 is used for Oregon, except that an AF of 1.00 (national unmodified average) is used for MII assembly costs and local vendor quotes.
Subcontractor Overhead and Profit	It is assumed that home office OH is 8% and profit is 9% for the Prime Contractor. Professional labor overhead is 100%.
Prime Contractor Overhead and Profit	Allowances and items with mandated costs such as per diem do not have overhead and profit applied.
	Items previously developed by Anchor QEA already include contractor markups, therefore overhead and profit were not applied to those items.
	It is assumed that OH is 1% and profit is 0% for vendor quotes for treatment and disposal at offsite disposal facilities. It is assumed that OH is 5% and profit is 0% for quotes for all other material vendor quotes.
	Items developed using MII already include contractor markups such as overhead and profit, therefore additional overhead and profit were not applied in the PC OH and PC PF to those items.

TABLE CW-C12

Alternative C **Cost Worksheet:** **CW-C12**

Capital Cost Sub-Element

Subtitle C/TSCA Disposal (Handling, Transportation, Treatment of Select PTW Materials, and Disposal)

COST WORKSHEET

Site: Portland Harbor Superfund Site
Location: Portland, Oregon
Phase: Feasibility Study
Base Year: 2016

Prepared By: JN **Date:** 5/20/2016
Checked By: AB **Date:** 5/23/2016

Work Statement:
This sub-element involves the disposal of contaminated sediments at a Subtitle C/TSCA landfill, including in-barge mixing of amendments, barge transportation of materials to a transload facility, materials handling from the barge to truck, transportation of the sediments to the Subtitle C/TSCA landfill, and disposal of contaminated sediments (including thermal treatment at the landfill facility for a portion of the volume). It includes costs for labor, equipment, and materials as well as recent vendor quotes. Costs for development of a transload facility are included in a separate cost worksheet.
Quantity development presented in Appendix D.

Cost Analysis:
Cost for Subtitle C/TSCA Disposal (Lump Sum)

COST DATABASE CODE	DESCRIPTION	QTY	UNIT(S)	HPF	LABOR	ADJ LABOR	EQUIP	ADJ EQUIP	MATL	OTHER	UNMOD UC	UNMOD LIC	PC OH	PC PF	BUR LIC	COST SOURCE CITATION	COMMENTS
Area 6W NRC/NAPL PTW																	
	Transportation																
A13	Barging to Transload Facility	218,332	CY	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$13.66	$13.66	$2,982,415.12	0%	0%	$2,982,415	MII MII	Project-specific unit cost developed in MII.
A5	Hauling Waste from Transload Facility to Landfill	218,332	CY	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$16.70	$16.70	$3,646,144.40	0%	0%	$3,646,144	MII MII	Project-specific unit cost developed in MII.
	Materials Handling at Transload Facility																
A14	Offloading of Sediments	218,332	CY	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$9.70	$9.70	$2,117,820.40	0%	0%	$2,117,820	MII MII	Project-specific unit cost developed in MII. Assumes mechanical offloading of sediments at the transload facility.
A4	Loading Trucks at Transload Facility	218,332	CY	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$2.68	$2.68	$585,129.76	0%	0%	$585,130	MII MII	Project-specific unit cost developed in MII.
	Treatment																
A11	In-Barge Stabilization / Mixing of Amendments	218,332	CY	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$24.50	$24.50	$5,349,134.00	0%	0%	$5,349,134	MII MII	Project-specific unit cost developed in MII.
P5	Diatomaceous Earth	12,655	TON	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$105.94	$105.94	$1,340,670.70	0%	0%	$1,340,671	P Anchor QEA	Project-specific cost developed by Anchor QEA (2010) - see Backup Table 24.
M25	Quicklime	17,463	TON	1.00	$0.00	$0.00	$0.00	$0.00	$239.00	$0.00	$239.00	$4,173,657.00	5%	0%	$4,382,340	V Vendor Quote	Project-specific vendor quote - Graymont, 2016.
A2	Hauling - Quicklime to Site	17,463	TON	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$5.71	$5.71	$99,713.73	0%	0%	$99,714	MII MII	Project-specific unit cost developed in MII. Assumes 10 mile one-way haul.
	Disposal at Subtitle C/TSCA Landfill																
M10	Tipping Fee at Subtitle C/TSCA Landfill	**283,209**	TON	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$86.19	$86.19	$24,409,783.71	1%	0%	$24,653,882	V Vendor Quote	Project-specific vendor quote - CWM of the Northwest, 2015.
Area 7W NRC/NAPL PTW																	
	Transportation																
A13	Barging to Transload Facility	66,633	CY	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$13.66	$13.66	$910,206.78	0%	0%	$910,207	MII MII	Project-specific unit cost developed in MII.
A5	Hauling Waste from Transload Facility to Landfill	66,633	CY	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$16.70	$16.70	$1,112,771.10	0%	0%	$1,112,771	MII MII	Project-specific unit cost developed in MII.
	Materials Handling at Transload Facility																
A14	Offloading of Sediments	66,633	CY	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$9.70	$9.70	$646,340.10	0%	0%	$646,340	MII MII	Project-specific unit cost developed in MII. Assumes mechanical offloading of sediments at the transload facility.
A4	Loading Trucks at Transload Facility	66,633	CY	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$2.68	$2.68	$178,576.44	0%	0%	$178,576	MII MII	Project-specific unit cost developed in MII.
	Treatment																
A11	In-Barge Stabilization / Mixing of Amendments	66,633	CY	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$24.50	$24.50	$1,632,508.50	0%	0%	$1,632,509	MII MII	Project-specific unit cost developed in MII.
P5	Diatomaceous Earth	5,700	TON	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$105.94	$105.94	$603,858.00	0%	0%	$603,858	P Anchor QEA	Project-specific cost developed by Anchor QEA (2010) - see Backup Table 24.
M25	Quicklime	1,573	TON	1.00	$0.00	$0.00	$0.00	$0.00	$239.00	$0.00	$239.00	$375,947.00	5%	0%	$394,744	V Vendor Quote	Project-specific vendor quote - Graymont, 2016.
A2	Hauling - Quicklime to Site	1,573	TON	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$5.71	$5.71	$8,981.83	0%	0%	$8,982	MII MII	Project-specific unit cost developed in MII. Assumes 10 mile one-way haul.
M20	Thermal Desorption Treatment at Subtitle C/TSCA Landfill (Low End of Treatment Cost Range)	12,541	TON	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$319.41	$319.41	$4,005,720.81	1%	0%	$4,045,778	V Vendor Quote	Project-specific vendor quote - CWM of the Northwest, 2015.
M9	Thermal Desorption Treatment at Subtitle C/TSCA Landfill (High End of Treatment Cost Range)	12,541	TON	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$572.91	$572.91	$7,184,864.31	1%	0%	$7,256,713	V Vendor Quote	Project-specific vendor quote - CWM of the Northwest, 2015.
	Disposal at Subtitle C/TSCA Landfill																
M10	Tipping Fee at Subtitle C/TSCA Landfill	**75,679**	TON	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$86.19	$86.19	$6,522,773.01	1%	0%	$6,588,001	V Vendor Quote	Project-specific vendor quote - CWM of the Northwest, 2015.
												TOTAL COST:			$68,535,729		

	Representative Unit Quantity	Unit(s)	Total Cost	Unit Cost
COST WORKSHEET SUMMARY	358,888	TON	$68,535,729	$191

TABLE CW-C12

Alternative C **Cost Worksheet:** **CW-C12**

Capital Cost Sub-Element

Subtitle C/TSCA Disposal (Handling, Transportation, Treatment of Select PTW Materials, and Disposal)

COST WORKSHEET

Site: Portland Harbor Superfund Site
Location: Portland, Oregon
Phase: Feasibility Study
Base Year: 2016

Prepared By: JN **Date:** 5/20/2016

Checked By: AB **Date:** 5/23/2016

Notes:

Further information about the development of cost worksheets can be found in Attachment A - Methodology and Organization of Detailed Cost Estimates.
The quantity bolded in the QTY column is the quantity selected as the representative unit quantity for this cost worksheet. If multiple quantities are bolded, the representative unit quantity is the sum of those quantities. When the LS unit is utilized, the default representative unit quantity is 1.
HTRW productivity factor is from Exhibit B-3 or B-4 of "A Guide to Developing and Documenting Cost Estimates During the Feasibility Study", EPA 2000
EPA developed project-specific unit costs using the Micro Computer Aided Cost Engineering System (MCACES) Second Generation (MII) software version 4.2, build 3

Cost Database Code:

The Cost Database Code is a reference code for linking with line item cost information with the cost source database and is not otherwise used within these cost worksheets. The following cost source database prefixes apply:

L (EPA-Derived Labor Unit Costs), M (Project-Specific Vendor Unit Costs), P (Previously Developed Unit Costs by Anchor QEA for Portland Harbor), A (EPA-Derived MII Unit Costs), O (Unit Costs from Other Projects/Sources)

Source of Cost Data:

For citation references, the following sources apply:

ALL (Allowance), FLC (www.flcdatacenter.com), LD (Costs Derived from Lower Duwamish Waterway Final Feasibility Study), MII (MII), O (Other), P (Previously Developed by Anchor QEA for Portland Harbor), and V (Vendor Quote)

Abbreviations:

QTY	Quantity	AC	Acres
EQUIP	Equipment	CLF	100 Linear Foot
MATL	Material	CY	Cubic Yard
HPF	HTRW Productivity Factor	DY	Days
ADJ LABOR	Adjusted Labor for HFP	EA	Each
ADJ EQUIP	Adjusted Equipment for HFP	FTE	Full Time Equivalent
UNMOD UC	Unmodified Unit Cost	HR	Hours
UNMOD LIC	Unmodified Line Item Cost	LB	Pounds
UNBUR LIC	Unburdened Line Item Cost	LCY	Loose Cubic Yard
PC OH	Prime Contractor Overhead	LF	Linear Foot
PC PF	Prime Contractor Profit	LS	Lump Sum
BUR LIC	Burdened Line Item Cost	MO	Month
		SF	Square Foot
		SY	Square Yard
		TON	Tons
		YR	Years

Cost Adjustment Checklist:	**NOTES:**
FACTOR:	Field work will be in Level "D" PPE.
H&S Productivity (labor and equipment only)	MII assembly costs include HPF adjustments.
Escalation to Base Year	2016 cost sources are not escalated (EF=1.00). All other costs are escalated based on the USACE CWCCIS, EM 1110-2-1304, Sept 2015.
Area Cost Factor	An AF of 1.05 is used for Oregon, except that an AF of 1.00 (national unmodified average) is used for MII assembly costs and local vendor quotes.
Subcontractor Overhead and Profit	It is assumed that home office OH is 8% and profit is 9% for the Prime Contractor. Professional labor overhead is 100%.
Prime Contractor Overhead and Profit	Allowances and items with mandated costs such as per diem do not have overhead and profit applied.
	Items previously developed by Anchor QEA already include contractor markups, therefore overhead and profit were not applied to those items.
	It is assumed that OH is 1% and profit is 0% for vendor quotes for treatment and disposal at offsite disposal facilities. It is assumed that OH is 5% and profit is 0% for quotes for all other material vendor quotes.
	Items developed using MII already include contractor markups such as overhead and profit, therefore additional overhead and profit were not applied in the PC OH and PC PF to those items.

TABLE CW-C13

Alternative C **Cost Worksheet:** **CW-C13**
Capital Cost Sub-Element
Subtitle D Disposal (Handling, Transportation, and Disposal)

COST WORKSHEET

Site: Portland Harbor Superfund Site
Location: Portland, Oregon
Phase: Feasibility Study
Base Year: 2016

Prepared By: JN **Date:** 3/4/2016
Checked By: AB **Date:** 3/7/2016

Work Statement:
This sub-element involves the disposal of contaminated sediments at a Subtitle D landfill, including barge transportation of materials to a transload facility, materials handling from the barge to truck, transportation of the sediments to the Subtitle C/TSCA landfill, and disposal of contaminated sediments (including thermal treatment at the landfill facility for a portion of the volume). It includes costs for labor, equipment, and materials as well as recent vendor quotes.
Quantity development presented in Appendix D.

Cost Analysis:
Cost for Subtitle D Disposal (Lump Sum)

COST DATABASE CODE	DESCRIPTION	QTY	UNIT(S)	HPF	LABOR	ADJ LABOR	EQUIP	ADJ EQUIP	MATL	OTHER	UNMOD UC	UNMOD LIC	PC OH	PC PF	BUR LIC	COST SOURCE CITATION	COMMENTS
	Diatomaceous Earth Amendment																
A11	In-Barge Stabilization / Mixing of Amendments	712,250	CY	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$24.50	$24.50	$17,450,125.00	0%	0%	$17,450,125	MII MII	Project-specific unit cost developed in MII.
P5	Diatomaceous Earth	42,524	TON	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$105.94	$105.94	$4,504,992.56	0%	0%	$4,504,993	P Anchor QEA	Project-specific cost developed by Anchor QEA (2010) - see Backup Table 24.
	Transportation to Transload Facility																
A13	Barging to Transload Facility	712,250	CY	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$13.66	$13.66	$9,729,335.00	0%	0%	$9,729,335	MII MII	Project-specific unit cost developed in MII.
	Transportation and Disposal at Subtitle D Landfill																
M11	Transportation and Disposal at Subtitle D Landfill	**893,003**	TON	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$74.53	$74.53	$66,555,513.59	1%	0%	$67,221,069	V Vendor Quote	Project-specific vendor quote - Republic Services (Roosevelt Landfill), 2015. Includes transloading of the sediments, truck transportation from the transload facility to the landfill, and disposal at the landfill.
												TOTAL COST:			$98,905,522		

	Representative Unit Quantity	Unit(s)	Total Cost	Unit Cost
COST WORKSHEET SUMMARY	893,003	TON	$98,905,522	$111

Notes:
Further information about the development of cost worksheets can be found in Attachment A - Methodology and Organization of Detailed Cost Estimates.
The quantity bolded in the QTY column is the quantity selected as the representative unit quantity for this cost worksheet. If multiple quantities are bolded, the representative unit quantity is the sum of those quantities. When the LS unit is utilized, the default representative unit quantity is 1.
HTRW productivity factor is from Exhibit B-3 or B-4 of "A Guide to Developing and Documenting Cost Estimates During the Feasibility Study", EPA 2000
EPA developed project-specific unit costs using the Micro Computer Aided Cost Engineering System (MCACES) Second Generation (MII) software version 4.2, build 3

Cost Database Code:
The Cost Database Code is a reference code for linking with line item cost information with the cost source database and is not otherwise used within these cost worksheets. The following cost source database prefixes apply:
L (EPA-Derived Labor Unit Costs), M (Project-Specific Vendor Unit Costs), P (Previously Developed Unit Costs by Anchor QEA for Portland Harbor), A (EPA-Derived MII Unit Costs), O (Unit Costs from Other Projects/Sources)

Source of Cost Data:
For citation references, the following sources apply:
ALL (Allowance), FLC (www.flcdatacenter.com), LD (Costs Derived from Lower Duwamish Waterway Final Feasibility Study), MII (MII), O (Other), P (Previously Developed by Anchor QEA for Portland Harbor), and V (Vendor Quote)

Abbreviations:

QTY	Quantity	AC	Acres
EQUIP	Equipment	CLF	100 Linear Foot
MATL	Material	CY	Cubic Yard
HPF	HTRW Productivity Factor	DY	Days
ADJ LABOR	Adjusted Labor for HFP	EA	Each
ADJ EQUIP	Adjusted Equipment for HFP	FTE	Full Time Equivalent
UNMOD UC	Unmodified Unit Cost	HR	Hours
UNMOD LIC	Unmodified Line Item Cost	LB	Pounds
UNBUR LIC	Unburdened Line Item Cost	LCY	Loose Cubic Yard
PC OH	Prime Contractor Overhead	LF	Linear Foot
PC PF	Prime Contractor Profit	LS	Lump Sum
BUR LIC	Burdened Line Item Cost	MO	Month
		SF	Square Foot
		SY	Square Yard
		TON	Tons
		YR	Years

Cost Adjustment Checklist:	**NOTES:**
FACTOR:	Field work will be in Level "D" PPE.
H&S Productivity (labor and equipment only)	MII assembly costs include HPF adjustments.
Escalation to Base Year	2016 cost sources are not escalated (EF=1.00). All other costs are escalated based on the USACE CWCCIS, EM 1110-2-1304, Sept 2015.
Area Cost Factor	An AF of 1.05 is used for Oregon, except that an AF of 1.00 (national unmodified average) is used for MII assembly costs and local vendor quotes.
Subcontractor Overhead and Profit	It is assumed that home office OH is 8% and profit is 9% for the Prime Contractor. Professional labor overhead is 100%.
Prime Contractor Overhead and Profit	Allowances and items with mandated costs such as per diem do not have overhead and profit applied.
	Items previously developed by Anchor QEA already include contractor markups, therefore overhead and profit were not applied to those items.
	It is assumed that OH is 1% and profit is 0% for vendor quotes for treatment and disposal at offsite disposal facilities. It is assumed that OH is 5% and profit is 0% for quotes for all other material vendor quotes.
	Items developed using MII already include contractor markups such as overhead and profit, therefore additional overhead and profit were not applied in the PC OH and PC PF to those items.

TABLE CW-C14

Alternative C
Capital Cost Sub-Element
Mitigation

Cost Worksheet: **CW-C14**

COST WORKSHEET

Site: Portland Harbor Superfund Site
Location: Portland, Oregon
Phase: Feasibility Study
Base Year: 2016

Prepared By: JN **Date:** 3/4/2016
Checked By: AB **Date:** 3/7/2016

Work Statement:
This sub-element involves mitigation of shallow water and riverbank areas. It includes costs for on-site labor, equipment, and materials developed from previous work.
Quantity development presented in Appendix D.

Cost Analysis:
Cost for Mitigation (Lump Sum)

COST DATABASE CODE	DESCRIPTION	QTY	UNIT(S)	HPF	LABOR	ADJ LABOR	EQUIP	ADJ EQUIP	MATL	OTHER	UNMOD UC	UNMOD LIC	PC OH	PC PF	BUR LIC	COST SOURCE CITATION	COMMENTS
O3	Mitigation	**18**	AC	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$1,070,827.00	$1,070,827.00	$19,274,886.00	0%	0%	$19,274,886	O Other	Average cost of projects presented in Tables 6.1-1 and 6.1-4 of the Appendix M, Attachment 1, Anchor QEA FS (2010) as well as select other projects. See Calculations for derivation.
												TOTAL COST:			$19,274,886		

	Representative Unit Quantity	Unit(s)	Total Cost	Unit Cost
COST WORKSHEET SUMMARY	18	AC	$19,274,886	$1,070,827

Notes:
Further information about the development of cost worksheets can be found in Attachment A - Methodology and Organization of Detailed Cost Estimates.
The quantity bolded in the QTY column is the quantity selected as the representative unit quantity for this cost worksheet. If multiple quantities are bolded, the representative unit quantity is the sum of those quantities. When the LS unit is utilized, the default representative unit quantity is 1.
HTRW productivity factor is from Exhibit B-3 or B-4 of "A Guide to Developing and Documenting Cost Estimates During the Feasibility Study", EPA 2000
EPA developed project-specific unit costs using the Micro Computer Aided Cost Engineering System (MCACES) Second Generation (MII) software version 4.2, build 3

Cost Database Code:
The Cost Database Code is a reference code for linking with line item cost information with the cost source database and is not otherwise used within these cost worksheets. The following cost source database prefixes apply:
L (EPA-Derived Labor Unit Costs), M (Project-Specific Vendor Unit Costs), P (Previously Developed Unit Costs by Anchor QEA for Portland Harbor), A (EPA-Derived MII Unit Costs), O (Unit Costs from Other Projects/Sources)

Source of Cost Data:
For citation references, the following sources apply:
ALL (Allowance), FLC (www.flcdatacenter.com), LD (Costs Derived from Lower Duwamish Waterway Final Feasibility Study), MII (MII), O (Other), P (Previously Developed by Anchor QEA for Portland Harbor), and V (Vendor Quote)

Abbreviations:

QTY	Quantity	AC	Acres
EQUIP	Equipment	CLF	100 Linear Foot
MATL	Material	CY	Cubic Yard
HPF	HTRW Productivity Factor	DY	Days
ADJ LABOR	Adjusted Labor for HFP	EA	Each
ADJ EQUIP	Adjusted Equipment for HFP	FTE	Full Time Equivalent
UNMOD UC	Unmodified Unit Cost	HR	Hours
UNMOD LIC	Unmodified Line Item Cost	LB	Pounds
UNBUR LIC	Unburdened Line Item Cost	LCY	Loose Cubic Yard
PC OH	Prime Contractor Overhead	LF	Linear Foot
PC PF	Prime Contractor Profit	LS	Lump Sum
BUR LIC	Burdened Line Item Cost	MO	Month
		SF	Square Foot
		SY	Square Yard
		TON	Tons
		YR	Years

Cost Adjustment Checklist:	**NOTES:**
FACTOR:	Field work will be in Level "D" PPE.
H&S Productivity (labor and equipment only)	MII assembly costs include HPF adjustments.
Escalation to Base Year	2016 cost sources are not escalated (EF=1.00). All other costs are escalated based on the USACE CWCCIS, EM 1110-2-1304, Sept 2015.
Area Cost Factor	An AF of 1.05 is used for Oregon, except that an AF of 1.00 (national unmodified average) is used for MII assembly costs and local vendor quotes.
Subcontractor Overhead and Profit	It is assumed that home office OH is 8% and profit is 9% for the Prime Contractor. Professional labor overhead is 100%.
Prime Contractor Overhead and Profit	Allowances and items with mandated costs such as per diem do not have overhead and profit applied.
	Items previously developed by Anchor QEA already include contractor markups, therefore overhead and profit were not applied to those items.
	It is assumed that OH is 1% and profit is 0% for vendor quotes for treatment and disposal at offsite disposal facilities. It is assumed that OH is 5% and profit is 0% for quotes for all other material vendor quotes.
	Items developed using MII already include contractor markups such as overhead and profit, therefore additional overhead and profit were not applied in the PC OH and PC PF to those items.

TABLE CW-C15

Alternative C **Cost Worksheet:** **CW-C15**
Capital Cost Sub-Element
Sand Placement for Technology Assignments

COST WORKSHEET

Site: Portland Harbor Superfund Site
Location: Portland, Oregon
Phase: Feasibility Study
Base Year: 2016

Prepared By: JN **Date:** 3/4/2016
Checked By: AB **Date:** 3/7/2016

Work Statement:
This sub-element involves the placement of sand for the construction of capping areas. It includes placement of sand within confined areas, open areas, and riverbanks. It includes costs for on-site labor, equipment, and materials as well as recent vendor quotes.
Quantity development presented in Appendix D.

Cost Analysis:
Cost for Sand Placement for Technology Assignments (Lump Sum)

COST DATABASE CODE	DESCRIPTION	QTY	UNIT(S)	HPF	LABOR	ADJ LABOR	EQUIP	ADJ EQUIP	MATL	OTHER	UNMOD UC	UNMOD LIC	PC OH	PC PF	BUR LIC	COST SOURCE CITATION	COMMENTS
P1	Sand	**384,021**	LCY	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$19.75	$19.75	$7,584,414.75	0%	0%	$7,584,415	P Anchor QEA	Project-specific cost developed by Anchor QEA (2010) - see Backup Table 29A. Includes conversion from TON to LCY.
	Sand Placement (Riverbanks)																
A16	Material Placement (Confined)	48,255	CY	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$20.39	$20.39	$983,919.45	0%	0%	$983,919	MII MII	Project-specific unit cost developed in MII.
	Sand Placement (Confined)																
A16	Material Placement (Confined)	33,592	CY	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$20.39	$20.39	$684,940.88	0%	0%	$684,941	MII MII	Project-specific unit cost developed in MII.
	Sand Placement (Open Water)																
A15	Material Placement (Open)	302,174	CY	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$12.42	$12.42	$3,753,001.08	0%	0%	$3,753,001	MII MII	Project-specific unit cost developed in MII.
												TOTAL COST:			$13,006,276		

	Representative Unit Quantity	Unit(s)	Total Cost	Unit Cost
COST WORKSHEET SUMMARY	384,021	CY	$13,006,276	$33.87

Notes:
Further information about the development of cost worksheets can be found in Attachment A - Methodology and Organization of Detailed Cost Estimates.
The quantity bolded in the QTY column is the quantity selected as the representative unit quantity for this cost worksheet. If multiple quantities are bolded, the representative unit quantity is the sum of those quantities. When the LS unit is utilized, the default representative unit quantity is 1.
HTRW productivity factor is from Exhibit B-3 or B-4 of "A Guide to Developing and Documenting Cost Estimates During the Feasibility Study", EPA 2000
EPA developed project-specific unit costs using the Micro Computer Aided Cost Engineering System (MCACES) Second Generation (MII) software version 4.2, build 3

Cost Database Code:
The Cost Database Code is a reference code for linking with line item cost information with the cost source database and is not otherwise used within these cost worksheets. The following cost source database prefixes apply:
L (EPA-Derived Labor Unit Costs), M (Project-Specific Vendor Unit Costs), P (Previously Developed Unit Costs by Anchor QEA for Portland Harbor), A (EPA-Derived MII Unit Costs), O (Unit Costs from Other Projects/Sources)

Source of Cost Data:
For citation references, the following sources apply:
ALL (Allowance), FLC (www.flcdatacenter.com), LD (Costs Derived from Lower Duwamish Waterway Final Feasibility Study), MII (MII), O (Other), P (Previously Developed by Anchor QEA for Portland Harbor), and V (Vendor Quote)

Abbreviations:

QTY	Quantity	AC	Acres
EQUIP	Equipment	CLF	100 Linear Foot
MATL	Material	CY	Cubic Yard
HPF	HTRW Productivity Factor	DY	Days
ADJ LABOR	Adjusted Labor for HFP	EA	Each
ADJ EQUIP	Adjusted Equipment for HFP	FTE	Full Time Equivalent
UNMOD UC	Unmodified Unit Cost	HR	Hours
UNMOD LIC	Unmodified Line Item Cost	LB	Pounds
UNBUR LIC	Unburdened Line Item Cost	LCY	Loose Cubic Yard
PC OH	Prime Contractor Overhead	LF	Linear Foot
PC PF	Prime Contractor Profit	LS	Lump Sum
BUR LIC	Burdened Line Item Cost	MO	Month
		SF	Square Foot
		SY	Square Yard
		TON	Tons
		YR	Years

Cost Adjustment Checklist:	**NOTES:**
FACTOR:	Field work will be in Level "D" PPE.
H&S Productivity (labor and equipment only)	MII assembly costs include HPF adjustments.
Escalation to Base Year	2016 cost sources are not escalated (EF=1.00). All other costs are escalated based on the USACE CWCCIS, EM 1110-2-1304, Sept 2015.
Area Cost Factor	An AF of 1.05 is used for Oregon, except that an AF of 1.00 (national unmodified average) is used for MII assembly costs and local vendor quotes.
Subcontractor Overhead and Profit	It is assumed that home office OH is 8% and profit is 9% for the Prime Contractor. Professional labor overhead is 100%.
Prime Contractor Overhead and Profit	Allowances and items with mandated costs such as per diem do not have overhead and profit applied.
	Items previously developed by Anchor QEA already include contractor markups, therefore overhead and profit were not applied to those items.
	It is assumed that OH is 1% and profit is 0% for vendor quotes for treatment and disposal at offsite disposal facilities. It is assumed that OH is 5% and profit is 0% for quotes for all other material vendor quotes.
	Items developed using MII already include contractor markups such as overhead and profit, therefore additional overhead and profit were not applied in the PC OH and PC PF to those items.

TABLE CW-C16

Alternative C **Cost Worksheet:** **CW-C16**
Capital Cost Sub-Element
Beach Mix Placement for Technology Assignments

COST WORKSHEET

Site: Portland Harbor Superfund Site
Location: Portland, Oregon
Phase: Feasibility Study
Base Year: 2016

Prepared By: JN **Date:** 3/4/2016
Checked By: AB **Date:** 3/7/2016

Work Statement:
This sub-element involves the placement of beach mix for the construction of capping areas. It includes placement of beach mix within confined areas, open areas, and riverbanks. It includes costs for on-site labor, equipment, and materials as well as recent vendor quotes.
Quantity development presented in Appendix D.

Cost Analysis:
Cost for Beach Mix Placement for Technology Assignments (Lump Sum)

COST DATABASE CODE	DESCRIPTION	QTY	UNIT(S)	HPF	LABOR	ADJ LABOR	EQUIP	ADJ EQUIP	MATL	OTHER	UNMOD UC	UNMOD LIC	PC OH	PC PF	BUR LIC	COST SOURCE CITATION	COMMENTS
P3	ODOT 100 Beach Mix	**22,675**	LCY	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$57.69	$57.69	$1,308,120.75	0%	0%	$1,308,121	P Anchor QEA	Project-specific cost developed by Anchor QEA (2010) - see Backup Table 29A. Includes conversion from TON to LCY.
	Beach Mix Placement (Riverbanks)																
A16	Material Placement (Confined)	8,128	CY	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$20.39	$20.39	$165,729.92	0%	0%	$165,730	MII MII	Project-specific unit cost developed in MII.
	Beach Mix Placement (Confined)																
A16	Material Placement (Confined)	2,995	CY	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$20.39	$20.39	$61,068.05	0%	0%	$61,068	MII MII	Project-specific unit cost developed in MII.
	Beach Mix Placement (Open Water)																
A15	Material Placement (Open)	11,552	CY	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$12.42	$12.42	$143,475.84	0%	0%	$143,476	MII MII	Project-specific unit cost developed in MII.
												TOTAL COST:			$1,678,395		

	Representative Unit Quantity	Unit(s)	Total Cost	Unit Cost
COST WORKSHEET SUMMARY	22,675	CY	$1,678,395	$74.02

Notes:
Further information about the development of cost worksheets can be found in Attachment A - Methodology and Organization of Detailed Cost Estimates.
The quantity bolded in the QTY column is the quantity selected as the representative unit quantity for this cost worksheet. If multiple quantities are bolded, the representative unit quantity is the sum of those quantities. When the LS unit is utilized, the default representative unit quantity is 1.
HTRW productivity factor is from Exhibit B-3 or B-4 of "A Guide to Developing and Documenting Cost Estimates During the Feasibility Study", EPA 2000
EPA developed project-specific unit costs using the Micro Computer Aided Cost Engineering System (MCACES) Second Generation (MII) software version 4.2, build 3

Cost Database Code:
The Cost Database Code is a reference code for linking with line item cost information with the cost source database and is not otherwise used within these cost worksheets. The following cost source database prefixes apply:
L (EPA-Derived Labor Unit Costs), M (Project-Specific Vendor Unit Costs), P (Previously Developed Unit Costs by Anchor QEA for Portland Harbor), A (EPA-Derived MII Unit Costs), O (Unit Costs from Other Projects/Sources)

Source of Cost Data:
For citation references, the following sources apply:
ALL (Allowance), FLC (www.flcdatacenter.com), LD (Costs Derived from Lower Duwamish Waterway Final Feasibility Study), MII (MII), O (Other), P (Previously Developed by Anchor QEA for Portland Harbor), and V (Vendor Quote)

Abbreviations:

QTY	Quantity	AC	Acres
EQUIP	Equipment	CLF	100 Linear Foot
MATL	Material	CY	Cubic Yard
HPF	HTRW Productivity Factor	DY	Days
ADJ LABOR	Adjusted Labor for HFP	EA	Each
ADJ EQUIP	Adjusted Equipment for HFP	FTE	Full Time Equivalent
UNMOD UC	Unmodified Unit Cost	HR	Hours
UNMOD LIC	Unmodified Line Item Cost	LB	Pounds
UNBUR LIC	Unburdened Line Item Cost	LCY	Loose Cubic Yard
PC OH	Prime Contractor Overhead	LF	Linear Foot
PC PF	Prime Contractor Profit	LS	Lump Sum
BUR LIC	Burdened Line Item Cost	MO	Month
		SF	Square Foot
		SY	Square Yard
		TON	Tons
		YR	Years

Cost Adjustment Checklist:	**NOTES:**
FACTOR:	Field work will be in Level "D" PPE.
H&S Productivity (labor and equipment only)	MII assembly costs include HPF adjustments.
Escalation to Base Year	2016 cost sources are not escalated (EF=1.00). All other costs are escalated based on the USACE CWCCIS, EM 1110-2-1304, Sept 2015.
Area Cost Factor	An AF of 1.05 is used for Oregon, except that an AF of 1.00 (national unmodified average) is used for MII assembly costs and local vendor quotes.
Subcontractor Overhead and Profit	It is assumed that home office OH is 8% and profit is 9% for the Prime Contractor. Professional labor overhead is 100%.
Prime Contractor Overhead and Profit	Allowances and items with mandated costs such as per diem do not have overhead and profit applied.
	Items previously developed by Anchor QEA already include contractor markups, therefore overhead and profit were not applied to those items.
	It is assumed that OH is 1% and profit is 0% for vendor quotes for treatment and disposal at offsite disposal facilities. It is assumed that OH is 5% and profit is 0% for quotes for all other material vendor quotes.
	Items developed using MII already include contractor markups such as overhead and profit, therefore additional overhead and profit were not applied in the PC OH and PC PF to those items.

TABLE CW-C17

Alternative C **Cost Worksheet:** **CW-C17**
Capital Cost Sub-Element
Armor Placement for Technology Assignments

COST WORKSHEET

Site: Portland Harbor Superfund Site
Location: Portland, Oregon
Phase: Feasibility Study
Base Year: 2016

Prepared By: JN **Date:** 3/4/2016
Checked By: AB **Date:** 3/7/2016

Work Statement:
This sub-element involves the placement of armor for the construction of capping areas. It includes placement of armor within confined areas, open areas, and riverbanks. It includes costs for on-site labor, equipment, and materials as well as recent vendor quotes.
Quantity development presented in Appendix D.

Cost Analysis:
Cost for Armor Placement for Technology Assignments (Lump Sum)

COST DATABASE CODE	DESCRIPTION	QTY	UNIT(S)	HPF	LABOR	ADJ LABOR	EQUIP	ADJ EQUIP	MATL	OTHER	UNMOD UC	UNMOD LIC	PC OH	PC PF	BUR LIC	COST SOURCE CITATION	COMMENTS
P2	ODOT 200 Armor	**37,218**	LCY	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$57.69	$57.69	$2,147,106.42	0%	0%	$2,147,106	P Anchor QEA	Project-specific cost developed by Anchor QEA (2010) - see Backup Table 29A. Includes conversion from TON to LCY.
	Armor Placement (Riverbanks)																
A16	Material Placement (Confined)	1,576	CY	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$20.39	$20.39	$32,134.64	0%	0%	$32,135	MII MII	Project-specific unit cost developed in MII.
	Armor Placement (Confined)																
A16	Material Placement (Confined)	8,384	CY	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$20.39	$20.39	$170,949.76	0%	0%	$170,950	MII MII	Project-specific unit cost developed in MII.
	Armor Placement (Open Water)																
A15	Material Placement (Open)	27,258	CY	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$12.42	$12.42	$338,544.36	0%	0%	$338,544	MII MII	Project-specific unit cost developed in MII.
												TOTAL COST:			$2,688,735		

	Representative Unit Quantity	Unit(s)	Total Cost	Unit Cost
COST WORKSHEET SUMMARY	37,218	CY	$2,688,735	$72.24

Notes:
Further information about the development of cost worksheets can be found in Attachment A - Methodology and Organization of Detailed Cost Estimates.
The quantity bolded in the QTY column is the quantity selected as the representative unit quantity for this cost worksheet. If multiple quantities are bolded, the representative unit quantity is the sum of those quantities. When the LS unit is utilized, the default representative unit quantity is 1.
HTRW productivity factor is from Exhibit B-3 or B-4 of "A Guide to Developing and Documenting Cost Estimates During the Feasibility Study", EPA 2000
EPA developed project-specific unit costs using the Micro Computer Aided Cost Engineering System (MCACES) Second Generation (MII) software version 4.2, build 3

Cost Database Code:
The Cost Database Code is a reference code for linking with line item cost information with the cost source database and is not otherwise used within these cost worksheets. The following cost source database prefixes apply:
L (EPA-Derived Labor Unit Costs), M (Project-Specific Vendor Unit Costs), P (Previously Developed Unit Costs by Anchor QEA for Portland Harbor), A (EPA-Derived MII Unit Costs), O (Unit Costs from Other Projects/Sources)

Source of Cost Data:
For citation references, the following sources apply:
ALL (Allowance), FLC (www.flcdatacenter.com), LD (Costs Derived from Lower Duwamish Waterway Final Feasibility Study), MII (MII), O (Other), P (Previously Developed by Anchor QEA for Portland Harbor), and V (Vendor Quote)

Abbreviations:

QTY	Quantity	AC	Acres
EQUIP	Equipment	CLF	100 Linear Foot
MATL	Material	CY	Cubic Yard
HPF	HTRW Productivity Factor	DY	Days
ADJ LABOR	Adjusted Labor for HFP	EA	Each
ADJ EQUIP	Adjusted Equipment for HFP	FTE	Full Time Equivalent
UNMOD UC	Unmodified Unit Cost	HR	Hours
UNMOD LIC	Unmodified Line Item Cost	LB	Pounds
UNBUR LIC	Unburdened Line Item Cost	LCY	Loose Cubic Yard
PC OH	Prime Contractor Overhead	LF	Linear Foot
PC PF	Prime Contractor Profit	LS	Lump Sum
BUR LIC	Burdened Line Item Cost	MO	Month
		SF	Square Foot
		SY	Square Yard
		TON	Tons
		YR	Years

Cost Adjustment Checklist:	**NOTES:**
FACTOR:	Field work will be in Level "D" PPE.
H&S Productivity (labor and equipment only)	MII assembly costs include HPF adjustments.
Escalation to Base Year	2016 cost sources are not escalated (EF=1.00). All other costs are escalated based on the USACE CWCCIS, EM 1110-2-1304, Sept 2015.
Area Cost Factor	An AF of 1.05 is used for Oregon, except that an AF of 1.00 (national unmodified average) is used for MII assembly costs and local vendor quotes.
Subcontractor Overhead and Profit	It is assumed that home office OH is 8% and profit is 9% for the Prime Contractor. Professional labor overhead is 100%.
Prime Contractor Overhead and Profit	Allowances and items with mandated costs such as per diem do not have overhead and profit applied.
	Items previously developed by Anchor QEA already include contractor markups, therefore overhead and profit were not applied to those items.
	It is assumed that OH is 1% and profit is 0% for vendor quotes for treatment and disposal at offsite disposal facilities. It is assumed that OH is 5% and profit is 0% for quotes for all other material vendor quotes.
	Items developed using MII already include contractor markups such as overhead and profit, therefore additional overhead and profit were not applied in the PC OH and PC PF to those items.

TABLE CW-C18

Alternative C **Cost Worksheet:** **CW-C18**
Capital Cost Sub-Element
Reactive/GAC Placement for Technology Assignments

COST WORKSHEET

Site: Portland Harbor Superfund Site
Location: Portland, Oregon
Phase: Feasibility Study
Base Year: 2016

Prepared By: JN **Date:** 3/4/2016
Checked By: AB **Date:** 3/7/2016

Work Statement:
This sub-element involves the placement of the reactive layers for the construction of capping areas. It includes placement of the reactive layer within confined areas, open areas, and riverbanks. It includes costs for on-site labor, equipment, and materials as well as recent vendor quotes.
Quantity development presented in Appendix D.

Cost Analysis:
Cost for Reactive/GAC Placement for Technology Assignments (Lump Sum)

COST DATABASE CODE	DESCRIPTION	QTY	UNIT(S)	HPF	LABOR	ADJ LABOR	EQUIP	ADJ EQUIP	MATL	OTHER	UNMOD UC	UNMOD LIC	PC OH	PC PF	BUR LIC	COST SOURCE CITATION	COMMENTS
	AquaGate Reactive Layer																
M4	Carbon (AquaGate + PAC 10%)	57,038	TON	1.00	$0.00	$0.00	$0.00	$0.00	$456.30	$0.00	$456.30	$26,026,439.40	5%	0%	$27,327,761	V Vendor Quote	Project-specific vendor quote - AquaBlok 2015. Material cost is $/TON.
P1	Sand	60,385	LCY	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$19.75	$19.75	$1,192,603.75	0%	0%	$1,192,604	P Anchor QEA	Project-specific cost developed by Anchor QEA (2010) - see Backup Table 29A. Includes conversion from TON to LCY.
A3	Mixing Sand & Carbon for Reactive Layer	117,482	CY	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$4.76	$4.76	$559,214.32	0%	0%	$559,214	MII MII	Project-specific unit cost developed in MII.
A16	Material Placement (Confined)	14,417	CY	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$20.39	$20.39	$293,962.63	0%	0%	$293,963	MII MII	Project-specific unit cost developed in MII.
A15	Material Placement (Open)	103,065	CY	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$12.42	$12.42	$1,280,067.30	0%	0%	$1,280,067	MII MII	Project-specific unit cost developed in MII.
	AquaBlock																
M3	Carbon (AquaBlok)	2,244	TON	1.00	$0.00	$0.00	$0.00	$0.00	$202.80	$0.00	$202.80	$455,083.20	5%	0%	$477,837	V Vendor Quote	Project-specific vendor quote - AquaBlok 2015. Material cost is $/TON.
A16	Material Placement (Confined)	1,956	CY	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$20.39	$20.39	$39,882.84	0%	0%	$39,883	MII MII	Project-specific unit cost developed in MII.
												TOTAL COST:			$31,171,329		

	Representative Unit Quantity	Unit(s)	Total Cost	Unit Cost
COST WORKSHEET SUMMARY	1	LS	$31,171,329	$31,171,329

Notes:
Further information about the development of cost worksheets can be found in Attachment A - Methodology and Organization of Detailed Cost Estimates.
The quantity bolded in the QTY column is the quantity selected as the representative unit quantity for this cost worksheet. If multiple quantities are bolded, the representative unit quantity is the sum of those quantities. When the LS unit is utilized, the default representative unit quantity is 1.
HTRW productivity factor is from Exhibit B-3 or B-4 of "A Guide to Developing and Documenting Cost Estimates During the Feasibility Study", EPA 2000
EPA developed project-specific unit costs using the Micro Computer Aided Cost Engineering System (MCACES) Second Generation (MII) software version 4.2, build 3

Cost Database Code:
The Cost Database Code is a reference code for linking with line item cost information with the cost source database and is not otherwise used within these cost worksheets. The following cost source database prefixes apply:
L (EPA-Derived Labor Unit Costs), M (Project-Specific Vendor Unit Costs), P (Previously Developed Unit Costs by Anchor QEA for Portland Harbor), A (EPA-Derived MII Unit Costs), O (Unit Costs from Other Projects/Sources)

Source of Cost Data:
For citation references, the following sources apply:
ALL (Allowance), FLC (www.flcdatacenter.com), LD (Costs Derived from Lower Duwamish Waterway Final Feasibility Study), MII (MII), O (Other), P (Previously Developed by Anchor QEA for Portland Harbor), and V (Vendor Quote)

Abbreviations:

QTY	Quantity	AC	Acres
EQUIP	Equipment	CLF	100 Linear Foot
MATL	Material	CY	Cubic Yard
HPF	HTRW Productivity Factor	DY	Days
ADJ LABOR	Adjusted Labor for HFP	EA	Each
ADJ EQUIP	Adjusted Equipment for HFP	FTE	Full Time Equivalent
UNMOD UC	Unmodified Unit Cost	HR	Hours
UNMOD LIC	Unmodified Line Item Cost	LB	Pounds
UNBUR LIC	Unburdened Line Item Cost	LCY	Loose Cubic Yard
PC OH	Prime Contractor Overhead	LF	Linear Foot
PC PF	Prime Contractor Profit	LS	Lump Sum
BUR LIC	Burdened Line Item Cost	MO	Month
		SF	Square Foot
		SY	Square Yard
		TON	Tons
		YR	Years

Cost Adjustment Checklist:	**NOTES:**
FACTOR:	Field work will be in Level "D" PPE.
H&S Productivity (labor and equipment only)	MII assembly costs include HPF adjustments.
Escalation to Base Year	2016 cost sources are not escalated (EF=1.00). All other costs are escalated based on the USACE CWCCIS, EM 1110-2-1304, Sept 2015.
Area Cost Factor	An AF of 1.05 is used for Oregon, except that an AF of 1.00 (national unmodified average) is used for MII assembly costs and local vendor quotes.
Subcontractor Overhead and Profit	It is assumed that home office OH is 8% and profit is 9% for the Prime Contractor. Professional labor overhead is 100%.
Prime Contractor Overhead and Profit	Allowances and items with mandated costs such as per diem do not have overhead and profit applied.
	Items previously developed by Anchor QEA already include contractor markups, therefore overhead and profit were not applied to those items.
	It is assumed that OH is 1% and profit is 0% for vendor quotes for treatment and disposal at offsite disposal facilities. It is assumed that OH is 5% and profit is 0% for quotes for all other material vendor quotes.
	Items developed using MII already include contractor markups such as overhead and profit, therefore additional overhead and profit were not applied in the PC OH and PC PF to those items.

TABLE CW-C19

Alternative C **Cost Worksheet:** **CW-C19**
Capital Cost Sub-Element
Geofabric for Riverbanks

COST WORKSHEET

Site: Portland Harbor Superfund Site
Location: Portland, Oregon
Phase: Feasibility Study
Base Year: 2016

Prepared By: JN **Date:** 3/4/2016
Checked By: AB **Date:** 3/7/2016

Work Statement:
This sub-element involves the installation of geofabric along the riverbanks. It includes costs for on-site labor, equipment, and materials from recent vendor quotes.
Quantity development presented in Appendix D.

Cost Analysis:
Cost for Geofabric for Riverbanks (Lump Sum)

COST DATABASE CODE	DESCRIPTION	QTY	UNIT(S)	HPF	LABOR	ADJ LABOR	EQUIP	ADJ EQUIP	MATL	OTHER	UNMOD UC	UNMOD LIC	PC OH	PC PF	BUR LIC	COST SOURCE CITATION	COMMENTS
O7	Geotextile Installation	**12.0**	AC	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$7,074.14	$7,074.14	$84,889.73	8%	9%	$99,932	V Vendor Quote	Vendor Quote - Geo-Synthetics (2014). Includes labor and equipment for installation
O6	Geotextile Material	12.0	AC	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$5,698.62	$5,698.62	$68,383.39	5%	0%	$71,803	V Vendor Quote	Vendor quote obtained for project of similar scope - Geo-Synthetics, 2014.
												TOTAL COST:			$171,735		

	Representative Unit Quantity	Unit(s)	Total Cost	Unit Cost
COST WORKSHEET SUMMARY	12.0	AC	$171,735	$14,311

Notes:
Further information about the development of cost worksheets can be found in Attachment A - Methodology and Organization of Detailed Cost Estimates.
The quantity bolded in the QTY column is the quantity selected as the representative unit quantity for this cost worksheet. If multiple quantities are bolded, the representative unit quantity is the sum of those quantities. When the LS unit is utilized, the default representative unit quantity is 1.
HTRW productivity factor is from Exhibit B-3 or B-4 of "A Guide to Developing and Documenting Cost Estimates During the Feasibility Study", EPA 2000
EPA developed project-specific unit costs using the Micro Computer Aided Cost Engineering System (MCACES) Second Generation (MII) software version 4.2, build 3

Cost Database Code:
The Cost Database Code is a reference code for linking with line item cost information with the cost source database and is not otherwise used within these cost worksheets. The following cost source database prefixes apply:
L (EPA-Derived Labor Unit Costs), M (Project-Specific Vendor Unit Costs), P (Previously Developed Unit Costs by Anchor QEA for Portland Harbor), A (EPA-Derived MII Unit Costs), O (Unit Costs from Other Projects/Sources)

Source of Cost Data:
For citation references, the following sources apply:
ALL (Allowance), FLC (www.flcdatacenter.com), LD (Costs Derived from Lower Duwamish Waterway Final Feasibility Study), MII (MII), O (Other), P (Previously Developed by Anchor QEA for Portland Harbor), and V (Vendor Quote)

Abbreviations:

QTY	Quantity	AC	Acres
EQUIP	Equipment	CLF	100 Linear Foot
MATL	Material	CY	Cubic Yard
HPF	HTRW Productivity Factor	DY	Days
ADJ LABOR	Adjusted Labor for HFP	EA	Each
ADJ EQUIP	Adjusted Equipment for HFP	FTE	Full Time Equivalent
UNMOD UC	Unmodified Unit Cost	HR	Hours
UNMOD LIC	Unmodified Line Item Cost	LB	Pounds
UNBUR LIC	Unburdened Line Item Cost	LCY	Loose Cubic Yard
PC OH	Prime Contractor Overhead	LF	Linear Foot
PC PF	Prime Contractor Profit	LS	Lump Sum
BUR LIC	Burdened Line Item Cost	MO	Month
		SF	Square Foot
		SY	Square Yard
		TON	Tons
		YR	Years

Cost Adjustment Checklist:	**NOTES:**
FACTOR:	Field work will be in Level "D" PPE.
H&S Productivity (labor and equipment only)	MII assembly costs include HPF adjustments.
Escalation to Base Year	2016 cost sources are not escalated (EF=1.00). All other costs are escalated based on the USACE CWCCIS, EM 1110-2-1304, Sept 2015.
Area Cost Factor	An AF of 1.05 is used for Oregon, except that an AF of 1.00 (national unmodified average) is used for MII assembly costs and local vendor quotes.
Subcontractor Overhead and Profit	It is assumed that home office OH is 8% and profit is 9% for the Prime Contractor. Professional labor overhead is 100%.
Prime Contractor Overhead and Profit	Allowances and items with mandated costs such as per diem do not have overhead and profit applied.
	Items previously developed by Anchor QEA already include contractor markups, therefore overhead and profit were not applied to those items.
	It is assumed that OH is 1% and profit is 0% for vendor quotes for treatment and disposal at offsite disposal facilities. It is assumed that OH is 5% and profit is 0% for quotes for all other material vendor quotes.
	Items developed using MII already include contractor markups such as overhead and profit, therefore additional overhead and profit were not applied in the PC OH and PC PF to those items.

TABLE CW-C20

Alternative C **Cost Worksheet:** **CW-C20**
Capital Cost Sub-Element
Organoclay Mat Placement for Technology Assignments

COST WORKSHEET

Site: Portland Harbor Superfund Site
Location: Portland, Oregon
Phase: Feasibility Study
Base Year: 2016

Prepared By: JN **Date:** 3/4/2016
Checked By: AB **Date:** 3/7/2016

Work Statement:
This sub-element involves the placement of the organoclay mat for the construction of capping areas. It includes placement of the organoclay mat within confined areas, open areas, and riverbanks. It includes costs for on-site labor, equipment, and materials as well as recent vendor quotes.
Quantity development presented in Appendix D.

Cost Analysis:
Cost for Organoclay Mat Placement for Technology Assignments (Lump Sum)

COST DATABASE CODE	DESCRIPTION	QTY	UNIT(S)	HPF	LABOR	ADJ LABOR	EQUIP	ADJ EQUIP	MATL	OTHER	UNMOD UC	UNMOD LIC	PC OH	PC PF	BUR LIC	COST SOURCE CITATION	COMMENTS
A17	Organoclay Mat Placement	**174,300**	SF	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$3.35	$3.35	$583,905.00	0%	0%	$583,905	MII MII	Project-specific unit cost developed in MII.
P4	Organoclay Mat Material	174,300	SF	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$3.38	$3.38	$589,134.00	0%	0%	$589,134	P Anchor QEA	Project-specific cost developed by Anchor QEA (2010) - see Backup Table 29A.
												TOTAL COST:			$1,173,039		

	Representative Unit Quantity	Unit(s)	Total Cost	Unit Cost
COST WORKSHEET SUMMARY	174,300	SF	$1,173,039	$6.73

Notes:
Further information about the development of cost worksheets can be found in Attachment A - Methodology and Organization of Detailed Cost Estimates.
The quantity bolded in the QTY column is the quantity selected as the representative unit quantity for this cost worksheet. If multiple quantities are bolded, the representative unit quantity is the sum of those quantities. When the LS unit is utilized, the default representative unit quantity is 1.
HTRW productivity factor is from Exhibit B-3 or B-4 of "A Guide to Developing and Documenting Cost Estimates During the Feasibility Study", EPA 2000
EPA developed project-specific unit costs using the Micro Computer Aided Cost Engineering System (MCACES) Second Generation (MII) software version 4.2, build 3

Cost Database Code:
The Cost Database Code is a reference code for linking with line item cost information with the cost source database and is not otherwise used within these cost worksheets. The following cost source database prefixes apply:
L (EPA-Derived Labor Unit Costs), M (Project-Specific Vendor Unit Costs), P (Previously Developed Unit Costs by Anchor QEA for Portland Harbor), A (EPA-Derived MII Unit Costs), O (Unit Costs from Other Projects/Sources)

Source of Cost Data:
For citation references, the following sources apply:
ALL (Allowance), FLC (www.flcdatacenter.com), LD (Costs Derived from Lower Duwamish Waterway Final Feasibility Study), MII (MII), O (Other), P (Previously Developed by Anchor QEA for Portland Harbor), and V (Vendor Quote)

Abbreviations:

QTY	Quantity	AC	Acres
EQUIP	Equipment	CLF	100 Linear Foot
MATL	Material	CY	Cubic Yard
HPF	HTRW Productivity Factor	DY	Days
ADJ LABOR	Adjusted Labor for HFP	EA	Each
ADJ EQUIP	Adjusted Equipment for HFP	FTE	Full Time Equivalent
UNMOD UC	Unmodified Unit Cost	HR	Hours
UNMOD LIC	Unmodified Line Item Cost	LB	Pounds
UNBUR LIC	Unburdened Line Item Cost	LCY	Loose Cubic Yard
PC OH	Prime Contractor Overhead	LF	Linear Foot
PC PF	Prime Contractor Profit	LS	Lump Sum
BUR LIC	Burdened Line Item Cost	MO	Month
		SF	Square Foot
		SY	Square Yard
		TON	Tons
		YR	Years

Cost Adjustment Checklist:	**NOTES:**
FACTOR:	Field work will be in Level "D" PPE.
H&S Productivity (labor and equipment only)	MII assembly costs include HPF adjustments.
Escalation to Base Year	2016 cost sources are not escalated (EF=1.00). All other costs are escalated based on the USACE CWCCIS, EM 1110-2-1304, Sept 2015.
Area Cost Factor	An AF of 1.05 is used for Oregon, except that an AF of 1.00 (national unmodified average) is used for MII assembly costs and local vendor quotes.
Subcontractor Overhead and Profit	It is assumed that home office OH is 8% and profit is 9% for the Prime Contractor. Professional labor overhead is 100%.
Prime Contractor Overhead and Profit	Allowances and items with mandated costs such as per diem do not have overhead and profit applied.
	Items previously developed by Anchor QEA already include contractor markups, therefore overhead and profit were not applied to those items.
	It is assumed that OH is 1% and profit is 0% for vendor quotes for treatment and disposal at offsite disposal facilities. It is assumed that OH is 5% and profit is 0% for quotes for all other material vendor quotes.
	Items developed using MII already include contractor markups such as overhead and profit, therefore additional overhead and profit were not applied in the PC OH and PC PF to those items.

TABLE CW-C21

Alternative C
Capital Cost Sub-Element
Transload Facility Development

Cost Worksheet: **CW-C21**

COST WORKSHEET

Site: Portland Harbor Superfund Site
Location: Portland, Oregon
Phase: Feasibility Study
Base Year: 2016

Prepared By: JN **Date:** 3/4/2016
Checked By: AB **Date:** 3/7/2016

Work Statement:
This sub-element involves the development of a transload facility for facilitating offsite disposal of contaminated sediments. It includes costs for on-site labor, equipment, and materials developed from previous work. Transload facility is expected to be operated for 5 years, based on estimated construction duration. Property lease quantity (20 acres) adjusted for construction duration. Labor for the annual inspections is assumed to be 2.5 times full time equivalent. Environmental monitoring is assumed to be once per quarter year for construction duration.

Cost Analysis:
Cost for Transload Facility Development (Lump Sum)

COST DATABASE CODE	DESCRIPTION	QTY	UNIT(S)	HPF	LABOR	ADJ LABOR	EQUIP	ADJ EQUIP	MATL	OTHER	UNMOD UC	UNMOD LIC	PC OH	PC PF	BUR LIC	COST SOURCE CITATION	COMMENTS
	Transload Facility Development																
P31	Transload Facility Permitting	1	LS	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$45,080.00	$45,080.00	$45,080.00	0%	0%	$45,080	P Anchor QEA	Project-specific cost developed by Anchor QEA (2010) - see Backup Table 24.
P32	Transload Facility Development	1	LS	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$4,508,000.00	$4,508,000.00	$4,508,000.00	0%	0%	$4,508,000	P Anchor QEA	Project-specific cost developed by Anchor QEA (2010) - see Backup Table 24.
P33	Yearly Property Lease	100	AC	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$26,484.50	$26,484.50	$2,648,450.00	0%	0%	$2,648,450	P Anchor QEA	Developed by Anchor QEA (2010) - see Backup Table 24. Assumes leasing of 20 acres multiplied by estimated construction duration.
	Inspection and Monitoring of Transload Facility																
P34	Labor Inspections During Operations of Transload Facility	12.5	FTE	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$84,525.00	$84,525.00	$1,056,562.50	0%	0%	$1,056,563	P Anchor QEA	Developed by Anchor QEA (2010) - see Backup Table 24. Assumes 2.5 FTE/YR multiplied by estimated construction duration.
P35	Environmental Monitoring During Offloading at Transload Facility	20	MO	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$16,905.00	$16,905.00	$338,100.00	0%	0%	$338,100	P Anchor QEA	Developed by Anchor QEA (2010) - see Backup Table 24. Assumes 4 MO/YR multiplied by estimated construction duration.
P36	Inspection and Monitoring Reporting for Transload Facility	5	YR	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$45,080.00	$45,080.00	$225,400.00	0%	0%	$225,400	P Anchor QEA	Project-specific cost developed by Anchor QEA (2010) - see Backup Table 24.
												TOTAL COST:			$8,821,593		

	Representative Unit Quantity	Unit(s)	Total Cost	Unit Cost
COST WORKSHEET SUMMARY	1	LS	$8,821,593	$8,821,593

TABLE CW-C21

Alternative C
Capital Cost Sub-Element
Transload Facility Development

Cost Worksheet: **CW-C21**

COST WORKSHEET

Site: Portland Harbor Superfund Site
Location: Portland, Oregon
Phase: Feasibility Study
Base Year: 2016

Prepared By: JN **Date:** 3/4/2016
Checked By: AB **Date:** 3/7/2016

Notes:

Further information about the development of cost worksheets can be found in Attachment A - Methodology and Organization of Detailed Cost Estimates.
The quantity bolded in the QTY column is the quantity selected as the representative unit quantity for this cost worksheet. If multiple quantities are bolded, the representative unit quantity is the sum of those quantities. When the LS unit is utilized, the default representative unit quantity is 1.
HTRW productivity factor is from Exhibit B-3 or B-4 of "A Guide to Developing and Documenting Cost Estimates During the Feasibility Study", EPA 2000
EPA developed project-specific unit costs using the Micro Computer Aided Cost Engineering System (MCACES) Second Generation (MII) software version 4.2, build 3

Cost Database Code:

The Cost Database Code is a reference code for linking with line item cost information with the cost source database and is not otherwise used within these cost worksheets. The following cost source database prefixes apply:

L (EPA-Derived Labor Unit Costs), M (Project-Specific Vendor Unit Costs), P (Previously Developed Unit Costs by Anchor QEA for Portland Harbor), A (EPA-Derived MII Unit Costs), O (Unit Costs from Other Projects/Sources)

Source of Cost Data:

For citation references, the following sources apply:

ALL (Allowance), FLC (www.flcdatacenter.com), LD (Costs Derived from Lower Duwamish Waterway Final Feasibility Study), MII (MII), O (Other), P (Previously Developed by Anchor QEA for Portland Harbor), and V (Vendor Quote)

Abbreviations:

QTY	Quantity	AC	Acres
EQUIP	Equipment	CLF	100 Linear Foot
MATL	Material	CY	Cubic Yard
HPF	HTRW Productivity Factor	DY	Days
ADJ LABOR	Adjusted Labor for HFP	EA	Each
ADJ EQUIP	Adjusted Equipment for HFP	FTE	Full Time Equivalent
UNMOD UC	Unmodified Unit Cost	HR	Hours
UNMOD LIC	Unmodified Line Item Cost	LB	Pounds
UNBUR LIC	Unburdened Line Item Cost	LCY	Loose Cubic Yard
PC OH	Prime Contractor Overhead	LF	Linear Foot
PC PF	Prime Contractor Profit	LS	Lump Sum
BUR LIC	Burdened Line Item Cost	MO	Month
		SF	Square Foot
		SY	Square Yard
		TON	Tons
		YR	Years

Cost Adjustment Checklist:	**NOTES:**
FACTOR:	Field work will be in Level "D" PPE.
H&S Productivity (labor and equipment only)	MII assembly costs include HPF adjustments.
Escalation to Base Year	2016 cost sources are not escalated (EF=1.00). All other costs are escalated based on the USACE CWCCIS, EM 1110-2-1304, Sept 2015.
Area Cost Factor	An AF of 1.05 is used for Oregon, except that an AF of 1.00 (national unmodified average) is used for MII assembly costs and local vendor quotes.
Subcontractor Overhead and Profit	It is assumed that home office OH is 8% and profit is 9% for the Prime Contractor. Professional labor overhead is 100%.
Prime Contractor Overhead and Profit	Allowances and items with mandated costs such as per diem do not have overhead and profit applied.
	Items previously developed by Anchor QEA already include contractor markups, therefore overhead and profit were not applied to those items.
	It is assumed that OH is 1% and profit is 0% for vendor quotes for treatment and disposal at offsite disposal facilities. It is assumed that OH is 5% and profit is 0% for quotes for all other material vendor quotes.
	Items developed using MII already include contractor markups such as overhead and profit, therefore additional overhead and profit were not applied in the PC OH and PC PF to those items.

TABLE CW-C22

Alternative C **Cost Worksheet: CW-C22**
Capital and Periodic Cost Sub-Element
Monitored Natural Recovery (MNR) for MNR/Enhanced Natural Recovery (ENR) and Broadcast GAC Areas

COST WORKSHEET

Site: Portland Harbor Superfund Site
Location: Portland, Oregon
Phase: Feasibility Study
Base Year: 2016

Prepared By: JN **Date:** 3/4/2016
Checked By: AB **Date:** 3/7/2016

Work Statement:
This sub-element involves sampling as part of monitored natural recovery for MNR, ENR, and Broadcast GAC areas. It includes costs for on-site labor, equipment, and materials developed from previous work.
Quantity development presented in Appendix D.

Cost Analysis:
Cost for Monitored Natural Recovery for MNR/ENR and Broadcast GAC Areas (Lump Sum)

COST DATABASE CODE	DESCRIPTION	QTY	UNIT(S)	HPF	LABOR	ADJ LABOR	EQUIP	ADJ EQUIP	MATL	OTHER	UNMOD UC	UNMOD LIC	PC OH	PC PF	BUR LIC	COST SOURCE CITATION	COMMENTS
P25	Monitored Natural Recovery	**2,051**	AC	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$3,686.33	$3,686.33	$7,560,656.35	0%	0%	$7,560,656	P Anchor QEA	Project-specific cost developed by Anchor QEA (2010) - based on Backup Table 2.
												TOTAL COST:			$7,560,656		

	Representative Unit Quantity	Unit(s)	Total Cost	Unit Cost
COST WORKSHEET SUMMARY	2,051	AC	$7,560,656	$3,686

Notes:
Further information about the development of cost worksheets can be found in Attachment A - Methodology and Organization of Detailed Cost Estimates.
The quantity bolded in the QTY column is the quantity selected as the representative unit quantity for this cost worksheet. If multiple quantities are bolded, the representative unit quantity is the sum of those quantities. When the LS unit is utilized, the default representative unit quantity is 1.
HTRW productivity factor is from Exhibit B-3 or B-4 of "A Guide to Developing and Documenting Cost Estimates During the Feasibility Study", EPA 2000
EPA developed project-specific unit costs using the Micro Computer Aided Cost Engineering System (MCACES) Second Generation (MII) software version 4.2, build 3

Cost Database Code:
The Cost Database Code is a reference code for linking with line item cost information with the cost source database and is not otherwise used within these cost worksheets. The following cost source database prefixes apply:
L (EPA-Derived Labor Unit Costs), M (Project-Specific Vendor Unit Costs), P (Previously Developed Unit Costs by Anchor QEA for Portland Harbor), A (EPA-Derived MII Unit Costs), O (Unit Costs from Other Projects/Sources)

Source of Cost Data:
For citation references, the following sources apply:
ALL (Allowance), FLC (www.flcdatacenter.com), LD (Costs Derived from Lower Duwamish Waterway Final Feasibility Study), MII (MII), O (Other), P (Previously Developed by Anchor QEA for Portland Harbor), and V (Vendor Quote)

Abbreviations:

QTY	Quantity	AC	Acres
EQUIP	Equipment	CLF	100 Linear Foot
MATL	Material	CY	Cubic Yard
HPF	HTRW Productivity Factor	DY	Days
ADJ LABOR	Adjusted Labor for HFP	EA	Each
ADJ EQUIP	Adjusted Equipment for HFP	FTE	Full Time Equivalent
UNMOD UC	Unmodified Unit Cost	HR	Hours
UNMOD LIC	Unmodified Line Item Cost	LB	Pounds
UNBUR LIC	Unburdened Line Item Cost	LCY	Loose Cubic Yard
PC OH	Prime Contractor Overhead	LF	Linear Foot
PC PF	Prime Contractor Profit	LS	Lump Sum
BUR LIC	Burdened Line Item Cost	MO	Month
		SF	Square Foot
		SY	Square Yard
		TON	Tons
		YR	Years

Cost Adjustment Checklist:	**NOTES:**
FACTOR:	Field work will be in Level "D" PPE.
H&S Productivity (labor and equipment only)	MII assembly costs include HPF adjustments.
Escalation to Base Year	2016 cost sources are not escalated (EF=1.00). All other costs are escalated based on the USACE CWCCIS, EM 1110-2-1304, Sept 2015.
Area Cost Factor	An AF of 1.05 is used for Oregon, except that an AF of 1.00 (national unmodified average) is used for MII assembly costs and local vendor quotes.
Subcontractor Overhead and Profit	It is assumed that home office OH is 8% and profit is 9% for the Prime Contractor. Professional labor overhead is 100%.
Prime Contractor Overhead and Profit	Allowances and items with mandated costs such as per diem do not have overhead and profit applied.
	Items previously developed by Anchor QEA already include contractor markups, therefore overhead and profit were not applied to those items.
	It is assumed that OH is 1% and profit is 0% for vendor quotes for treatment and disposal at offsite disposal facilities. It is assumed that OH is 5% and profit is 0% for quotes for all other material vendor quotes.
	Items developed using MII already include contractor markups such as overhead and profit, therefore additional overhead and profit were not applied in the PC OH and PC PF to those items.

TABLE CW-C23

Alternative C
Periodic Cost Sub-Element
Site-Wide Monitoring

Cost Worksheet: **CW-C23**

COST WORKSHEET

Site: Portland Harbor Superfund Site
Location: Portland, Oregon
Phase: Feasibility Study
Base Year: 2016

Prepared By: JN **Date:** 3/4/2016
Checked By: AB **Date:** 3/7/2016

Work Statement:
This sub-element involves sampling, surveying, data management, and reporting as part of sitewide monitoring. It includes costs for on-site labor, equipment, and materials developed from previous work.

Cost Analysis:
Cost for Site-Wide Monitoring (Lump Sum)

COST DATABASE CODE	DESCRIPTION	QTY	UNIT(S)	HPF	LABOR	ADJ LABOR	EQUIP	ADJ EQUIP	MATL	OTHER	UNMOD UC	UNMOD LIC	PC OH	PC PF	BUR LIC	COST SOURCE CITATION	COMMENTS
	Site-Wide Monitoring																
P26	Sitewide Monitoring	1	LS	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$957,659.23	$957,659.23	$957,659.23	0%	0%	$957,659	P Anchor QEA	Project-specific cost developed by Anchor QEA (2010) - based on Backup Table 1.
												TOTAL COST:			$957,659		

	Representative Unit Quantity	Unit(s)	Total Cost	Unit Cost
COST WORKSHEET SUMMARY	1	LS	$957,659	$957,659

Notes:
Further information about the development of cost worksheets can be found in Attachment A - Methodology and Organization of Detailed Cost Estimates.
The quantity bolded in the QTY column is the quantity selected as the representative unit quantity for this cost worksheet. If multiple quantities are bolded, the representative unit quantity is the sum of those quantities. When the LS unit is utilized, the default representative unit quantity is 1.
HTRW productivity factor is from Exhibit B-3 or B-4 of "A Guide to Developing and Documenting Cost Estimates During the Feasibility Study", EPA 2000
EPA developed project-specific unit costs using the Micro Computer Aided Cost Engineering System (MCACES) Second Generation (MII) software version 4.2, build 3

Cost Database Code:
The Cost Database Code is a reference code for linking with line item cost information with the cost source database and is not otherwise used within these cost worksheets. The following cost source database prefixes apply:
L (EPA-Derived Labor Unit Costs), M (Project-Specific Vendor Unit Costs), P (Previously Developed Unit Costs by Anchor QEA for Portland Harbor), A (EPA-Derived MII Unit Costs), O (Unit Costs from Other Projects/Sources)

Source of Cost Data:
For citation references, the following sources apply:
ALL (Allowance), FLC (www.flcdatacenter.com), LD (Costs Derived from Lower Duwamish Waterway Final Feasibility Study), MII (MII), O (Other), P (Previously Developed by Anchor QEA for Portland Harbor), and V (Vendor Quote)

Abbreviations:

QTY	Quantity	AC	Acres
EQUIP	Equipment	CLF	100 Linear Foot
MATL	Material	CY	Cubic Yard
HPF	HTRW Productivity Factor	DY	Days
ADJ LABOR	Adjusted Labor for HFP	EA	Each
ADJ EQUIP	Adjusted Equipment for HFP	FTE	Full Time Equivalent
UNMOD UC	Unmodified Unit Cost	HR	Hours
UNMOD LIC	Unmodified Line Item Cost	LB	Pounds
UNBUR LIC	Unburdened Line Item Cost	LCY	Loose Cubic Yard
PC OH	Prime Contractor Overhead	LF	Linear Foot
PC PF	Prime Contractor Profit	LS	Lump Sum
BUR LIC	Burdened Line Item Cost	MO	Month
		SF	Square Foot
		SY	Square Yard
		TON	Tons
		YR	Years

Cost Adjustment Checklist:	**NOTES:**
FACTOR:	Field work will be in Level "D" PPE.
H&S Productivity (labor and equipment only)	MII assembly costs include HPF adjustments.
Escalation to Base Year	2016 cost sources are not escalated (EF=1.00). All other costs are escalated based on the USACE CWCCIS, EM 1110-2-1304, Sept 2015.
Area Cost Factor	An AF of 1.05 is used for Oregon, except that an AF of 1.00 (national unmodified average) is used for MII assembly costs and local vendor quotes.
Subcontractor Overhead and Profit	It is assumed that home office OH is 8% and profit is 9% for the Prime Contractor. Professional labor overhead is 100%.
Prime Contractor Overhead and Profit	Allowances and items with mandated costs such as per diem do not have overhead and profit applied.
	Items previously developed by Anchor QEA already include contractor markups, therefore overhead and profit were not applied to those items.
	It is assumed that OH is 1% and profit is 0% for vendor quotes for treatment and disposal at offsite disposal facilities. It is assumed that OH is 5% and profit is 0% for quotes for all other material vendor quotes.
	Items developed using MII already include contractor markups such as overhead and profit, therefore additional overhead and profit were not applied in the PC OH and PC PF to those items.

TABLE CW-C24

Alternative C **Cost Worksheet:** **CW-C24**
Periodic Cost Sub-Element
Cap Area Monitoring and Reactive Layer Monitoring

COST WORKSHEET

Site: Portland Harbor Superfund Site
Location: Portland, Oregon
Phase: Feasibility Study
Base Year: 2016

Prepared By: JN **Date:** 3/4/2016
Checked By: AB **Date:** 3/7/2016

Work Statement:
This sub-element involves sampling, surveying, data management, and reporting as part of cap and reactive layer monitoring. It includes costs for on-site labor, equipment, and materials developed from previous work.
Quantity development presented in Appendix D.

Cost Analysis:
Cost for Cap and Reactive Layer Monitoring (Lump Sum)

COST DATABASE CODE	DESCRIPTION	QTY	UNIT(S)	HPF	LABOR	ADJ LABOR	EQUIP	ADJ EQUIP	MATL	OTHER	UNMOD UC	UNMOD LIC	PC OH	PC PF	BUR LIC	COST SOURCE CITATION	COMMENTS
	Cap Area Monitoring																
P27	Cap Monitoring	91	AC	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$78,961.34	$78,961.34	$7,185,481.86	0%	0%	$7,185,482	P Anchor QEA	Project-specific cost developed by Anchor QEA (2010) - based on Backup Table 4.
	Reactive Layer Monitoring																
P28	Reactive Layer Monitoring	79	AC	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$88,968.76	$88,968.76	$7,028,532.12	0%	0%	$7,028,532	P Anchor QEA	Project-specific cost developed by Anchor QEA (2010) - based on Backup Table 3.
												TOTAL COST:			$14,214,014		

	Representative Unit Quantity	Unit(s)	Total Cost	Unit Cost
COST WORKSHEET SUMMARY	1	LS	$14,214,014	$14,214,014

Notes:
Further information about the development of cost worksheets can be found in Attachment A - Methodology and Organization of Detailed Cost Estimates.
The quantity bolded in the QTY column is the quantity selected as the representative unit quantity for this cost worksheet. If multiple quantities are bolded, the representative unit quantity is the sum of those quantities. When the LS unit is utilized, the default representative unit quantity is 1.
HTRW productivity factor is from Exhibit B-3 or B-4 of "A Guide to Developing and Documenting Cost Estimates During the Feasibility Study", EPA 2000
EPA developed project-specific unit costs using the Micro Computer Aided Cost Engineering System (MCACES) Second Generation (MII) software version 4.2, build 3

Cost Database Code:
The Cost Database Code is a reference code for linking with line item cost information with the cost source database and is not otherwise used within these cost worksheets. The following cost source database prefixes apply:
L (EPA-Derived Labor Unit Costs), M (Project-Specific Vendor Unit Costs), P (Previously Developed Unit Costs by Anchor QEA for Portland Harbor), A (EPA-Derived MII Unit Costs), O (Unit Costs from Other Projects/Sources)

Source of Cost Data:
For citation references, the following sources apply:
ALL (Allowance), FLC (www.flcdatacenter.com), LD (Costs Derived from Lower Duwamish Waterway Final Feasibility Study), MII (MII), O (Other), P (Previously Developed by Anchor QEA for Portland Harbor), and V (Vendor Quote)

Abbreviations:

QTY	Quantity	AC	Acres
EQUIP	Equipment	CLF	100 Linear Foot
MATL	Material	CY	Cubic Yard
HPF	HTRW Productivity Factor	DY	Days
ADJ LABOR	Adjusted Labor for HFP	EA	Each
ADJ EQUIP	Adjusted Equipment for HFP	FTE	Full Time Equivalent
UNMOD UC	Unmodified Unit Cost	HR	Hours
UNMOD LIC	Unmodified Line Item Cost	LB	Pounds
UNBUR LIC	Unburdened Line Item Cost	LCY	Loose Cubic Yard
PC OH	Prime Contractor Overhead	LF	Linear Foot
PC PF	Prime Contractor Profit	LS	Lump Sum
BUR LIC	Burdened Line Item Cost	MO	Month
		SF	Square Foot
		SY	Square Yard
		TON	Tons
		YR	Years

Cost Adjustment Checklist:	**NOTES:**
FACTOR:	Field work will be in Level "D" PPE.
H&S Productivity (labor and equipment only)	MII assembly costs include HPF adjustments.
Escalation to Base Year	2016 cost sources are not escalated (EF=1.00). All other costs are escalated based on the USACE CWCCIS, EM 1110-2-1304, Sept 2015.
Area Cost Factor	An AF of 1.05 is used for Oregon, except that an AF of 1.00 (national unmodified average) is used for MII assembly costs and local vendor quotes.
Subcontractor Overhead and Profit	It is assumed that home office OH is 8% and profit is 9% for the Prime Contractor. Professional labor overhead is 100%.
Prime Contractor Overhead and Profit	Allowances and items with mandated costs such as per diem do not have overhead and profit applied.
	Items previously developed by Anchor QEA already include contractor markups, therefore overhead and profit were not applied to those items.
	It is assumed that OH is 1% and profit is 0% for vendor quotes for treatment and disposal at offsite disposal facilities. It is assumed that OH is 5% and profit is 0% for quotes for all other material vendor quotes.
	Items developed using MII already include contractor markups such as overhead and profit, therefore additional overhead and profit were not applied in the PC OH and PC PF to those items.

TABLE CW-C25

Alternative C **Cost Worksheet:** **CW-C25**
Periodic Cost Sub-Element
Long-Term Maintenance for Capping, ENR, and In Situ Treatment

COST WORKSHEET

Site: Portland Harbor Superfund Site
Location: Portland, Oregon
Phase: Feasibility Study
Base Year: 2016

Prepared By: JN **Date:** 3/4/2016
Checked By: AB **Date:** 3/7/2016

Work Statement:
This sub-element involves replacement of 5% of the technology assignment layers as part of long-term maintenance. It includes costs for on-site labor, equipment, and materials developed from previous work.
Quantities represent 5% of material placement quantities which were developed and presented in Appendix D.

Cost Analysis:
Cost for Long-Term Maintenance (Lump Sum)

COST DATABASE CODE	DESCRIPTION	QTY	UNIT(S)	HPF	LABOR	ADJ LABOR	EQUIP	ADJ EQUIP	MATL	OTHER	UNMOD UC	UNMOD LIC	PC OH	PC PF	BUR LIC	COST SOURCE CITATION	COMMENTS
	Mobilization / Demobilization																
O2	Mobilization/Demobilization for Long Term Maintenance	1	LS	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$39,912.28	$39,912.28	$39,912.28	0%	0%	$39,912	LD Lower Duwamish	Assumes 1.6% of total capital costs per Lower Duwamish Feasibility Study. See Calculations for derivation.
	Sand Placement for Technology Assignments																
P1	Sand	19,201	LCY	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$19.75	$19.75	$379,219.75	0%	0%	$379,220	P Anchor QEA	Assume 5% of placement of additional material
	Sand Placement (Riverbanks)																
A16	Material Placement (Confined)	2,413	CY	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$20.39	$20.39	$49,201.07	0%	0%	$49,201	MII MII	Assume 5% of placement of additional material
	Sand Placement (Confined)																
A16	Material Placement (Confined)	1,680	CY	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$20.39	$20.39	$34,255.20	0%	0%	$34,255	MII MII	Assume 5% of placement of additional material
	Sand Placement (Open Water)																
A15	Material Placement (Open)	15,109	CY	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$12.42	$12.42	$187,653.78	0%	0%	$187,654	MII MII	Assume 5% of placement of additional material
	Beach Mix Placement for Technology Assignments																
P3	ODOT 100 Beach Mix	1,134	LCY	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$57.69	$57.69	$65,420.46	0%	0%	$65,420	P Anchor QEA	Assume 5% of placement of additional material
	Beach Mix Placement (Riverbanks)																
A16	Material Placement (Confined)	406	CY	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$20.39	$20.39	$8,278.34	0%	0%	$8,278	MII MII	Assume 5% of placement of additional material
	Beach Mix Placement (Confined)																
A16	Material Placement (Confined)	150	CY	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$20.39	$20.39	$3,058.50	0%	0%	$3,059	MII MII	Assume 5% of placement of additional material
	Beach Mix Placement (Open Water)																
A15	Material Placement (Open)	578	CY	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$12.42	$12.42	$7,178.76	0%	0%	$7,179	MII MII	Assume 5% of placement of additional material
	Armor Placement for Technology Assignments																
P2	ODOT 200 Armor	1,861	LCY	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$57.69	$57.69	$107,361.09	0%	0%	$107,361	P Anchor QEA	Assume 5% of placement of additional material
	Armor Placement (Riverbanks)																
A16	Material Placement (Confined)	79	CY	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$20.39	$20.39	$1,610.81	0%	0%	$1,611	MII MII	Assume 5% of placement of additional material
	Armor Placement (Confined)																
A16	Material Placement (Confined)	419	CY	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$20.39	$20.39	$8,543.41	0%	0%	$8,543	MII MII	Assume 5% of placement of additional material
	Armor Placement (Open Water)																
A15	Material Placement (Open)	1,363	CY	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$12.42	$12.42	$16,928.46	0%	0%	$16,928	MII MII	Assume 5% of placement of additional material
	Reactive/GAC Placement for Technology Assignments																
	AquaGate Reactive Layer																
M4	Carbon (AquaGate + PAC 10%)	2,852	TON	1.00	$0.00	$0.00	$0.00	$0.00	$456.30	$0.00	$456.30	$1,301,367.60	5%	0%	$1,366,436	V Vendor Quote	Assume 5% of placement of additional material
P1	Sand	3,019	LCY	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$19.75	$19.75	$59,625.25	0%	0%	$59,625	P Anchor QEA	Assume 5% of placement of additional material
A3	Mixing Sand & Carbon for Reactive Layer	5,874	CY	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$4.76	$4.76	$27,960.24	0%	0%	$27,960	MII MII	Assume 5% of placement of additional material
A16	Material Placement (Confined)	721	CY	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$20.39	$20.39	$14,701.19	0%	0%	$14,701	MII MII	Assume 5% of placement of additional material
A15	Material Placement (Open)	5,153	CY	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$12.42	$12.42	$64,000.26	0%	0%	$64,000	MII MII	Assume 5% of placement of additional material
	AquaBlock																
M3	Carbon (AquaBlok)	112	TON	1.00	$0.00	$0.00	$0.00	$0.00	$202.80	$0.00	$202.80	$22,713.60	5%	0%	$23,849	V Vendor Quote	Assume 5% of placement of additional material
A16	Material Placement (Confined)	98	CY	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$20.39	$20.39	$1,998.22	0%	0%	$1,998	MII MII	Assume 5% of placement of additional material

TABLE CW-C25

Alternative C **Cost Worksheet:** **CW-C25**
Periodic Cost Sub-Element
Long-Term Maintenance for Capping, ENR, and In Situ Treatment

COST WORKSHEET

Site: Portland Harbor Superfund Site
Location: Portland, Oregon
Phase: Feasibility Study
Base Year: 2016

Prepared By: JN **Date:** 3/4/2016
Checked By: AB **Date:** 3/7/2016

Work Statement:
This sub-element involves replacement of 5% of the technology assignment layers as part of long-term maintenance. It includes costs for on-site labor, equipment, and materials developed from previous work.
Quantities represent 5% of material placement quantities which were developed and presented in Appendix D.

Cost Analysis:
Cost for Long-Term Maintenance (Lump Sum)

COST DATABASE CODE	DESCRIPTION	QTY	UNIT(S)	HPF	LABOR	ADJ LABOR	EQUIP	ADJ EQUIP	MATL	OTHER	UNMOD UC	UNMOD LIC	PC OH	PC PF	BUR LIC	COST SOURCE CITATION	COMMENTS
	Geofabric for Riverbanks																
O7	Geotextile Installation	0.6	AC	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$7,074.14	$7,074.14	$4,244.49	8%	9%	$4,997	V Vendor Quote	Assume 5% of placement of additional material
O6	Geotextile Material	0.6	AC	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$5,698.62	$5,698.62	$3,419.17	5%	0%	$3,590	V Vendor Quote	Assume 5% of placement of additional material
	Organoclay Mat Placement for Technology Assignments																
A17	Organoclay Mat Placement	8,715	SF	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$3.35	$3.35	$29,195.25	0%	0%	$29,195	MII MII	Assume 5% of placement of additional material
P4	Organoclay Mat Material	8,715	SF	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$3.38	$3.38	$29,456.70	0%	0%	$29,457	P Anchor QEA	Assume 5% of placement of additional material
												TOTAL COST:			$2,534,429		

	Representative Unit Quantity	Unit(s)	Total Cost	Unit Cost
COST WORKSHEET SUMMARY	1	LS	$2,534,429	$2,534,429

Notes:
Further information about the development of cost worksheets can be found in Attachment A - Methodology and Organization of Detailed Cost Estimates.
The quantity bolded in the QTY column is the quantity selected as the representative unit quantity for this cost worksheet. If multiple quantities are bolded, the representative unit quantity is the sum of those quantities. When the LS unit is utilized, the default representative unit quantity is 1.
HTRW productivity factor is from Exhibit B-3 or B-4 of "A Guide to Developing and Documenting Cost Estimates During the Feasibility Study", EPA 2000
EPA developed project-specific unit costs using the Micro Computer Aided Cost Engineering System (MCACES) Second Generation (MII) software version 4.2, build 3

Cost Database Code:
The Cost Database Code is a reference code for linking with line item cost information with the cost source database and is not otherwise used within these cost worksheets. The following cost source database prefixes apply:
L (EPA-Derived Labor Unit Costs), M (Project-Specific Vendor Unit Costs), P (Previously Developed Unit Costs by Anchor QEA for Portland Harbor), A (EPA-Derived MII Unit Costs), O (Unit Costs from Other Projects/Sources)

Source of Cost Data:
For citation references, the following sources apply:
ALL (Allowance), FLC (www.flcdatacenter.com), LD (Costs Derived from Lower Duwamish Waterway Final Feasibility Study), MII (MII), O (Other), P (Previously Developed by Anchor QEA for Portland Harbor), and V (Vendor Quote)

Abbreviations:

QTY	Quantity	AC	Acres
EQUIP	Equipment	CLF	100 Linear Foot
MATL	Material	CY	Cubic Yard
HPF	HTRW Productivity Factor	DY	Days
ADJ LABOR	Adjusted Labor for HFP	EA	Each
ADJ EQUIP	Adjusted Equipment for HFP	FTE	Full Time Equivalent
UNMOD UC	Unmodified Unit Cost	HR	Hours
UNMOD LIC	Unmodified Line Item Cost	LB	Pounds
UNBUR LIC	Unburdened Line Item Cost	LCY	Loose Cubic Yard
PC OH	Prime Contractor Overhead	LF	Linear Foot
PC PF	Prime Contractor Profit	LS	Lump Sum
BUR LIC	Burdened Line Item Cost	MO	Month
		SF	Square Foot
		SY	Square Yard
		TON	Tons
		YR	Years

Cost Adjustment Checklist:	**NOTES:**
FACTOR:	Field work will be in Level "D" PPE.
H&S Productivity (labor and equipment only)	MII assembly costs include HPF adjustments.
Escalation to Base Year	2016 cost sources are not escalated (EF=1.00). All other costs are escalated based on the USACE CWCCIS, EM 1110-2-1304, Sept 2015.
Area Cost Factor	An AF of 1.05 is used for Oregon, except that an AF of 1.00 (national unmodified average) is used for MII assembly costs and local vendor quotes.
Subcontractor Overhead and Profit	It is assumed that home office OH is 8% and profit is 9% for the Prime Contractor. Professional labor overhead is 100%.
Prime Contractor Overhead and Profit	Allowances and items with mandated costs such as per diem do not have overhead and profit applied.
	Items previously developed by Anchor QEA already include contractor markups, therefore overhead and profit were not applied to those items.
	It is assumed that OH is 1% and profit is 0% for vendor quotes for treatment and disposal at offsite disposal facilities. It is assumed that OH is 5% and profit is 0% for quotes for all other material vendor quotes.
	Items developed using MII already include contractor markups such as overhead and profit, therefore additional overhead and profit were not applied in the PC OH and PC PF to those items.

TABLE CW-C26

Alternative C
Periodic Cost Sub-Element
5-Year Site Review

Cost Worksheet: **CW-C26**

COST WORKSHEET

Site: Portland Harbor Superfund Site
Location: Portland, Oregon
Phase: Feasibility Study
Base Year: 2016

Prepared By: JN **Date:** 3/4/2016
Checked By: AB **Date:** 3/7/2016

Work Statement:
This sub-element involves the site visit and 5-year site review report. The following cost includes labor, material and shipping costs for site visits and 5-year site review reports.

Cost Analysis:
Cost for 5-Year Site Review (Lump Sum)

COST DATABASE CODE	DESCRIPTION	QTY	UNIT(S)	HPF	LABOR	ADJ LABOR	EQUIP	ADJ EQUIP	MATL	OTHER	UNMOD UC	UNMOD LIC	PC OH	PC PF	BUR LIC	COST SOURCE CITATION	COMMENTS
L11	Project Manager	300	HR	1.00	$82.17	$82.17	$0.00	$0.00	$0.00	$0.00	$82.17	$24,651.00	100%	9%	$53,739	FLC FLCDataCenter	Project-specific unit cost developed by EPA.
L4	Environmental Engineer	600	HR	1.00	$48.91	$48.91	$0.00	$0.00	$0.00	$0.00	$48.91	$29,346.00	100%	9%	$63,974	FLC FLCDataCenter	Project-specific unit cost developed by EPA.
L6	Environmental Scientist	900	HR	1.00	$37.70	$37.70	$0.00	$0.00	$0.00	$0.00	$37.70	$33,930.00	100%	9%	$73,967	FLC FLCDataCenter	Project-specific unit cost developed by EPA.
L12	Quality Control Engineer	120	HR	1.00	$64.99	$64.99	$0.00	$0.00	$0.00	$0.00	$64.99	$7,798.80	100%	9%	$17,001	FLC FLCDataCenter	Project-specific unit cost developed by EPA.
L1	CAD Drafter	300	HR	1.00	$31.31	$31.31	$0.00	$0.00	$0.00	$0.00	$31.31	$9,393.00	100%	9%	$20,477	FLC FLCDataCenter	Project-specific unit cost developed by EPA.
L3	Clerks, Typist, Bookkeeper & Receptionist	300	HR	1.00	$19.89	$19.89	$0.00	$0.00	$0.00	$0.00	$19.89	$5,967.00	100%	9%	$13,008	FLC FLCDataCenter	Project-specific unit cost developed by EPA.
O4	Copy and Shipping Allowance	1	LS	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$1,521.00	$1,521.00	$1,521.00	0%	0%	$1,521	ALL Allowance	
												TOTAL COST:			$243,687		

	Representative Unit Quantity	Unit(s)	Total Cost	Unit Cost
COST WORKSHEET SUMMARY	1	LS	$243,687	$243,687

Notes:
Further information about the development of cost worksheets can be found in Attachment A - Methodology and Organization of Detailed Cost Estimates.
The quantity bolded in the QTY column is the quantity selected as the representative unit quantity for this cost worksheet. If multiple quantities are bolded, the representative unit quantity is the sum of those quantities. When the LS unit is utilized, the default representative unit quantity is 1.
HTRW productivity factor is from Exhibit B-3 or B-4 of "A Guide to Developing and Documenting Cost Estimates During the Feasibility Study", EPA 2000
EPA developed project-specific unit costs using the Micro Computer Aided Cost Engineering System (MCACES) Second Generation (MII) software version 4.2, build 3

Cost Database Code:
The Cost Database Code is a reference code for linking with line item cost information with the cost source database and is not otherwise used within these cost worksheets. The following cost source database prefixes apply:
L (EPA-Derived Labor Unit Costs), M (Project-Specific Vendor Unit Costs), P (Previously Developed Unit Costs by Anchor QEA for Portland Harbor), A (EPA-Derived MII Unit Costs), O (Unit Costs from Other Projects/Sources)

Source of Cost Data:
For citation references, the following sources apply:
ALL (Allowance), FLC (www.flcdatacenter.com), LD (Costs Derived from Lower Duwamish Waterway Final Feasibility Study), MII (MII), O (Other), P (Previously Developed by Anchor QEA for Portland Harbor), and V (Vendor Quote)

Abbreviations:

QTY	Quantity	AC	Acres
EQUIP	Equipment	CLF	100 Linear Foot
MATL	Material	CY	Cubic Yard
HPF	HTRW Productivity Factor	DY	Days
ADJ LABOR	Adjusted Labor for HFP	EA	Each
ADJ EQUIP	Adjusted Equipment for HFP	FTE	Full Time Equivalent
UNMOD UC	Unmodified Unit Cost	HR	Hours
UNMOD LIC	Unmodified Line Item Cost	LB	Pounds
UNBUR LIC	Unburdened Line Item Cost	LCY	Loose Cubic Yard
PC OH	Prime Contractor Overhead	LF	Linear Foot
PC PF	Prime Contractor Profit	LS	Lump Sum
BUR LIC	Burdened Line Item Cost	MO	Month
		SF	Square Foot
		SY	Square Yard
		TON	Tons
		YR	Years

Cost Adjustment Checklist:	**NOTES:**
FACTOR:	Field work will be in Level "D" PPE.
H&S Productivity (labor and equipment only)	MII assembly costs include HPF adjustments.
Escalation to Base Year	2016 cost sources are not escalated (EF=1.00). All other costs are escalated based on the USACE CWCCIS, EM 1110-2-1304, Sept 2015.
Area Cost Factor	An AF of 1.05 is used for Oregon, except that an AF of 1.00 (national unmodified average) is used for MII assembly costs and local vendor quotes.
Subcontractor Overhead and Profit	It is assumed that home office OH is 8% and profit is 9% for the Prime Contractor. Professional labor overhead is 100%.
Prime Contractor Overhead and Profit	Allowances and items with mandated costs such as per diem do not have overhead and profit applied.
	Items previously developed by Anchor QEA already include contractor markups, therefore overhead and profit were not applied to those items.
	It is assumed that OH is 1% and profit is 0% for vendor quotes for treatment and disposal at offsite disposal facilities. It is assumed that OH is 5% and profit is 0% for quotes for all other material vendor quotes.
	Items developed using MII already include contractor markups such as overhead and profit, therefore additional overhead and profit were not applied in the PC OH and PC PF to those items.

Cost Worksheets
Alternative D

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TABLE CW-D1

Alternative D **Cost Worksheet:** **CW-D1**
Capital Cost Sub-Element
Mobilization / Demobilization

COST WORKSHEET

Site: Portland Harbor Superfund Site
Location: Portland, Oregon
Phase: Feasibility Study
Base Year: 2016

Prepared By: JN **Date:** 3/4/2016
Checked By: AB **Date:** 3/7/2016

Work Statement:
This sub-element involves mobilization and demobilization of all the required equipment to and from the site respectively.

Cost Analysis:
Cost for Mobilization/Demobilization (Lump Sum)

COST DATABASE CODE	DESCRIPTION	QTY	UNIT(S)	HPF	LABOR	ADJ LABOR	EQUIP	ADJ EQUIP	MATL	OTHER	UNMOD UC	UNMOD LIC	PC OH	PC PF	BUR LIC	COST SOURCE CITATION	COMMENTS
O1	Mobilization/Demobilization	1	LS	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$6,653,000.00	$6,653,000.00	$6,653,000.00	0%	0%	$6,653,000	LD Lower Duwamish	Assumes 1.6% of total capital costs per Lower Duwamish Feasibility Study. See Calculations for derivation.
												TOTAL COST:			$6,653,000		

	Representative Unit Quantity	Unit(s)	Total Cost	Unit Cost
COST WORKSHEET SUMMARY	1	LS	$6,653,000	$6,653,000

Notes:
Further information about the development of cost worksheets can be found in Attachment A - Methodology and Organization of Detailed Cost Estimates.
The quantity bolded in the QTY column is the quantity selected as the representative unit quantity for this cost worksheet. If multiple quantities are bolded, the representative unit quantity is the sum of those quantities. When the LS unit is utilized, the default representative unit quantity is 1.
HTRW productivity factor is from Exhibit B-3 or B-4 of "A Guide to Developing and Documenting Cost Estimates During the Feasibility Study", EPA 2000
EPA developed project-specific unit costs using the Micro Computer Aided Cost Engineering System (MCACES) Second Generation (MII) software version 4.2, build 3

Cost Database Code:
The Cost Database Code is a reference code for linking with line item cost information with the cost source database and is not otherwise used within these cost worksheets. The following cost source database prefixes apply:
L (EPA-Derived Labor Unit Costs), M (Project-Specific Vendor Unit Costs), P (Previously Developed Unit Costs by Anchor QEA for Portland Harbor), A (EPA-Derived MII Unit Costs), O (Unit Costs from Other Projects/Sources)

Source of Cost Data:
For citation references, the following sources apply:
ALL (Allowance), FLC (www.flcdatacenter.com), LD (Costs Derived from Lower Duwamish Waterway Final Feasibility Study), MII (MII), O (Other), P (Previously Developed by Anchor QEA for Portland Harbor), and V (Vendor Quote)

Abbreviations:

QTY	Quantity	AC	Acres
EQUIP	Equipment	CLF	100 Linear Foot
MATL	Material	CY	Cubic Yard
HPF	HTRW Productivity Factor	DY	Days
ADJ LABOR	Adjusted Labor for HFP	EA	Each
ADJ EQUIP	Adjusted Equipment for HFP	FTE	Full Time Equivalent
UNMOD UC	Unmodified Unit Cost	HR	Hours
UNMOD LIC	Unmodified Line Item Cost	LB	Pounds
UNBUR LIC	Unburdened Line Item Cost	LCY	Loose Cubic Yard
PC OH	Prime Contractor Overhead	LF	Linear Foot
PC PF	Prime Contractor Profit	LS	Lump Sum
BUR LIC	Burdened Line Item Cost	MO	Month
		SF	Square Foot
		SY	Square Yard
		TON	Tons
		YR	Years

Cost Adjustment Checklist:	**NOTES:**
FACTOR:	Field work will be in Level "D" PPE.
H&S Productivity (labor and equipment only)	MII assembly costs include HPF adjustments.
Escalation to Base Year	2016 cost sources are not escalated (EF=1.00). All other costs are escalated based on the USACE CWCCIS, EM 1110-2-1304, Sept 2015.
Area Cost Factor	An AF of 1.05 is used for Oregon, except that an AF of 1.00 (national unmodified average) is used for MII assembly costs and local vendor quotes.
Subcontractor Overhead and Profit	It is assumed that home office OH is 8% and profit is 9% for the Prime Contractor. Professional labor overhead is 100%.
Prime Contractor Overhead and Profit	Allowances and items with mandated costs such as per diem do not have overhead and profit applied.
	Items previously developed by Anchor QEA already include contractor markups, therefore overhead and profit were not applied to those items.
	It is assumed that OH is 1% and profit is 0% for vendor quotes for treatment and disposal at offsite disposal facilities. It is assumed that OH is 5% and profit is 0% for quotes for all other material vendor quotes.
	Items developed using MII already include contractor markups such as overhead and profit, therefore additional overhead and profit were not applied in the PC OH and PC PF to those items.

TABLE CW-D2

Alternative D **Cost Worksheet:** **CW-D2**
Capital Cost Sub-Element
Initial Establishment of Institutional Controls

COST WORKSHEET

Site: Portland Harbor Superfund Site
Location: Portland, Oregon
Phase: Feasibility Study
Base Year: 2016

Prepared By: JN **Date:** 3/4/2016
Checked By: AB **Date:** 3/7/2016

Work Statement:
This sub-element involves implementation of institutional controls for the site. The following cost includes labor and materials to develop legal documents for institutional controls and cost for document submission and recording.
Quantity development presented in Appendix D.

Cost Analysis:
Cost for Initial Establishment of Institutional Controls (Lump Sum)

COST DATABASE CODE	DESCRIPTION	QTY	UNIT(S)	HPF	LABOR	ADJ LABOR	EQUIP	ADJ EQUIP	MATL	OTHER	UNMOD UC	UNMOD LIC	PC OH	PC PF	BUR LIC	COST SOURCE CITATION	COMMENTS
	Informational Devices - Fish Consumption Advisory																
L11	Project Manager	2,080	HR	1.00	$82.17	$82.17	$0.00	$0.00	$0.00	$0.00	$82.17	$170,913.60	100%	9%	$372,592	FLC FLCDataCenter	Assumes 1 FTE for implementation of fish advisory
L4	Environmental Engineer	1,040	HR	1.00	$48.91	$48.91	$0.00	$0.00	$0.00	$0.00	$48.91	$50,866.40	100%	9%	$110,889	FLC FLCDataCenter	Assumes 0.5 FTE for implementation of fish advisory
L6	Environmental Scientist	1,040	HR	1.00	$37.70	$37.70	$0.00	$0.00	$0.00	$0.00	$37.70	$39,208.00	100%	9%	$85,473	FLC FLCDataCenter	Assumes 0.5 FTE for implementation of fish advisory
L3	Clerks, Typist, Bookkeeper & Receptionist	520	HR	1.00	$19.89	$19.89	$0.00	$0.00	$0.00	$0.00	$19.89	$10,342.80	100%	9%	$22,547	FLC FLCDataCenter	Assumes 0.25 FTE for implementation of fish advisory
L5	Environmental Lawyer	260	HR	1.00	$71.72	$71.72	$0.00	$0.00	$0.00	$0.00	$71.72	$18,647.20	100%	9%	$40,651	FLC FLCDataCenter	Assumes 0.125 FTE for implementation of fish advisory
L13	Paralegal	260	HR	1.00	$29.56	$29.56	$0.00	$0.00	$0.00	$0.00	$29.56	$7,685.60	100%	9%	$16,755	FLC FLCDataCenter	Assumes 0.125 FTE for implementation of fish advisory
M26	Signage	50	EA	1.00	$0.00	$0.00	$0.00	$0.00	$165.75	$0.00	$165.75	$8,287.50	5%	0%	$8,702	V Vendor Quote	Project-specific vendor quote - Allstate Sign & Plaque, 2016. 36" x 36" Signs
L8	Field Technician	50	HR	1.00	$31.42	$31.42	$0.00	$0.00	$0.00	$0.00	$31.42	$1,571.00	100%	9%	$3,425	FLC FLCDataCenter	Assumes 1 hr/sign for sign placement (2 technician crew)
O5	Allowance for Production & Copies for Advisories	1	LS	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$1,000.00	$1,000.00	$1,000.00	0%	0%	$1,000	ALL Allowance	
	Informational Devices - Regulated Navigation Area (RNA) Setup																
L11	Project Manager	200	HR	1.00	$82.17	$82.17	$0.00	$0.00	$0.00	$0.00	$82.17	$16,434.00	100%	9%	$35,826	FLC FLCDataCenter	Project-specific unit cost developed by EPA.
L4	Environmental Engineer	150	HR	1.00	$48.91	$48.91	$0.00	$0.00	$0.00	$0.00	$48.91	$7,336.50	100%	9%	$15,994	FLC FLCDataCenter	Project-specific unit cost developed by EPA.
L3	Clerks, Typist, Bookkeeper & Receptionist	40	HR	1.00	$19.89	$19.89	$0.00	$0.00	$0.00	$0.00	$19.89	$795.60	100%	9%	$1,734	FLC FLCDataCenter	Project-specific unit cost developed by EPA.
A1	18' Boat	264	HR	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$25.42	$25.42	$6,710.88	0%	0%	$6,711	MII MII	Assumes 2 hr/buoy for buoy setup
L17	Boat Operator	264	HR	1.00	$33.16	$33.16	$0.00	$0.00	$0.00	$0.00	$33.16	$8,754.24	100%	9%	$19,084	FLC FLCDataCenter	Assumes 2 hr/buoy for buoy setup
L8	Field Technician	528	HR	1.00	$31.42	$31.42	$0.00	$0.00	$0.00	$0.00	$31.42	$16,589.76	100%	9%	$36,166	FLC FLCDataCenter	Assumes 4 hrs/buoy for buoy setup (2 technician crew)
M21	Buoy	132	EA	1.00	$0.00	$0.00	$0.00	$0.00	$558.63	$0.00	$558.63	$73,739.16	5%	0%	$77,426	V Vendor Quote	Project-specific vendor quote - Go2Marine, 2016.
	Proprietary Controls																
L5	Environmental Lawyer	3,750	HR	1.00	$71.72	$71.72	$0.00	$0.00	$0.00	$0.00	$71.72	$268,950.00	100%	9%	$586,311	FLC FLCDataCenter	Assumes 150 hrs per dock/structure
L13	Paralegal	5,000	HR	1.00	$29.56	$29.56	$0.00	$0.00	$0.00	$0.00	$29.56	$147,800.00	100%	9%	$322,204	FLC FLCDataCenter	Assumes 200 hrs per dock/structure
L3	Clerks, Typist, Bookkeeper & Receptionist	2,500	HR	1.00	$19.89	$19.89	$0.00	$0.00	$0.00	$0.00	$19.89	$49,725.00	100%	9%	$108,401	FLC FLCDataCenter	Assumes 100 hrs per dock/structure
	Enforcement Tools																
L11	Project Manager	260	HR	1.00	$82.17	$82.17	$0.00	$0.00	$0.00	$0.00	$82.17	$21,364.20	100%	9%	$46,574	FLC FLCDataCenter	Assumes 0.125 FTE for implementation of enforcement tools
L5	Environmental Lawyer	2,080	HR	1.00	$71.72	$71.72	$0.00	$0.00	$0.00	$0.00	$71.72	$149,177.60	100%	9%	$325,207	FLC FLCDataCenter	Assumes 1 FTE for implementation of enforcement tools
L13	Paralegal	4,160	HR	1.00	$29.56	$29.56	$0.00	$0.00	$0.00	$0.00	$29.56	$122,969.60	100%	9%	$268,074	FLC FLCDataCenter	Assumes 2 FTE for implementation of enforcement tools
L3	Clerks, Typist, Bookkeeper & Receptionist	260	HR	1.00	$19.89	$19.89	$0.00	$0.00	$0.00	$0.00	$19.89	$5,171.40	100%	9%	$11,274	FLC FLCDataCenter	Assumes 0.125 FTE for implementation of enforcement tools
												TOTAL COST:			$2,523,020		

	Representative Unit Quantity	Unit(s)	Total Cost	Unit Cost
COST WORKSHEET SUMMARY	1	LS	$2,523,020	$2,523,020

TABLE CW-D2

Alternative D **Cost Worksheet:** **CW-D2**
Capital Cost Sub-Element
Initial Establishment of Institutional Controls

COST WORKSHEET

Site: Portland Harbor Superfund Site
Location: Portland, Oregon
Phase: Feasibility Study
Base Year: 2016

Prepared By: JN **Date:** 3/4/2016
Checked By: AB **Date:** 3/7/2016

Notes:

Further information about the development of cost worksheets can be found in Attachment A - Methodology and Organization of Detailed Cost Estimates.
The quantity bolded in the QTY column is the quantity selected as the representative unit quantity for this cost worksheet. If multiple quantities are bolded, the representative unit quantity is the sum of those quantities. When the LS unit is utilized, the default representative unit quantity is 1.
HTRW productivity factor is from Exhibit B-3 or B-4 of "A Guide to Developing and Documenting Cost Estimates During the Feasibility Study", EPA 2000
EPA developed project-specific unit costs using the Micro Computer Aided Cost Engineering System (MCACES) Second Generation (MII) software version 4.2, build 3

Cost Database Code:

The Cost Database Code is a reference code for linking with line item cost information with the cost source database and is not otherwise used within these cost worksheets. The following cost source database prefixes apply:

L (EPA-Derived Labor Unit Costs), M (Project-Specific Vendor Unit Costs), P (Previously Developed Unit Costs by Anchor QEA for Portland Harbor), A (EPA-Derived MII Unit Costs), O (Unit Costs from Other Projects/Sources)

Source of Cost Data:

For citation references, the following sources apply:

ALL (Allowance), FLC (www.flcdatacenter.com), LD (Costs Derived from Lower Duwamish Waterway Final Feasibility Study), MII (MII), O (Other), P (Previously Developed by Anchor QEA for Portland Harbor), and V (Vendor Quote)

Abbreviations:

QTY	Quantity	AC	Acres
EQUIP	Equipment	CLF	100 Linear Foot
MATL	Material	CY	Cubic Yard
HPF	HTRW Productivity Factor	DY	Days
ADJ LABOR	Adjusted Labor for HFP	EA	Each
ADJ EQUIP	Adjusted Equipment for HFP	FTE	Full Time Equivalent
UNMOD UC	Unmodified Unit Cost	HR	Hours
UNMOD LIC	Unmodified Line Item Cost	LB	Pounds
UNBUR LIC	Unburdened Line Item Cost	LCY	Loose Cubic Yard
PC OH	Prime Contractor Overhead	LF	Linear Foot
PC PF	Prime Contractor Profit	LS	Lump Sum
BUR LIC	Burdened Line Item Cost	MO	Month
		SF	Square Foot
		SY	Square Yard
		TON	Tons
		YR	Years

Cost Adjustment Checklist:	**NOTES:**
FACTOR:	Field work will be in Level "D" PPE.
H&S Productivity (labor and equipment only)	MII assembly costs include HPF adjustments.
Escalation to Base Year	2016 cost sources are not escalated (EF=1.00). All other costs are escalated based on the USACE CWCCIS, EM 1110-2-1304, Sept 2015.
Area Cost Factor	An AF of 1.05 is used for Oregon, except that an AF of 1.00 (national unmodified average) is used for MII assembly costs and local vendor quotes.
Subcontractor Overhead and Profit	It is assumed that home office OH is 8% and profit is 9% for the Prime Contractor. Professional labor overhead is 100%.
Prime Contractor Overhead and Profit	Allowances and items with mandated costs such as per diem do not have overhead and profit applied.
	Items previously developed by Anchor QEA already include contractor markups, therefore overhead and profit were not applied to those items.
	It is assumed that OH is 1% and profit is 0% for vendor quotes for treatment and disposal at offsite disposal facilities. It is assumed that OH is 5% and profit is 0% for quotes for all other material vendor quotes.
	Items developed using MII already include contractor markups such as overhead and profit, therefore additional overhead and profit were not applied in the PC OH and PC PF to those items.

TABLE CW-D3

Alternative D **Cost Worksheet:** **CW-D3**

Periodic Cost Sub-Element

Evaluating and Updating Institutional Controls

COST WORKSHEET

Site: Portland Harbor Superfund Site
Location: Portland, Oregon
Phase: Feasibility Study
Base Year: 2016

Prepared By: JN **Date:** 3/4/2016
Checked By: AB **Date:** 3/7/2016

Work Statement:
This sub-element involves evaluating and updating of institutional controls for the site. The following cost includes labor and materials to required for evaluating and updating institutional controls every 5 years.
Quantity development presented in Appendix D.

Cost Analysis:
Cost for Evaluating and Updating Institutional Controls (Lump Sum)

COST DATABASE CODE	DESCRIPTION	QTY	UNIT(S)	HPF	LABOR	ADJ LABOR	EQUIP	ADJ EQUIP	MATL	OTHER	UNMOD UC	UNMOD LIC	PC OH	PC PF	BUR LIC	COST SOURCE CITATION	COMMENTS
	Informational Devices - Fish Consumption Advisory																
L11	Project Manager	208	HR	1.00	$82.17	$82.17	$0.00	$0.00	$0.00	$0.00	$82.17	$17,091.36	100%	9%	$37,259	FLC FLCDataCenter	Assumes 10% of initial costs for updating periodically
L4	Environmental Engineer	104	HR	1.00	$48.91	$48.91	$0.00	$0.00	$0.00	$0.00	$48.91	$5,086.64	100%	9%	$11,089	FLC FLCDataCenter	Assumes 10% of initial costs for updating periodically
L6	Environmental Scientist	104	HR	1.00	$37.70	$37.70	$0.00	$0.00	$0.00	$0.00	$37.70	$3,920.80	100%	9%	$8,547	FLC FLCDataCenter	Assumes 10% of initial costs for updating periodically
L3	Clerks, Typist, Bookkeeper & Receptionist	52	HR	1.00	$19.89	$19.89	$0.00	$0.00	$0.00	$0.00	$19.89	$1,034.28	100%	9%	$2,255	FLC FLCDataCenter	Assumes 10% of initial costs for updating periodically
L5	Environmental Lawyer	26	HR	1.00	$71.72	$71.72	$0.00	$0.00	$0.00	$0.00	$71.72	$1,864.72	100%	9%	$4,065	FLC FLCDataCenter	Assumes 10% of initial costs for updating periodically
L13	Paralegal	26	HR	1.00	$29.56	$29.56	$0.00	$0.00	$0.00	$0.00	$29.56	$768.56	100%	9%	$1,675	FLC FLCDataCenter	Assumes 10% of initial costs for updating periodically
M26	Signage	50	EA	1.00	$0.00	$0.00	$0.00	$0.00	$165.75	$0.00	$165.75	$8,287.50	5%	0%	$8,702	V Vendor Quote	Assumes 100% replacement of signs every 5 years
L8	Field Technician	50	HR	1.00	$31.42	$31.42	$0.00	$0.00	$0.00	$0.00	$31.42	$1,571.00	100%	9%	$3,425	FLC FLCDataCenter	Assumes 1 hr/sign for sign placement (2 technician crew)
O5	Allowance for Production & Copies for Advisories	5	LS	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$1,000.00	$1,000.00	$5,000.00	0%	0%	$5,000	ALL Allowance	Assumes yearly allowance for production and copies during 5-yr periodic updates
	Informational Devices - Regulated Navigation Area (RNA) Setup																
L11	Project Manager	200	HR	1.00	$82.17	$82.17	$0.00	$0.00	$0.00	$0.00	$82.17	$16,434.00	100%	9%	$35,826	FLC FLCDataCenter	Project-specific unit cost developed by EPA.
L4	Environmental Engineer	150	HR	1.00	$48.91	$48.91	$0.00	$0.00	$0.00	$0.00	$48.91	$7,336.50	100%	9%	$15,994	FLC FLCDataCenter	Project-specific unit cost developed by EPA.
L3	Clerks, Typist, Bookkeeper & Receptionist	40	HR	1.00	$19.89	$19.89	$0.00	$0.00	$0.00	$0.00	$19.89	$795.60	100%	9%	$1,734	FLC FLCDataCenter	Project-specific unit cost developed by EPA.
A1	18' Boat	264	HR	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$25.42	$25.42	$6,710.88	0%	0%	$6,711	MII MII	Assumes 2 hr/buoy for buoy setup
L17	Boat Operator	264	HR	1.00	$33.16	$33.16	$0.00	$0.00	$0.00	$0.00	$33.16	$8,754.24	100%	9%	$19,084	FLC FLCDataCenter	Assumes 2 hr/buoy for buoy setup
L8	Field Technician	528	HR	1.00	$31.42	$31.42	$0.00	$0.00	$0.00	$0.00	$31.42	$16,589.76	100%	9%	$36,166	FLC FLCDataCenter	Assumes 4 hrs/buoy for buoy setup (2 technician crew)
M21	Buoy	132	EA	1.00	$0.00	$0.00	$0.00	$0.00	$558.63	$0.00	$558.63	$73,739.16	5%	0%	$77,426	V Vendor Quote	Assumes 100% replacement of buoys every 5 years. Quote - Go2Marine 2016.
	Proprietary Controls																
L5	Environmental Lawyer	375	HR	1.00	$71.72	$71.72	$0.00	$0.00	$0.00	$0.00	$71.72	$26,895.00	100%	9%	$58,631	FLC FLCDataCenter	Assumes 10% of initial costs for updating periodically
L13	Paralegal	500	HR	1.00	$29.56	$29.56	$0.00	$0.00	$0.00	$0.00	$29.56	$14,780.00	100%	9%	$32,220	FLC FLCDataCenter	Assumes 10% of initial costs for updating periodically
L3	Clerks, Typist, Bookkeeper & Receptionist	250	HR	1.00	$19.89	$19.89	$0.00	$0.00	$0.00	$0.00	$19.89	$4,972.50	100%	9%	$10,840	FLC FLCDataCenter	Assumes 10% of initial costs for updating periodically
	Enforcement Tools																
L11	Project Manager	26	HR	1.00	$82.17	$82.17	$0.00	$0.00	$0.00	$0.00	$82.17	$2,136.42	100%	9%	$4,657	FLC FLCDataCenter	Assumes 10% of initial costs for updating periodically
L5	Environmental Lawyer	208	HR	1.00	$71.72	$71.72	$0.00	$0.00	$0.00	$0.00	$71.72	$14,917.76	100%	9%	$32,521	FLC FLCDataCenter	Assumes 10% of initial costs for updating periodically
L13	Paralegal	416	HR	1.00	$29.56	$29.56	$0.00	$0.00	$0.00	$0.00	$29.56	$12,296.96	100%	9%	$26,807	FLC FLCDataCenter	Assumes 10% of initial costs for updating periodically
L3	Clerks, Typist, Bookkeeper & Receptionist	26	HR	1.00	$19.89	$19.89	$0.00	$0.00	$0.00	$0.00	$19.89	$517.14	100%	9%	$1,127	FLC FLCDataCenter	Assumes 10% of initial costs for updating periodically
												TOTAL COST:			$441,761		

	Representative Unit Quantity	Unit(s)	Total Cost	Unit Cost
COST WORKSHEET SUMMARY	1	LS	$441,761	$441,761

TABLE CW-D3

Alternative D **Cost Worksheet:** **CW-D3**
Periodic Cost Sub-Element
Evaluating and Updating Institutional Controls

COST WORKSHEET

Site: Portland Harbor Superfund Site
Location: Portland, Oregon
Phase: Feasibility Study
Base Year: 2016

Prepared By: JN **Date:** 3/4/2016
Checked By: AB **Date:** 3/7/2016

Notes:

Further information about the development of cost worksheets can be found in Attachment A - Methodology and Organization of Detailed Cost Estimates.
The quantity bolded in the QTY column is the quantity selected as the representative unit quantity for this cost worksheet. If multiple quantities are bolded, the representative unit quantity is the sum of those quantities. When the LS unit is utilized, the default representative unit quantity is 1.
HTRW productivity factor is from Exhibit B-3 or B-4 of "A Guide to Developing and Documenting Cost Estimates During the Feasibility Study", EPA 2000
EPA developed project-specific unit costs using the Micro Computer Aided Cost Engineering System (MCACES) Second Generation (MII) software version 4.2, build 3

Cost Database Code:

The Cost Database Code is a reference code for linking with line item cost information with the cost source database and is not otherwise used within these cost worksheets. The following cost source database prefixes apply:

L (EPA-Derived Labor Unit Costs), M (Project-Specific Vendor Unit Costs), P (Previously Developed Unit Costs by Anchor QEA for Portland Harbor), A (EPA-Derived MII Unit Costs), O (Unit Costs from Other Projects/Sources)

Source of Cost Data:

For citation references, the following sources apply:

ALL (Allowance), FLC (www.flcdatacenter.com), LD (Costs Derived from Lower Duwamish Waterway Final Feasibility Study), MII (MII), O (Other), P (Previously Developed by Anchor QEA for Portland Harbor), and V (Vendor Quote)

Abbreviations:

QTY	Quantity	AC	Acres
EQUIP	Equipment	CLF	100 Linear Foot
MATL	Material	CY	Cubic Yard
HPF	HTRW Productivity Factor	DY	Days
ADJ LABOR	Adjusted Labor for HFP	EA	Each
ADJ EQUIP	Adjusted Equipment for HFP	FTE	Full Time Equivalent
UNMOD UC	Unmodified Unit Cost	HR	Hours
UNMOD LIC	Unmodified Line Item Cost	LB	Pounds
UNBUR LIC	Unburdened Line Item Cost	LCY	Loose Cubic Yard
PC OH	Prime Contractor Overhead	LF	Linear Foot
PC PF	Prime Contractor Profit	LS	Lump Sum
BUR LIC	Burdened Line Item Cost	MO	Month
		SF	Square Foot
		SY	Square Yard
		TON	Tons
		YR	Years

Cost Adjustment Checklist:	**NOTES:**
FACTOR:	Field work will be in Level "D" PPE.
H&S Productivity (labor and equipment only)	MII assembly costs include HPF adjustments.
Escalation to Base Year	2016 cost sources are not escalated (EF=1.00). All other costs are escalated based on the USACE CWCCIS, EM 1110-2-1304, Sept 2015.
Area Cost Factor	An AF of 1.05 is used for Oregon, except that an AF of 1.00 (national unmodified average) is used for MII assembly costs and local vendor quotes.
Subcontractor Overhead and Profit	It is assumed that home office OH is 8% and profit is 9% for the Prime Contractor. Professional labor overhead is 100%.
Prime Contractor Overhead and Profit	Allowances and items with mandated costs such as per diem do not have overhead and profit applied.
	Items previously developed by Anchor QEA already include contractor markups, therefore overhead and profit were not applied to those items.
	It is assumed that OH is 1% and profit is 0% for vendor quotes for treatment and disposal at offsite disposal facilities. It is assumed that OH is 5% and profit is 0% for quotes for all other material vendor quotes.
	Items developed using MII already include contractor markups such as overhead and profit, therefore additional overhead and profit were not applied in the PC OH and PC PF to those items.

TABLE CW-D5

Alternative D **Cost Worksheet:** **CW-D5**
Capital Cost Sub-Element
Debris Removal and Disposal

COST WORKSHEET

Site: Portland Harbor Superfund Site
Location: Portland, Oregon
Phase: Feasibility Study
Base Year: 2016

Prepared By: JN **Date:** 3/4/2016
Checked By: AB **Date:** 3/7/2016

Work Statement:
This sub-element involves removal and disposal of debris for all areas prior to remedial activities. It includes costs for on-site labor, equipment, and materials developed from previous work.
Quantity development presented in Appendix D.

Cost Analysis:
Cost for Debris Removal and Disposal (Lump Sum)

COST DATABASE CODE	DESCRIPTION	QTY	UNIT(S)	HPF	LABOR	ADJ LABOR	EQUIP	ADJ EQUIP	MATL	OTHER	UNMOD UC	UNMOD LIC	PC OH	PC PF	BUR LIC	COST SOURCE CITATION	COMMENTS
P9	Debris Removal and Disposal	**268**	AC	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$13,107.01	$13,107.01	$3,512,678.68	0%	0%	$3,512,679	P Anchor QEA	Project-specific cost developed by Anchor QEA (2010) - see Backup Table 2.
												TOTAL COST:			$3,512,679		

	Representative Unit Quantity	Unit(s)	Total Cost	Unit Cost
COST WORKSHEET SUMMARY	268	AC	$3,512,679	$13,107

Notes:
Further information about the development of cost worksheets can be found in Attachment A - Methodology and Organization of Detailed Cost Estimates.
The quantity bolded in the QTY column is the quantity selected as the representative unit quantity for this cost worksheet. If multiple quantities are bolded, the representative unit quantity is the sum of those quantities. When the LS unit is utilized, the default representative unit quantity is 1.
HTRW productivity factor is from Exhibit B-3 or B-4 of "A Guide to Developing and Documenting Cost Estimates During the Feasibility Study", EPA 2000
EPA developed project-specific unit costs using the Micro Computer Aided Cost Engineering System (MCACES) Second Generation (MII) software version 4.2, build 3

Cost Database Code:
The Cost Database Code is a reference code for linking with line item cost information with the cost source database and is not otherwise used within these cost worksheets. The following cost source database prefixes apply:
L (EPA-Derived Labor Unit Costs), M (Project-Specific Vendor Unit Costs), P (Previously Developed Unit Costs by Anchor QEA for Portland Harbor), A (EPA-Derived MII Unit Costs), O (Unit Costs from Other Projects/Sources)

Source of Cost Data:
For citation references, the following sources apply:
ALL (Allowance), FLC (www.flcdatacenter.com), LD (Costs Derived from Lower Duwamish Waterway Final Feasibility Study), MII (MII), O (Other), P (Previously Developed by Anchor QEA for Portland Harbor), and V (Vendor Quote)

Abbreviations:

QTY	Quantity	AC	Acres
EQUIP	Equipment	CLF	100 Linear Foot
MATL	Material	CY	Cubic Yard
HPF	HTRW Productivity Factor	DY	Days
ADJ LABOR	Adjusted Labor for HFP	EA	Each
ADJ EQUIP	Adjusted Equipment for HFP	FTE	Full Time Equivalent
UNMOD UC	Unmodified Unit Cost	HR	Hours
UNMOD LIC	Unmodified Line Item Cost	LB	Pounds
UNBUR LIC	Unburdened Line Item Cost	LCY	Loose Cubic Yard
PC OH	Prime Contractor Overhead	LF	Linear Foot
PC PF	Prime Contractor Profit	LS	Lump Sum
BUR LIC	Burdened Line Item Cost	MO	Month
		SF	Square Foot
		SY	Square Yard
		TON	Tons
		YR	Years

Cost Adjustment Checklist:	**NOTES:**
FACTOR:	Field work will be in Level "D" PPE.
H&S Productivity (labor and equipment only)	MII assembly costs include HPF adjustments.
Escalation to Base Year	2016 cost sources are not escalated (EF=1.00). All other costs are escalated based on the USACE CWCCIS, EM 1110-2-1304, Sept 2015.
Area Cost Factor	An AF of 1.05 is used for Oregon, except that an AF of 1.00 (national unmodified average) is used for MII assembly costs and local vendor quotes.
Subcontractor Overhead and Profit	It is assumed that home office OH is 8% and profit is 9% for the Prime Contractor. Professional labor overhead is 100%.
Prime Contractor Overhead and Profit	Allowances and items with mandated costs such as per diem do not have overhead and profit applied.
	Items previously developed by Anchor QEA already include contractor markups, therefore overhead and profit were not applied to those items.
	It is assumed that OH is 1% and profit is 0% for vendor quotes for treatment and disposal at offsite disposal facilities. It is assumed that OH is 5% and profit is 0% for quotes for all other material vendor quotes.
	Items developed using MII already include contractor markups such as overhead and profit, therefore additional overhead and profit were not applied in the PC OH and PC PF to those items.

TABLE CW-D6

Alternative D **Cost Worksheet:** **CW-D6**
Capital Cost Sub-Element
Obstruction Removal and Relocation

COST WORKSHEET

Site: Portland Harbor Superfund Site
Location: Portland, Oregon
Phase: Feasibility Study
Base Year: 2016

Prepared By: JN **Date:** 3/4/2016
Checked By: AB **Date:** 3/7/2016

Work Statement:
This sub-element involves all work related to obstructions removal, relocation, and disposal. It includes all costs for labor, equipment and materials developed from previous work for pile removal and disposal, pile replacement, and temporary dock relocation.
Quantity development presented in Appendix D.

Cost Analysis:
Cost for Obstructions (Lump Sum)

COST DATABASE CODE	DESCRIPTION	QTY	UNIT(S)	HPF	LABOR	ADJ LABOR	EQUIP	ADJ EQUIP	MATL	OTHER	UNMOD UC	UNMOD LIC	PC OH	PC PF	BUR LIC	COST SOURCE CITATION	COMMENTS
P10	Pile Removal and Disposal	748	EA	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$715.65	$715.65	$535,302.46	0%	0%	$535,302	P Anchor QEA	Project-specific cost developed by Anchor QEA (2010) - see Backup Table 3.
P11	Pile Replacement	748	EA	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$7,478.77	$7,478.77	$5,594,121.46	0%	0%	$5,594,121	P Anchor QEA	Project-specific cost developed by Anchor QEA (2010) - see Backup Table 4.
P12	Temporary Dock Relocation	8	EA	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$100,497.97	$100,497.97	$803,983.77	0%	0%	$803,984	P Anchor QEA	Project-specific cost developed by Anchor QEA (2010) - see Backup Table 5.
												TOTAL COST:			$6,933,407		

	Representative Unit Quantity	Unit(s)	Total Cost	Unit Cost
COST WORKSHEET SUMMARY	1	LS	$6,933,407	$6,933,407

Notes:
Further information about the development of cost worksheets can be found in Attachment A - Methodology and Organization of Detailed Cost Estimates.
The quantity bolded in the QTY column is the quantity selected as the representative unit quantity for this cost worksheet. If multiple quantities are bolded, the representative unit quantity is the sum of those quantities. When the LS unit is utilized, the default representative unit quantity is 1.
HTRW productivity factor is from Exhibit B-3 or B-4 of "A Guide to Developing and Documenting Cost Estimates During the Feasibility Study", EPA 2000
EPA developed project-specific unit costs using the Micro Computer Aided Cost Engineering System (MCACES) Second Generation (MII) software version 4.2, build 3

Cost Database Code:
The Cost Database Code is a reference code for linking with line item cost information with the cost source database and is not otherwise used within these cost worksheets. The following cost source database prefixes apply:
L (EPA-Derived Labor Unit Costs), M (Project-Specific Vendor Unit Costs), P (Previously Developed Unit Costs by Anchor QEA for Portland Harbor), A (EPA-Derived MII Unit Costs), O (Unit Costs from Other Projects/Sources)

Source of Cost Data:
For citation references, the following sources apply:
ALL (Allowance), FLC (www.flcdatacenter.com), LD (Costs Derived from Lower Duwamish Waterway Final Feasibility Study), MII (MII), O (Other), P (Previously Developed by Anchor QEA for Portland Harbor), and V (Vendor Quote)

Abbreviations:

QTY	Quantity	AC	Acres
EQUIP	Equipment	CLF	100 Linear Foot
MATL	Material	CY	Cubic Yard
HPF	HTRW Productivity Factor	DY	Days
ADJ LABOR	Adjusted Labor for HFP	EA	Each
ADJ EQUIP	Adjusted Equipment for HFP	FTE	Full Time Equivalent
UNMOD UC	Unmodified Unit Cost	HR	Hours
UNMOD LIC	Unmodified Line Item Cost	LB	Pounds
UNBUR LIC	Unburdened Line Item Cost	LCY	Loose Cubic Yard
PC OH	Prime Contractor Overhead	LF	Linear Foot
PC PF	Prime Contractor Profit	LS	Lump Sum
BUR LIC	Burdened Line Item Cost	MO	Month
		SF	Square Foot
		SY	Square Yard
		TON	Tons
		YR	Years

Cost Adjustment Checklist:	**NOTES:**
FACTOR:	Field work will be in Level "D" PPE.
H&S Productivity (labor and equipment only)	MII assembly costs include HPF adjustments.
Escalation to Base Year	2016 cost sources are not escalated (EF=1.00). All other costs are escalated based on the USACE CWCCIS, EM 1110-2-1304, Sept 2015.
Area Cost Factor	An AF of 1.05 is used for Oregon, except that an AF of 1.00 (national unmodified average) is used for MII assembly costs and local vendor quotes.
Subcontractor Overhead and Profit	It is assumed that home office OH is 8% and profit is 9% for the Prime Contractor. Professional labor overhead is 100%.
Prime Contractor Overhead and Profit	Allowances and items with mandated costs such as per diem do not have overhead and profit applied.
	Items previously developed by Anchor QEA already include contractor markups, therefore overhead and profit were not applied to those items.
	It is assumed that OH is 1% and profit is 0% for vendor quotes for treatment and disposal at offsite disposal facilities. It is assumed that OH is 5% and profit is 0% for quotes for all other material vendor quotes.
	Items developed using MII already include contractor markups such as overhead and profit, therefore additional overhead and profit were not applied in the PC OH and PC PF to those items.

TABLE CW-D7

Alternative D **Cost Worksheet:** **CW-D7**
Capital Cost Sub-Element
Erosion/Residual Control Measures

COST WORKSHEET

Site: Portland Harbor Superfund Site
Location: Portland, Oregon
Phase: Feasibility Study
Base Year: 2016

Prepared By: JN **Date:** 3/4/2016
Checked By: AB **Date:** 3/7/2016

Work Statement:
This sub-element involves the installation, maintainance, and removal of silt curtains and sheet pile walls for erosion and residual control. It includes costs for on-site labor, equipment, and materials developed from previous work.
Quantity development presented in Appendix D.

Cost Analysis:
Cost for Erosion/Residual Control Measures (Lump Sum)

COST DATABASE CODE	DESCRIPTION	QTY	UNIT(S)	HPF	LABOR	ADJ LABOR	EQUIP	ADJ EQUIP	MATL	OTHER	UNMOD UC	UNMOD LIC	PC OH	PC PF	BUR LIC	COST SOURCE CITATION	COMMENTS
P13	Purchase, Install and Maintain Silt Curtains	30,000	LF	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$96.92	$96.92	$2,907,660.00	0%	0%	$2,907,660	P Anchor QEA	Project-specific cost developed by Anchor QEA (2010) - see Backup Table 7.
P14	Purchase, Install and Remove Sheet Pile Walls	7,500	LF	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$2,749.88	$2,749.88	$20,624,100.00	0%	0%	$20,624,100	P Anchor QEA	Project-specific cost developed by Anchor QEA (2010) - see Backup Table 6.
												TOTAL COST:			$23,531,760		

	Representative Unit Quantity	Unit(s)	Total Cost	Unit Cost
COST WORKSHEET SUMMARY	1	LS	$23,531,760	$23,531,760

Notes:
Further information about the development of cost worksheets can be found in Attachment A - Methodology and Organization of Detailed Cost Estimates.
The quantity bolded in the QTY column is the quantity selected as the representative unit quantity for this cost worksheet. If multiple quantities are bolded, the representative unit quantity is the sum of those quantities. When the LS unit is utilized, the default representative unit quantity is 1.
HTRW productivity factor is from Exhibit B-3 or B-4 of "A Guide to Developing and Documenting Cost Estimates During the Feasibility Study", EPA 2000
EPA developed project-specific unit costs using the Micro Computer Aided Cost Engineering System (MCACES) Second Generation (MII) software version 4.2, build 3

Cost Database Code:
The Cost Database Code is a reference code for linking with line item cost information with the cost source database and is not otherwise used within these cost worksheets. The following cost source database prefixes apply:
L (EPA-Derived Labor Unit Costs), M (Project-Specific Vendor Unit Costs), P (Previously Developed Unit Costs by Anchor QEA for Portland Harbor), A (EPA-Derived MII Unit Costs), O (Unit Costs from Other Projects/Sources)

Source of Cost Data:
For citation references, the following sources apply:
ALL (Allowance), FLC (www.flcdatacenter.com), LD (Costs Derived from Lower Duwamish Waterway Final Feasibility Study), MII (MII), O (Other), P (Previously Developed by Anchor QEA for Portland Harbor), and V (Vendor Quote)

Abbreviations:

QTY	Quantity	AC	Acres
EQUIP	Equipment	CLF	100 Linear Foot
MATL	Material	CY	Cubic Yard
HPF	HTRW Productivity Factor	DY	Days
ADJ LABOR	Adjusted Labor for HFP	EA	Each
ADJ EQUIP	Adjusted Equipment for HFP	FTE	Full Time Equivalent
UNMOD UC	Unmodified Unit Cost	HR	Hours
UNMOD LIC	Unmodified Line Item Cost	LB	Pounds
UNBUR LIC	Unburdened Line Item Cost	LCY	Loose Cubic Yard
PC OH	Prime Contractor Overhead	LF	Linear Foot
PC PF	Prime Contractor Profit	LS	Lump Sum
BUR LIC	Burdened Line Item Cost	MO	Month
		SF	Square Foot
		SY	Square Yard
		TON	Tons
		YR	Years

Cost Adjustment Checklist:	NOTES:
FACTOR:	Field work will be in Level "D" PPE.
H&S Productivity (labor and equipment only)	MII assembly costs include HPF adjustments.
Escalation to Base Year	2016 cost sources are not escalated (EF=1.00). All other costs are escalated based on the USACE CWCCIS, EM 1110-2-1304, Sept 2015.
Area Cost Factor	An AF of 1.05 is used for Oregon, except that an AF of 1.00 (national unmodified average) is used for MII assembly costs and local vendor quotes.
Subcontractor Overhead and Profit	It is assumed that home office OH is 8% and profit is 9% for the Prime Contractor. Professional labor overhead is 100%.
Prime Contractor Overhead and Profit	Allowances and items with mandated costs such as per diem do not have overhead and profit applied.
	Items previously developed by Anchor QEA already include contractor markups, therefore overhead and profit were not applied to those items.
	It is assumed that OH is 1% and profit is 0% for vendor quotes for treatment and disposal at offsite disposal facilities. It is assumed that OH is 5% and profit is 0% for quotes for all other material vendor quotes.
	Items developed using MII already include contractor markups such as overhead and profit, therefore additional overhead and profit were not applied in the PC OH and PC PF to those items.

TABLE CW-D8

Alternative D **Cost Worksheet:** **CW-D8**
Capital Cost Sub-Element
Dredging of Contaminated Sediments (Open Water)

COST WORKSHEET

Site: Portland Harbor Superfund Site
Location: Portland, Oregon
Phase: Feasibility Study
Base Year: 2016

Prepared By: JN **Date:** 3/4/2016
Checked By: AB **Date:** 3/7/2016

Work Statement:
This sub-element involves mechanical dredging of contaminated sediments in open water areas and transport to dewatering/stabilization area. It includes costs for on-site labor, equipment, and materials for open water dredging, assuming a 10 CY barge mounted crane and clamshell.
Quantity development presented in Appendix D.

Cost Analysis:
Cost for Open Water Dredging (Lump Sum)

COST DATABASE CODE	DESCRIPTION	QTY	UNIT(S)	HPF	LABOR	ADJ LABOR	EQUIP	ADJ EQUIP	MATL	OTHER	UNMOD UC	UNMOD LIC	PC OH	PC PF	BUR LIC	COST SOURCE CITATION	COMMENTS
A6	Open Water Dredging	**1,035,580**	CY	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$24.53	$24.53	$25,402,777.40	0%	0%	$25,402,777	MII MII	Project-specific unit cost developed in MII.
												TOTAL COST:			$25,402,777		

	Representative Unit Quantity	Unit(s)	Total Cost	Unit Cost
COST WORKSHEET SUMMARY	1,035,580	CY	$25,402,777	$24.53

Notes:
Further information about the development of cost worksheets can be found in Attachment A - Methodology and Organization of Detailed Cost Estimates.
The quantity bolded in the QTY column is the quantity selected as the representative unit quantity for this cost worksheet. If multiple quantities are bolded, the representative unit quantity is the sum of those quantities. When the LS unit is utilized, the default representative unit quantity is 1.
HTRW productivity factor is from Exhibit B-3 or B-4 of "A Guide to Developing and Documenting Cost Estimates During the Feasibility Study", EPA 2000
EPA developed project-specific unit costs using the Micro Computer Aided Cost Engineering System (MCACES) Second Generation (MII) software version 4.2, build 3

Cost Database Code:
The Cost Database Code is a reference code for linking with line item cost information with the cost source database and is not otherwise used within these cost worksheets. The following cost source database prefixes apply:
L (EPA-Derived Labor Unit Costs), M (Project-Specific Vendor Unit Costs), P (Previously Developed Unit Costs by Anchor QEA for Portland Harbor), A (EPA-Derived MII Unit Costs), O (Unit Costs from Other Projects/Sources)

Source of Cost Data:
For citation references, the following sources apply:
ALL (Allowance), FLC (www.flcdatacenter.com), LD (Costs Derived from Lower Duwamish Waterway Final Feasibility Study), MII (MII), O (Other), P (Previously Developed by Anchor QEA for Portland Harbor), and V (Vendor Quote)

Abbreviations:

QTY	Quantity	AC	Acres
EQUIP	Equipment	CLF	100 Linear Foot
MATL	Material	CY	Cubic Yard
HPF	HTRW Productivity Factor	DY	Days
ADJ LABOR	Adjusted Labor for HFP	EA	Each
ADJ EQUIP	Adjusted Equipment for HFP	FTE	Full Time Equivalent
UNMOD UC	Unmodified Unit Cost	HR	Hours
UNMOD LIC	Unmodified Line Item Cost	LB	Pounds
UNBUR LIC	Unburdened Line Item Cost	LCY	Loose Cubic Yard
PC OH	Prime Contractor Overhead	LF	Linear Foot
PC PF	Prime Contractor Profit	LS	Lump Sum
BUR LIC	Burdened Line Item Cost	MO	Month
		SF	Square Foot
		SY	Square Yard
		TON	Tons
		YR	Years

Cost Adjustment Checklist:	**NOTES:**
FACTOR:	Field work will be in Level "D" PPE.
H&S Productivity (labor and equipment only)	MII assembly costs include HPF adjustments.
Escalation to Base Year	2016 cost sources are not escalated (EF=1.00). All other costs are escalated based on the USACE CWCCIS, EM 1110-2-1304, Sept 2015.
Area Cost Factor	An AF of 1.05 is used for Oregon, except that an AF of 1.00 (national unmodified average) is used for MII assembly costs and local vendor quotes.
Subcontractor Overhead and Profit	It is assumed that home office OH is 8% and profit is 9% for the Prime Contractor. Professional labor overhead is 100%.
Prime Contractor Overhead and Profit	Allowances and items with mandated costs such as per diem do not have overhead and profit applied.
	Items previously developed by Anchor QEA already include contractor markups, therefore overhead and profit were not applied to those items.
	It is assumed that OH is 1% and profit is 0% for vendor quotes for treatment and disposal at offsite disposal facilities. It is assumed that OH is 5% and profit is 0% for quotes for all other material vendor quotes.
	Items developed using MII already include contractor markups such as overhead and profit, therefore additional overhead and profit were not applied in the PC OH and PC PF to those items.

TABLE CW-D9

Alternative D **Cost Worksheet:** **CW-D9**
Capital Cost Sub-Element
Dredging of Contaminated Sediments (Confined)

COST WORKSHEET

Site: Portland Harbor Superfund Site
Location: Portland, Oregon
Phase: Feasibility Study
Base Year: 2016

Prepared By: JN **Date:** 3/4/2016
Checked By: AB **Date:** 3/7/2016

Work Statement:
This sub-element involves mechanical dredging of contaminated sediments in confined areas and transport to dewatering/stabilization area. It includes costs for on-site labor, equipment, and materials for confined dredging, assuming a 4 CY barge mounted excavator.
Quantity development presented in Appendix D.

Cost Analysis:
Cost for Confined Dredging (Lump Sum)

COST DATABASE CODE	DESCRIPTION	QTY	UNIT(S)	HPF	LABOR	ADJ LABOR	EQUIP	ADJ EQUIP	MATL	OTHER	UNMOD UC	UNMOD LIC	PC OH	PC PF	BUR LIC	COST SOURCE CITATION	COMMENTS
A7	Confined Dredging	**72,466**	CY	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$31.10	$31.10	$2,253,692.60	0%	0%	$2,253,693	MII MII	Project-specific unit cost developed in MII.
												TOTAL COST:			$2,253,693		

	Representative Unit Quantity	Unit(s)	Total Cost	Unit Cost
COST WORKSHEET SUMMARY	72,466	CY	$2,253,693	$31.10

Notes:
Further information about the development of cost worksheets can be found in Attachment A - Methodology and Organization of Detailed Cost Estimates.
The quantity bolded in the QTY column is the quantity selected as the representative unit quantity for this cost worksheet. If multiple quantities are bolded, the representative unit quantity is the sum of those quantities. When the LS unit is utilized, the default representative unit quantity is 1.
HTRW productivity factor is from Exhibit B-3 or B-4 of "A Guide to Developing and Documenting Cost Estimates During the Feasibility Study", EPA 2000
EPA developed project-specific unit costs using the Micro Computer Aided Cost Engineering System (MCACES) Second Generation (MII) software version 4.2, build 3

Cost Database Code:
The Cost Database Code is a reference code for linking with line item cost information with the cost source database and is not otherwise used within these cost worksheets. The following cost source database prefixes apply:
L (EPA-Derived Labor Unit Costs), M (Project-Specific Vendor Unit Costs), P (Previously Developed Unit Costs by Anchor QEA for Portland Harbor), A (EPA-Derived MII Unit Costs), O (Unit Costs from Other Projects/Sources)

Source of Cost Data:
For citation references, the following sources apply:
ALL (Allowance), FLC (www.flcdatacenter.com), LD (Costs Derived from Lower Duwamish Waterway Final Feasibility Study), MII (MII), O (Other), P (Previously Developed by Anchor QEA for Portland Harbor), and V (Vendor Quote)

Abbreviations:

QTY	Quantity	AC	Acres
EQUIP	Equipment	CLF	100 Linear Foot
MATL	Material	CY	Cubic Yard
HPF	HTRW Productivity Factor	DY	Days
ADJ LABOR	Adjusted Labor for HFP	EA	Each
ADJ EQUIP	Adjusted Equipment for HFP	FTE	Full Time Equivalent
UNMOD UC	Unmodified Unit Cost	HR	Hours
UNMOD LIC	Unmodified Line Item Cost	LB	Pounds
UNBUR LIC	Unburdened Line Item Cost	LCY	Loose Cubic Yard
PC OH	Prime Contractor Overhead	LF	Linear Foot
PC PF	Prime Contractor Profit	LS	Lump Sum
BUR LIC	Burdened Line Item Cost	MO	Month
		SF	Square Foot
		SY	Square Yard
		TON	Tons
		YR	Years

Cost Adjustment Checklist:	**NOTES:**
FACTOR:	Field work will be in Level "D" PPE.
H&S Productivity (labor and equipment only)	MII assembly costs include HPF adjustments.
Escalation to Base Year	2016 cost sources are not escalated (EF=1.00). All other costs are escalated based on the USACE CWCCIS, EM 1110-2-1304, Sept 2015.
Area Cost Factor	An AF of 1.05 is used for Oregon, except that an AF of 1.00 (national unmodified average) is used for MII assembly costs and local vendor quotes.
Subcontractor Overhead and Profit	It is assumed that home office OH is 8% and profit is 9% for the Prime Contractor. Professional labor overhead is 100%.
Prime Contractor Overhead and Profit	Allowances and items with mandated costs such as per diem do not have overhead and profit applied.
	Items previously developed by Anchor QEA already include contractor markups, therefore overhead and profit were not applied to those items.
	It is assumed that OH is 1% and profit is 0% for vendor quotes for treatment and disposal at offsite disposal facilities. It is assumed that OH is 5% and profit is 0% for quotes for all other material vendor quotes.
	Items developed using MII already include contractor markups such as overhead and profit, therefore additional overhead and profit were not applied in the PC OH and PC PF to those items.

TABLE CW-D10

Alternative D
Capital Cost Sub-Element
Excavation of Riverbanks

Cost Worksheet: **CW-D10**

COST WORKSHEET

Site: Portland Harbor Superfund Site
Location: Portland, Oregon
Phase: Feasibility Study
Base Year: 2016

Prepared By: JN **Date:** 3/4/2016
Checked By: AB **Date:** 3/7/2016

Work Statement:
This sub-element involves mechanical excavation of riverbank materials and transport to dewatering/stabilization area. It includes costs for on-site labor, equipment, and materials for riverbank excavation, assuming a 4 CY long-arm excavator.
Quantity development presented in Appendix D.

Cost Analysis:
Cost for Excavation from Shore for Riverbanks (Lump Sum)

COST DATABASE CODE	DESCRIPTION	QTY	UNIT(S)	HPF	LABOR	ADJ LABOR	EQUIP	ADJ EQUIP	MATL	OTHER	UNMOD UC	UNMOD LIC	PC OH	PC PF	BUR LIC	COST SOURCE CITATION	COMMENTS
A8	Riverbank Excavation	**73,192**	CY	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$5.19	$5.19	$379,864.29	0%	0%	$379,864	MII MII	Project-specific unit cost developed in MII.
												TOTAL COST:			$379,864		

	Representative Unit Quantity	Unit(s)	Total Cost	Unit Cost
COST WORKSHEET SUMMARY	73,192	CY	$379,864	$5.19

Notes:
Further information about the development of cost worksheets can be found in Attachment A - Methodology and Organization of Detailed Cost Estimates.
The quantity bolded in the QTY column is the quantity selected as the representative unit quantity for this cost worksheet. If multiple quantities are bolded, the representative unit quantity is the sum of those quantities. When the LS unit is utilized, the default representative unit quantity is 1.
HTRW productivity factor is from Exhibit B-3 or B-4 of "A Guide to Developing and Documenting Cost Estimates During the Feasibility Study", EPA 2000
EPA developed project-specific unit costs using the Micro Computer Aided Cost Engineering System (MCACES) Second Generation (MII) software version 4.2, build 3

Cost Database Code:
The Cost Database Code is a reference code for linking with line item cost information with the cost source database and is not otherwise used within these cost worksheets. The following cost source database prefixes apply:
L (EPA-Derived Labor Unit Costs), M (Project-Specific Vendor Unit Costs), P (Previously Developed Unit Costs by Anchor QEA for Portland Harbor), A (EPA-Derived MII Unit Costs), O (Unit Costs from Other Projects/Sources)

Source of Cost Data:
For citation references, the following sources apply:
ALL (Allowance), FLC (www.flcdatacenter.com), LD (Costs Derived from Lower Duwamish Waterway Final Feasibility Study), MII (MII), O (Other), P (Previously Developed by Anchor QEA for Portland Harbor), and V (Vendor Quote)

Abbreviations:

QTY	Quantity	AC	Acres
EQUIP	Equipment	CLF	100 Linear Foot
MATL	Material	CY	Cubic Yard
HPF	HTRW Productivity Factor	DY	Days
ADJ LABOR	Adjusted Labor for HFP	EA	Each
ADJ EQUIP	Adjusted Equipment for HFP	FTE	Full Time Equivalent
UNMOD UC	Unmodified Unit Cost	HR	Hours
UNMOD LIC	Unmodified Line Item Cost	LB	Pounds
UNBUR LIC	Unburdened Line Item Cost	LCY	Loose Cubic Yard
PC OH	Prime Contractor Overhead	LF	Linear Foot
PC PF	Prime Contractor Profit	LS	Lump Sum
BUR LIC	Burdened Line Item Cost	MO	Month
		SF	Square Foot
		SY	Square Yard
		TON	Tons
		YR	Years

Cost Adjustment Checklist:	**NOTES:**
FACTOR:	Field work will be in Level "D" PPE.
H&S Productivity (labor and equipment only)	MII assembly costs include HPF adjustments.
Escalation to Base Year	2016 cost sources are not escalated (EF=1.00). All other costs are escalated based on the USACE CWCCIS, EM 1110-2-1304, Sept 2015.
Area Cost Factor	An AF of 1.05 is used for Oregon, except that an AF of 1.00 (national unmodified average) is used for MII assembly costs and local vendor quotes.
Subcontractor Overhead and Profit	It is assumed that home office OH is 8% and profit is 9% for the Prime Contractor. Professional labor overhead is 100%.
Prime Contractor Overhead and Profit	Allowances and items with mandated costs such as per diem do not have overhead and profit applied.
	Items previously developed by Anchor QEA already include contractor markups, therefore overhead and profit were not applied to those items.
	It is assumed that OH is 1% and profit is 0% for vendor quotes for treatment and disposal at offsite disposal facilities. It is assumed that OH is 5% and profit is 0% for quotes for all other material vendor quotes.
	Items developed using MII already include contractor markups such as overhead and profit, therefore additional overhead and profit were not applied in the PC OH and PC PF to those items.

TABLE CW-D11

Alternative D **Cost Worksheet:** **CW-D11**
Capital Cost Sub-Element
Dewatering and Water Treatment for Dredging Operations

COST WORKSHEET

Site: Portland Harbor Superfund Site
Location: Portland, Oregon
Phase: Feasibility Study
Base Year: 2016

Prepared By: JN **Date:** 3/4/2016
Checked By: AB **Date:** 3/7/2016

Work Statement:
This sub-element involves the dewatering and water treatment for dredging operations. Assumes a temporary water treatment plant will be utilized for treatment of water generated from dewatering of sediments. It includes costs for labor, equipment, and materials for treatment of water generated from dredged sediments. Quantity development presented in Appendix D.

Cost Analysis:
Cost for Dewatering and Water Treatment for Dredging Operations (Lump Sum)

COST DATABASE CODE	DESCRIPTION	QTY	UNIT(S)	HPF	LABOR	ADJ LABOR	EQUIP	ADJ EQUIP	MATL	OTHER	UNMOD UC	UNMOD LIC	PC OH	PC PF	BUR LIC	COST SOURCE CITATION	COMMENTS
A9	Mobilization/Demobilization of Temporary Water Treatment System	6	EA	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$36,600.00	$36,600.00	$219,600.00	0%	0%	$219,600	MII MII	Project-specific unit cost developed in MII. Assumes mob/demob of treatment system will be required for each construction season
A10	Dewatering and Temporary Water Treatment System Operations	217	DY	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$21,654.00	$21,654.00	$4,705,414.20	0%	0%	$4,705,414	MII MII	Project-specific unit cost developed in MII.
												TOTAL COST:			$4,925,014		

	Representative Unit Quantity	Unit(s)	Total Cost	Unit Cost
COST WORKSHEET SUMMARY	1	LS	$4,925,014	$4,925,014

Notes:
Further information about the development of cost worksheets can be found in Attachment A - Methodology and Organization of Detailed Cost Estimates.
The quantity bolded in the QTY column is the quantity selected as the representative unit quantity for this cost worksheet. If multiple quantities are bolded, the representative unit quantity is the sum of those quantities. When the LS unit is utilized, the default representative unit quantity is 1.
HTRW productivity factor is from Exhibit B-3 or B-4 of "A Guide to Developing and Documenting Cost Estimates During the Feasibility Study", EPA 2000
EPA developed project-specific unit costs using the Micro Computer Aided Cost Engineering System (MCACES) Second Generation (MII) software version 4.2, build 3

Cost Database Code:
The Cost Database Code is a reference code for linking with line item cost information with the cost source database and is not otherwise used within these cost worksheets. The following cost source database prefixes apply:
L (EPA-Derived Labor Unit Costs), M (Project-Specific Vendor Unit Costs), P (Previously Developed Unit Costs by Anchor QEA for Portland Harbor), A (EPA-Derived MII Unit Costs), O (Unit Costs from Other Projects/Sources)

Source of Cost Data:
For citation references, the following sources apply:
ALL (Allowance), FLC (www.flcdatacenter.com), LD (Costs Derived from Lower Duwamish Waterway Final Feasibility Study), MII (MII), O (Other), P (Previously Developed by Anchor QEA for Portland Harbor), and V (Vendor Quote)

Abbreviations:

QTY	Quantity	AC	Acres
EQUIP	Equipment	CLF	100 Linear Foot
MATL	Material	CY	Cubic Yard
HPF	HTRW Productivity Factor	DY	Days
ADJ LABOR	Adjusted Labor for HFP	EA	Each
ADJ EQUIP	Adjusted Equipment for HFP	FTE	Full Time Equivalent
UNMOD UC	Unmodified Unit Cost	HR	Hours
UNMOD LIC	Unmodified Line Item Cost	LB	Pounds
UNBUR LIC	Unburdened Line Item Cost	LCY	Loose Cubic Yard
PC OH	Prime Contractor Overhead	LF	Linear Foot
PC PF	Prime Contractor Profit	LS	Lump Sum
BUR LIC	Burdened Line Item Cost	MO	Month
		SF	Square Foot
		SY	Square Yard
		TON	Tons
		YR	Years

Cost Adjustment Checklist:	**NOTES:**
FACTOR:	Field work will be in Level "D" PPE.
H&S Productivity (labor and equipment only)	MII assembly costs include HPF adjustments.
Escalation to Base Year	2016 cost sources are not escalated (EF=1.00). All other costs are escalated based on the USACE CWCCIS, EM 1110-2-1304, Sept 2015.
Area Cost Factor	An AF of 1.05 is used for Oregon, except that an AF of 1.00 (national unmodified average) is used for MII assembly costs and local vendor quotes.
Subcontractor Overhead and Profit	It is assumed that home office OH is 8% and profit is 9% for the Prime Contractor. Professional labor overhead is 100%.
Prime Contractor Overhead and Profit	Allowances and items with mandated costs such as per diem do not have overhead and profit applied.
	Items previously developed by Anchor QEA already include contractor markups, therefore overhead and profit were not applied to those items.
	It is assumed that OH is 1% and profit is 0% for vendor quotes for treatment and disposal at offsite disposal facilities. It is assumed that OH is 5% and profit is 0% for quotes for all other material vendor quotes.
	Items developed using MII already include contractor markups such as overhead and profit, therefore additional overhead and profit were not applied in the PC OH and PC PF to those items.

TABLE CW-D12

Alternative D **Cost Worksheet: CW-D12**
Capital Cost Sub-Element
Subtitle C/TSCA Disposal (Handling, Transportation, Treatment of Select PTW Materials, and Disposal)

COST WORKSHEET

Site: Portland Harbor Superfund Site
Location: Portland, Oregon
Phase: Feasibility Study
Base Year: 2016

Prepared By: JN **Date:** 5/20/2016
Checked By: AB **Date:** 5/23/2016

Work Statement:
This sub-element involves the disposal of contaminated sediments at a Subtitle C/TSCA landfill, including in-barge mixing of amendments, barge transportation of materials to a transload facility, materials handling from the barge to truck, transportation of the sediments to the Subtitle C/TSCA landfill, and disposal of contaminated sediments (including thermal treatment at the landfill facility for a portion of the volume). It includes costs for labor, equipment, and materials as well as recent vendor quotes. Costs for development of a transload facility are included in a separate cost worksheet.
Quantity development presented in Appendix D.

Cost Analysis:
Cost for Subtitle C/TSCA Disposal (Lump Sum)

COST DATABASE CODE	DESCRIPTION	QTY	UNIT(S)	HPF	LABOR	ADJ LABOR	EQUIP	ADJ EQUIP	MATL	OTHER	UNMOD UC	UNMOD LIC	PC OH	PC PF	BUR LIC	COST SOURCE CITATION	COMMENTS
Area 6W NRC/NAPL PTW																	
	Transportation																
A13	Barging to Transload Facility	218,332	CY	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$13.66	$13.66	$2,982,415.12	0%	0%	$2,982,415	MII MII	Project-specific unit cost developed in MII.
A5	Hauling Waste from Transload Facility to Landfill	218,332	CY	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$16.70	$16.70	$3,646,144.40	0%	0%	$3,646,144	MII MII	Project-specific unit cost developed in MII.
	Materials Handling at Transload Facility																
A14	Offloading of Sediments	218,332	CY	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$9.70	$9.70	$2,117,820.40	0%	0%	$2,117,820	MII MII	Project-specific unit cost developed in MII. Assumes mechanical offloading of sediments at the transload facility.
A4	Loading Trucks at Transload Facility	218,332	CY	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$2.68	$2.68	$585,129.76	0%	0%	$585,130	MII MII	Project-specific unit cost developed in MII.
	Treatment																
A11	In-Barge Stabilization / Mixing of Amendments	218,332	CY	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$24.50	$24.50	$5,349,134.00	0%	0%	$5,349,134	MII MII	Project-specific unit cost developed in MII.
P5	Diatomaceous Earth	12,655	TON	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$105.94	$105.94	$1,340,670.70	0%	0%	$1,340,671	P Anchor QEA	Project-specific cost developed by Anchor QEA (2010) - see Backup Table 24.
M25	Quicklime	17,463	TON	1.00	$0.00	$0.00	$0.00	$0.00	$239.00	$0.00	$239.00	$4,173,657.00	5%	0%	$4,382,340	V Vendor Quote	Project-specific vendor quote - Graymont, 2016.
A2	Hauling - Quicklime to Site	17,463	TON	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$5.71	$5.71	$99,713.73	0%	0%	$99,714	MII MII	Project-specific unit cost developed in MII. Assumes 10 mile one-way haul.
	Disposal at Subtitle C/TSCA Landfill																
M10	Tipping Fee at Subtitle C/TSCA Landfill	**283,209**	TON	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$86.19	$86.19	$24,409,783.71	1%	0%	$24,653,882	V Vendor Quote	Project-specific vendor quote - CWM of the Northwest, 2015.
Area 7W NRC/NAPL PTW																	
	Transportation																
A13	Barging to Transload Facility	66,633	CY	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$13.66	$13.66	$910,206.78	0%	0%	$910,207	MII MII	Project-specific unit cost developed in MII.
A5	Hauling Waste from Transload Facility to Landfill	66,633	CY	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$16.70	$16.70	$1,112,771.10	0%	0%	$1,112,771	MII MII	Project-specific unit cost developed in MII.
	Materials Handling at Transload Facility																
A14	Offloading of Sediments	66,633	CY	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$9.70	$9.70	$646,340.10	0%	0%	$646,340	MII MII	Project-specific unit cost developed in MII. Assumes mechanical offloading of sediments at the transload facility.
A4	Loading Trucks at Transload Facility	66,633	CY	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$2.68	$2.68	$178,576.44	0%	0%	$178,576	MII MII	Project-specific unit cost developed in MII.
	Treatment																
A11	In-Barge Stabilization / Mixing of Amendments	66,633	CY	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$24.50	$24.50	$1,632,508.50	0%	0%	$1,632,509	MII MII	Project-specific unit cost developed in MII.
P5	Diatomaceous Earth	5,700	TON	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$105.94	$105.94	$603,858.00	0%	0%	$603,858	P Anchor QEA	Project-specific cost developed by Anchor QEA (2010) - see Backup Table 24.
M25	Quicklime	1,573	TON	1.00	$0.00	$0.00	$0.00	$0.00	$239.00	$0.00	$239.00	$375,947.00	5%	0%	$394,744	V Vendor Quote	Project-specific vendor quote - Graymont, 2016.
A2	Hauling - Quicklime to Site	1,573	TON	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$5.71	$5.71	$8,981.83	0%	0%	$8,982	MII MII	Project-specific unit cost developed in MII. Assumes 10 mile one-way haul.
M20	Thermal Desorption Treatment at Subtitle C/TSCA Landfill (Low End of Treatment Cost Range)	12,541	TON	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$319.41	$319.41	$4,005,720.81	1%	0%	$4,045,778	V Vendor Quote	Project-specific vendor quote - CWM of the Northwest, 2015.
M9	Thermal Desorption Treatment at Subtitle C/TSCA Landfill (High End of Treatment Cost Range)	12,541	TON	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$572.91	$572.91	$7,184,864.31	1%	0%	$7,256,713	V Vendor Quote	Project-specific vendor quote - CWM of the Northwest, 2015.
	Disposal at Subtitle C/TSCA Landfill																
M10	Tipping Fee at Subtitle C/TSCA Landfill	**75,679**	TON	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$86.19	$86.19	$6,522,773.01	1%	0%	$6,588,001	V Vendor Quote	Project-specific vendor quote - CWM of the Northwest, 2015.
												TOTAL COST:			$68,535,729		

	Representative Unit Quantity	Unit(s)	Total Cost	Unit Cost
COST WORKSHEET SUMMARY	358,888	TON	$68,535,729	$191

TABLE CW-D12

Alternative D **Cost Worksheet:** **CW-D12**

Capital Cost Sub-Element

Subtitle C/TSCA Disposal (Handling, Transportation, Treatment of Select PTW Materials, and Disposal)

COST WORKSHEET

Site: Portland Harbor Superfund Site
Location: Portland, Oregon
Phase: Feasibility Study
Base Year: 2016

Prepared By: JN **Date:** 5/20/2016
Checked By: AB **Date:** 5/23/2016

Notes:

Further information about the development of cost worksheets can be found in Attachment A - Methodology and Organization of Detailed Cost Estimates.
The quantity bolded in the QTY column is the quantity selected as the representative unit quantity for this cost worksheet. If multiple quantities are bolded, the representative unit quantity is the sum of those quantities. When the LS unit is utilized, the default representative unit quantity is 1.
HTRW productivity factor is from Exhibit B-3 or B-4 of "A Guide to Developing and Documenting Cost Estimates During the Feasibility Study", EPA 2000
EPA developed project-specific unit costs using the Micro Computer Aided Cost Engineering System (MCACES) Second Generation (MII) software version 4.2, build 3

Cost Database Code:

The Cost Database Code is a reference code for linking with line item cost information with the cost source database and is not otherwise used within these cost worksheets. The following cost source database prefixes apply:

L (EPA-Derived Labor Unit Costs), M (Project-Specific Vendor Unit Costs), P (Previously Developed Unit Costs by Anchor QEA for Portland Harbor), A (EPA-Derived MII Unit Costs), O (Unit Costs from Other Projects/Sources)

Source of Cost Data:

For citation references, the following sources apply:

ALL (Allowance), FLC (www.flcdatacenter.com), LD (Costs Derived from Lower Duwamish Waterway Final Feasibility Study), MII (MII), O (Other), P (Previously Developed by Anchor QEA for Portland Harbor), and V (Vendor Quote)

Abbreviations:

QTY	Quantity	AC	Acres
EQUIP	Equipment	CLF	100 Linear Foot
MATL	Material	CY	Cubic Yard
HPF	HTRW Productivity Factor	DY	Days
ADJ LABOR	Adjusted Labor for HFP	EA	Each
ADJ EQUIP	Adjusted Equipment for HFP	FTE	Full Time Equivalent
UNMOD UC	Unmodified Unit Cost	HR	Hours
UNMOD LIC	Unmodified Line Item Cost	LB	Pounds
UNBUR LIC	Unburdened Line Item Cost	LCY	Loose Cubic Yard
PC OH	Prime Contractor Overhead	LF	Linear Foot
PC PF	Prime Contractor Profit	LS	Lump Sum
BUR LIC	Burdened Line Item Cost	MO	Month
		SF	Square Foot
		SY	Square Yard
		TON	Tons
		YR	Years

Cost Adjustment Checklist:	**NOTES:**
FACTOR:	Field work will be in Level "D" PPE.
H&S Productivity (labor and equipment only)	MII assembly costs include HPF adjustments.
Escalation to Base Year	2016 cost sources are not escalated (EF=1.00). All other costs are escalated based on the USACE CWCCIS, EM 1110-2-1304, Sept 2015.
Area Cost Factor	An AF of 1.05 is used for Oregon, except that an AF of 1.00 (national unmodified average) is used for MII assembly costs and local vendor quotes.
Subcontractor Overhead and Profit	It is assumed that home office OH is 8% and profit is 9% for the Prime Contractor. Professional labor overhead is 100%.
Prime Contractor Overhead and Profit	Allowances and items with mandated costs such as per diem do not have overhead and profit applied.
	Items previously developed by Anchor QEA already include contractor markups, therefore overhead and profit were not applied to those items.
	It is assumed that OH is 1% and profit is 0% for vendor quotes for treatment and disposal at offsite disposal facilities. It is assumed that OH is 5% and profit is 0% for quotes for all other material vendor quotes.
	Items developed using MII already include contractor markups such as overhead and profit, therefore additional overhead and profit were not applied in the PC OH and PC PF to those items.

TABLE CW-D13

Alternative D **Cost Worksheet: CW-D13**
Capital Cost Sub-Element
Subtitle D Disposal (Handling, Transportation, and Disposal)

COST WORKSHEET

Site: Portland Harbor Superfund Site
Location: Portland, Oregon
Phase: Feasibility Study
Base Year: 2016

Prepared By: JN **Date:** 3/4/2016
Checked By: AB **Date:** 3/7/2016

Work Statement:
This sub-element involves the disposal of contaminated sediments at a Subtitle D landfill, including barge transportation of materials to a transload facility, materials handling from the barge to truck, transportation of the sediments to the Subtitle C/TSCA landfill, and disposal of contaminated sediments (including thermal treatment at the landfill facility for a portion of the volume). It includes costs for labor, equipment, and materials as well as recent vendor quotes.
Quantity development presented in Appendix D.

Cost Analysis:
Cost for Subtitle D Disposal (Lump Sum)

COST DATABASE CODE	DESCRIPTION	QTY	UNIT(S)	HPF	LABOR	ADJ LABOR	EQUIP	ADJ EQUIP	MATL	OTHER	UNMOD UC	UNMOD LIC	PC OH	PC PF	BUR LIC	COST SOURCE CITATION	COMMENTS
	Diatomaceous Earth Amendment																
A11	In-Barge Stabilization / Mixing of Amendments	1,275,493	CY	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$24.50	$24.50	$31,249,578.50	0%	0%	$31,249,579	MII MII	Project-specific unit cost developed in MII.
P5	Diatomaceous Earth	76,152	TON	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$105.94	$105.94	$8,067,542.88	0%	0%	$8,067,543	P Anchor QEA	Project-specific cost developed by Anchor QEA (2010) - see Backup Table 24.
	Transportation to Transload Facility																
A13	Barging to Transload Facility	1,275,493	CY	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$13.66	$13.66	$17,423,234.38	0%	0%	$17,423,234	MII MII	Project-specific unit cost developed in MII.
	Transportation and Disposal at Subtitle D Landfill																
M11	Transportation and Disposal at Subtitle D Landfill	**1,599,182**	TON	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$74.53	$74.53	$119,187,034.46	1%	0%	$120,378,905	V Vendor Quote	Project-specific vendor quote - Republic Services (Roosevelt Landfill), 2015. Includes transloading of the sediments, truck transportation from the transload facility to the landfill, and disposal at the landfill.
												TOTAL COST:			$177,119,261		

	Representative Unit Quantity	Unit(s)	Total Cost	Unit Cost
COST WORKSHEET SUMMARY	1,599,182	TON	$177,119,261	$111

Notes:
Further information about the development of cost worksheets can be found in Attachment A - Methodology and Organization of Detailed Cost Estimates.
The quantity bolded in the QTY column is the quantity selected as the representative unit quantity for this cost worksheet. If multiple quantities are bolded, the representative unit quantity is the sum of those quantities. When the LS unit is utilized, the default representative unit quantity is 1.
HTRW productivity factor is from Exhibit B-3 or B-4 of "A Guide to Developing and Documenting Cost Estimates During the Feasibility Study", EPA 2000
EPA developed project-specific unit costs using the Micro Computer Aided Cost Engineering System (MCACES) Second Generation (MII) software version 4.2, build 3

Cost Database Code:
The Cost Database Code is a reference code for linking with line item cost information with the cost source database and is not otherwise used within these cost worksheets. The following cost source database prefixes apply:
L (EPA-Derived Labor Unit Costs), M (Project-Specific Vendor Unit Costs), P (Previously Developed Unit Costs by Anchor QEA for Portland Harbor), A (EPA-Derived MII Unit Costs), O (Unit Costs from Other Projects/Sources)

Source of Cost Data:
For citation references, the following sources apply:
ALL (Allowance), FLC (www.flcdatacenter.com), LD (Costs Derived from Lower Duwamish Waterway Final Feasibility Study), MII (MII), O (Other), P (Previously Developed by Anchor QEA for Portland Harbor), and V (Vendor Quote)

Abbreviations:

QTY	Quantity	AC	Acres
EQUIP	Equipment	CLF	100 Linear Foot
MATL	Material	CY	Cubic Yard
HPF	HTRW Productivity Factor	DY	Days
ADJ LABOR	Adjusted Labor for HFP	EA	Each
ADJ EQUIP	Adjusted Equipment for HFP	FTE	Full Time Equivalent
UNMOD UC	Unmodified Unit Cost	HR	Hours
UNMOD LIC	Unmodified Line Item Cost	LB	Pounds
UNBUR LIC	Unburdened Line Item Cost	LCY	Loose Cubic Yard
PC OH	Prime Contractor Overhead	LF	Linear Foot
PC PF	Prime Contractor Profit	LS	Lump Sum
BUR LIC	Burdened Line Item Cost	MO	Month
		SF	Square Foot
		SY	Square Yard
		TON	Tons
		YR	Years

Cost Adjustment Checklist:	**NOTES:**
FACTOR:	Field work will be in Level "D" PPE.
H&S Productivity (labor and equipment only)	MII assembly costs include HPF adjustments.
Escalation to Base Year	2016 cost sources are not escalated (EF=1.00). All other costs are escalated based on the USACE CWCCIS, EM 1110-2-1304, Sept 2015.
Area Cost Factor	An AF of 1.05 is used for Oregon, except that an AF of 1.00 (national unmodified average) is used for MII assembly costs and local vendor quotes.
Subcontractor Overhead and Profit	It is assumed that home office OH is 8% and profit is 9% for the Prime Contractor. Professional labor overhead is 100%.
Prime Contractor Overhead and Profit	Allowances and items with mandated costs such as per diem do not have overhead and profit applied.
	Items previously developed by Anchor QEA already include contractor markups, therefore overhead and profit were not applied to those items.
	It is assumed that OH is 1% and profit is 0% for vendor quotes for treatment and disposal at offsite disposal facilities. It is assumed that OH is 5% and profit is 0% for quotes for all other material vendor quotes.
	Items developed using MII already include contractor markups such as overhead and profit, therefore additional overhead and profit were not applied in the PC OH and PC PF to those items.

TABLE CW-D14

Alternative D
Capital Cost Sub-Element
Mitigation

Cost Worksheet: **CW-D14**

COST WORKSHEET

Site: Portland Harbor Superfund Site
Location: Portland, Oregon
Phase: Feasibility Study
Base Year: 2016

Prepared By: JN **Date:** 3/4/2016
Checked By: AB **Date:** 3/7/2016

Work Statement:
This sub-element involves mitigation of shallow water and riverbank areas. It includes costs for on-site labor, equipment, and materials developed from previous work.
Quantity development presented in Appendix D.

Cost Analysis:
Cost for Mitigation (Lump Sum)

COST DATABASE CODE	DESCRIPTION	QTY	UNIT(S)	HPF	LABOR	ADJ LABOR	EQUIP	ADJ EQUIP	MATL	OTHER	UNMOD UC	UNMOD LIC	PC OH	PC PF	BUR LIC	COST SOURCE CITATION	COMMENTS
O3	Mitigation	**25**	AC	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$1,070,827.00	$1,070,827.00	$26,770,675.00	0%	0%	$26,770,675	O Other	Average cost of projects presented in Tables 6.1-1 and 6.1-4 of the Appendix M, Attachment 1, Anchor QEA FS (2010) as well as select other projects. See Calculations for derivation.
												TOTAL COST:			$26,770,675		

	Representative Unit Quantity	Unit(s)	Total Cost	Unit Cost
COST WORKSHEET SUMMARY	25	AC	$26,770,675	$1,070,827

Notes:
Further information about the development of cost worksheets can be found in Attachment A - Methodology and Organization of Detailed Cost Estimates.
The quantity bolded in the QTY column is the quantity selected as the representative unit quantity for this cost worksheet. If multiple quantities are bolded, the representative unit quantity is the sum of those quantities. When the LS unit is utilized, the default representative unit quantity is 1.
HTRW productivity factor is from Exhibit B-3 or B-4 of "A Guide to Developing and Documenting Cost Estimates During the Feasibility Study", EPA 2000
EPA developed project-specific unit costs using the Micro Computer Aided Cost Engineering System (MCACES) Second Generation (MII) software version 4.2, build 3

Cost Database Code:
The Cost Database Code is a reference code for linking with line item cost information with the cost source database and is not otherwise used within these cost worksheets. The following cost source database prefixes apply:
L (EPA-Derived Labor Unit Costs), M (Project-Specific Vendor Unit Costs), P (Previously Developed Unit Costs by Anchor QEA for Portland Harbor), A (EPA-Derived MII Unit Costs), O (Unit Costs from Other Projects/Sources)

Source of Cost Data:
For citation references, the following sources apply:
ALL (Allowance), FLC (www.flcdatacenter.com), LD (Costs Derived from Lower Duwamish Waterway Final Feasibility Study), MII (MII), O (Other), P (Previously Developed by Anchor QEA for Portland Harbor), and V (Vendor Quote)

Abbreviations:

QTY	Quantity	AC	Acres
EQUIP	Equipment	CLF	100 Linear Foot
MATL	Material	CY	Cubic Yard
HPF	HTRW Productivity Factor	DY	Days
ADJ LABOR	Adjusted Labor for HFP	EA	Each
ADJ EQUIP	Adjusted Equipment for HFP	FTE	Full Time Equivalent
UNMOD UC	Unmodified Unit Cost	HR	Hours
UNMOD LIC	Unmodified Line Item Cost	LB	Pounds
UNBUR LIC	Unburdened Line Item Cost	LCY	Loose Cubic Yard
PC OH	Prime Contractor Overhead	LF	Linear Foot
PC PF	Prime Contractor Profit	LS	Lump Sum
BUR LIC	Burdened Line Item Cost	MO	Month
		SF	Square Foot
		SY	Square Yard
		TON	Tons
		YR	Years

Cost Adjustment Checklist:	**NOTES:**
FACTOR:	Field work will be in Level "D" PPE.
H&S Productivity (labor and equipment only)	MII assembly costs include HPF adjustments.
Escalation to Base Year	2016 cost sources are not escalated (EF=1.00). All other costs are escalated based on the USACE CWCCIS, EM 1110-2-1304, Sept 2015.
Area Cost Factor	An AF of 1.05 is used for Oregon, except that an AF of 1.00 (national unmodified average) is used for MII assembly costs and local vendor quotes.
Subcontractor Overhead and Profit	It is assumed that home office OH is 8% and profit is 9% for the Prime Contractor. Professional labor overhead is 100%.
Prime Contractor Overhead and Profit	Allowances and items with mandated costs such as per diem do not have overhead and profit applied.
	Items previously developed by Anchor QEA already include contractor markups, therefore overhead and profit were not applied to those items.
	It is assumed that OH is 1% and profit is 0% for vendor quotes for treatment and disposal at offsite disposal facilities. It is assumed that OH is 5% and profit is 0% for quotes for all other material vendor quotes.
	Items developed using MII already include contractor markups such as overhead and profit, therefore additional overhead and profit were not applied in the PC OH and PC PF to those items.

TABLE CW-D15

Alternative D **Cost Worksheet:** **CW-D15**
Capital Cost Sub-Element
Sand Placement for Technology Assignments

COST WORKSHEET

Site: Portland Harbor Superfund Site
Location: Portland, Oregon
Phase: Feasibility Study
Base Year: 2016

Prepared By: JN **Date:** 3/4/2016
Checked By: AB **Date:** 3/7/2016

Work Statement:
This sub-element involves the placement of sand for the construction of capping areas. It includes placement of sand within confined areas, open areas, and riverbanks. It includes costs for on-site labor, equipment, and materials as well as recent vendor quotes.
Quantity development presented in Appendix D.

Cost Analysis:
Cost for Sand Placement for Technology Assignments (Lump Sum)

COST DATABASE CODE	DESCRIPTION	QTY	UNIT(S)	HPF	LABOR	ADJ LABOR	EQUIP	ADJ EQUIP	MATL	OTHER	UNMOD UC	UNMOD LIC	PC OH	PC PF	BUR LIC	COST SOURCE CITATION	COMMENTS
P1	Sand	**475,860**	LCY	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$19.75	$19.75	$9,398,235.00	0%	0%	$9,398,235	P Anchor QEA	Project-specific cost developed by Anchor QEA (2010) - see Backup Table 29A. Includes conversion from TON to LCY.
	Sand Placement (Riverbanks)																
A16	Material Placement (Confined)	60,730	CY	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$20.39	$20.39	$1,238,284.70	0%	0%	$1,238,285	MII MII	Project-specific unit cost developed in MII.
	Sand Placement (Confined)																
A16	Material Placement (Confined)	38,021	CY	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$20.39	$20.39	$775,248.19	0%	0%	$775,248	MII MII	Project-specific unit cost developed in MII.
	Sand Placement (Open Water)																
A15	Material Placement (Open)	377,109	CY	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$12.42	$12.42	$4,683,693.78	0%	0%	$4,683,694	MII MII	Project-specific unit cost developed in MII.
												TOTAL COST:			$16,095,462		

	Representative Unit Quantity	Unit(s)	Total Cost	Unit Cost
COST WORKSHEET SUMMARY	475,860	CY	$16,095,462	$33.82

Notes:
Further information about the development of cost worksheets can be found in Attachment A - Methodology and Organization of Detailed Cost Estimates.
The quantity bolded in the QTY column is the quantity selected as the representative unit quantity for this cost worksheet. If multiple quantities are bolded, the representative unit quantity is the sum of those quantities. When the LS unit is utilized, the default representative unit quantity is 1.
HTRW productivity factor is from Exhibit B-3 or B-4 of "A Guide to Developing and Documenting Cost Estimates During the Feasibility Study", EPA 2000
EPA developed project-specific unit costs using the Micro Computer Aided Cost Engineering System (MCACES) Second Generation (MII) software version 4.2, build 3

Cost Database Code:
The Cost Database Code is a reference code for linking with line item cost information with the cost source database and is not otherwise used within these cost worksheets. The following cost source database prefixes apply:
L (EPA-Derived Labor Unit Costs), M (Project-Specific Vendor Unit Costs), P (Previously Developed Unit Costs by Anchor QEA for Portland Harbor), A (EPA-Derived MII Unit Costs), O (Unit Costs from Other Projects/Sources)

Source of Cost Data:
For citation references, the following sources apply:
ALL (Allowance), FLC (www.flcdatacenter.com), LD (Costs Derived from Lower Duwamish Waterway Final Feasibility Study), MII (MII), O (Other), P (Previously Developed by Anchor QEA for Portland Harbor), and V (Vendor Quote)

Abbreviations:

QTY	Quantity	AC	Acres
EQUIP	Equipment	CLF	100 Linear Foot
MATL	Material	CY	Cubic Yard
HPF	HTRW Productivity Factor	DY	Days
ADJ LABOR	Adjusted Labor for HFP	EA	Each
ADJ EQUIP	Adjusted Equipment for HFP	FTE	Full Time Equivalent
UNMOD UC	Unmodified Unit Cost	HR	Hours
UNMOD LIC	Unmodified Line Item Cost	LB	Pounds
UNBUR LIC	Unburdened Line Item Cost	LCY	Loose Cubic Yard
PC OH	Prime Contractor Overhead	LF	Linear Foot
PC PF	Prime Contractor Profit	LS	Lump Sum
BUR LIC	Burdened Line Item Cost	MO	Month
		SF	Square Foot
		SY	Square Yard
		TON	Tons
		YR	Years

Cost Adjustment Checklist:	**NOTES:**
FACTOR:	Field work will be in Level "D" PPE.
H&S Productivity (labor and equipment only)	MII assembly costs include HPF adjustments.
Escalation to Base Year	2016 cost sources are not escalated (EF=1.00). All other costs are escalated based on the USACE CWCCIS, EM 1110-2-1304, Sept 2015.
Area Cost Factor	An AF of 1.05 is used for Oregon, except that an AF of 1.00 (national unmodified average) is used for MII assembly costs and local vendor quotes.
Subcontractor Overhead and Profit	It is assumed that home office OH is 8% and profit is 9% for the Prime Contractor. Professional labor overhead is 100%.
Prime Contractor Overhead and Profit	Allowances and items with mandated costs such as per diem do not have overhead and profit applied.
	Items previously developed by Anchor QEA already include contractor markups, therefore overhead and profit were not applied to those items.
	It is assumed that OH is 1% and profit is 0% for vendor quotes for treatment and disposal at offsite disposal facilities. It is assumed that OH is 5% and profit is 0% for quotes for all other material vendor quotes.
	Items developed using MII already include contractor markups such as overhead and profit, therefore additional overhead and profit were not applied in the PC OH and PC PF to those items.

TABLE CW-D16

Alternative D **Cost Worksheet:** **CW-D16**
Capital Cost Sub-Element
Beach Mix Placement for Technology Assignments

COST WORKSHEET

Site: Portland Harbor Superfund Site
Location: Portland, Oregon
Phase: Feasibility Study
Base Year: 2016

Prepared By: JN **Date:** 3/4/2016
Checked By: AB **Date:** 3/7/2016

Work Statement:
This sub-element involves the placement of beach mix for the construction of capping areas. It includes placement of beach mix within confined areas, open areas, and riverbanks. It includes costs for on-site labor, equipment, and materials as well as recent vendor quotes.
Quantity development presented in Appendix D.

Cost Analysis:
Cost for Beach Mix Placement for Technology Assignments (Lump Sum)

COST DATABASE CODE	DESCRIPTION	QTY	UNIT(S)	HPF	LABOR	ADJ LABOR	EQUIP	ADJ EQUIP	MATL	OTHER	UNMOD UC	UNMOD LIC	PC OH	PC PF	BUR LIC	COST SOURCE CITATION	COMMENTS
P3	ODOT 100 Beach Mix	**32,441**	LCY	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$57.69	$57.69	$1,871,521.29	0%	0%	$1,871,521	P Anchor QEA	Project-specific cost developed by Anchor QEA (2010) - see Backup Table 29A. Includes conversion from TON to LCY.
	Beach Mix Placement (Riverbanks)																
A16	Material Placement (Confined)	10,623	CY	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$20.39	$20.39	$216,602.97	0%	0%	$216,603	MII MII	Project-specific unit cost developed in MII.
	Beach Mix Placement (Confined)																
A16	Material Placement (Confined)	3,545	CY	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$20.39	$20.39	$72,282.55	0%	0%	$72,283	MII MII	Project-specific unit cost developed in MII.
	Beach Mix Placement (Open Water)																
A15	Material Placement (Open)	18,273	CY	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$12.42	$12.42	$226,950.66	0%	0%	$226,951	MII MII	Project-specific unit cost developed in MII.
												TOTAL COST:			$2,387,358		

	Representative Unit Quantity	Unit(s)	Total Cost	Unit Cost
COST WORKSHEET SUMMARY	32,441	CY	$2,387,358	$73.59

Notes:
Further information about the development of cost worksheets can be found in Attachment A - Methodology and Organization of Detailed Cost Estimates.
The quantity bolded in the QTY column is the quantity selected as the representative unit quantity for this cost worksheet. If multiple quantities are bolded, the representative unit quantity is the sum of those quantities. When the LS unit is utilized, the default representative unit quantity is 1.
HTRW productivity factor is from Exhibit B-3 or B-4 of "A Guide to Developing and Documenting Cost Estimates During the Feasibility Study", EPA 2000
EPA developed project-specific unit costs using the Micro Computer Aided Cost Engineering System (MCACES) Second Generation (MII) software version 4.2, build 3

Cost Database Code:
The Cost Database Code is a reference code for linking with line item cost information with the cost source database and is not otherwise used within these cost worksheets. The following cost source database prefixes apply:
L (EPA-Derived Labor Unit Costs), M (Project-Specific Vendor Unit Costs), P (Previously Developed Unit Costs by Anchor QEA for Portland Harbor), A (EPA-Derived MII Unit Costs), O (Unit Costs from Other Projects/Sources)

Source of Cost Data:
For citation references, the following sources apply:
ALL (Allowance), FLC (www.flcdatacenter.com), LD (Costs Derived from Lower Duwamish Waterway Final Feasibility Study), MII (MII), O (Other), P (Previously Developed by Anchor QEA for Portland Harbor), and V (Vendor Quote)

Abbreviations:

QTY	Quantity	AC	Acres
EQUIP	Equipment	CLF	100 Linear Foot
MATL	Material	CY	Cubic Yard
HPF	HTRW Productivity Factor	DY	Days
ADJ LABOR	Adjusted Labor for HFP	EA	Each
ADJ EQUIP	Adjusted Equipment for HFP	FTE	Full Time Equivalent
UNMOD UC	Unmodified Unit Cost	HR	Hours
UNMOD LIC	Unmodified Line Item Cost	LB	Pounds
UNBUR LIC	Unburdened Line Item Cost	LCY	Loose Cubic Yard
PC OH	Prime Contractor Overhead	LF	Linear Foot
PC PF	Prime Contractor Profit	LS	Lump Sum
BUR LIC	Burdened Line Item Cost	MO	Month
		SF	Square Foot
		SY	Square Yard
		TON	Tons
		YR	Years

Cost Adjustment Checklist:	**NOTES:**
FACTOR:	Field work will be in Level "D" PPE.
H&S Productivity (labor and equipment only)	MII assembly costs include HPF adjustments.
Escalation to Base Year	2016 cost sources are not escalated (EF=1.00). All other costs are escalated based on the USACE CWCCIS, EM 1110-2-1304, Sept 2015.
Area Cost Factor	An AF of 1.05 is used for Oregon, except that an AF of 1.00 (national unmodified average) is used for MII assembly costs and local vendor quotes.
Subcontractor Overhead and Profit	It is assumed that home office OH is 8% and profit is 9% for the Prime Contractor. Professional labor overhead is 100%.
Prime Contractor Overhead and Profit	Allowances and items with mandated costs such as per diem do not have overhead and profit applied.
	Items previously developed by Anchor QEA already include contractor markups, therefore overhead and profit were not applied to those items.
	It is assumed that OH is 1% and profit is 0% for vendor quotes for treatment and disposal at offsite disposal facilities. It is assumed that OH is 5% and profit is 0% for quotes for all other material vendor quotes.
	Items developed using MII already include contractor markups such as overhead and profit, therefore additional overhead and profit were not applied in the PC OH and PC PF to those items.

TABLE CW-D17

Alternative D **Cost Worksheet:** **CW-D17**
Capital Cost Sub-Element
Armor Placement for Technology Assignments

COST WORKSHEET

Site: Portland Harbor Superfund Site
Location: Portland, Oregon
Phase: Feasibility Study
Base Year: 2016

Prepared By: JN **Date:** 3/4/2016
Checked By: AB **Date:** 3/7/2016

Work Statement:
This sub-element involves the placement of armor for the construction of capping areas. It includes placement of armor within confined areas, open areas, and riverbanks. It includes costs for on-site labor, equipment, and materials as well as recent vendor quotes.
Quantity development presented in Appendix D.

Cost Analysis:
Cost for Armor Placement for Technology Assignments (Lump Sum)

COST DATABASE CODE	DESCRIPTION	QTY	UNIT(S)	HPF	LABOR	ADJ LABOR	EQUIP	ADJ EQUIP	MATL	OTHER	UNMOD UC	UNMOD LIC	PC OH	PC PF	BUR LIC	COST SOURCE CITATION	COMMENTS
P2	ODOT 200 Armor	**53,344**	LCY	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$57.69	$57.69	$3,077,415.36	0%	0%	$3,077,415	P Anchor QEA	Project-specific cost developed by Anchor QEA (2010) - see Backup Table 29A. Includes conversion from TON to LCY.
	Armor Placement (Riverbanks)																
A16	Material Placement (Confined)	1,576	CY	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$20.39	$20.39	$32,134.64	0%	0%	$32,135	MII MII	Project-specific unit cost developed in MII.
	Armor Placement (Confined)																
A16	Material Placement (Confined)	11,484	CY	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$20.39	$20.39	$234,158.76	0%	0%	$234,159	MII MII	Project-specific unit cost developed in MII.
	Armor Placement (Open Water)																
A15	Material Placement (Open)	40,284	CY	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$12.42	$12.42	$500,327.28	0%	0%	$500,327	MII MII	Project-specific unit cost developed in MII.
												TOTAL COST:			$3,844,036		

	Representative Unit Quantity	Unit(s)	Total Cost	Unit Cost
COST WORKSHEET SUMMARY	53,344	CY	$3,844,036	$72.06

Notes:
Further information about the development of cost worksheets can be found in Attachment A - Methodology and Organization of Detailed Cost Estimates.
The quantity bolded in the QTY column is the quantity selected as the representative unit quantity for this cost worksheet. If multiple quantities are bolded, the representative unit quantity is the sum of those quantities. When the LS unit is utilized, the default representative unit quantity is 1.
HTRW productivity factor is from Exhibit B-3 or B-4 of "A Guide to Developing and Documenting Cost Estimates During the Feasibility Study", EPA 2000
EPA developed project-specific unit costs using the Micro Computer Aided Cost Engineering System (MCACES) Second Generation (MII) software version 4.2, build 3

Cost Database Code:
The Cost Database Code is a reference code for linking with line item cost information with the cost source database and is not otherwise used within these cost worksheets. The following cost source database prefixes apply:
L (EPA-Derived Labor Unit Costs), M (Project-Specific Vendor Unit Costs), P (Previously Developed Unit Costs by Anchor QEA for Portland Harbor), A (EPA-Derived MII Unit Costs), O (Unit Costs from Other Projects/Sources)

Source of Cost Data:
For citation references, the following sources apply:
ALL (Allowance), FLC (www.flcdatacenter.com), LD (Costs Derived from Lower Duwamish Waterway Final Feasibility Study), MII (MII), O (Other), P (Previously Developed by Anchor QEA for Portland Harbor), and V (Vendor Quote)

Abbreviations:

QTY	Quantity	AC	Acres
EQUIP	Equipment	CLF	100 Linear Foot
MATL	Material	CY	Cubic Yard
HPF	HTRW Productivity Factor	DY	Days
ADJ LABOR	Adjusted Labor for HFP	EA	Each
ADJ EQUIP	Adjusted Equipment for HFP	FTE	Full Time Equivalent
UNMOD UC	Unmodified Unit Cost	HR	Hours
UNMOD LIC	Unmodified Line Item Cost	LB	Pounds
UNBUR LIC	Unburdened Line Item Cost	LCY	Loose Cubic Yard
PC OH	Prime Contractor Overhead	LF	Linear Foot
PC PF	Prime Contractor Profit	LS	Lump Sum
BUR LIC	Burdened Line Item Cost	MO	Month
		SF	Square Foot
		SY	Square Yard
		TON	Tons
		YR	Years

Cost Adjustment Checklist:	**NOTES:**
FACTOR:	Field work will be in Level "D" PPE.
H&S Productivity (labor and equipment only)	MII assembly costs include HPF adjustments.
Escalation to Base Year	2016 cost sources are not escalated (EF=1.00). All other costs are escalated based on the USACE CWCCIS, EM 1110-2-1304, Sept 2015.
Area Cost Factor	An AF of 1.05 is used for Oregon, except that an AF of 1.00 (national unmodified average) is used for MII assembly costs and local vendor quotes.
Subcontractor Overhead and Profit	It is assumed that home office OH is 8% and profit is 9% for the Prime Contractor. Professional labor overhead is 100%.
Prime Contractor Overhead and Profit	Allowances and items with mandated costs such as per diem do not have overhead and profit applied.
	Items previously developed by Anchor QEA already include contractor markups, therefore overhead and profit were not applied to those items.
	It is assumed that OH is 1% and profit is 0% for vendor quotes for treatment and disposal at offsite disposal facilities. It is assumed that OH is 5% and profit is 0% for quotes for all other material vendor quotes.
	Items developed using MII already include contractor markups such as overhead and profit, therefore additional overhead and profit were not applied in the PC OH and PC PF to those items.

TABLE CW-D18

Alternative D **Cost Worksheet:** **CW-D18**
Capital Cost Sub-Element
Reactive/GAC Placement for Technology Assignments

COST WORKSHEET

Site: Portland Harbor Superfund Site
Location: Portland, Oregon
Phase: Feasibility Study
Base Year: 2016

Prepared By: JN **Date:** 3/4/2016
Checked By: AB **Date:** 3/7/2016

Work Statement:
This sub-element involves the placement of the reactive layers for the construction of capping areas. It includes placement of the reactive layer within confined areas, open areas, and riverbanks. It includes costs for on-site labor, equipment, and materials as well as recent vendor quotes.
Quantity development presented in Appendix D.

Cost Analysis:
Cost for Reactive/GAC Placement for Technology Assignments (Lump Sum)

COST DATABASE CODE	DESCRIPTION	QTY	UNIT(S)	HPF	LABOR	ADJ LABOR	EQUIP	ADJ EQUIP	MATL	OTHER	UNMOD UC	UNMOD LIC	PC OH	PC PF	BUR LIC	COST SOURCE CITATION	COMMENTS
	AquaGate Reactive Layer																
M4	Carbon (AquaGate + PAC 10%)	78,553	TON	1.00	$0.00	$0.00	$0.00	$0.00	$456.30	$0.00	$456.30	$35,843,733.90	5%	0%	$37,635,921	V Vendor Quote	Project-specific vendor quote - AquaBlok 2015. Material cost is $/TON.
P1	Sand	83,163	LCY	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$19.75	$19.75	$1,642,469.25	0%	0%	$1,642,469	P Anchor QEA	Project-specific cost developed by Anchor QEA (2010) - see Backup Table 29A. Includes conversion from TON to LCY.
A3	Mixing Sand & Carbon for Reactive Layer	161,797	CY	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$4.76	$4.76	$770,153.72	0%	0%	$770,154	MII MII	Project-specific unit cost developed in MII.
A16	Material Placement (Confined)	15,798	CY	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$20.39	$20.39	$322,121.22	0%	0%	$322,121	MII MII	Project-specific unit cost developed in MII.
A15	Material Placement (Open)	145,999	CY	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$12.42	$12.42	$1,813,307.58	0%	0%	$1,813,308	MII MII	Project-specific unit cost developed in MII.
	AquaBlock																
M3	Carbon (AquaBlok)	3,689	TON	1.00	$0.00	$0.00	$0.00	$0.00	$202.80	$0.00	$202.80	$748,129.20	5%	0%	$785,536	V Vendor Quote	Project-specific vendor quote - AquaBlok 2015. Material cost is $/TON.
A16	Material Placement (Confined)	3,215	CY	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$20.39	$20.39	$65,553.85	0%	0%	$65,554	MII MII	Project-specific unit cost developed in MII.
												TOTAL COST:			$43,035,063		

	Representative Unit Quantity	Unit(s)	Total Cost	Unit Cost
COST WORKSHEET SUMMARY	1	LS	$43,035,063	$43,035,063

Notes:
Further information about the development of cost worksheets can be found in Attachment A - Methodology and Organization of Detailed Cost Estimates.
The quantity bolded in the QTY column is the quantity selected as the representative unit quantity for this cost worksheet. If multiple quantities are bolded, the representative unit quantity is the sum of those quantities. When the LS unit is utilized, the default representative unit quantity is 1.
HTRW productivity factor is from Exhibit B-3 or B-4 of "A Guide to Developing and Documenting Cost Estimates During the Feasibility Study", EPA 2000
EPA developed project-specific unit costs using the Micro Computer Aided Cost Engineering System (MCACES) Second Generation (MII) software version 4.2, build 3

Cost Database Code:
The Cost Database Code is a reference code for linking with line item cost information with the cost source database and is not otherwise used within these cost worksheets. The following cost source database prefixes apply:
L (EPA-Derived Labor Unit Costs), M (Project-Specific Vendor Unit Costs), P (Previously Developed Unit Costs by Anchor QEA for Portland Harbor), A (EPA-Derived MII Unit Costs), O (Unit Costs from Other Projects/Sources)

Source of Cost Data:
For citation references, the following sources apply:
ALL (Allowance), FLC (www.flcdatacenter.com), LD (Costs Derived from Lower Duwamish Waterway Final Feasibility Study), MII (MII), O (Other), P (Previously Developed by Anchor QEA for Portland Harbor), and V (Vendor Quote)

Abbreviations:

QTY	Quantity	AC	Acres
EQUIP	Equipment	CLF	100 Linear Foot
MATL	Material	CY	Cubic Yard
HPF	HTRW Productivity Factor	DY	Days
ADJ LABOR	Adjusted Labor for HFP	EA	Each
ADJ EQUIP	Adjusted Equipment for HFP	FTE	Full Time Equivalent
UNMOD UC	Unmodified Unit Cost	HR	Hours
UNMOD LIC	Unmodified Line Item Cost	LB	Pounds
UNBUR LIC	Unburdened Line Item Cost	LCY	Loose Cubic Yard
PC OH	Prime Contractor Overhead	LF	Linear Foot
PC PF	Prime Contractor Profit	LS	Lump Sum
BUR LIC	Burdened Line Item Cost	MO	Month
		SF	Square Foot
		SY	Square Yard
		TON	Tons
		YR	Years

Cost Adjustment Checklist:	**NOTES:**
FACTOR:	Field work will be in Level "D" PPE.
H&S Productivity (labor and equipment only)	MII assembly costs include HPF adjustments.
Escalation to Base Year	2016 cost sources are not escalated (EF=1.00). All other costs are escalated based on the USACE CWCCIS, EM 1110-2-1304, Sept 2015.
Area Cost Factor	An AF of 1.05 is used for Oregon, except that an AF of 1.00 (national unmodified average) is used for MII assembly costs and local vendor quotes.
Subcontractor Overhead and Profit	It is assumed that home office OH is 8% and profit is 9% for the Prime Contractor. Professional labor overhead is 100%.
Prime Contractor Overhead and Profit	Allowances and items with mandated costs such as per diem do not have overhead and profit applied.
	Items previously developed by Anchor QEA already include contractor markups, therefore overhead and profit were not applied to those items.
	It is assumed that OH is 1% and profit is 0% for vendor quotes for treatment and disposal at offsite disposal facilities. It is assumed that OH is 5% and profit is 0% for quotes for all other material vendor quotes.
	Items developed using MII already include contractor markups such as overhead and profit, therefore additional overhead and profit were not applied in the PC OH and PC PF to those items.

TABLE CW-D19

Alternative D **Cost Worksheet:** **CW-D19**
Capital Cost Sub-Element
Geofabric for Riverbanks

COST WORKSHEET

Site: Portland Harbor Superfund Site
Location: Portland, Oregon
Phase: Feasibility Study
Base Year: 2016

Prepared By: JN **Date:** 3/4/2016
Checked By: AB **Date:** 3/7/2016

Work Statement:
This sub-element involves the installation of geofabric along the riverbanks. It includes costs for on-site labor, equipment, and materials from recent vendor quotes.
Quantity development presented in Appendix D.

Cost Analysis:
Cost for Geofabric for Riverbanks (Lump Sum)

COST DATABASE CODE	DESCRIPTION	QTY	UNIT(S)	HPF	LABOR	ADJ LABOR	EQUIP	ADJ EQUIP	MATL	OTHER	UNMOD UC	UNMOD LIC	PC OH	PC PF	BUR LIC	COST SOURCE CITATION	COMMENTS
O7	Geotextile Installation	**15.1**	AC	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$7,074.14	$7,074.14	$106,819.57	8%	9%	$125,748	V Vendor Quote	Vendor Quote - Geo-Synthetics (2014). Includes labor and equipment for installation
O6	Geotextile Material	15.1	AC	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$5,698.62	$5,698.62	$86,049.10	5%	0%	$90,352	V Vendor Quote	Vendor quote obtained for project of similar scope - Geo-Synthetics, 2014.
												TOTAL COST:			$216,100		

	Representative Unit Quantity	Unit(s)	Total Cost	Unit Cost
COST WORKSHEET SUMMARY	15.1	AC	$216,100	$14,311

Notes:
Further information about the development of cost worksheets can be found in Attachment A - Methodology and Organization of Detailed Cost Estimates.
The quantity bolded in the QTY column is the quantity selected as the representative unit quantity for this cost worksheet. If multiple quantities are bolded, the representative unit quantity is the sum of those quantities. When the LS unit is utilized, the default representative unit quantity is 1.
HTRW productivity factor is from Exhibit B-3 or B-4 of "A Guide to Developing and Documenting Cost Estimates During the Feasibility Study", EPA 2000
EPA developed project-specific unit costs using the Micro Computer Aided Cost Engineering System (MCACES) Second Generation (MII) software version 4.2, build 3

Cost Database Code:
The Cost Database Code is a reference code for linking with line item cost information with the cost source database and is not otherwise used within these cost worksheets. The following cost source database prefixes apply:
L (EPA-Derived Labor Unit Costs), M (Project-Specific Vendor Unit Costs), P (Previously Developed Unit Costs by Anchor QEA for Portland Harbor), A (EPA-Derived MII Unit Costs), O (Unit Costs from Other Projects/Sources)

Source of Cost Data:
For citation references, the following sources apply:
ALL (Allowance), FLC (www.flcdatacenter.com), LD (Costs Derived from Lower Duwamish Waterway Final Feasibility Study), MII (MII), O (Other), P (Previously Developed by Anchor QEA for Portland Harbor), and V (Vendor Quote)

Abbreviations:

QTY	Quantity	AC	Acres
EQUIP	Equipment	CLF	100 Linear Foot
MATL	Material	CY	Cubic Yard
HPF	HTRW Productivity Factor	DY	Days
ADJ LABOR	Adjusted Labor for HFP	EA	Each
ADJ EQUIP	Adjusted Equipment for HFP	FTE	Full Time Equivalent
UNMOD UC	Unmodified Unit Cost	HR	Hours
UNMOD LIC	Unmodified Line Item Cost	LB	Pounds
UNBUR LIC	Unburdened Line Item Cost	LCY	Loose Cubic Yard
PC OH	Prime Contractor Overhead	LF	Linear Foot
PC PF	Prime Contractor Profit	LS	Lump Sum
BUR LIC	Burdened Line Item Cost	MO	Month
		SF	Square Foot
		SY	Square Yard
		TON	Tons
		YR	Years

Cost Adjustment Checklist:	**NOTES:**
FACTOR:	Field work will be in Level "D" PPE.
H&S Productivity (labor and equipment only)	MII assembly costs include HPF adjustments.
Escalation to Base Year	2016 cost sources are not escalated (EF=1.00). All other costs are escalated based on the USACE CWCCIS, EM 1110-2-1304, Sept 2015.
Area Cost Factor	An AF of 1.05 is used for Oregon, except that an AF of 1.00 (national unmodified average) is used for MII assembly costs and local vendor quotes.
Subcontractor Overhead and Profit	It is assumed that home office OH is 8% and profit is 9% for the Prime Contractor. Professional labor overhead is 100%.
Prime Contractor Overhead and Profit	Allowances and items with mandated costs such as per diem do not have overhead and profit applied.
	Items previously developed by Anchor QEA already include contractor markups, therefore overhead and profit were not applied to those items.
	It is assumed that OH is 1% and profit is 0% for vendor quotes for treatment and disposal at offsite disposal facilities. It is assumed that OH is 5% and profit is 0% for quotes for all other material vendor quotes.
	Items developed using MII already include contractor markups such as overhead and profit, therefore additional overhead and profit were not applied in the PC OH and PC PF to those items.

TABLE CW-D20

Alternative D **Cost Worksheet:** **CW-D20**
Capital Cost Sub-Element
Organoclay Mat Placement for Technology Assignments

COST WORKSHEET

Site: Portland Harbor Superfund Site
Location: Portland, Oregon
Phase: Feasibility Study
Base Year: 2016

Prepared By: JN **Date:** 3/4/2016
Checked By: AB **Date:** 3/7/2016

Work Statement:
This sub-element involves the placement of the organoclay mat for the construction of capping areas. It includes placement of the organoclay mat within confined areas, open areas, and riverbanks. It includes costs for on-site labor, equipment, and materials as well as recent vendor quotes.
Quantity development presented in Appendix D.

Cost Analysis:
Cost for Organoclay Mat Placement for Technology Assignments (Lump Sum)

COST DATABASE CODE	DESCRIPTION	QTY	UNIT(S)	HPF	LABOR	ADJ LABOR	EQUIP	ADJ EQUIP	MATL	OTHER	UNMOD UC	UNMOD LIC	PC OH	PC PF	BUR LIC	COST SOURCE CITATION	COMMENTS
A17	Organoclay Mat Placement	**174,300**	SF	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$3.35	$3.35	$583,905.00	0%	0%	$583,905	MII MII	Project-specific unit cost developed in MII.
P4	Organoclay Mat Material	174,300	SF	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$3.38	$3.38	$589,134.00	0%	0%	$589,134	P Anchor QEA	Project-specific cost developed by Anchor QEA (2010) - see Backup Table 29A.
												TOTAL COST:			$1,173,039		

	Representative Unit Quantity	Unit(s)	Total Cost	Unit Cost
COST WORKSHEET SUMMARY	174,300	SF	$1,173,039	$6.73

Notes:
Further information about the development of cost worksheets can be found in Attachment A - Methodology and Organization of Detailed Cost Estimates.
The quantity bolded in the QTY column is the quantity selected as the representative unit quantity for this cost worksheet. If multiple quantities are bolded, the representative unit quantity is the sum of those quantities. When the LS unit is utilized, the default representative unit quantity is 1.
HTRW productivity factor is from Exhibit B-3 or B-4 of "A Guide to Developing and Documenting Cost Estimates During the Feasibility Study", EPA 2000
EPA developed project-specific unit costs using the Micro Computer Aided Cost Engineering System (MCACES) Second Generation (MII) software version 4.2, build 3

Cost Database Code:
The Cost Database Code is a reference code for linking with line item cost information with the cost source database and is not otherwise used within these cost worksheets. The following cost source database prefixes apply:
L (EPA-Derived Labor Unit Costs), M (Project-Specific Vendor Unit Costs), P (Previously Developed Unit Costs by Anchor QEA for Portland Harbor), A (EPA-Derived MII Unit Costs), O (Unit Costs from Other Projects/Sources)

Source of Cost Data:
For citation references, the following sources apply:
ALL (Allowance), FLC (www.flcdatacenter.com), LD (Costs Derived from Lower Duwamish Waterway Final Feasibility Study), MII (MII), O (Other), P (Previously Developed by Anchor QEA for Portland Harbor), and V (Vendor Quote)

Abbreviations:

QTY	Quantity	AC	Acres
EQUIP	Equipment	CLF	100 Linear Foot
MATL	Material	CY	Cubic Yard
HPF	HTRW Productivity Factor	DY	Days
ADJ LABOR	Adjusted Labor for HFP	EA	Each
ADJ EQUIP	Adjusted Equipment for HFP	FTE	Full Time Equivalent
UNMOD UC	Unmodified Unit Cost	HR	Hours
UNMOD LIC	Unmodified Line Item Cost	LB	Pounds
UNBUR LIC	Unburdened Line Item Cost	LCY	Loose Cubic Yard
PC OH	Prime Contractor Overhead	LF	Linear Foot
PC PF	Prime Contractor Profit	LS	Lump Sum
BUR LIC	Burdened Line Item Cost	MO	Month
		SF	Square Foot
		SY	Square Yard
		TON	Tons
		YR	Years

Cost Adjustment Checklist:	**NOTES:**
FACTOR:	Field work will be in Level "D" PPE.
H&S Productivity (labor and equipment only)	MII assembly costs include HPF adjustments.
Escalation to Base Year	2016 cost sources are not escalated (EF=1.00). All other costs are escalated based on the USACE CWCCIS, EM 1110-2-1304, Sept 2015.
Area Cost Factor	An AF of 1.05 is used for Oregon, except that an AF of 1.00 (national unmodified average) is used for MII assembly costs and local vendor quotes.
Subcontractor Overhead and Profit	It is assumed that home office OH is 8% and profit is 9% for the Prime Contractor. Professional labor overhead is 100%.
Prime Contractor Overhead and Profit	Allowances and items with mandated costs such as per diem do not have overhead and profit applied.
	Items previously developed by Anchor QEA already include contractor markups, therefore overhead and profit were not applied to those items.
	It is assumed that OH is 1% and profit is 0% for vendor quotes for treatment and disposal at offsite disposal facilities. It is assumed that OH is 5% and profit is 0% for quotes for all other material vendor quotes.
	Items developed using MII already include contractor markups such as overhead and profit, therefore additional overhead and profit were not applied in the PC OH and PC PF to those items.

TABLE CW-D21

Alternative D
Capital Cost Sub-Element
Transload Facility Development

Cost Worksheet: **CW-D21**

COST WORKSHEET

Site: Portland Harbor Superfund Site
Location: Portland, Oregon
Phase: Feasibility Study
Base Year: 2016

Prepared By: JN **Date:** 3/4/2016
Checked By: AB **Date:** 3/7/2016

Work Statement:
This sub-element involves the development of a transload facility for facilitating offsite disposal of contaminated sediments. It includes costs for on-site labor, equipment, and materials developed from previous work. Transload facility is expected to be operated for 6 years, based on estimated construction duration. Property lease quantity (20 acres) adjusted for construction duration. Labor for the annual inspections is assumed to be 2.5 times full time equivalent. Environmental monitoring is assumed to be once per quarter year for construction duration.

Cost Analysis:
Cost for Transload Facility Development (Lump Sum)

COST DATABASE CODE	DESCRIPTION	QTY	UNIT(S)	HPF	LABOR	ADJ LABOR	EQUIP	ADJ EQUIP	MATL	OTHER	UNMOD UC	UNMOD LIC	PC OH	PC PF	BUR LIC	COST SOURCE CITATION	COMMENTS
	Transload Facility Development																
P31	Transload Facility Permitting	1	LS	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$45,080.00	$45,080.00	$45,080.00	0%	0%	$45,080	P Anchor QEA	Project-specific cost developed by Anchor QEA (2010) - see Backup Table 24.
P32	Transload Facility Development	1	LS	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$4,508,000.00	$4,508,000.00	$4,508,000.00	0%	0%	$4,508,000	P Anchor QEA	Project-specific cost developed by Anchor QEA (2010) - see Backup Table 24.
P33	Yearly Property Lease	120	AC	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$26,484.50	$26,484.50	$3,178,140.00	0%	0%	$3,178,140	P Anchor QEA	Developed by Anchor QEA (2010) - see Backup Table 24. Assumes leasing of 20 acres multiplied by estimated construction duration.
	Inspection and Monitoring of Transload Facility																
P34	Labor Inspections During Operations of Transload Facility	15.0	FTE	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$84,525.00	$84,525.00	$1,267,875.00	0%	0%	$1,267,875	P Anchor QEA	Developed by Anchor QEA (2010) - see Backup Table 24. Assumes 2.5 FTE/YR multiplied by estimated construction duration.
P35	Environmental Monitoring During Offloading at Transload Facility	24	MO	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$16,905.00	$16,905.00	$405,720.00	0%	0%	$405,720	P Anchor QEA	Developed by Anchor QEA (2010) - see Backup Table 24. Assumes 4 MO/YR multiplied by estimated construction duration.
P36	Inspection and Monitoring Reporting for Transload Facility	6	YR	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$45,080.00	$45,080.00	$270,480.00	0%	0%	$270,480	P Anchor QEA	Project-specific cost developed by Anchor QEA (2010) - see Backup Table 24.
												TOTAL COST:			$9,675,295		

	Representative Unit Quantity	Unit(s)	Total Cost	Unit Cost
COST WORKSHEET SUMMARY	1	LS	$9,675,295	$9,675,295

TABLE CW-D21

Alternative D **Cost Worksheet:** **CW-D21**
Capital Cost Sub-Element
Transload Facility Development

COST WORKSHEET

Site: Portland Harbor Superfund Site
Location: Portland, Oregon
Phase: Feasibility Study
Base Year: 2016

Prepared By: JN **Date:** 3/4/2016
Checked By: AB **Date:** 3/7/2016

Notes:

Further information about the development of cost worksheets can be found in Attachment A - Methodology and Organization of Detailed Cost Estimates.
The quantity bolded in the QTY column is the quantity selected as the representative unit quantity for this cost worksheet. If multiple quantities are bolded, the representative unit quantity is the sum of those quantities. When the LS unit is utilized, the default representative unit quantity is 1.
HTRW productivity factor is from Exhibit B-3 or B-4 of "A Guide to Developing and Documenting Cost Estimates During the Feasibility Study", EPA 2000
EPA developed project-specific unit costs using the Micro Computer Aided Cost Engineering System (MCACES) Second Generation (MII) software version 4.2, build 3

Cost Database Code:

The Cost Database Code is a reference code for linking with line item cost information with the cost source database and is not otherwise used within these cost worksheets. The following cost source database prefixes apply:

L (EPA-Derived Labor Unit Costs), M (Project-Specific Vendor Unit Costs), P (Previously Developed Unit Costs by Anchor QEA for Portland Harbor), A (EPA-Derived MII Unit Costs), O (Unit Costs from Other Projects/Sources)

Source of Cost Data:

For citation references, the following sources apply:

ALL (Allowance), FLC (www.flcdatacenter.com), LD (Costs Derived from Lower Duwamish Waterway Final Feasibility Study), MII (MII), O (Other), P (Previously Developed by Anchor QEA for Portland Harbor), and V (Vendor Quote)

Abbreviations:

QTY	Quantity	AC	Acres
EQUIP	Equipment	CLF	100 Linear Foot
MATL	Material	CY	Cubic Yard
HPF	HTRW Productivity Factor	DY	Days
ADJ LABOR	Adjusted Labor for HFP	EA	Each
ADJ EQUIP	Adjusted Equipment for HFP	FTE	Full Time Equivalent
UNMOD UC	Unmodified Unit Cost	HR	Hours
UNMOD LIC	Unmodified Line Item Cost	LB	Pounds
UNBUR LIC	Unburdened Line Item Cost	LCY	Loose Cubic Yard
PC OH	Prime Contractor Overhead	LF	Linear Foot
PC PF	Prime Contractor Profit	LS	Lump Sum
BUR LIC	Burdened Line Item Cost	MO	Month
		SF	Square Foot
		SY	Square Yard
		TON	Tons
		YR	Years

Cost Adjustment Checklist:	**NOTES:**
FACTOR:	Field work will be in Level "D" PPE.
H&S Productivity (labor and equipment only)	MII assembly costs include HPF adjustments.
Escalation to Base Year	2016 cost sources are not escalated (EF=1.00). All other costs are escalated based on the USACE CWCCIS, EM 1110-2-1304, Sept 2015.
Area Cost Factor	An AF of 1.05 is used for Oregon, except that an AF of 1.00 (national unmodified average) is used for MII assembly costs and local vendor quotes.
Subcontractor Overhead and Profit	It is assumed that home office OH is 8% and profit is 9% for the Prime Contractor. Professional labor overhead is 100%.
Prime Contractor Overhead and Profit	Allowances and items with mandated costs such as per diem do not have overhead and profit applied.
	Items previously developed by Anchor QEA already include contractor markups, therefore overhead and profit were not applied to those items.
	It is assumed that OH is 1% and profit is 0% for vendor quotes for treatment and disposal at offsite disposal facilities. It is assumed that OH is 5% and profit is 0% for quotes for all other material vendor quotes.
	Items developed using MII already include contractor markups such as overhead and profit, therefore additional overhead and profit were not applied in the PC OH and PC PF to those items.

TABLE CW-D22

Alternative D **Cost Worksheet:** **CW-D22**
Capital and Periodic Cost Sub-Element
Monitored Natural Recovery (MNR) for MNR/Enhanced Natural Recovery (ENR) and Broadcast GAC Areas

COST WORKSHEET

Site: Portland Harbor Superfund Site
Location: Portland, Oregon
Phase: Feasibility Study
Base Year: 2016

Prepared By: JN **Date:** 3/4/2016
Checked By: AB **Date:** 3/7/2016

Work Statement:
This sub-element involves sampling as part of monitored natural recovery for MNR, ENR, and Broadcast GAC areas. It includes costs for on-site labor, equipment, and materials developed from previous work.
Quantity development presented in Appendix D.

Cost Analysis:
Cost for Monitored Natural Recovery for MNR/ENR and Broadcast GAC Areas (Lump Sum)

COST DATABASE CODE	DESCRIPTION	QTY	UNIT(S)	HPF	LABOR	ADJ LABOR	EQUIP	ADJ EQUIP	MATL	OTHER	UNMOD UC	UNMOD LIC	PC OH	PC PF	BUR LIC	COST SOURCE CITATION	COMMENTS
P25	Monitored Natural Recovery	**1,991**	AC	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$3,686.33	$3,686.33	$7,339,476.74	0%	0%	$7,339,477	P Anchor QEA	Project-specific cost developed by Anchor QEA (2010) - based on Backup Table 2.
												TOTAL COST:			$7,339,477		

	Representative Unit Quantity	Unit(s)	Total Cost	Unit Cost
COST WORKSHEET SUMMARY	1,991	AC	$7,339,477	$3,686

Notes:
Further information about the development of cost worksheets can be found in Attachment A - Methodology and Organization of Detailed Cost Estimates.
The quantity bolded in the QTY column is the quantity selected as the representative unit quantity for this cost worksheet. If multiple quantities are bolded, the representative unit quantity is the sum of those quantities. When the LS unit is utilized, the default representative unit quantity is 1.
HTRW productivity factor is from Exhibit B-3 or B-4 of "A Guide to Developing and Documenting Cost Estimates During the Feasibility Study", EPA 2000
EPA developed project-specific unit costs using the Micro Computer Aided Cost Engineering System (MCACES) Second Generation (MII) software version 4.2, build 3

Cost Database Code:
The Cost Database Code is a reference code for linking with line item cost information with the cost source database and is not otherwise used within these cost worksheets. The following cost source database prefixes apply:
L (EPA-Derived Labor Unit Costs), M (Project-Specific Vendor Unit Costs), P (Previously Developed Unit Costs by Anchor QEA for Portland Harbor), A (EPA-Derived MII Unit Costs), O (Unit Costs from Other Projects/Sources)

Source of Cost Data:
For citation references, the following sources apply:
ALL (Allowance), FLC (www.flcdatacenter.com), LD (Costs Derived from Lower Duwamish Waterway Final Feasibility Study), MII (MII), O (Other), P (Previously Developed by Anchor QEA for Portland Harbor), and V (Vendor Quote)

Abbreviations:

QTY	Quantity	AC	Acres
EQUIP	Equipment	CLF	100 Linear Foot
MATL	Material	CY	Cubic Yard
HPF	HTRW Productivity Factor	DY	Days
ADJ LABOR	Adjusted Labor for HFP	EA	Each
ADJ EQUIP	Adjusted Equipment for HFP	FTE	Full Time Equivalent
UNMOD UC	Unmodified Unit Cost	HR	Hours
UNMOD LIC	Unmodified Line Item Cost	LB	Pounds
UNBUR LIC	Unburdened Line Item Cost	LCY	Loose Cubic Yard
PC OH	Prime Contractor Overhead	LF	Linear Foot
PC PF	Prime Contractor Profit	LS	Lump Sum
BUR LIC	Burdened Line Item Cost	MO	Month
		SF	Square Foot
		SY	Square Yard
		TON	Tons
		YR	Years

Cost Adjustment Checklist:	**NOTES:**
FACTOR:	Field work will be in Level "D" PPE.
H&S Productivity (labor and equipment only)	MII assembly costs include HPF adjustments.
Escalation to Base Year	2016 cost sources are not escalated (EF=1.00). All other costs are escalated based on the USACE CWCCIS, EM 1110-2-1304, Sept 2015.
Area Cost Factor	An AF of 1.05 is used for Oregon, except that an AF of 1.00 (national unmodified average) is used for MII assembly costs and local vendor quotes.
Subcontractor Overhead and Profit	It is assumed that home office OH is 8% and profit is 9% for the Prime Contractor. Professional labor overhead is 100%.
Prime Contractor Overhead and Profit	Allowances and items with mandated costs such as per diem do not have overhead and profit applied.
	Items previously developed by Anchor QEA already include contractor markups, therefore overhead and profit were not applied to those items.
	It is assumed that OH is 1% and profit is 0% for vendor quotes for treatment and disposal at offsite disposal facilities. It is assumed that OH is 5% and profit is 0% for quotes for all other material vendor quotes.
	Items developed using MII already include contractor markups such as overhead and profit, therefore additional overhead and profit were not applied in the PC OH and PC PF to those items.

TABLE CW-D23

Alternative D
Periodic Cost Sub-Element
Site-Wide Monitoring

Cost Worksheet: **CW-D23**

COST WORKSHEET

Site: Portland Harbor Superfund Site
Location: Portland, Oregon
Phase: Feasibility Study
Base Year: 2016

Prepared By: JN **Date:** 3/4/2016
Checked By: AB **Date:** 3/7/2016

Work Statement:
This sub-element involves sampling, surveying, data management, and reporting as part of sitewide monitoring. It includes costs for on-site labor, equipment, and materials developed from previous work.

Cost Analysis:
Cost for Site-Wide Monitoring (Lump Sum)

COST DATABASE CODE	DESCRIPTION	QTY	UNIT(S)	HPF	LABOR	ADJ LABOR	EQUIP	ADJ EQUIP	MATL	OTHER	UNMOD UC	UNMOD LIC	PC OH	PC PF	BUR LIC	COST SOURCE CITATION	COMMENTS
	Site-Wide Monitoring																
P26	Sitewide Monitoring	1	LS	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$957,659.23	$957,659.23	$957,659.23	0%	0%	$957,659	P Anchor QEA	Project-specific cost developed by Anchor QEA (2010) - based on Backup Table 1.
												TOTAL COST:			$957,659		

	Representative Unit Quantity	Unit(s)	Total Cost	Unit Cost
COST WORKSHEET SUMMARY	1	LS	$957,659	$957,659

Notes:
Further information about the development of cost worksheets can be found in Attachment A - Methodology and Organization of Detailed Cost Estimates.
The quantity bolded in the QTY column is the quantity selected as the representative unit quantity for this cost worksheet. If multiple quantities are bolded, the representative unit quantity is the sum of those quantities. When the LS unit is utilized, the default representative unit quantity is 1.
HTRW productivity factor is from Exhibit B-3 or B-4 of "A Guide to Developing and Documenting Cost Estimates During the Feasibility Study", EPA 2000
EPA developed project-specific unit costs using the Micro Computer Aided Cost Engineering System (MCACES) Second Generation (MII) software version 4.2, build 3

Cost Database Code:
The Cost Database Code is a reference code for linking with line item cost information with the cost source database and is not otherwise used within these cost worksheets. The following cost source database prefixes apply:
L (EPA-Derived Labor Unit Costs), M (Project-Specific Vendor Unit Costs), P (Previously Developed Unit Costs by Anchor QEA for Portland Harbor), A (EPA-Derived MII Unit Costs), O (Unit Costs from Other Projects/Sources)

Source of Cost Data:
For citation references, the following sources apply:
ALL (Allowance), FLC (www.flcdatacenter.com), LD (Costs Derived from Lower Duwamish Waterway Final Feasibility Study), MII (MII), O (Other), P (Previously Developed by Anchor QEA for Portland Harbor), and V (Vendor Quote)

Abbreviations:

QTY	Quantity	AC	Acres
EQUIP	Equipment	CLF	100 Linear Foot
MATL	Material	CY	Cubic Yard
HPF	HTRW Productivity Factor	DY	Days
ADJ LABOR	Adjusted Labor for HFP	EA	Each
ADJ EQUIP	Adjusted Equipment for HFP	FTE	Full Time Equivalent
UNMOD UC	Unmodified Unit Cost	HR	Hours
UNMOD LIC	Unmodified Line Item Cost	LB	Pounds
UNBUR LIC	Unburdened Line Item Cost	LCY	Loose Cubic Yard
PC OH	Prime Contractor Overhead	LF	Linear Foot
PC PF	Prime Contractor Profit	LS	Lump Sum
BUR LIC	Burdened Line Item Cost	MO	Month
		SF	Square Foot
		SY	Square Yard
		TON	Tons
		YR	Years

Cost Adjustment Checklist:	**NOTES:**
FACTOR:	Field work will be in Level "D" PPE.
H&S Productivity (labor and equipment only)	MII assembly costs include HPF adjustments.
Escalation to Base Year	2016 cost sources are not escalated (EF=1.00). All other costs are escalated based on the USACE CWCCIS, EM 1110-2-1304, Sept 2015.
Area Cost Factor	An AF of 1.05 is used for Oregon, except that an AF of 1.00 (national unmodified average) is used for MII assembly costs and local vendor quotes.
Subcontractor Overhead and Profit	It is assumed that home office OH is 8% and profit is 9% for the Prime Contractor. Professional labor overhead is 100%.
Prime Contractor Overhead and Profit	Allowances and items with mandated costs such as per diem do not have overhead and profit applied.
	Items previously developed by Anchor QEA already include contractor markups, therefore overhead and profit were not applied to those items.
	It is assumed that OH is 1% and profit is 0% for vendor quotes for treatment and disposal at offsite disposal facilities. It is assumed that OH is 5% and profit is 0% for quotes for all other material vendor quotes.
	Items developed using MII already include contractor markups such as overhead and profit, therefore additional overhead and profit were not applied in the PC OH and PC PF to those items.

TABLE CW-D24

Alternative D **Cost Worksheet:** **CW-D24**
Periodic Cost Sub-Element
Cap Area Monitoring and Reactive Layer Monitoring

COST WORKSHEET

Site: Portland Harbor Superfund Site
Location: Portland, Oregon
Phase: Feasibility Study
Base Year: 2016

Prepared By: JN **Date:** 3/4/2016
Checked By: AB **Date:** 3/7/2016

Work Statement:
This sub-element involves sampling, surveying, data management, and reporting as part of cap and reactive layer monitoring. It includes costs for on-site labor, equipment, and materials developed from previous work.
Quantity development presented in Appendix D.

Cost Analysis:
Cost for Cap and Reactive Layer Monitoring (Lump Sum)

COST DATABASE CODE	DESCRIPTION	QTY	UNIT(S)	HPF	LABOR	ADJ LABOR	EQUIP	ADJ EQUIP	MATL	OTHER	UNMOD UC	UNMOD LIC	PC OH	PC PF	BUR LIC	COST SOURCE CITATION	COMMENTS
	Cap Area Monitoring																
P27	Cap Monitoring	132	AC	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$78,961.34	$78,961.34	$10,422,896.76	0%	0%	$10,422,897	P Anchor QEA	Project-specific cost developed by Anchor QEA (2010) - based on Backup Table 4.
	Reactive Layer Monitoring																
P28	Reactive Layer Monitoring	108	AC	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$88,968.76	$88,968.76	$9,608,626.19	0%	0%	$9,608,626	P Anchor QEA	Project-specific cost developed by Anchor QEA (2010) - based on Backup Table 3.
												TOTAL COST:			$20,031,523		

	Representative Unit Quantity	Unit(s)	Total Cost	Unit Cost
COST WORKSHEET SUMMARY	1	LS	$20,031,523	$20,031,523

Notes:
Further information about the development of cost worksheets can be found in Attachment A - Methodology and Organization of Detailed Cost Estimates.
The quantity bolded in the QTY column is the quantity selected as the representative unit quantity for this cost worksheet. If multiple quantities are bolded, the representative unit quantity is the sum of those quantities. When the LS unit is utilized, the default representative unit quantity is 1.
HTRW productivity factor is from Exhibit B-3 or B-4 of "A Guide to Developing and Documenting Cost Estimates During the Feasibility Study", EPA 2000
EPA developed project-specific unit costs using the Micro Computer Aided Cost Engineering System (MCACES) Second Generation (MII) software version 4.2, build 3

Cost Database Code:
The Cost Database Code is a reference code for linking with line item cost information with the cost source database and is not otherwise used within these cost worksheets. The following cost source database prefixes apply:
L (EPA-Derived Labor Unit Costs), M (Project-Specific Vendor Unit Costs), P (Previously Developed Unit Costs by Anchor QEA for Portland Harbor), A (EPA-Derived MII Unit Costs), O (Unit Costs from Other Projects/Sources)

Source of Cost Data:
For citation references, the following sources apply:
ALL (Allowance), FLC (www.flcdatacenter.com), LD (Costs Derived from Lower Duwamish Waterway Final Feasibility Study), MII (MII), O (Other), P (Previously Developed by Anchor QEA for Portland Harbor), and V (Vendor Quote)

Abbreviations:

QTY	Quantity	AC	Acres
EQUIP	Equipment	CLF	100 Linear Foot
MATL	Material	CY	Cubic Yard
HPF	HTRW Productivity Factor	DY	Days
ADJ LABOR	Adjusted Labor for HFP	EA	Each
ADJ EQUIP	Adjusted Equipment for HFP	FTE	Full Time Equivalent
UNMOD UC	Unmodified Unit Cost	HR	Hours
UNMOD LIC	Unmodified Line Item Cost	LB	Pounds
UNBUR LIC	Unburdened Line Item Cost	LCY	Loose Cubic Yard
PC OH	Prime Contractor Overhead	LF	Linear Foot
PC PF	Prime Contractor Profit	LS	Lump Sum
BUR LIC	Burdened Line Item Cost	MO	Month
		SF	Square Foot
		SY	Square Yard
		TON	Tons
		YR	Years

Cost Adjustment Checklist:	**NOTES:**
FACTOR:	Field work will be in Level "D" PPE.
H&S Productivity (labor and equipment only)	MII assembly costs include HPF adjustments.
Escalation to Base Year	2016 cost sources are not escalated (EF=1.00). All other costs are escalated based on the USACE CWCCIS, EM 1110-2-1304, Sept 2015.
Area Cost Factor	An AF of 1.05 is used for Oregon, except that an AF of 1.00 (national unmodified average) is used for MII assembly costs and local vendor quotes.
Subcontractor Overhead and Profit	It is assumed that home office OH is 8% and profit is 9% for the Prime Contractor. Professional labor overhead is 100%.
Prime Contractor Overhead and Profit	Allowances and items with mandated costs such as per diem do not have overhead and profit applied.
	Items previously developed by Anchor QEA already include contractor markups, therefore overhead and profit were not applied to those items.
	It is assumed that OH is 1% and profit is 0% for vendor quotes for treatment and disposal at offsite disposal facilities. It is assumed that OH is 5% and profit is 0% for quotes for all other material vendor quotes.
	Items developed using MII already include contractor markups such as overhead and profit, therefore additional overhead and profit were not applied in the PC OH and PC PF to those items.

TABLE CW-D25

Alternative D **Cost Worksheet:** **CW-D25**
Periodic Cost Sub-Element
Long-Term Maintenance for Capping, ENR, and In Situ Treatment

COST WORKSHEET

Site: Portland Harbor Superfund Site
Location: Portland, Oregon
Phase: Feasibility Study
Base Year: 2016

Prepared By: JN **Date:** 3/4/2016
Checked By: AB **Date:** 3/7/2016

Work Statement:
This sub-element involves replacement of 5% of the technology assignment layers as part of long-term maintenance. It includes costs for on-site labor, equipment, and materials developed from previous work.
Quantities represent 5% of material placement quantities which were developed and presented in Appendix D.

Cost Analysis:
Cost for Long-Term Maintenance (Lump Sum)

COST DATABASE CODE	DESCRIPTION	QTY	UNIT(S)	HPF	LABOR	ADJ LABOR	EQUIP	ADJ EQUIP	MATL	OTHER	UNMOD UC	UNMOD LIC	PC OH	PC PF	BUR LIC	COST SOURCE CITATION	COMMENTS
	Mobilization / Demobilization																
O2	Mobilization/Demobilization for Long Term Maintenance	1	LS	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$53,412.12	$53,412.12	$53,412.12	0%	0%	$53,412	LD Lower Duwamish	Assumes 1.6% of total capital costs per Lower Duwamish Feasibility Study. See Calculations for derivation.
	Sand Placement for Technology Assignments																
P1	Sand	23,793	LCY	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$19.75	$19.75	$469,911.75	0%	0%	$469,912	P Anchor QEA	Assume 5% of placement of additional material
	Sand Placement (Riverbanks)																
A16	Material Placement (Confined)	3,037	CY	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$20.39	$20.39	$61,924.43	0%	0%	$61,924	MII MII	Assume 5% of placement of additional material
	Sand Placement (Confined)																
A16	Material Placement (Confined)	1,901	CY	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$20.39	$20.39	$38,761.39	0%	0%	$38,761	MII MII	Assume 5% of placement of additional material
	Sand Placement (Open Water)																
A15	Material Placement (Open)	18,855	CY	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$12.42	$12.42	$234,179.10	0%	0%	$234,179	MII MII	Assume 5% of placement of additional material
	Beach Mix Placement for Technology Assignments																
P3	ODOT 100 Beach Mix	1,622	LCY	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$57.69	$57.69	$93,573.18	0%	0%	$93,573	P Anchor QEA	Assume 5% of placement of additional material
	Beach Mix Placement (Riverbanks)																
A16	Material Placement (Confined)	531	CY	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$20.39	$20.39	$10,827.09	0%	0%	$10,827	MII MII	Assume 5% of placement of additional material
	Beach Mix Placement (Confined)																
A16	Material Placement (Confined)	177	CY	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$20.39	$20.39	$3,609.03	0%	0%	$3,609	MII MII	Assume 5% of placement of additional material
	Beach Mix Placement (Open Water)																
A15	Material Placement (Open)	914	CY	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$12.42	$12.42	$11,351.88	0%	0%	$11,352	MII MII	Assume 5% of placement of additional material
	Armor Placement for Technology Assignments																
P2	ODOT 200 Armor	2,667	LCY	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$57.69	$57.69	$153,859.23	0%	0%	$153,859	P Anchor QEA	Assume 5% of placement of additional material
	Armor Placement (Riverbanks)																
A16	Material Placement (Confined)	79	CY	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$20.39	$20.39	$1,610.81	0%	0%	$1,611	MII MII	Assume 5% of placement of additional material
	Armor Placement (Confined)																
A16	Material Placement (Confined)	574	CY	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$20.39	$20.39	$11,703.86	0%	0%	$11,704	MII MII	Assume 5% of placement of additional material
	Armor Placement (Open Water)																
A15	Material Placement (Open)	2,014	CY	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$12.42	$12.42	$25,013.88	0%	0%	$25,014	MII MII	Assume 5% of placement of additional material
	Reactive/GAC Placement for Technology Assignments																
	AquaGate Reactive Layer																
M4	Carbon (AquaGate + PAC 10%)	3,928	TON	1.00	$0.00	$0.00	$0.00	$0.00	$456.30	$0.00	$456.30	$1,792,346.40	5%	0%	$1,881,964	V Vendor Quote	Assume 5% of placement of additional material
P1	Sand	4,158	LCY	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$19.75	$19.75	$82,120.50	0%	0%	$82,121	P Anchor QEA	Assume 5% of placement of additional material
A3	Mixing Sand & Carbon for Reactive Layer	8,090	CY	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$4.76	$4.76	$38,508.40	0%	0%	$38,508	MII MII	Assume 5% of placement of additional material
A16	Material Placement (Confined)	790	CY	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$20.39	$20.39	$16,108.10	0%	0%	$16,108	MII MII	Assume 5% of placement of additional material
A15	Material Placement (Open)	7,300	CY	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$12.42	$12.42	$90,666.00	0%	0%	$90,666	MII MII	Assume 5% of placement of additional material
	AquaBlock																
M3	Carbon (AquaBlok)	184	TON	1.00	$0.00	$0.00	$0.00	$0.00	$202.80	$0.00	$202.80	$37,315.20	5%	0%	$39,181	V Vendor Quote	Assume 5% of placement of additional material
A16	Material Placement (Confined)	161	CY	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$20.39	$20.39	$3,282.79	0%	0%	$3,283	MII MII	Assume 5% of placement of additional material

TABLE CW-D25

Alternative D **Cost Worksheet:** **CW-D25**
Periodic Cost Sub-Element
Long-Term Maintenance for Capping, ENR, and In Situ Treatment

COST WORKSHEET

Site: Portland Harbor Superfund Site
Location: Portland, Oregon
Phase: Feasibility Study
Base Year: 2016

Prepared By: JN **Date:** 3/4/2016
Checked By: AB **Date:** 3/7/2016

Work Statement:
This sub-element involves replacement of 5% of the technology assignment layers as part of long-term maintenance. It includes costs for on-site labor, equipment, and materials developed from previous work.
Quantities represent 5% of material placement quantities which were developed and presented in Appendix D.

Cost Analysis:
Cost for Long-Term Maintenance (Lump Sum)

COST DATABASE CODE	DESCRIPTION	QTY	UNIT(S)	HPF	LABOR	ADJ LABOR	EQUIP	ADJ EQUIP	MATL	OTHER	UNMOD UC	UNMOD LIC	PC OH	PC PF	BUR LIC	COST SOURCE CITATION	COMMENTS
	Geofabric for Riverbanks																
O7	Geotextile Installation	0.8	AC	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$7,074.14	$7,074.14	$5,659.32	8%	9%	$6,662	V Vendor Quote	Assume 5% of placement of additional material
O6	Geotextile Material	0.8	AC	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$5,698.62	$5,698.62	$4,558.89	5%	0%	$4,787	V Vendor Quote	Assume 5% of placement of additional material
	Organoclay Mat Placement for Technology Assignments																
A17	Organoclay Mat Placement	8,715	SF	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$3.35	$3.35	$29,195.25	0%	0%	$29,195	MII MII	Assume 5% of placement of additional material
P4	Organoclay Mat Material	8,715	SF	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$3.38	$3.38	$29,456.70	0%	0%	$29,457	P Anchor QEA	Assume 5% of placement of additional material
												TOTAL COST:			$3,391,669		

	Representative Unit Quantity	Unit(s)	Total Cost	Unit Cost
COST WORKSHEET SUMMARY	1	LS	$3,391,669	$3,391,669

Notes:
Further information about the development of cost worksheets can be found in Attachment A - Methodology and Organization of Detailed Cost Estimates.
The quantity bolded in the QTY column is the quantity selected as the representative unit quantity for this cost worksheet. If multiple quantities are bolded, the representative unit quantity is the sum of those quantities. When the LS unit is utilized, the default representative unit quantity is 1.
HTRW productivity factor is from Exhibit B-3 or B-4 of "A Guide to Developing and Documenting Cost Estimates During the Feasibility Study", EPA 2000
EPA developed project-specific unit costs using the Micro Computer Aided Cost Engineering System (MCACES) Second Generation (MII) software version 4.2, build 3

Cost Database Code:
The Cost Database Code is a reference code for linking with line item cost information with the cost source database and is not otherwise used within these cost worksheets. The following cost source database prefixes apply:
L (EPA-Derived Labor Unit Costs), M (Project-Specific Vendor Unit Costs), P (Previously Developed Unit Costs by Anchor QEA for Portland Harbor), A (EPA-Derived MII Unit Costs), O (Unit Costs from Other Projects/Sources)

Source of Cost Data:
For citation references, the following sources apply:
ALL (Allowance), FLC (www.flcdatacenter.com), LD (Costs Derived from Lower Duwamish Waterway Final Feasibility Study), MII (MII), O (Other), P (Previously Developed by Anchor QEA for Portland Harbor), and V (Vendor Quote)

Abbreviations:

QTY	Quantity	AC	Acres
EQUIP	Equipment	CLF	100 Linear Foot
MATL	Material	CY	Cubic Yard
HPF	HTRW Productivity Factor	DY	Days
ADJ LABOR	Adjusted Labor for HFP	EA	Each
ADJ EQUIP	Adjusted Equipment for HFP	FTE	Full Time Equivalent
UNMOD UC	Unmodified Unit Cost	HR	Hours
UNMOD LIC	Unmodified Line Item Cost	LB	Pounds
UNBUR LIC	Unburdened Line Item Cost	LCY	Loose Cubic Yard
PC OH	Prime Contractor Overhead	LF	Linear Foot
PC PF	Prime Contractor Profit	LS	Lump Sum
BUR LIC	Burdened Line Item Cost	MO	Month
		SF	Square Foot
		SY	Square Yard
		TON	Tons
		YR	Years

Cost Adjustment Checklist:	**NOTES:**
FACTOR:	Field work will be in Level "D" PPE.
H&S Productivity (labor and equipment only)	MII assembly costs include HPF adjustments.
Escalation to Base Year	2016 cost sources are not escalated (EF=1.00). All other costs are escalated based on the USACE CWCCIS, EM 1110-2-1304, Sept 2015.
Area Cost Factor	An AF of 1.05 is used for Oregon, except that an AF of 1.00 (national unmodified average) is used for MII assembly costs and local vendor quotes.
Subcontractor Overhead and Profit	It is assumed that home office OH is 8% and profit is 9% for the Prime Contractor. Professional labor overhead is 100%.
Prime Contractor Overhead and Profit	Allowances and items with mandated costs such as per diem do not have overhead and profit applied.
	Items previously developed by Anchor QEA already include contractor markups, therefore overhead and profit were not applied to those items.
	It is assumed that OH is 1% and profit is 0% for vendor quotes for treatment and disposal at offsite disposal facilities. It is assumed that OH is 5% and profit is 0% for quotes for all other material vendor quotes.
	Items developed using MII already include contractor markups such as overhead and profit, therefore additional overhead and profit were not applied in the PC OH and PC PF to those items.

TABLE CW-D26

Alternative D **Cost Worksheet:** **CW-D26**
Periodic Cost Sub-Element
5-Year Site Review

COST WORKSHEET

Site: Portland Harbor Superfund Site
Location: Portland, Oregon
Phase: Feasibility Study
Base Year: 2016

Prepared By: JN **Date:** 3/4/2016
Checked By: AB **Date:** 3/7/2016

Work Statement:
This sub-element involves the site visit and 5-year site review report. The following cost includes labor, material and shipping costs for site visits and 5-year site review reports.

Cost Analysis:
Cost for 5-Year Site Review (Lump Sum)

COST DATABASE CODE	DESCRIPTION	QTY	UNIT(S)	HPF	LABOR	ADJ LABOR	EQUIP	ADJ EQUIP	MATL	OTHER	UNMOD UC	UNMOD LIC	PC OH	PC PF	BUR LIC	COST SOURCE CITATION	COMMENTS
L11	Project Manager	300	HR	1.00	$82.17	$82.17	$0.00	$0.00	$0.00	$0.00	$82.17	$24,651.00	100%	9%	$53,739	FLC FLCDataCenter	Project-specific unit cost developed by EPA.
L4	Environmental Engineer	600	HR	1.00	$48.91	$48.91	$0.00	$0.00	$0.00	$0.00	$48.91	$29,346.00	100%	9%	$63,974	FLC FLCDataCenter	Project-specific unit cost developed by EPA.
L6	Environmental Scientist	900	HR	1.00	$37.70	$37.70	$0.00	$0.00	$0.00	$0.00	$37.70	$33,930.00	100%	9%	$73,967	FLC FLCDataCenter	Project-specific unit cost developed by EPA.
L12	Quality Control Engineer	120	HR	1.00	$64.99	$64.99	$0.00	$0.00	$0.00	$0.00	$64.99	$7,798.80	100%	9%	$17,001	FLC FLCDataCenter	Project-specific unit cost developed by EPA.
L1	CAD Drafter	300	HR	1.00	$31.31	$31.31	$0.00	$0.00	$0.00	$0.00	$31.31	$9,393.00	100%	9%	$20,477	FLC FLCDataCenter	Project-specific unit cost developed by EPA.
L3	Clerks, Typist, Bookkeeper & Receptionist	300	HR	1.00	$19.89	$19.89	$0.00	$0.00	$0.00	$0.00	$19.89	$5,967.00	100%	9%	$13,008	FLC FLCDataCenter	Project-specific unit cost developed by EPA.
O4	Copy and Shipping Allowance	1	LS	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$1,521.00	$1,521.00	$1,521.00	0%	0%	$1,521	ALL Allowance	
												TOTAL COST:			$243,687		

	Representative Unit Quantity	Unit(s)	Total Cost	Unit Cost
COST WORKSHEET SUMMARY	1	LS	$243,687	$243,687

Notes:
Further information about the development of cost worksheets can be found in Attachment A - Methodology and Organization of Detailed Cost Estimates.
The quantity bolded in the QTY column is the quantity selected as the representative unit quantity for this cost worksheet. If multiple quantities are bolded, the representative unit quantity is the sum of those quantities. When the LS unit is utilized, the default representative unit quantity is 1.
HTRW productivity factor is from Exhibit B-3 or B-4 of "A Guide to Developing and Documenting Cost Estimates During the Feasibility Study", EPA 2000
EPA developed project-specific unit costs using the Micro Computer Aided Cost Engineering System (MCACES) Second Generation (MII) software version 4.2, build 3

Cost Database Code:
The Cost Database Code is a reference code for linking with line item cost information with the cost source database and is not otherwise used within these cost worksheets. The following cost source database prefixes apply:
L (EPA-Derived Labor Unit Costs), M (Project-Specific Vendor Unit Costs), P (Previously Developed Unit Costs by Anchor QEA for Portland Harbor), A (EPA-Derived MII Unit Costs), O (Unit Costs from Other Projects/Sources)

Source of Cost Data:
For citation references, the following sources apply:
ALL (Allowance), FLC (www.flcdatacenter.com), LD (Costs Derived from Lower Duwamish Waterway Final Feasibility Study), MII (MII), O (Other), P (Previously Developed by Anchor QEA for Portland Harbor), and V (Vendor Quote)

Abbreviations:

QTY	Quantity	AC	Acres
EQUIP	Equipment	CLF	100 Linear Foot
MATL	Material	CY	Cubic Yard
HPF	HTRW Productivity Factor	DY	Days
ADJ LABOR	Adjusted Labor for HFP	EA	Each
ADJ EQUIP	Adjusted Equipment for HFP	FTE	Full Time Equivalent
UNMOD UC	Unmodified Unit Cost	HR	Hours
UNMOD LIC	Unmodified Line Item Cost	LB	Pounds
UNBUR LIC	Unburdened Line Item Cost	LCY	Loose Cubic Yard
PC OH	Prime Contractor Overhead	LF	Linear Foot
PC PF	Prime Contractor Profit	LS	Lump Sum
BUR LIC	Burdened Line Item Cost	MO	Month
		SF	Square Foot
		SY	Square Yard
		TON	Tons
		YR	Years

Cost Adjustment Checklist:	**NOTES:**
FACTOR:	Field work will be in Level "D" PPE.
H&S Productivity (labor and equipment only)	MII assembly costs include HPF adjustments.
Escalation to Base Year	2016 cost sources are not escalated (EF=1.00). All other costs are escalated based on the USACE CWCCIS, EM 1110-2-1304, Sept 2015.
Area Cost Factor	An AF of 1.05 is used for Oregon, except that an AF of 1.00 (national unmodified average) is used for MII assembly costs and local vendor quotes.
Subcontractor Overhead and Profit	It is assumed that home office OH is 8% and profit is 9% for the Prime Contractor. Professional labor overhead is 100%.
Prime Contractor Overhead and Profit	Allowances and items with mandated costs such as per diem do not have overhead and profit applied.
	Items previously developed by Anchor QEA already include contractor markups, therefore overhead and profit were not applied to those items.
	It is assumed that OH is 1% and profit is 0% for vendor quotes for treatment and disposal at offsite disposal facilities. It is assumed that OH is 5% and profit is 0% for quotes for all other material vendor quotes.
	Items developed using MII already include contractor markups such as overhead and profit, therefore additional overhead and profit were not applied in the PC OH and PC PF to those items.

Cost Worksheets
Alternative E

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TABLE CW-E1

Alternative E **Cost Worksheet:** **CW-E1**
Capital Cost Sub-Element
Mobilization / Demobilization

COST WORKSHEET

Site: Portland Harbor Superfund Site
Location: Portland, Oregon
Phase: Feasibility Study
Base Year: 2016

Prepared By: JN **Date:** 3/4/2016
Checked By: AB **Date:** 3/7/2016

Work Statement:
This sub-element involves mobilization and demobilization of all the required equipment to and from the site respectively.

Cost Analysis:
Cost for Mobilization/Demobilization (Lump Sum)

COST DATABASE CODE	DESCRIPTION	QTY	UNIT(S)	HPF	LABOR	ADJ LABOR	EQUIP	ADJ EQUIP	MATL	OTHER	UNMOD UC	UNMOD LIC	PC OH	PC PF	BUR LIC	COST SOURCE CITATION	COMMENTS
O1	Mobilization/Demobilization	1	LS	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$9,982,000.00	$9,982,000.00	$9,982,000.00	0%	0%	$9,982,000	LD Lower Duwamish	Assumes 1.6% of total capital costs per Lower Duwamish Feasibility Study. See Calculations for derivation.
												TOTAL COST:			$9,982,000		

	Representative Unit Quantity	Unit(s)	Total Cost	Unit Cost
COST WORKSHEET SUMMARY	1	LS	$9,982,000	$9,982,000

Notes:
Further information about the development of cost worksheets can be found in Attachment A - Methodology and Organization of Detailed Cost Estimates.
The quantity bolded in the QTY column is the quantity selected as the representative unit quantity for this cost worksheet. If multiple quantities are bolded, the representative unit quantity is the sum of those quantities. When the LS unit is utilized, the default representative unit quantity is 1.
HTRW productivity factor is from Exhibit B-3 or B-4 of "A Guide to Developing and Documenting Cost Estimates During the Feasibility Study", EPA 2000
EPA developed project-specific unit costs using the Micro Computer Aided Cost Engineering System (MCACES) Second Generation (MII) software version 4.2, build 3

Cost Database Code:
The Cost Database Code is a reference code for linking with line item cost information with the cost source database and is not otherwise used within these cost worksheets. The following cost source database prefixes apply:
L (EPA-Derived Labor Unit Costs), M (Project-Specific Vendor Unit Costs), P (Previously Developed Unit Costs by Anchor QEA for Portland Harbor), A (EPA-Derived MII Unit Costs), O (Unit Costs from Other Projects/Sources)

Source of Cost Data:
For citation references, the following sources apply:
ALL (Allowance), FLC (www.flcdatacenter.com), LD (Costs Derived from Lower Duwamish Waterway Final Feasibility Study), MII (MII), O (Other), P (Previously Developed by Anchor QEA for Portland Harbor), and V (Vendor Quote)

Abbreviations:

QTY	Quantity	AC	Acres
EQUIP	Equipment	CLF	100 Linear Foot
MATL	Material	CY	Cubic Yard
HPF	HTRW Productivity Factor	DY	Days
ADJ LABOR	Adjusted Labor for HFP	EA	Each
ADJ EQUIP	Adjusted Equipment for HFP	FTE	Full Time Equivalent
UNMOD UC	Unmodified Unit Cost	HR	Hours
UNMOD LIC	Unmodified Line Item Cost	LB	Pounds
UNBUR LIC	Unburdened Line Item Cost	LCY	Loose Cubic Yard
PC OH	Prime Contractor Overhead	LF	Linear Foot
PC PF	Prime Contractor Profit	LS	Lump Sum
BUR LIC	Burdened Line Item Cost	MO	Month
		SF	Square Foot
		SY	Square Yard
		TON	Tons
		YR	Years

Cost Adjustment Checklist:	**NOTES:**
FACTOR:	Field work will be in Level "D" PPE.
H&S Productivity (labor and equipment only)	MII assembly costs include HPF adjustments.
Escalation to Base Year	2016 cost sources are not escalated (EF=1.00). All other costs are escalated based on the USACE CWCCIS, EM 1110-2-1304, Sept 2015.
Area Cost Factor	An AF of 1.05 is used for Oregon, except that an AF of 1.00 (national unmodified average) is used for MII assembly costs and local vendor quotes.
Subcontractor Overhead and Profit	It is assumed that home office OH is 8% and profit is 9% for the Prime Contractor. Professional labor overhead is 100%.
Prime Contractor Overhead and Profit	Allowances and items with mandated costs such as per diem do not have overhead and profit applied.
	Items previously developed by Anchor QEA already include contractor markups, therefore overhead and profit were not applied to those items.
	It is assumed that OH is 1% and profit is 0% for vendor quotes for treatment and disposal at offsite disposal facilities. It is assumed that OH is 5% and profit is 0% for quotes for all other material vendor quotes.
	Items developed using MII already include contractor markups such as overhead and profit, therefore additional overhead and profit were not applied in the PC OH and PC PF to those items.

TABLE CW-E2

Alternative E **Cost Worksheet:** **CW-E2**
Capital Cost Sub-Element
Initial Establishment of Institutional Controls

COST WORKSHEET

Site: Portland Harbor Superfund Site
Location: Portland, Oregon
Phase: Feasibility Study
Base Year: 2016

Prepared By: JN **Date:** 3/4/2016
Checked By: AB **Date:** 3/7/2016

Work Statement:
This sub-element involves implementation of institutional controls for the site. The following cost includes labor and materials to develop legal documents for institutional controls and cost for document submission and recording.
Quantity development presented in Appendix D.

Cost Analysis:
Cost for Initial Establishment of Institutional Controls (Lump Sum)

COST DATABASE CODE	DESCRIPTION	QTY	UNIT(S)	HPF	LABOR	ADJ LABOR	EQUIP	ADJ EQUIP	MATL	OTHER	UNMOD UC	UNMOD LIC	PC OH	PC PF	BUR LIC	COST SOURCE CITATION	COMMENTS
	Informational Devices - Fish Consumption Advisory																
L11	Project Manager	2,080	HR	1.00	$82.17	$82.17	$0.00	$0.00	$0.00	$0.00	$82.17	$170,913.60	100%	9%	$372,592	FLC FLCDataCenter	Assumes 1 FTE for implementation of fish advisory
L4	Environmental Engineer	1,040	HR	1.00	$48.91	$48.91	$0.00	$0.00	$0.00	$0.00	$48.91	$50,866.40	100%	9%	$110,889	FLC FLCDataCenter	Assumes 0.5 FTE for implementation of fish advisory
L6	Environmental Scientist	1,040	HR	1.00	$37.70	$37.70	$0.00	$0.00	$0.00	$0.00	$37.70	$39,208.00	100%	9%	$85,473	FLC FLCDataCenter	Assumes 0.5 FTE for implementation of fish advisory
L3	Clerks, Typist, Bookkeeper & Receptionist	520	HR	1.00	$19.89	$19.89	$0.00	$0.00	$0.00	$0.00	$19.89	$10,342.80	100%	9%	$22,547	FLC FLCDataCenter	Assumes 0.25 FTE for implementation of fish advisory
L5	Environmental Lawyer	260	HR	1.00	$71.72	$71.72	$0.00	$0.00	$0.00	$0.00	$71.72	$18,647.20	100%	9%	$40,651	FLC FLCDataCenter	Assumes 0.125 FTE for implementation of fish advisory
L13	Paralegal	260	HR	1.00	$29.56	$29.56	$0.00	$0.00	$0.00	$0.00	$29.56	$7,685.60	100%	9%	$16,755	FLC FLCDataCenter	Assumes 0.125 FTE for implementation of fish advisory
M26	Signage	50	EA	1.00	$0.00	$0.00	$0.00	$0.00	$165.75	$0.00	$165.75	$8,287.50	5%	0%	$8,702	V Vendor Quote	Project-specific vendor quote - Allstate Sign & Plaque, 2016. 36" x 36" Signs
L8	Field Technician	50	HR	1.00	$31.42	$31.42	$0.00	$0.00	$0.00	$0.00	$31.42	$1,571.00	100%	9%	$3,425	FLC FLCDataCenter	Assumes 1 hr/sign for sign placement (2 technician crew)
O5	Allowance for Production & Copies for Advisories	1	LS	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$1,000.00	$1,000.00	$1,000.00	0%	0%	$1,000	ALL Allowance	
	Informational Devices - Regulated Navigation Area (RNA) Setup																
L11	Project Manager	200	HR	1.00	$82.17	$82.17	$0.00	$0.00	$0.00	$0.00	$82.17	$16,434.00	100%	9%	$35,826	FLC FLCDataCenter	Project-specific unit cost developed by EPA.
L4	Environmental Engineer	150	HR	1.00	$48.91	$48.91	$0.00	$0.00	$0.00	$0.00	$48.91	$7,336.50	100%	9%	$15,994	FLC FLCDataCenter	Project-specific unit cost developed by EPA.
L3	Clerks, Typist, Bookkeeper & Receptionist	40	HR	1.00	$19.89	$19.89	$0.00	$0.00	$0.00	$0.00	$19.89	$795.60	100%	9%	$1,734	FLC FLCDataCenter	Project-specific unit cost developed by EPA.
A1	18' Boat	292	HR	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$25.42	$25.42	$7,422.64	0%	0%	$7,423	MII MII	Assumes 2 hr/buoy for buoy setup
L17	Boat Operator	292	HR	1.00	$33.16	$33.16	$0.00	$0.00	$0.00	$0.00	$33.16	$9,682.72	100%	9%	$21,108	FLC FLCDataCenter	Assumes 2 hr/buoy for buoy setup
L8	Field Technician	584	HR	1.00	$31.42	$31.42	$0.00	$0.00	$0.00	$0.00	$31.42	$18,349.28	100%	9%	$40,001	FLC FLCDataCenter	Assumes 4 hrs/buoy for buoy setup (2 technician crew)
M21	Buoy	146	EA	1.00	$0.00	$0.00	$0.00	$0.00	$558.63	$0.00	$558.63	$81,559.98	5%	0%	$85,638	V Vendor Quote	Project-specific vendor quote - Go2Marine, 2016.
	Proprietary Controls																
L5	Environmental Lawyer	5,400	HR	1.00	$71.72	$71.72	$0.00	$0.00	$0.00	$0.00	$71.72	$387,288.00	100%	9%	$844,288	FLC FLCDataCenter	Assumes 150 hrs per dock/structure
L13	Paralegal	7,200	HR	1.00	$29.56	$29.56	$0.00	$0.00	$0.00	$0.00	$29.56	$212,832.00	100%	9%	$463,974	FLC FLCDataCenter	Assumes 200 hrs per dock/structure
L3	Clerks, Typist, Bookkeeper & Receptionist	3,600	HR	1.00	$19.89	$19.89	$0.00	$0.00	$0.00	$0.00	$19.89	$71,604.00	100%	9%	$156,097	FLC FLCDataCenter	Assumes 100 hrs per dock/structure
	Enforcement Tools																
L11	Project Manager	260	HR	1.00	$82.17	$82.17	$0.00	$0.00	$0.00	$0.00	$82.17	$21,364.20	100%	9%	$46,574	FLC FLCDataCenter	Assumes 0.125 FTE for implementation of enforcement tools
L5	Environmental Lawyer	2,080	HR	1.00	$71.72	$71.72	$0.00	$0.00	$0.00	$0.00	$71.72	$149,177.60	100%	9%	$325,207	FLC FLCDataCenter	Assumes 1 FTE for implementation of enforcement tools
L13	Paralegal	4,160	HR	1.00	$29.56	$29.56	$0.00	$0.00	$0.00	$0.00	$29.56	$122,969.60	100%	9%	$268,074	FLC FLCDataCenter	Assumes 2 FTE for implementation of enforcement tools
L3	Clerks, Typist, Bookkeeper & Receptionist	260	HR	1.00	$19.89	$19.89	$0.00	$0.00	$0.00	$0.00	$19.89	$5,171.40	100%	9%	$11,274	FLC FLCDataCenter	Assumes 0.125 FTE for implementation of enforcement tools
												TOTAL COST:			$2,985,246		

	Representative Unit Quantity	Unit(s)	Total Cost	Unit Cost
COST WORKSHEET SUMMARY	1	LS	$2,985,246	$2,985,246

TABLE CW-E2

Alternative E **Cost Worksheet:** **CW-E2**
Capital Cost Sub-Element
Initial Establishment of Institutional Controls

COST WORKSHEET

Site: Portland Harbor Superfund Site
Location: Portland, Oregon
Phase: Feasibility Study
Base Year: 2016

Prepared By: JN **Date:** 3/4/2016
Checked By: AB **Date:** 3/7/2016

Notes:

Further information about the development of cost worksheets can be found in Attachment A - Methodology and Organization of Detailed Cost Estimates.
The quantity bolded in the QTY column is the quantity selected as the representative unit quantity for this cost worksheet. If multiple quantities are bolded, the representative unit quantity is the sum of those quantities. When the LS unit is utilized, the default representative unit quantity is 1.
HTRW productivity factor is from Exhibit B-3 or B-4 of "A Guide to Developing and Documenting Cost Estimates During the Feasibility Study", EPA 2000
EPA developed project-specific unit costs using the Micro Computer Aided Cost Engineering System (MCACES) Second Generation (MII) software version 4.2, build 3

Cost Database Code:

The Cost Database Code is a reference code for linking with line item cost information with the cost source database and is not otherwise used within these cost worksheets. The following cost source database prefixes apply:

L (EPA-Derived Labor Unit Costs), M (Project-Specific Vendor Unit Costs), P (Previously Developed Unit Costs by Anchor QEA for Portland Harbor), A (EPA-Derived MII Unit Costs), O (Unit Costs from Other Projects/Sources)

Source of Cost Data:

For citation references, the following sources apply:

ALL (Allowance), FLC (www.flcdatacenter.com), LD (Costs Derived from Lower Duwamish Waterway Final Feasibility Study), MII (MII), O (Other), P (Previously Developed by Anchor QEA for Portland Harbor), and V (Vendor Quote)

Abbreviations:

QTY	Quantity	AC	Acres
EQUIP	Equipment	CLF	100 Linear Foot
MATL	Material	CY	Cubic Yard
HPF	HTRW Productivity Factor	DY	Days
ADJ LABOR	Adjusted Labor for HFP	EA	Each
ADJ EQUIP	Adjusted Equipment for HFP	FTE	Full Time Equivalent
UNMOD UC	Unmodified Unit Cost	HR	Hours
UNMOD LIC	Unmodified Line Item Cost	LB	Pounds
UNBUR LIC	Unburdened Line Item Cost	LCY	Loose Cubic Yard
PC OH	Prime Contractor Overhead	LF	Linear Foot
PC PF	Prime Contractor Profit	LS	Lump Sum
BUR LIC	Burdened Line Item Cost	MO	Month
		SF	Square Foot
		SY	Square Yard
		TON	Tons
		YR	Years

Cost Adjustment Checklist:	**NOTES:**
FACTOR:	Field work will be in Level "D" PPE.
H&S Productivity (labor and equipment only)	MII assembly costs include HPF adjustments.
Escalation to Base Year	2016 cost sources are not escalated (EF=1.00). All other costs are escalated based on the USACE CWCCIS, EM 1110-2-1304, Sept 2015.
Area Cost Factor	An AF of 1.05 is used for Oregon, except that an AF of 1.00 (national unmodified average) is used for MII assembly costs and local vendor quotes.
Subcontractor Overhead and Profit	It is assumed that home office OH is 8% and profit is 9% for the Prime Contractor. Professional labor overhead is 100%.
Prime Contractor Overhead and Profit	Allowances and items with mandated costs such as per diem do not have overhead and profit applied.
	Items previously developed by Anchor QEA already include contractor markups, therefore overhead and profit were not applied to those items.
	It is assumed that OH is 1% and profit is 0% for vendor quotes for treatment and disposal at offsite disposal facilities. It is assumed that OH is 5% and profit is 0% for quotes for all other material vendor quotes.
	Items developed using MII already include contractor markups such as overhead and profit, therefore additional overhead and profit were not applied in the PC OH and PC PF to those items.

TABLE CW-E3

Alternative E **Cost Worksheet:** **CW-E3**
Periodic Cost Sub-Element
Evaluating and Updating Institutional Controls

COST WORKSHEET

Site: Portland Harbor Superfund Site
Location: Portland, Oregon
Phase: Feasibility Study
Base Year: 2016

Prepared By: JN **Date:** 3/4/2016
Checked By: AB **Date:** 3/7/2016

Work Statement:
This sub-element involves evaluating and updating of institutional controls for the site. The following cost includes labor and materials to required for evaluating and updating institutional controls every 5 years.
Quantity development presented in Appendix D.

Cost Analysis:
Cost for Evaluating and Updating Institutional Controls (Lump Sum)

COST DATABASE CODE	DESCRIPTION	QTY	UNIT(S)	HPF	LABOR	ADJ LABOR	EQUIP	ADJ EQUIP	MATL	OTHER	UNMOD UC	UNMOD LIC	PC OH	PC PF	BUR LIC	COST SOURCE CITATION	COMMENTS
	Informational Devices - Fish Consumption Advisory																
L11	Project Manager	208	HR	1.00	$82.17	$82.17	$0.00	$0.00	$0.00	$0.00	$82.17	$17,091.36	100%	9%	$37,259	FLC FLCDataCenter	Assumes 10% of initial costs for updating periodically
L4	Environmental Engineer	104	HR	1.00	$48.91	$48.91	$0.00	$0.00	$0.00	$0.00	$48.91	$5,086.64	100%	9%	$11,089	FLC FLCDataCenter	Assumes 10% of initial costs for updating periodically
L6	Environmental Scientist	104	HR	1.00	$37.70	$37.70	$0.00	$0.00	$0.00	$0.00	$37.70	$3,920.80	100%	9%	$8,547	FLC FLCDataCenter	Assumes 10% of initial costs for updating periodically
L3	Clerks, Typist, Bookkeeper & Receptionist	52	HR	1.00	$19.89	$19.89	$0.00	$0.00	$0.00	$0.00	$19.89	$1,034.28	100%	9%	$2,255	FLC FLCDataCenter	Assumes 10% of initial costs for updating periodically
L5	Environmental Lawyer	26	HR	1.00	$71.72	$71.72	$0.00	$0.00	$0.00	$0.00	$71.72	$1,864.72	100%	9%	$4,065	FLC FLCDataCenter	Assumes 10% of initial costs for updating periodically
L13	Paralegal	26	HR	1.00	$29.56	$29.56	$0.00	$0.00	$0.00	$0.00	$29.56	$768.56	100%	9%	$1,675	FLC FLCDataCenter	Assumes 10% of initial costs for updating periodically
M26	Signage	50	EA	1.00	$0.00	$0.00	$0.00	$0.00	$165.75	$0.00	$165.75	$8,287.50	5%	0%	$8,702	V Vendor Quote	Assumes 100% replacement of signs every 5 years
L8	Field Technician	50	HR	1.00	$31.42	$31.42	$0.00	$0.00	$0.00	$0.00	$31.42	$1,571.00	100%	9%	$3,425	FLC FLCDataCenter	Assumes 1 hr/sign for sign placement (2 technician crew)
O5	Allowance for Production & Copies for Advisories	5	LS	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$1,000.00	$1,000.00	$5,000.00	0%	0%	$5,000	ALL Allowance	Assumes yearly allowance for production and copies during 5-yr periodic updates
	Informational Devices - Regulated Navigation Area (RNA) Setup																
L11	Project Manager	200	HR	1.00	$82.17	$82.17	$0.00	$0.00	$0.00	$0.00	$82.17	$16,434.00	100%	9%	$35,826	FLC FLCDataCenter	Project-specific unit cost developed by EPA.
L4	Environmental Engineer	150	HR	1.00	$48.91	$48.91	$0.00	$0.00	$0.00	$0.00	$48.91	$7,336.50	100%	9%	$15,994	FLC FLCDataCenter	Project-specific unit cost developed by EPA.
L3	Clerks, Typist, Bookkeeper & Receptionist	40	HR	1.00	$19.89	$19.89	$0.00	$0.00	$0.00	$0.00	$19.89	$795.60	100%	9%	$1,734	FLC FLCDataCenter	Project-specific unit cost developed by EPA.
A1	18' Boat	292	HR	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$25.42	$25.42	$7,422.64	0%	0%	$7,423	MII MII	Assumes 2 hr/buoy for buoy setup
L17	Boat Operator	292	HR	1.00	$33.16	$33.16	$0.00	$0.00	$0.00	$0.00	$33.16	$9,682.72	100%	9%	$21,108	FLC FLCDataCenter	Assumes 2 hr/buoy for buoy setup
L8	Field Technician	584	HR	1.00	$31.42	$31.42	$0.00	$0.00	$0.00	$0.00	$31.42	$18,349.28	100%	9%	$40,001	FLC FLCDataCenter	Assumes 4 hrs/buoy for buoy setup (2 technician crew)
M21	Buoy	146	EA	1.00	$0.00	$0.00	$0.00	$0.00	$558.63	$0.00	$558.63	$81,559.98	5%	0%	$85,638	V Vendor Quote	Assumes 100% replacement of buoys every 5 years. Quote - Go2Marine 2016.
	Proprietary Controls																
L5	Environmental Lawyer	540	HR	1.00	$71.72	$71.72	$0.00	$0.00	$0.00	$0.00	$71.72	$38,728.80	100%	9%	$84,429	FLC FLCDataCenter	Assumes 10% of initial costs for updating periodically
L13	Paralegal	720	HR	1.00	$29.56	$29.56	$0.00	$0.00	$0.00	$0.00	$29.56	$21,283.20	100%	9%	$46,397	FLC FLCDataCenter	Assumes 10% of initial costs for updating periodically
L3	Clerks, Typist, Bookkeeper & Receptionist	360	HR	1.00	$19.89	$19.89	$0.00	$0.00	$0.00	$0.00	$19.89	$7,160.40	100%	9%	$15,610	FLC FLCDataCenter	Assumes 10% of initial costs for updating periodically
	Enforcement Tools																
L11	Project Manager	26	HR	1.00	$82.17	$82.17	$0.00	$0.00	$0.00	$0.00	$82.17	$2,136.42	100%	9%	$4,657	FLC FLCDataCenter	Assumes 10% of initial costs for updating periodically
L5	Environmental Lawyer	208	HR	1.00	$71.72	$71.72	$0.00	$0.00	$0.00	$0.00	$71.72	$14,917.76	100%	9%	$32,521	FLC FLCDataCenter	Assumes 10% of initial costs for updating periodically
L13	Paralegal	416	HR	1.00	$29.56	$29.56	$0.00	$0.00	$0.00	$0.00	$29.56	$12,296.96	100%	9%	$26,807	FLC FLCDataCenter	Assumes 10% of initial costs for updating periodically
L3	Clerks, Typist, Bookkeeper & Receptionist	26	HR	1.00	$19.89	$19.89	$0.00	$0.00	$0.00	$0.00	$19.89	$517.14	100%	9%	$1,127	FLC FLCDataCenter	Assumes 10% of initial costs for updating periodically
												TOTAL COST:			$501,289		

	Representative Unit Quantity	Unit(s)	Total Cost	Unit Cost
COST WORKSHEET SUMMARY	1	LS	$501,289	$501,289

TABLE CW-E3

Alternative E **Cost Worksheet:** **CW-E3**
Periodic Cost Sub-Element
Evaluating and Updating Institutional Controls

COST WORKSHEET

Site: Portland Harbor Superfund Site
Location: Portland, Oregon
Phase: Feasibility Study
Base Year: 2016

Prepared By: JN **Date:** 3/4/2016
Checked By: AB **Date:** 3/7/2016

Notes:

Further information about the development of cost worksheets can be found in Attachment A - Methodology and Organization of Detailed Cost Estimates.
The quantity bolded in the QTY column is the quantity selected as the representative unit quantity for this cost worksheet. If multiple quantities are bolded, the representative unit quantity is the sum of those quantities. When the LS unit is utilized, the default representative unit quantity is 1.
HTRW productivity factor is from Exhibit B-3 or B-4 of "A Guide to Developing and Documenting Cost Estimates During the Feasibility Study", EPA 2000
EPA developed project-specific unit costs using the Micro Computer Aided Cost Engineering System (MCACES) Second Generation (MII) software version 4.2, build 3

Cost Database Code:

The Cost Database Code is a reference code for linking with line item cost information with the cost source database and is not otherwise used within these cost worksheets. The following cost source database prefixes apply:

L (EPA-Derived Labor Unit Costs), M (Project-Specific Vendor Unit Costs), P (Previously Developed Unit Costs by Anchor QEA for Portland Harbor), A (EPA-Derived MII Unit Costs), O (Unit Costs from Other Projects/Sources)

Source of Cost Data:

For citation references, the following sources apply:

ALL (Allowance), FLC (www.flcdatacenter.com), LD (Costs Derived from Lower Duwamish Waterway Final Feasibility Study), MII (MII), O (Other), P (Previously Developed by Anchor QEA for Portland Harbor), and V (Vendor Quote)

Abbreviations:

QTY	Quantity	AC	Acres
EQUIP	Equipment	CLF	100 Linear Foot
MATL	Material	CY	Cubic Yard
HPF	HTRW Productivity Factor	DY	Days
ADJ LABOR	Adjusted Labor for HFP	EA	Each
ADJ EQUIP	Adjusted Equipment for HFP	FTE	Full Time Equivalent
UNMOD UC	Unmodified Unit Cost	HR	Hours
UNMOD LIC	Unmodified Line Item Cost	LB	Pounds
UNBUR LIC	Unburdened Line Item Cost	LCY	Loose Cubic Yard
PC OH	Prime Contractor Overhead	LF	Linear Foot
PC PF	Prime Contractor Profit	LS	Lump Sum
BUR LIC	Burdened Line Item Cost	MO	Month
		SF	Square Foot
		SY	Square Yard
		TON	Tons
		YR	Years

Cost Adjustment Checklist:	**NOTES:**
FACTOR:	Field work will be in Level "D" PPE.
H&S Productivity (labor and equipment only)	MII assembly costs include HPF adjustments.
Escalation to Base Year	2016 cost sources are not escalated (EF=1.00). All other costs are escalated based on the USACE CWCCIS, EM 1110-2-1304, Sept 2015.
Area Cost Factor	An AF of 1.05 is used for Oregon, except that an AF of 1.00 (national unmodified average) is used for MII assembly costs and local vendor quotes.
Subcontractor Overhead and Profit	It is assumed that home office OH is 8% and profit is 9% for the Prime Contractor. Professional labor overhead is 100%.
Prime Contractor Overhead and Profit	Allowances and items with mandated costs such as per diem do not have overhead and profit applied.
	Items previously developed by Anchor QEA already include contractor markups, therefore overhead and profit were not applied to those items.
	It is assumed that OH is 1% and profit is 0% for vendor quotes for treatment and disposal at offsite disposal facilities. It is assumed that OH is 5% and profit is 0% for quotes for all other material vendor quotes.
	Items developed using MII already include contractor markups such as overhead and profit, therefore additional overhead and profit were not applied in the PC OH and PC PF to those items.

TABLE CW-E5

Alternative E **Cost Worksheet:** **CW-E5**
Capital Cost Sub-Element
Debris Removal and Disposal

COST WORKSHEET

Site: Portland Harbor Superfund Site
Location: Portland, Oregon
Phase: Feasibility Study
Base Year: 2016

Prepared By: JN **Date:** 3/4/2016
Checked By: AB **Date:** 3/7/2016

Work Statement:
This sub-element involves removal and disposal of debris for all areas prior to remedial activities. It includes costs for on-site labor, equipment, and materials developed from previous work.
Quantity development presented in Appendix D.

Cost Analysis:
Cost for Debris Removal and Disposal (Lump Sum)

COST DATABASE CODE	DESCRIPTION	QTY	UNIT(S)	HPF	LABOR	ADJ LABOR	EQUIP	ADJ EQUIP	MATL	OTHER	UNMOD UC	UNMOD LIC	PC OH	PC PF	BUR LIC	COST SOURCE CITATION	COMMENTS
P9	Debris Removal and Disposal	**330**	AC	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$13,107.01	$13,107.01	$4,325,313.30	0%	0%	$4,325,313	P Anchor QEA	Project-specific cost developed by Anchor QEA (2010) - see Backup Table 2.
												TOTAL COST:			$4,325,313		

	Representative Unit Quantity	Unit(s)	Total Cost	Unit Cost
COST WORKSHEET SUMMARY	330	AC	$4,325,313	$13,107

Notes:
Further information about the development of cost worksheets can be found in Attachment A - Methodology and Organization of Detailed Cost Estimates.
The quantity bolded in the QTY column is the quantity selected as the representative unit quantity for this cost worksheet. If multiple quantities are bolded, the representative unit quantity is the sum of those quantities. When the LS unit is utilized, the default representative unit quantity is 1.
HTRW productivity factor is from Exhibit B-3 or B-4 of "A Guide to Developing and Documenting Cost Estimates During the Feasibility Study", EPA 2000
EPA developed project-specific unit costs using the Micro Computer Aided Cost Engineering System (MCACES) Second Generation (MII) software version 4.2, build 3

Cost Database Code:
The Cost Database Code is a reference code for linking with line item cost information with the cost source database and is not otherwise used within these cost worksheets. The following cost source database prefixes apply:
L (EPA-Derived Labor Unit Costs), M (Project-Specific Vendor Unit Costs), P (Previously Developed Unit Costs by Anchor QEA for Portland Harbor), A (EPA-Derived MII Unit Costs), O (Unit Costs from Other Projects/Sources)

Source of Cost Data:
For citation references, the following sources apply:
ALL (Allowance), FLC (www.flcdatacenter.com), LD (Costs Derived from Lower Duwamish Waterway Final Feasibility Study), MII (MII), O (Other), P (Previously Developed by Anchor QEA for Portland Harbor), and V (Vendor Quote)

Abbreviations:

QTY	Quantity	AC	Acres
EQUIP	Equipment	CLF	100 Linear Foot
MATL	Material	CY	Cubic Yard
HPF	HTRW Productivity Factor	DY	Days
ADJ LABOR	Adjusted Labor for HFP	EA	Each
ADJ EQUIP	Adjusted Equipment for HFP	FTE	Full Time Equivalent
UNMOD UC	Unmodified Unit Cost	HR	Hours
UNMOD LIC	Unmodified Line Item Cost	LB	Pounds
UNBUR LIC	Unburdened Line Item Cost	LCY	Loose Cubic Yard
PC OH	Prime Contractor Overhead	LF	Linear Foot
PC PF	Prime Contractor Profit	LS	Lump Sum
BUR LIC	Burdened Line Item Cost	MO	Month
		SF	Square Foot
		SY	Square Yard
		TON	Tons
		YR	Years

Cost Adjustment Checklist:	**NOTES:**
FACTOR:	Field work will be in Level "D" PPE.
H&S Productivity (labor and equipment only)	MII assembly costs include HPF adjustments.
Escalation to Base Year	2016 cost sources are not escalated (EF=1.00). All other costs are escalated based on the USACE CWCCIS, EM 1110-2-1304, Sept 2015.
Area Cost Factor	An AF of 1.05 is used for Oregon, except that an AF of 1.00 (national unmodified average) is used for MII assembly costs and local vendor quotes.
Subcontractor Overhead and Profit	It is assumed that home office OH is 8% and profit is 9% for the Prime Contractor. Professional labor overhead is 100%.
Prime Contractor Overhead and Profit	Allowances and items with mandated costs such as per diem do not have overhead and profit applied.
	Items previously developed by Anchor QEA already include contractor markups, therefore overhead and profit were not applied to those items.
	It is assumed that OH is 1% and profit is 0% for vendor quotes for treatment and disposal at offsite disposal facilities. It is assumed that OH is 5% and profit is 0% for quotes for all other material vendor quotes.
	Items developed using MII already include contractor markups such as overhead and profit, therefore additional overhead and profit were not applied in the PC OH and PC PF to those items.

TABLE CW-E6

Alternative E **Cost Worksheet:** **CW-E6**
Capital Cost Sub-Element
Obstruction Removal and Relocation

COST WORKSHEET

Site: Portland Harbor Superfund Site
Location: Portland, Oregon
Phase: Feasibility Study
Base Year: 2016

Prepared By: JN **Date:** 3/4/2016
Checked By: AB **Date:** 3/7/2016

Work Statement:
This sub-element involves all work related to obstructions removal, relocation, and disposal. It includes all costs for labor, equipment and materials developed from previous work for pile removal and disposal, pile replacement, and temporary dock relocation.
Quantity development presented in Appendix D.

Cost Analysis:
Cost for Obstructions (Lump Sum)

COST DATABASE CODE	DESCRIPTION	QTY	UNIT(S)	HPF	LABOR	ADJ LABOR	EQUIP	ADJ EQUIP	MATL	OTHER	UNMOD UC	UNMOD LIC	PC OH	PC PF	BUR LIC	COST SOURCE CITATION	COMMENTS
P10	Pile Removal and Disposal	1,818	EA	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$715.65	$715.65	$1,301,042.61	0%	0%	$1,301,043	P Anchor QEA	Project-specific cost developed by Anchor QEA (2010) - see Backup Table 3.
P11	Pile Replacement	1,818	EA	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$7,478.77	$7,478.77	$13,596,407.50	0%	0%	$13,596,407	P Anchor QEA	Project-specific cost developed by Anchor QEA (2010) - see Backup Table 4.
P12	Temporary Dock Relocation	8	EA	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$100,497.97	$100,497.97	$803,983.77	0%	0%	$803,984	P Anchor QEA	Project-specific cost developed by Anchor QEA (2010) - see Backup Table 5.
												TOTAL COST:			$15,701,434		

	Representative Unit Quantity	Unit(s)	Total Cost	Unit Cost
COST WORKSHEET SUMMARY	1	LS	$15,701,434	$15,701,434

Notes:
Further information about the development of cost worksheets can be found in Attachment A - Methodology and Organization of Detailed Cost Estimates.
The quantity bolded in the QTY column is the quantity selected as the representative unit quantity for this cost worksheet. If multiple quantities are bolded, the representative unit quantity is the sum of those quantities. When the LS unit is utilized, the default representative unit quantity is 1.
HTRW productivity factor is from Exhibit B-3 or B-4 of "A Guide to Developing and Documenting Cost Estimates During the Feasibility Study", EPA 2000
EPA developed project-specific unit costs using the Micro Computer Aided Cost Engineering System (MCACES) Second Generation (MII) software version 4.2, build 3

Cost Database Code:
The Cost Database Code is a reference code for linking with line item cost information with the cost source database and is not otherwise used within these cost worksheets. The following cost source database prefixes apply:
L (EPA-Derived Labor Unit Costs), M (Project-Specific Vendor Unit Costs), P (Previously Developed Unit Costs by Anchor QEA for Portland Harbor), A (EPA-Derived MII Unit Costs), O (Unit Costs from Other Projects/Sources)

Source of Cost Data:
For citation references, the following sources apply:
ALL (Allowance), FLC (www.flcdatacenter.com), LD (Costs Derived from Lower Duwamish Waterway Final Feasibility Study), MII (MII), O (Other), P (Previously Developed by Anchor QEA for Portland Harbor), and V (Vendor Quote)

Abbreviations:

QTY	Quantity	AC	Acres
EQUIP	Equipment	CLF	100 Linear Foot
MATL	Material	CY	Cubic Yard
HPF	HTRW Productivity Factor	DY	Days
ADJ LABOR	Adjusted Labor for HFP	EA	Each
ADJ EQUIP	Adjusted Equipment for HFP	FTE	Full Time Equivalent
UNMOD UC	Unmodified Unit Cost	HR	Hours
UNMOD LIC	Unmodified Line Item Cost	LB	Pounds
UNBUR LIC	Unburdened Line Item Cost	LCY	Loose Cubic Yard
PC OH	Prime Contractor Overhead	LF	Linear Foot
PC PF	Prime Contractor Profit	LS	Lump Sum
BUR LIC	Burdened Line Item Cost	MO	Month
		SF	Square Foot
		SY	Square Yard
		TON	Tons
		YR	Years

Cost Adjustment Checklist:	**NOTES:**
FACTOR:	Field work will be in Level "D" PPE.
H&S Productivity (labor and equipment only)	MII assembly costs include HPF adjustments.
Escalation to Base Year	2016 cost sources are not escalated (EF=1.00). All other costs are escalated based on the USACE CWCCIS, EM 1110-2-1304, Sept 2015.
Area Cost Factor	An AF of 1.05 is used for Oregon, except that an AF of 1.00 (national unmodified average) is used for MII assembly costs and local vendor quotes.
Subcontractor Overhead and Profit	It is assumed that home office OH is 8% and profit is 9% for the Prime Contractor. Professional labor overhead is 100%.
Prime Contractor Overhead and Profit	Allowances and items with mandated costs such as per diem do not have overhead and profit applied.
	Items previously developed by Anchor QEA already include contractor markups, therefore overhead and profit were not applied to those items.
	It is assumed that OH is 1% and profit is 0% for vendor quotes for treatment and disposal at offsite disposal facilities. It is assumed that OH is 5% and profit is 0% for quotes for all other material vendor quotes.
	Items developed using MII already include contractor markups such as overhead and profit, therefore additional overhead and profit were not applied in the PC OH and PC PF to those items.

TABLE CW-E7

Alternative E **Cost Worksheet:** **CW-E7**
Capital Cost Sub-Element
Erosion/Residual Control Measures

COST WORKSHEET

Site: Portland Harbor Superfund Site
Location: Portland, Oregon
Phase: Feasibility Study
Base Year: 2016

Prepared By: JN **Date:** 3/4/2016
Checked By: AB **Date:** 3/7/2016

Work Statement:
This sub-element involves the installation, maintainance, and removal of silt curtains and sheet pile walls for erosion and residual control. It includes costs for on-site labor, equipment, and materials developed from previous work.
Quantity development presented in Appendix D.

Cost Analysis:
Cost for Erosion/Residual Control Measures (Lump Sum)

COST DATABASE CODE	DESCRIPTION	QTY	UNIT(S)	HPF	LABOR	ADJ LABOR	EQUIP	ADJ EQUIP	MATL	OTHER	UNMOD UC	UNMOD LIC	PC OH	PC PF	BUR LIC	COST SOURCE CITATION	COMMENTS
P13	Purchase, Install and Maintain Silt Curtains	42,500	LF	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$96.92	$96.92	$4,119,185.00	0%	0%	$4,119,185	P Anchor QEA	Project-specific cost developed by Anchor QEA (2010) - see Backup Table 7.
P14	Purchase, Install and Remove Sheet Pile Walls	7,500	LF	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$2,749.88	$2,749.88	$20,624,100.00	0%	0%	$20,624,100	P Anchor QEA	Project-specific cost developed by Anchor QEA (2010) - see Backup Table 6.
												TOTAL COST:			$24,743,285		

	Representative Unit Quantity	Unit(s)	Total Cost	Unit Cost
COST WORKSHEET SUMMARY	1	LS	$24,743,285	$24,743,285

Notes:
Further information about the development of cost worksheets can be found in Attachment A - Methodology and Organization of Detailed Cost Estimates.
The quantity bolded in the QTY column is the quantity selected as the representative unit quantity for this cost worksheet. If multiple quantities are bolded, the representative unit quantity is the sum of those quantities. When the LS unit is utilized, the default representative unit quantity is 1.
HTRW productivity factor is from Exhibit B-3 or B-4 of "A Guide to Developing and Documenting Cost Estimates During the Feasibility Study", EPA 2000
EPA developed project-specific unit costs using the Micro Computer Aided Cost Engineering System (MCACES) Second Generation (MII) software version 4.2, build 3

Cost Database Code:
The Cost Database Code is a reference code for linking with line item cost information with the cost source database and is not otherwise used within these cost worksheets. The following cost source database prefixes apply:
L (EPA-Derived Labor Unit Costs), M (Project-Specific Vendor Unit Costs), P (Previously Developed Unit Costs by Anchor QEA for Portland Harbor), A (EPA-Derived MII Unit Costs), O (Unit Costs from Other Projects/Sources)

Source of Cost Data:
For citation references, the following sources apply:
ALL (Allowance), FLC (www.flcdatacenter.com), LD (Costs Derived from Lower Duwamish Waterway Final Feasibility Study), MII (MII), O (Other), P (Previously Developed by Anchor QEA for Portland Harbor), and V (Vendor Quote)

Abbreviations:

QTY	Quantity	AC	Acres
EQUIP	Equipment	CLF	100 Linear Foot
MATL	Material	CY	Cubic Yard
HPF	HTRW Productivity Factor	DY	Days
ADJ LABOR	Adjusted Labor for HFP	EA	Each
ADJ EQUIP	Adjusted Equipment for HFP	FTE	Full Time Equivalent
UNMOD UC	Unmodified Unit Cost	HR	Hours
UNMOD LIC	Unmodified Line Item Cost	LB	Pounds
UNBUR LIC	Unburdened Line Item Cost	LCY	Loose Cubic Yard
PC OH	Prime Contractor Overhead	LF	Linear Foot
PC PF	Prime Contractor Profit	LS	Lump Sum
BUR LIC	Burdened Line Item Cost	MO	Month
		SF	Square Foot
		SY	Square Yard
		TON	Tons
		YR	Years

Cost Adjustment Checklist:	NOTES:
FACTOR:	Field work will be in Level "D" PPE.
H&S Productivity (labor and equipment only)	MII assembly costs include HPF adjustments.
Escalation to Base Year	2016 cost sources are not escalated (EF=1.00). All other costs are escalated based on the USACE CWCCIS, EM 1110-2-1304, Sept 2015.
Area Cost Factor	An AF of 1.05 is used for Oregon, except that an AF of 1.00 (national unmodified average) is used for MII assembly costs and local vendor quotes.
Subcontractor Overhead and Profit	It is assumed that home office OH is 8% and profit is 9% for the Prime Contractor. Professional labor overhead is 100%.
Prime Contractor Overhead and Profit	Allowances and items with mandated costs such as per diem do not have overhead and profit applied.
	Items previously developed by Anchor QEA already include contractor markups, therefore overhead and profit were not applied to those items.
	It is assumed that OH is 1% and profit is 0% for vendor quotes for treatment and disposal at offsite disposal facilities. It is assumed that OH is 5% and profit is 0% for quotes for all other material vendor quotes.
	Items developed using MII already include contractor markups such as overhead and profit, therefore additional overhead and profit were not applied in the PC OH and PC PF to those items.

TABLE CW-E8

Alternative E **Cost Worksheet:** **CW-E8**
Capital Cost Sub-Element
Dredging of Contaminated Sediments (Open Water)

COST WORKSHEET

Site: Portland Harbor Superfund Site
Location: Portland, Oregon
Phase: Feasibility Study
Base Year: 2016

Prepared By: JN **Date:** 3/4/2016
Checked By: AB **Date:** 3/7/2016

Work Statement:
This sub-element involves mechanical dredging of contaminated sediments in open water areas and transport to dewatering/stabilization area. It includes costs for on-site labor, equipment, and materials for open water dredging, assuming a 10 CY barge mounted crane and clamshell.
Quantity development presented in Appendix D.

Cost Analysis:
Cost for Open Water Dredging (Lump Sum)

COST DATABASE CODE	DESCRIPTION	QTY	UNIT(S)	HPF	LABOR	ADJ LABOR	EQUIP	ADJ EQUIP	MATL	OTHER	UNMOD UC	UNMOD LIC	PC OH	PC PF	BUR LIC	COST SOURCE CITATION	COMMENTS
A6	Open Water Dredging	**1,835,521**	CY	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$24.53	$24.53	$45,025,330.13	0%	0%	$45,025,330	MII MII	Project-specific unit cost developed in MII.
												TOTAL COST:			$45,025,330		

	Representative Unit Quantity	Unit(s)	Total Cost	Unit Cost
COST WORKSHEET SUMMARY	1,835,521	CY	$45,025,330	$24.53

Notes:
Further information about the development of cost worksheets can be found in Attachment A - Methodology and Organization of Detailed Cost Estimates.
The quantity bolded in the QTY column is the quantity selected as the representative unit quantity for this cost worksheet. If multiple quantities are bolded, the representative unit quantity is the sum of those quantities. When the LS unit is utilized, the default representative unit quantity is 1.
HTRW productivity factor is from Exhibit B-3 or B-4 of "A Guide to Developing and Documenting Cost Estimates During the Feasibility Study", EPA 2000
EPA developed project-specific unit costs using the Micro Computer Aided Cost Engineering System (MCACES) Second Generation (MII) software version 4.2, build 3

Cost Database Code:
The Cost Database Code is a reference code for linking with line item cost information with the cost source database and is not otherwise used within these cost worksheets. The following cost source database prefixes apply:
L (EPA-Derived Labor Unit Costs), M (Project-Specific Vendor Unit Costs), P (Previously Developed Unit Costs by Anchor QEA for Portland Harbor), A (EPA-Derived MII Unit Costs), O (Unit Costs from Other Projects/Sources)

Source of Cost Data:
For citation references, the following sources apply:
ALL (Allowance), FLC (www.flcdatacenter.com), LD (Costs Derived from Lower Duwamish Waterway Final Feasibility Study), MII (MII), O (Other), P (Previously Developed by Anchor QEA for Portland Harbor), and V (Vendor Quote)

Abbreviations:

QTY	Quantity	AC	Acres
EQUIP	Equipment	CLF	100 Linear Foot
MATL	Material	CY	Cubic Yard
HPF	HTRW Productivity Factor	DY	Days
ADJ LABOR	Adjusted Labor for HFP	EA	Each
ADJ EQUIP	Adjusted Equipment for HFP	FTE	Full Time Equivalent
UNMOD UC	Unmodified Unit Cost	HR	Hours
UNMOD LIC	Unmodified Line Item Cost	LB	Pounds
UNBUR LIC	Unburdened Line Item Cost	LCY	Loose Cubic Yard
PC OH	Prime Contractor Overhead	LF	Linear Foot
PC PF	Prime Contractor Profit	LS	Lump Sum
BUR LIC	Burdened Line Item Cost	MO	Month
		SF	Square Foot
		SY	Square Yard
		TON	Tons
		YR	Years

Cost Adjustment Checklist:	**NOTES:**
FACTOR:	Field work will be in Level "D" PPE.
H&S Productivity (labor and equipment only)	MII assembly costs include HPF adjustments.
Escalation to Base Year	2016 cost sources are not escalated (EF=1.00). All other costs are escalated based on the USACE CWCCIS, EM 1110-2-1304, Sept 2015.
Area Cost Factor	An AF of 1.05 is used for Oregon, except that an AF of 1.00 (national unmodified average) is used for MII assembly costs and local vendor quotes.
Subcontractor Overhead and Profit	It is assumed that home office OH is 8% and profit is 9% for the Prime Contractor. Professional labor overhead is 100%.
Prime Contractor Overhead and Profit	Allowances and items with mandated costs such as per diem do not have overhead and profit applied.
	Items previously developed by Anchor QEA already include contractor markups, therefore overhead and profit were not applied to those items.
	It is assumed that OH is 1% and profit is 0% for vendor quotes for treatment and disposal at offsite disposal facilities. It is assumed that OH is 5% and profit is 0% for quotes for all other material vendor quotes.
	Items developed using MII already include contractor markups such as overhead and profit, therefore additional overhead and profit were not applied in the PC OH and PC PF to those items.

TABLE CW-E9

Alternative E **Cost Worksheet:** **CW-E9**
Capital Cost Sub-Element
Dredging of Contaminated Sediments (Confined)

COST WORKSHEET

Site: Portland Harbor Superfund Site
Location: Portland, Oregon
Phase: Feasibility Study
Base Year: 2016

Prepared By: JN **Date:** 3/4/2016
Checked By: AB **Date:** 3/7/2016

Work Statement:
This sub-element involves mechanical dredging of contaminated sediments in confined areas and transport to dewatering/stabilization area. It includes costs for on-site labor, equipment, and materials for confined dredging, assuming a 4 CY barge mounted excavator.
Quantity development presented in Appendix D.

Cost Analysis:
Cost for Confined Dredging (Lump Sum)

COST DATABASE CODE	DESCRIPTION	QTY	UNIT(S)	HPF	LABOR	ADJ LABOR	EQUIP	ADJ EQUIP	MATL	OTHER	UNMOD UC	UNMOD LIC	PC OH	PC PF	BUR LIC	COST SOURCE CITATION	COMMENTS
A7	Confined Dredging	**92,616**	CY	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$31.10	$31.10	$2,880,357.60	0%	0%	$2,880,358	MII MII	Project-specific unit cost developed in MII.
												TOTAL COST:			$2,880,358		

	Representative Unit Quantity	Unit(s)	Total Cost	Unit Cost
COST WORKSHEET SUMMARY	92,616	CY	$2,880,358	$31.10

Notes:
Further information about the development of cost worksheets can be found in Attachment A - Methodology and Organization of Detailed Cost Estimates.
The quantity bolded in the QTY column is the quantity selected as the representative unit quantity for this cost worksheet. If multiple quantities are bolded, the representative unit quantity is the sum of those quantities. When the LS unit is utilized, the default representative unit quantity is 1.
HTRW productivity factor is from Exhibit B-3 or B-4 of "A Guide to Developing and Documenting Cost Estimates During the Feasibility Study", EPA 2000
EPA developed project-specific unit costs using the Micro Computer Aided Cost Engineering System (MCACES) Second Generation (MII) software version 4.2, build 3

Cost Database Code:
The Cost Database Code is a reference code for linking with line item cost information with the cost source database and is not otherwise used within these cost worksheets. The following cost source database prefixes apply:
L (EPA-Derived Labor Unit Costs), M (Project-Specific Vendor Unit Costs), P (Previously Developed Unit Costs by Anchor QEA for Portland Harbor), A (EPA-Derived MII Unit Costs), O (Unit Costs from Other Projects/Sources)

Source of Cost Data:
For citation references, the following sources apply:
ALL (Allowance), FLC (www.flcdatacenter.com), LD (Costs Derived from Lower Duwamish Waterway Final Feasibility Study), MII (MII), O (Other), P (Previously Developed by Anchor QEA for Portland Harbor), and V (Vendor Quote)

Abbreviations:

QTY	Quantity	AC	Acres
EQUIP	Equipment	CLF	100 Linear Foot
MATL	Material	CY	Cubic Yard
HPF	HTRW Productivity Factor	DY	Days
ADJ LABOR	Adjusted Labor for HFP	EA	Each
ADJ EQUIP	Adjusted Equipment for HFP	FTE	Full Time Equivalent
UNMOD UC	Unmodified Unit Cost	HR	Hours
UNMOD LIC	Unmodified Line Item Cost	LB	Pounds
UNBUR LIC	Unburdened Line Item Cost	LCY	Loose Cubic Yard
PC OH	Prime Contractor Overhead	LF	Linear Foot
PC PF	Prime Contractor Profit	LS	Lump Sum
BUR LIC	Burdened Line Item Cost	MO	Month
		SF	Square Foot
		SY	Square Yard
		TON	Tons
		YR	Years

Cost Adjustment Checklist:	**NOTES:**
FACTOR:	Field work will be in Level "D" PPE.
H&S Productivity (labor and equipment only)	MII assembly costs include HPF adjustments.
Escalation to Base Year	2016 cost sources are not escalated (EF=1.00). All other costs are escalated based on the USACE CWCCIS, EM 1110-2-1304, Sept 2015.
Area Cost Factor	An AF of 1.05 is used for Oregon, except that an AF of 1.00 (national unmodified average) is used for MII assembly costs and local vendor quotes.
Subcontractor Overhead and Profit	It is assumed that home office OH is 8% and profit is 9% for the Prime Contractor. Professional labor overhead is 100%.
Prime Contractor Overhead and Profit	Allowances and items with mandated costs such as per diem do not have overhead and profit applied.
	Items previously developed by Anchor QEA already include contractor markups, therefore overhead and profit were not applied to those items.
	It is assumed that OH is 1% and profit is 0% for vendor quotes for treatment and disposal at offsite disposal facilities. It is assumed that OH is 5% and profit is 0% for quotes for all other material vendor quotes.
	Items developed using MII already include contractor markups such as overhead and profit, therefore additional overhead and profit were not applied in the PC OH and PC PF to those items.

TABLE CW-E10

Alternative E
Capital Cost Sub-Element
Excavation of Riverbanks

Cost Worksheet: **CW-E10**

COST WORKSHEET

Site: Portland Harbor Superfund Site
Location: Portland, Oregon
Phase: Feasibility Study
Base Year: 2016

Prepared By: JN **Date:** 3/4/2016
Checked By: AB **Date:** 3/7/2016

Work Statement:
This sub-element involves mechanical excavation of riverbank materials and transport to dewatering/stabilization area. It includes costs for on-site labor, equipment, and materials for riverbank excavation, assuming a 4 CY long-arm excavator.
Quantity development presented in Appendix D.

Cost Analysis:
Cost for Excavation from Shore for Riverbanks (Lump Sum)

COST DATABASE CODE	DESCRIPTION	QTY	UNIT(S)	HPF	LABOR	ADJ LABOR	EQUIP	ADJ EQUIP	MATL	OTHER	UNMOD UC	UNMOD LIC	PC OH	PC PF	BUR LIC	COST SOURCE CITATION	COMMENTS
A8	Riverbank Excavation	**96,086**	CY	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$5.19	$5.19	$498,687.40	0%	0%	$498,687	MII MII	Project-specific unit cost developed in MII.
												TOTAL COST:			$498,687		

	Representative Unit Quantity	Unit(s)	Total Cost	Unit Cost
COST WORKSHEET SUMMARY	96,086	CY	$498,687	$5.19

Notes:
Further information about the development of cost worksheets can be found in Attachment A - Methodology and Organization of Detailed Cost Estimates.
The quantity bolded in the QTY column is the quantity selected as the representative unit quantity for this cost worksheet. If multiple quantities are bolded, the representative unit quantity is the sum of those quantities. When the LS unit is utilized, the default representative unit quantity is 1.
HTRW productivity factor is from Exhibit B-3 or B-4 of "A Guide to Developing and Documenting Cost Estimates During the Feasibility Study", EPA 2000
EPA developed project-specific unit costs using the Micro Computer Aided Cost Engineering System (MCACES) Second Generation (MII) software version 4.2, build 3

Cost Database Code:
The Cost Database Code is a reference code for linking with line item cost information with the cost source database and is not otherwise used within these cost worksheets. The following cost source database prefixes apply:
L (EPA-Derived Labor Unit Costs), M (Project-Specific Vendor Unit Costs), P (Previously Developed Unit Costs by Anchor QEA for Portland Harbor), A (EPA-Derived MII Unit Costs), O (Unit Costs from Other Projects/Sources)

Source of Cost Data:
For citation references, the following sources apply:
ALL (Allowance), FLC (www.flcdatacenter.com), LD (Costs Derived from Lower Duwamish Waterway Final Feasibility Study), MII (MII), O (Other), P (Previously Developed by Anchor QEA for Portland Harbor), and V (Vendor Quote)

Abbreviations:

QTY	Quantity	AC	Acres
EQUIP	Equipment	CLF	100 Linear Foot
MATL	Material	CY	Cubic Yard
HPF	HTRW Productivity Factor	DY	Days
ADJ LABOR	Adjusted Labor for HFP	EA	Each
ADJ EQUIP	Adjusted Equipment for HFP	FTE	Full Time Equivalent
UNMOD UC	Unmodified Unit Cost	HR	Hours
UNMOD LIC	Unmodified Line Item Cost	LB	Pounds
UNBUR LIC	Unburdened Line Item Cost	LCY	Loose Cubic Yard
PC OH	Prime Contractor Overhead	LF	Linear Foot
PC PF	Prime Contractor Profit	LS	Lump Sum
BUR LIC	Burdened Line Item Cost	MO	Month
		SF	Square Foot
		SY	Square Yard
		TON	Tons
		YR	Years

Cost Adjustment Checklist:	**NOTES:**
FACTOR:	Field work will be in Level "D" PPE.
H&S Productivity (labor and equipment only)	MII assembly costs include HPF adjustments.
Escalation to Base Year	2016 cost sources are not escalated (EF=1.00). All other costs are escalated based on the USACE CWCCIS, EM 1110-2-1304, Sept 2015.
Area Cost Factor	An AF of 1.05 is used for Oregon, except that an AF of 1.00 (national unmodified average) is used for MII assembly costs and local vendor quotes.
Subcontractor Overhead and Profit	It is assumed that home office OH is 8% and profit is 9% for the Prime Contractor. Professional labor overhead is 100%.
Prime Contractor Overhead and Profit	Allowances and items with mandated costs such as per diem do not have overhead and profit applied.
	Items previously developed by Anchor QEA already include contractor markups, therefore overhead and profit were not applied to those items.
	It is assumed that OH is 1% and profit is 0% for vendor quotes for treatment and disposal at offsite disposal facilities. It is assumed that OH is 5% and profit is 0% for quotes for all other material vendor quotes.
	Items developed using MII already include contractor markups such as overhead and profit, therefore additional overhead and profit were not applied in the PC OH and PC PF to those items.

TABLE CW-E11

Alternative E **Cost Worksheet:** **CW-E11**
Capital Cost Sub-Element
Dewatering and Water Treatment for Dredging Operations

COST WORKSHEET

Site: Portland Harbor Superfund Site
Location: Portland, Oregon
Phase: Feasibility Study
Base Year: 2016

Prepared By: JN **Date:** 3/4/2016
Checked By: AB **Date:** 3/7/2016

Work Statement:
This sub-element involves the dewatering and water treatment for dredging operations. Assumes a temporary water treatment plant will be utilized for treatment of water generated from dewatering of sediments. It includes costs for labor, equipment, and materials for treatment of water generated from dredged sediments. Quantity development presented in Appendix D.

Cost Analysis:
Cost for Dewatering and Water Treatment for Dredging Operations (Lump Sum)

COST DATABASE CODE	DESCRIPTION	QTY	UNIT(S)	HPF	LABOR	ADJ LABOR	EQUIP	ADJ EQUIP	MATL	OTHER	UNMOD UC	UNMOD LIC	PC OH	PC PF	BUR LIC	COST SOURCE CITATION	COMMENTS
A9	Mobilization/Demobilization of Temporary Water Treatment System	7	EA	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$36,600.00	$36,600.00	$256,200.00	0%	0%	$256,200	MII MII	Project-specific unit cost developed in MII. Assumes mob/demob of treatment system will be required for each construction season
A10	Dewatering and Temporary Water Treatment System Operations	378	DY	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$21,654.00	$21,654.00	$8,187,377.40	0%	0%	$8,187,377	MII MII	Project-specific unit cost developed in MII.
														TOTAL COST:	$8,443,577		

	Representative Unit Quantity	Unit(s)	Total Cost	Unit Cost
COST WORKSHEET SUMMARY	1	LS	$8,443,577	$8,443,577

Notes:
Further information about the development of cost worksheets can be found in Attachment A - Methodology and Organization of Detailed Cost Estimates.
The quantity bolded in the QTY column is the quantity selected as the representative unit quantity for this cost worksheet. If multiple quantities are bolded, the representative unit quantity is the sum of those quantities. When the LS unit is utilized, the default representative unit quantity is 1.
HTRW productivity factor is from Exhibit B-3 or B-4 of "A Guide to Developing and Documenting Cost Estimates During the Feasibility Study", EPA 2000
EPA developed project-specific unit costs using the Micro Computer Aided Cost Engineering System (MCACES) Second Generation (MII) software version 4.2, build 3

Cost Database Code:
The Cost Database Code is a reference code for linking with line item cost information with the cost source database and is not otherwise used within these cost worksheets. The following cost source database prefixes apply:
L (EPA-Derived Labor Unit Costs), M (Project-Specific Vendor Unit Costs), P (Previously Developed Unit Costs by Anchor QEA for Portland Harbor), A (EPA-Derived MII Unit Costs), O (Unit Costs from Other Projects/Sources)

Source of Cost Data:
For citation references, the following sources apply:
ALL (Allowance), FLC (www.flcdatacenter.com), LD (Costs Derived from Lower Duwamish Waterway Final Feasibility Study), MII (MII), O (Other), P (Previously Developed by Anchor QEA for Portland Harbor), and V (Vendor Quote)

Abbreviations:

QTY	Quantity	AC	Acres
EQUIP	Equipment	CLF	100 Linear Foot
MATL	Material	CY	Cubic Yard
HPF	HTRW Productivity Factor	DY	Days
ADJ LABOR	Adjusted Labor for HFP	EA	Each
ADJ EQUIP	Adjusted Equipment for HFP	FTE	Full Time Equivalent
UNMOD UC	Unmodified Unit Cost	HR	Hours
UNMOD LIC	Unmodified Line Item Cost	LB	Pounds
UNBUR LIC	Unburdened Line Item Cost	LCY	Loose Cubic Yard
PC OH	Prime Contractor Overhead	LF	Linear Foot
PC PF	Prime Contractor Profit	LS	Lump Sum
BUR LIC	Burdened Line Item Cost	MO	Month
		SF	Square Foot
		SY	Square Yard
		TON	Tons
		YR	Years

Cost Adjustment Checklist:	**NOTES:**
FACTOR:	Field work will be in Level "D" PPE.
H&S Productivity (labor and equipment only)	MII assembly costs include HPF adjustments.
Escalation to Base Year	2016 cost sources are not escalated (EF=1.00). All other costs are escalated based on the USACE CWCCIS, EM 1110-2-1304, Sept 2015.
Area Cost Factor	An AF of 1.05 is used for Oregon, except that an AF of 1.00 (national unmodified average) is used for MII assembly costs and local vendor quotes.
Subcontractor Overhead and Profit	It is assumed that home office OH is 8% and profit is 9% for the Prime Contractor. Professional labor overhead is 100%.
Prime Contractor Overhead and Profit	Allowances and items with mandated costs such as per diem do not have overhead and profit applied.
	Items previously developed by Anchor QEA already include contractor markups, therefore overhead and profit were not applied to those items.
	It is assumed that OH is 1% and profit is 0% for vendor quotes for treatment and disposal at offsite disposal facilities. It is assumed that OH is 5% and profit is 0% for quotes for all other material vendor quotes.
	Items developed using MII already include contractor markups such as overhead and profit, therefore additional overhead and profit were not applied in the PC OH and PC PF to those items.

TABLE CW-E12

Alternative E **Cost Worksheet: CW-E12**
Capital Cost Sub-Element
Subtitle C/TSCA Disposal (Handling, Transportation, Treatment of Select PTW Materials, and Disposal)

COST WORKSHEET

Site: Portland Harbor Superfund Site
Location: Portland, Oregon
Phase: Feasibility Study
Base Year: 2016

Prepared By: JN **Date:** 5/20/2016
Checked By: AB **Date:** 5/23/2016

Work Statement:
This sub-element involves the disposal of contaminated sediments at a Subtitle C/TSCA landfill, including in-barge mixing of amendments, barge transportation of materials to a transload facility, materials handling from the barge to truck, transportation of the sediments to the Subtitle C/TSCA landfill, and disposal of contaminated sediments (including thermal treatment at the landfill facility for a portion of the volume). It includes costs for labor, equipment, and materials as well as recent vendor quotes. Costs for development of a transload facility are included in a separate cost worksheet.
Quantity development presented in Appendix D.

Cost Analysis:
Cost for Subtitle C/TSCA Disposal (Lump Sum)

COST DATABASE CODE	DESCRIPTION	QTY	UNIT(S)	HPF	LABOR	ADJ LABOR	EQUIP	ADJ EQUIP	MATL	OTHER	UNMOD UC	UNMOD LIC	PC OH	PC PF	BUR LIC	COST SOURCE CITATION	COMMENTS
Area 6W NRC/NAPL PTW																	
	Transportation																
A13	Barging to Transload Facility	218,332	CY	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$13.66	$13.66	$2,982,415.12	0%	0%	$2,982,415	MII MII	Project-specific unit cost developed in MII.
A5	Hauling Waste from Transload Facility to Landfill	218,332	CY	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$16.70	$16.70	$3,646,144.40	0%	0%	$3,646,144	MII MII	Project-specific unit cost developed in MII.
	Materials Handling at Transload Facility																
A14	Offloading of Sediments	218,332	CY	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$9.70	$9.70	$2,117,820.40	0%	0%	$2,117,820	MII MII	Project-specific unit cost developed in MII. Assumes mechanical offloading of sediments at the transload facility.
A4	Loading Trucks at Transload Facility	218,332	CY	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$2.68	$2.68	$585,129.76	0%	0%	$585,130	MII MII	Project-specific unit cost developed in MII.
	Treatment																
A11	In-Barge Stabilization / Mixing of Amendments	218,332	CY	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$24.50	$24.50	$5,349,134.00	0%	0%	$5,349,134	MII MII	Project-specific unit cost developed in MII.
P5	Diatomaceous Earth	12,655	TON	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$105.94	$105.94	$1,340,670.70	0%	0%	$1,340,671	P Anchor QEA	Project-specific cost developed by Anchor QEA (2010) - see Backup Table 24.
M25	Quicklime	17,463	TON	1.00	$0.00	$0.00	$0.00	$0.00	$239.00	$0.00	$239.00	$4,173,657.00	5%	0%	$4,382,340	V Vendor Quote	Project-specific vendor quote - Graymont, 2016.
A2	Hauling - Quicklime to Site	17,463	TON	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$5.71	$5.71	$99,713.73	0%	0%	$99,714	MII MII	Project-specific unit cost developed in MII. Assumes 10 mile one-way haul.
	Disposal at Subtitle C/TSCA Landfill																
M10	Tipping Fee at Subtitle C/TSCA Landfill	**283,209**	TON	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$86.19	$86.19	$24,409,783.71	1%	0%	$24,653,882	V Vendor Quote	Project-specific vendor quote - CWM of the Northwest, 2015.
Area 7W NRC/NAPL PTW																	
	Transportation																
A13	Barging to Transload Facility	66,633	CY	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$13.66	$13.66	$910,206.78	0%	0%	$910,207	MII MII	Project-specific unit cost developed in MII.
A5	Hauling Waste from Transload Facility to Landfill	66,633	CY	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$16.70	$16.70	$1,112,771.10	0%	0%	$1,112,771	MII MII	Project-specific unit cost developed in MII.
	Materials Handling at Transload Facility																
A14	Offloading of Sediments	66,633	CY	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$9.70	$9.70	$646,340.10	0%	0%	$646,340	MII MII	Project-specific unit cost developed in MII. Assumes mechanical offloading of sediments at the transload facility.
A4	Loading Trucks at Transload Facility	66,633	CY	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$2.68	$2.68	$178,576.44	0%	0%	$178,576	MII MII	Project-specific unit cost developed in MII.
	Treatment																
A11	In-Barge Stabilization / Mixing of Amendments	66,633	CY	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$24.50	$24.50	$1,632,508.50	0%	0%	$1,632,509	MII MII	Project-specific unit cost developed in MII.
P5	Diatomaceous Earth	5,700	TON	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$105.94	$105.94	$603,858.00	0%	0%	$603,858	P Anchor QEA	Project-specific cost developed by Anchor QEA (2010) - see Backup Table 24.
M25	Quicklime	1,573	TON	1.00	$0.00	$0.00	$0.00	$0.00	$239.00	$0.00	$239.00	$375,947.00	5%	0%	$394,744	V Vendor Quote	Project-specific vendor quote - Graymont, 2016.
A2	Hauling - Quicklime to Site	1,573	TON	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$5.71	$5.71	$8,981.83	0%	0%	$8,982	MII MII	Project-specific unit cost developed in MII. Assumes 10 mile one-way haul.
M20	Thermal Desorption Treatment at Subtitle C/TSCA Landfill (Low End of Treatment Cost Range)	12,541	TON	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$319.41	$319.41	$4,005,720.81	1%	0%	$4,045,778	V Vendor Quote	Project-specific vendor quote - CWM of the Northwest, 2015.
M9	Thermal Desorption Treatment at Subtitle C/TSCA Landfill (High End of Treatment Cost Range)	12,541	TON	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$572.91	$572.91	$7,184,864.31	1%	0%	$7,256,713	V Vendor Quote	Project-specific vendor quote - CWM of the Northwest, 2015.
	Disposal at Subtitle C/TSCA Landfill																
M10	Tipping Fee at Subtitle C/TSCA Landfill	**75,679**	TON	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$86.19	$86.19	$6,522,773.01	1%	0%	$6,588,001	V Vendor Quote	Project-specific vendor quote - CWM of the Northwest, 2015.
												TOTAL COST:			$68,535,729		

	Representative Unit Quantity	Unit(s)	Total Cost	Unit Cost
COST WORKSHEET SUMMARY	358,888	TON	$68,535,729	$191

TABLE CW-E12

Alternative E **Cost Worksheet:** **CW-E12**

Capital Cost Sub-Element

Subtitle C/TSCA Disposal (Handling, Transportation, Treatment of Select PTW Materials, and Disposal)

COST WORKSHEET

Site: Portland Harbor Superfund Site
Location: Portland, Oregon
Phase: Feasibility Study
Base Year: 2016

Prepared By: JN **Date:** 5/20/2016

Checked By: AB **Date:** 5/23/2016

Notes:

Further information about the development of cost worksheets can be found in Attachment A - Methodology and Organization of Detailed Cost Estimates.
The quantity bolded in the QTY column is the quantity selected as the representative unit quantity for this cost worksheet. If multiple quantities are bolded, the representative unit quantity is the sum of those quantities. When the LS unit is utilized, the default representative unit quantity is 1.
HTRW productivity factor is from Exhibit B-3 or B-4 of "A Guide to Developing and Documenting Cost Estimates During the Feasibility Study", EPA 2000
EPA developed project-specific unit costs using the Micro Computer Aided Cost Engineering System (MCACES) Second Generation (MII) software version 4.2, build 3

Cost Database Code:

The Cost Database Code is a reference code for linking with line item cost information with the cost source database and is not otherwise used within these cost worksheets. The following cost source database prefixes apply:

L (EPA-Derived Labor Unit Costs), M (Project-Specific Vendor Unit Costs), P (Previously Developed Unit Costs by Anchor QEA for Portland Harbor), A (EPA-Derived MII Unit Costs), O (Unit Costs from Other Projects/Sources)

Source of Cost Data:

For citation references, the following sources apply:

ALL (Allowance), FLC (www.flcdatacenter.com), LD (Costs Derived from Lower Duwamish Waterway Final Feasibility Study), MII (MII), O (Other), P (Previously Developed by Anchor QEA for Portland Harbor), and V (Vendor Quote)

Abbreviations:

QTY	Quantity	AC	Acres
EQUIP	Equipment	CLF	100 Linear Foot
MATL	Material	CY	Cubic Yard
HPF	HTRW Productivity Factor	DY	Days
ADJ LABOR	Adjusted Labor for HFP	EA	Each
ADJ EQUIP	Adjusted Equipment for HFP	FTE	Full Time Equivalent
UNMOD UC	Unmodified Unit Cost	HR	Hours
UNMOD LIC	Unmodified Line Item Cost	LB	Pounds
UNBUR LIC	Unburdened Line Item Cost	LCY	Loose Cubic Yard
PC OH	Prime Contractor Overhead	LF	Linear Foot
PC PF	Prime Contractor Profit	LS	Lump Sum
BUR LIC	Burdened Line Item Cost	MO	Month
		SF	Square Foot
		SY	Square Yard
		TON	Tons
		YR	Years

Cost Adjustment Checklist:	**NOTES:**
FACTOR:	Field work will be in Level "D" PPE.
H&S Productivity (labor and equipment only)	MII assembly costs include HPF adjustments.
Escalation to Base Year	2016 cost sources are not escalated (EF=1.00). All other costs are escalated based on the USACE CWCCIS, EM 1110-2-1304, Sept 2015.
Area Cost Factor	An AF of 1.05 is used for Oregon, except that an AF of 1.00 (national unmodified average) is used for MII assembly costs and local vendor quotes.
Subcontractor Overhead and Profit	It is assumed that home office OH is 8% and profit is 9% for the Prime Contractor. Professional labor overhead is 100%.
Prime Contractor Overhead and Profit	Allowances and items with mandated costs such as per diem do not have overhead and profit applied.
	Items previously developed by Anchor QEA already include contractor markups, therefore overhead and profit were not applied to those items.
	It is assumed that OH is 1% and profit is 0% for vendor quotes for treatment and disposal at offsite disposal facilities. It is assumed that OH is 5% and profit is 0% for quotes for all other material vendor quotes.
	Items developed using MII already include contractor markups such as overhead and profit, therefore additional overhead and profit were not applied in the PC OH and PC PF to those items.

TABLE CW-E13

Alternative E **Cost Worksheet:** **CW-E13**
Capital Cost Sub-Element
Subtitle D Disposal (Handling, Transportation, and Disposal)

COST WORKSHEET

Site: Portland Harbor Superfund Site
Location: Portland, Oregon
Phase: Feasibility Study
Base Year: 2016

Prepared By: JN **Date:** 3/4/2016
Checked By: AB **Date:** 3/7/2016

Work Statement:
This sub-element involves the disposal of contaminated sediments at a Subtitle D landfill, including barge transportation of materials to a transload facility, materials handling from the barge to truck, transportation of the sediments to the Subtitle C/TSCA landfill, and disposal of contaminated sediments (including thermal treatment at the landfill facility for a portion of the volume). It includes costs for labor, equipment, and materials as well as recent vendor quotes.
Quantity development presented in Appendix D.

Cost Analysis:
Cost for Subtitle D Disposal (Lump Sum)

COST DATABASE CODE	DESCRIPTION	QTY	UNIT(S)	HPF	LABOR	ADJ LABOR	EQUIP	ADJ EQUIP	MATL	OTHER	UNMOD UC	UNMOD LIC	PC OH	PC PF	BUR LIC	COST SOURCE CITATION	COMMENTS
	Diatomaceous Earth Amendment																
A11	In-Barge Stabilization / Mixing of Amendments	2,373,318	CY	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$24.50	$24.50	$58,146,291.00	0%	0%	$58,146,291	MII MII	Project-specific unit cost developed in MII.
P5	Diatomaceous Earth	141,696	TON	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$105.94	$105.94	$15,011,274.24	0%	0%	$15,011,274	P Anchor QEA	Project-specific cost developed by Anchor QEA (2010) - see Backup Table 24.
	Transportation to Transload Facility																
A13	Barging to Transload Facility	2,373,318	CY	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$13.66	$13.66	$32,419,523.88	0%	0%	$32,419,524	MII MII	Project-specific unit cost developed in MII.
	Transportation and Disposal at Subtitle D Landfill																
M11	Transportation and Disposal at Subtitle D Landfill	**2,975,613**	TON	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$74.53	$74.53	$221,772,436.89	1%	0%	$223,990,161	V Vendor Quote	Project-specific vendor quote - Republic Services (Roosevelt Landfill), 2015. Includes transloading of the sediments, truck transportation from the transload facility to the landfill, and disposal at the landfill.
													TOTAL COST:		$329,567,250		

	Representative Unit Quantity	Unit(s)	Total Cost	Unit Cost
COST WORKSHEET SUMMARY	2,975,613	TON	$329,567,250	$111

Notes:
Further information about the development of cost worksheets can be found in Attachment A - Methodology and Organization of Detailed Cost Estimates.
The quantity bolded in the QTY column is the quantity selected as the representative unit quantity for this cost worksheet. If multiple quantities are bolded, the representative unit quantity is the sum of those quantities. When the LS unit is utilized, the default representative unit quantity is 1.
HTRW productivity factor is from Exhibit B-3 or B-4 of "A Guide to Developing and Documenting Cost Estimates During the Feasibility Study", EPA 2000
EPA developed project-specific unit costs using the Micro Computer Aided Cost Engineering System (MCACES) Second Generation (MII) software version 4.2, build 3

Cost Database Code:
The Cost Database Code is a reference code for linking with line item cost information with the cost source database and is not otherwise used within these cost worksheets. The following cost source database prefixes apply:
L (EPA-Derived Labor Unit Costs), M (Project-Specific Vendor Unit Costs), P (Previously Developed Unit Costs by Anchor QEA for Portland Harbor), A (EPA-Derived MII Unit Costs), O (Unit Costs from Other Projects/Sources)

Source of Cost Data:
For citation references, the following sources apply:
ALL (Allowance), FLC (www.flcdatacenter.com), LD (Costs Derived from Lower Duwamish Waterway Final Feasibility Study), MII (MII), O (Other), P (Previously Developed by Anchor QEA for Portland Harbor), and V (Vendor Quote)

Abbreviations:

QTY	Quantity	AC	Acres
EQUIP	Equipment	CLF	100 Linear Foot
MATL	Material	CY	Cubic Yard
HPF	HTRW Productivity Factor	DY	Days
ADJ LABOR	Adjusted Labor for HFP	EA	Each
ADJ EQUIP	Adjusted Equipment for HFP	FTE	Full Time Equivalent
UNMOD UC	Unmodified Unit Cost	HR	Hours
UNMOD LIC	Unmodified Line Item Cost	LB	Pounds
UNBUR LIC	Unburdened Line Item Cost	LCY	Loose Cubic Yard
PC OH	Prime Contractor Overhead	LF	Linear Foot
PC PF	Prime Contractor Profit	LS	Lump Sum
BUR LIC	Burdened Line Item Cost	MO	Month
		SF	Square Foot
		SY	Square Yard
		TON	Tons
		YR	Years

Cost Adjustment Checklist:	**NOTES:**
FACTOR:	Field work will be in Level "D" PPE.
H&S Productivity (labor and equipment only)	MII assembly costs include HPF adjustments.
Escalation to Base Year	2016 cost sources are not escalated (EF=1.00). All other costs are escalated based on the USACE CWCCIS, EM 1110-2-1304, Sept 2015.
Area Cost Factor	An AF of 1.05 is used for Oregon, except that an AF of 1.00 (national unmodified average) is used for MII assembly costs and local vendor quotes.
Subcontractor Overhead and Profit	It is assumed that home office OH is 8% and profit is 9% for the Prime Contractor. Professional labor overhead is 100%.
Prime Contractor Overhead and Profit	Allowances and items with mandated costs such as per diem do not have overhead and profit applied.
	Items previously developed by Anchor QEA already include contractor markups, therefore overhead and profit were not applied to those items.
	It is assumed that OH is 1% and profit is 0% for vendor quotes for treatment and disposal at offsite disposal facilities. It is assumed that OH is 5% and profit is 0% for quotes for all other material vendor quotes.
	Items developed using MII already include contractor markups such as overhead and profit, therefore additional overhead and profit were not applied in the PC OH and PC PF to those items.

TABLE CW-E14

Alternative E
Capital Cost Sub-Element
Mitigation

Cost Worksheet: **CW-E14**

COST WORKSHEET

Site: Portland Harbor Superfund Site
Location: Portland, Oregon
Phase: Feasibility Study
Base Year: 2016

Prepared By: JN **Date:** 3/4/2016
Checked By: AB **Date:** 3/7/2016

Work Statement:
This sub-element involves mitigation of shallow water and riverbank areas. It includes costs for on-site labor, equipment, and materials developed from previous work.
Quantity development presented in Appendix D.

Cost Analysis:
Cost for Mitigation (Lump Sum)

COST DATABASE CODE	DESCRIPTION	QTY	UNIT(S)	HPF	LABOR	ADJ LABOR	EQUIP	ADJ EQUIP	MATL	OTHER	UNMOD UC	UNMOD LIC	PC OH	PC PF	BUR LIC	COST SOURCE CITATION	COMMENTS
O3	Mitigation	**35**	AC	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$1,070,827.00	$1,070,827.00	$37,478,945.00	0%	0%	$37,478,945	O Other	Average cost of projects presented in Tables 6.1-1 and 6.1-4 of the Appendix M, Attachment 1, Anchor QEA FS (2010) as well as select other projects. See Calculations for derivation.
												TOTAL COST:			$37,478,945		

	Representative Unit Quantity	Unit(s)	Total Cost	Unit Cost
COST WORKSHEET SUMMARY	35	AC	$37,478,945	$1,070,827

Notes:
Further information about the development of cost worksheets can be found in Attachment A - Methodology and Organization of Detailed Cost Estimates.
The quantity bolded in the QTY column is the quantity selected as the representative unit quantity for this cost worksheet. If multiple quantities are bolded, the representative unit quantity is the sum of those quantities. When the LS unit is utilized, the default representative unit quantity is 1.
HTRW productivity factor is from Exhibit B-3 or B-4 of "A Guide to Developing and Documenting Cost Estimates During the Feasibility Study", EPA 2000
EPA developed project-specific unit costs using the Micro Computer Aided Cost Engineering System (MCACES) Second Generation (MII) software version 4.2, build 3

Cost Database Code:
The Cost Database Code is a reference code for linking with line item cost information with the cost source database and is not otherwise used within these cost worksheets. The following cost source database prefixes apply:
L (EPA-Derived Labor Unit Costs), M (Project-Specific Vendor Unit Costs), P (Previously Developed Unit Costs by Anchor QEA for Portland Harbor), A (EPA-Derived MII Unit Costs), O (Unit Costs from Other Projects/Sources)

Source of Cost Data:
For citation references, the following sources apply:
ALL (Allowance), FLC (www.flcdatacenter.com), LD (Costs Derived from Lower Duwamish Waterway Final Feasibility Study), MII (MII), O (Other), P (Previously Developed by Anchor QEA for Portland Harbor), and V (Vendor Quote)

Abbreviations:

QTY	Quantity	AC	Acres
EQUIP	Equipment	CLF	100 Linear Foot
MATL	Material	CY	Cubic Yard
HPF	HTRW Productivity Factor	DY	Days
ADJ LABOR	Adjusted Labor for HFP	EA	Each
ADJ EQUIP	Adjusted Equipment for HFP	FTE	Full Time Equivalent
UNMOD UC	Unmodified Unit Cost	HR	Hours
UNMOD LIC	Unmodified Line Item Cost	LB	Pounds
UNBUR LIC	Unburdened Line Item Cost	LCY	Loose Cubic Yard
PC OH	Prime Contractor Overhead	LF	Linear Foot
PC PF	Prime Contractor Profit	LS	Lump Sum
BUR LIC	Burdened Line Item Cost	MO	Month
		SF	Square Foot
		SY	Square Yard
		TON	Tons
		YR	Years

Cost Adjustment Checklist:	**NOTES:**
FACTOR:	Field work will be in Level "D" PPE.
H&S Productivity (labor and equipment only)	MII assembly costs include HPF adjustments.
Escalation to Base Year	2016 cost sources are not escalated (EF=1.00). All other costs are escalated based on the USACE CWCCIS, EM 1110-2-1304, Sept 2015.
Area Cost Factor	An AF of 1.05 is used for Oregon, except that an AF of 1.00 (national unmodified average) is used for MII assembly costs and local vendor quotes.
Subcontractor Overhead and Profit	It is assumed that home office OH is 8% and profit is 9% for the Prime Contractor. Professional labor overhead is 100%.
Prime Contractor Overhead and Profit	Allowances and items with mandated costs such as per diem do not have overhead and profit applied.
	Items previously developed by Anchor QEA already include contractor markups, therefore overhead and profit were not applied to those items.
	It is assumed that OH is 1% and profit is 0% for vendor quotes for treatment and disposal at offsite disposal facilities. It is assumed that OH is 5% and profit is 0% for quotes for all other material vendor quotes.
	Items developed using MII already include contractor markups such as overhead and profit, therefore additional overhead and profit were not applied in the PC OH and PC PF to those items.

TABLE CW-E15

Alternative E **Cost Worksheet:** **CW-E15**
Capital Cost Sub-Element
Sand Placement for Technology Assignments

COST WORKSHEET

Site: Portland Harbor Superfund Site
Location: Portland, Oregon
Phase: Feasibility Study
Base Year: 2016

Prepared By: JN **Date:** 3/4/2016
Checked By: AB **Date:** 3/7/2016

Work Statement:
This sub-element involves the placement of sand for the construction of capping areas. It includes placement of sand within confined areas, open areas, and riverbanks. It includes costs for on-site labor, equipment, and materials as well as recent vendor quotes.
Quantity development presented in Appendix D.

Cost Analysis:
Cost for Sand Placement for Technology Assignments (Lump Sum)

COST DATABASE CODE	DESCRIPTION	QTY	UNIT(S)	HPF	LABOR	ADJ LABOR	EQUIP	ADJ EQUIP	MATL	OTHER	UNMOD UC	UNMOD LIC	PC OH	PC PF	BUR LIC	COST SOURCE CITATION	COMMENTS
P1	Sand	**665,248**	LCY	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$19.75	$19.75	$13,138,648.00	0%	0%	$13,138,648	P Anchor QEA	Project-specific cost developed by Anchor QEA (2010) - see Backup Table 29A. Includes conversion from TON to LCY.
	Sand Placement (Riverbanks)																
A16	Material Placement (Confined)	79,809	CY	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$20.39	$20.39	$1,627,305.51	0%	0%	$1,627,306	MII MII	Project-specific unit cost developed in MII.
	Sand Placement (Confined)																
A16	Material Placement (Confined)	50,234	CY	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$20.39	$20.39	$1,024,271.26	0%	0%	$1,024,271	MII MII	Project-specific unit cost developed in MII.
	Sand Placement (Open Water)																
A15	Material Placement (Open)	535,205	CY	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$12.42	$12.42	$6,647,246.10	0%	0%	$6,647,246	MII MII	Project-specific unit cost developed in MII.
												TOTAL COST:			$22,437,471		

	Representative Unit Quantity	Unit(s)	Total Cost	Unit Cost
COST WORKSHEET SUMMARY	665,248	CY	$22,437,471	$33.73

Notes:
Further information about the development of cost worksheets can be found in Attachment A - Methodology and Organization of Detailed Cost Estimates.
The quantity bolded in the QTY column is the quantity selected as the representative unit quantity for this cost worksheet. If multiple quantities are bolded, the representative unit quantity is the sum of those quantities. When the LS unit is utilized, the default representative unit quantity is 1.
HTRW productivity factor is from Exhibit B-3 or B-4 of "A Guide to Developing and Documenting Cost Estimates During the Feasibility Study", EPA 2000
EPA developed project-specific unit costs using the Micro Computer Aided Cost Engineering System (MCACES) Second Generation (MII) software version 4.2, build 3

Cost Database Code:
The Cost Database Code is a reference code for linking with line item cost information with the cost source database and is not otherwise used within these cost worksheets. The following cost source database prefixes apply:
L (EPA-Derived Labor Unit Costs), M (Project-Specific Vendor Unit Costs), P (Previously Developed Unit Costs by Anchor QEA for Portland Harbor), A (EPA-Derived MII Unit Costs), O (Unit Costs from Other Projects/Sources)

Source of Cost Data:
For citation references, the following sources apply:
ALL (Allowance), FLC (www.flcdatacenter.com), LD (Costs Derived from Lower Duwamish Waterway Final Feasibility Study), MII (MII), O (Other), P (Previously Developed by Anchor QEA for Portland Harbor), and V (Vendor Quote)

Abbreviations:

QTY	Quantity	AC	Acres
EQUIP	Equipment	CLF	100 Linear Foot
MATL	Material	CY	Cubic Yard
HPF	HTRW Productivity Factor	DY	Days
ADJ LABOR	Adjusted Labor for HFP	EA	Each
ADJ EQUIP	Adjusted Equipment for HFP	FTE	Full Time Equivalent
UNMOD UC	Unmodified Unit Cost	HR	Hours
UNMOD LIC	Unmodified Line Item Cost	LB	Pounds
UNBUR LIC	Unburdened Line Item Cost	LCY	Loose Cubic Yard
PC OH	Prime Contractor Overhead	LF	Linear Foot
PC PF	Prime Contractor Profit	LS	Lump Sum
BUR LIC	Burdened Line Item Cost	MO	Month
		SF	Square Foot
		SY	Square Yard
		TON	Tons
		YR	Years

Cost Adjustment Checklist:	**NOTES:**
FACTOR:	Field work will be in Level "D" PPE.
H&S Productivity (labor and equipment only)	MII assembly costs include HPF adjustments.
Escalation to Base Year	2016 cost sources are not escalated (EF=1.00). All other costs are escalated based on the USACE CWCCIS, EM 1110-2-1304, Sept 2015.
Area Cost Factor	An AF of 1.05 is used for Oregon, except that an AF of 1.00 (national unmodified average) is used for MII assembly costs and local vendor quotes.
Subcontractor Overhead and Profit	It is assumed that home office OH is 8% and profit is 9% for the Prime Contractor. Professional labor overhead is 100%.
Prime Contractor Overhead and Profit	Allowances and items with mandated costs such as per diem do not have overhead and profit applied.
	Items previously developed by Anchor QEA already include contractor markups, therefore overhead and profit were not applied to those items.
	It is assumed that OH is 1% and profit is 0% for vendor quotes for treatment and disposal at offsite disposal facilities. It is assumed that OH is 5% and profit is 0% for quotes for all other material vendor quotes.
	Items developed using MII already include contractor markups such as overhead and profit, therefore additional overhead and profit were not applied in the PC OH and PC PF to those items.

TABLE CW-E16

Alternative E **Cost Worksheet:** **CW-E16**
Capital Cost Sub-Element
Beach Mix Placement for Technology Assignments

COST WORKSHEET

Site: Portland Harbor Superfund Site
Location: Portland, Oregon
Phase: Feasibility Study
Base Year: 2016

Prepared By: JN **Date:** 3/4/2016
Checked By: AB **Date:** 3/7/2016

Work Statement:
This sub-element involves the placement of beach mix for the construction of capping areas. It includes placement of beach mix within confined areas, open areas, and riverbanks. It includes costs for on-site labor, equipment, and materials as well as recent vendor quotes.
Quantity development presented in Appendix D.

Cost Analysis:
Cost for Beach Mix Placement for Technology Assignments (Lump Sum)

COST DATABASE CODE	DESCRIPTION	QTY	UNIT(S)	HPF	LABOR	ADJ LABOR	EQUIP	ADJ EQUIP	MATL	OTHER	UNMOD UC	UNMOD LIC	PC OH	PC PF	BUR LIC	COST SOURCE CITATION	COMMENTS
P3	ODOT 100 Beach Mix	**48,189**	LCY	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$57.69	$57.69	$2,780,023.41	0%	0%	$2,780,023	P Anchor QEA	Project-specific cost developed by Anchor QEA (2010) - see Backup Table 29A. Includes conversion from TON to LCY.
	Beach Mix Placement (Riverbanks)																
A16	Material Placement (Confined)	14,438	CY	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$20.39	$20.39	$294,390.82	0%	0%	$294,391	MII MII	Project-specific unit cost developed in MII.
	Beach Mix Placement (Confined)																
A16	Material Placement (Confined)	5,075	CY	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$20.39	$20.39	$103,479.25	0%	0%	$103,479	MII MII	Project-specific unit cost developed in MII.
	Beach Mix Placement (Open Water)																
A15	Material Placement (Open)	28,676	CY	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$12.42	$12.42	$356,155.92	0%	0%	$356,156	MII MII	Project-specific unit cost developed in MII.
												TOTAL COST:			$3,534,049		

	Representative Unit Quantity	Unit(s)	Total Cost	Unit Cost
COST WORKSHEET SUMMARY	48,189	CY	$3,534,049	$73.34

Notes:
Further information about the development of cost worksheets can be found in Attachment A - Methodology and Organization of Detailed Cost Estimates.
The quantity bolded in the QTY column is the quantity selected as the representative unit quantity for this cost worksheet. If multiple quantities are bolded, the representative unit quantity is the sum of those quantities. When the LS unit is utilized, the default representative unit quantity is 1.
HTRW productivity factor is from Exhibit B-3 or B-4 of "A Guide to Developing and Documenting Cost Estimates During the Feasibility Study", EPA 2000
EPA developed project-specific unit costs using the Micro Computer Aided Cost Engineering System (MCACES) Second Generation (MII) software version 4.2, build 3

Cost Database Code:
The Cost Database Code is a reference code for linking with line item cost information with the cost source database and is not otherwise used within these cost worksheets. The following cost source database prefixes apply:
L (EPA-Derived Labor Unit Costs), M (Project-Specific Vendor Unit Costs), P (Previously Developed Unit Costs by Anchor QEA for Portland Harbor), A (EPA-Derived MII Unit Costs), O (Unit Costs from Other Projects/Sources)

Source of Cost Data:
For citation references, the following sources apply:
ALL (Allowance), FLC (www.flcdatacenter.com), LD (Costs Derived from Lower Duwamish Waterway Final Feasibility Study), MII (MII), O (Other), P (Previously Developed by Anchor QEA for Portland Harbor), and V (Vendor Quote)

Abbreviations:

QTY	Quantity	AC	Acres
EQUIP	Equipment	CLF	100 Linear Foot
MATL	Material	CY	Cubic Yard
HPF	HTRW Productivity Factor	DY	Days
ADJ LABOR	Adjusted Labor for HFP	EA	Each
ADJ EQUIP	Adjusted Equipment for HFP	FTE	Full Time Equivalent
UNMOD UC	Unmodified Unit Cost	HR	Hours
UNMOD LIC	Unmodified Line Item Cost	LB	Pounds
UNBUR LIC	Unburdened Line Item Cost	LCY	Loose Cubic Yard
PC OH	Prime Contractor Overhead	LF	Linear Foot
PC PF	Prime Contractor Profit	LS	Lump Sum
BUR LIC	Burdened Line Item Cost	MO	Month
		SF	Square Foot
		SY	Square Yard
		TON	Tons
		YR	Years

Cost Adjustment Checklist:	**NOTES:**
FACTOR:	Field work will be in Level "D" PPE.
H&S Productivity (labor and equipment only)	MII assembly costs include HPF adjustments.
Escalation to Base Year	2016 cost sources are not escalated (EF=1.00). All other costs are escalated based on the USACE CWCCIS, EM 1110-2-1304, Sept 2015.
Area Cost Factor	An AF of 1.05 is used for Oregon, except that an AF of 1.00 (national unmodified average) is used for MII assembly costs and local vendor quotes.
Subcontractor Overhead and Profit	It is assumed that home office OH is 8% and profit is 9% for the Prime Contractor. Professional labor overhead is 100%.
Prime Contractor Overhead and Profit	Allowances and items with mandated costs such as per diem do not have overhead and profit applied.
	Items previously developed by Anchor QEA already include contractor markups, therefore overhead and profit were not applied to those items.
	It is assumed that OH is 1% and profit is 0% for vendor quotes for treatment and disposal at offsite disposal facilities. It is assumed that OH is 5% and profit is 0% for quotes for all other material vendor quotes.
	Items developed using MII already include contractor markups such as overhead and profit, therefore additional overhead and profit were not applied in the PC OH and PC PF to those items.

TABLE CW-E17

Alternative E **Cost Worksheet:** **CW-E17**
Capital Cost Sub-Element
Armor Placement for Technology Assignments

COST WORKSHEET

Site: Portland Harbor Superfund Site
Location: Portland, Oregon
Phase: Feasibility Study
Base Year: 2016

Prepared By: JN **Date:** 3/4/2016
Checked By: AB **Date:** 3/7/2016

Work Statement:
This sub-element involves the placement of armor for the construction of capping areas. It includes placement of armor within confined areas, open areas, and riverbanks. It includes costs for on-site labor, equipment, and materials as well as recent vendor quotes.
Quantity development presented in Appendix D.

Cost Analysis:
Cost for Armor Placement for Technology Assignments (Lump Sum)

COST DATABASE CODE	DESCRIPTION	QTY	UNIT(S)	HPF	LABOR	ADJ LABOR	EQUIP	ADJ EQUIP	MATL	OTHER	UNMOD UC	UNMOD LIC	PC OH	PC PF	BUR LIC	COST SOURCE CITATION	COMMENTS
P2	ODOT 200 Armor	**79,256**	LCY	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$57.69	$57.69	$4,572,278.64	0%	0%	$4,572,279	P Anchor QEA	Project-specific cost developed by Anchor QEA (2010) - see Backup Table 29A. Includes conversion from TON to LCY.
	Armor Placement (Riverbanks)																
A16	Material Placement (Confined)	1,576	CY	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$20.39	$20.39	$32,134.64	0%	0%	$32,135	MII MII	Project-specific unit cost developed in MII.
	Armor Placement (Confined)																
A16	Material Placement (Confined)	18,567	CY	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$20.39	$20.39	$378,581.13	0%	0%	$378,581	MII MII	Project-specific unit cost developed in MII.
	Armor Placement (Open Water)																
A15	Material Placement (Open)	59,113	CY	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$12.42	$12.42	$734,183.46	0%	0%	$734,183	MII MII	Project-specific unit cost developed in MII.
												TOTAL COST:			$5,717,178		

	Representative Unit Quantity	Unit(s)	Total Cost	Unit Cost
COST WORKSHEET SUMMARY	79,256	CY	$5,717,178	$72.14

Notes:
Further information about the development of cost worksheets can be found in Attachment A - Methodology and Organization of Detailed Cost Estimates.
The quantity bolded in the QTY column is the quantity selected as the representative unit quantity for this cost worksheet. If multiple quantities are bolded, the representative unit quantity is the sum of those quantities. When the LS unit is utilized, the default representative unit quantity is 1.
HTRW productivity factor is from Exhibit B-3 or B-4 of "A Guide to Developing and Documenting Cost Estimates During the Feasibility Study", EPA 2000
EPA developed project-specific unit costs using the Micro Computer Aided Cost Engineering System (MCACES) Second Generation (MII) software version 4.2, build 3

Cost Database Code:
The Cost Database Code is a reference code for linking with line item cost information with the cost source database and is not otherwise used within these cost worksheets. The following cost source database prefixes apply:
L (EPA-Derived Labor Unit Costs), M (Project-Specific Vendor Unit Costs), P (Previously Developed Unit Costs by Anchor QEA for Portland Harbor), A (EPA-Derived MII Unit Costs), O (Unit Costs from Other Projects/Sources)

Source of Cost Data:
For citation references, the following sources apply:
ALL (Allowance), FLC (www.flcdatacenter.com), LD (Costs Derived from Lower Duwamish Waterway Final Feasibility Study), MII (MII), O (Other), P (Previously Developed by Anchor QEA for Portland Harbor), and V (Vendor Quote)

Abbreviations:

QTY	Quantity	AC	Acres
EQUIP	Equipment	CLF	100 Linear Foot
MATL	Material	CY	Cubic Yard
HPF	HTRW Productivity Factor	DY	Days
ADJ LABOR	Adjusted Labor for HFP	EA	Each
ADJ EQUIP	Adjusted Equipment for HFP	FTE	Full Time Equivalent
UNMOD UC	Unmodified Unit Cost	HR	Hours
UNMOD LIC	Unmodified Line Item Cost	LB	Pounds
UNBUR LIC	Unburdened Line Item Cost	LCY	Loose Cubic Yard
PC OH	Prime Contractor Overhead	LF	Linear Foot
PC PF	Prime Contractor Profit	LS	Lump Sum
BUR LIC	Burdened Line Item Cost	MO	Month
		SF	Square Foot
		SY	Square Yard
		TON	Tons
		YR	Years

Cost Adjustment Checklist:	**NOTES:**
FACTOR:	Field work will be in Level "D" PPE.
H&S Productivity (labor and equipment only)	MII assembly costs include HPF adjustments.
Escalation to Base Year	2016 cost sources are not escalated (EF=1.00). All other costs are escalated based on the USACE CWCCIS, EM 1110-2-1304, Sept 2015.
Area Cost Factor	An AF of 1.05 is used for Oregon, except that an AF of 1.00 (national unmodified average) is used for MII assembly costs and local vendor quotes.
Subcontractor Overhead and Profit	It is assumed that home office OH is 8% and profit is 9% for the Prime Contractor. Professional labor overhead is 100%.
Prime Contractor Overhead and Profit	Allowances and items with mandated costs such as per diem do not have overhead and profit applied.
	Items previously developed by Anchor QEA already include contractor markups, therefore overhead and profit were not applied to those items.
	It is assumed that OH is 1% and profit is 0% for vendor quotes for treatment and disposal at offsite disposal facilities. It is assumed that OH is 5% and profit is 0% for quotes for all other material vendor quotes.
	Items developed using MII already include contractor markups such as overhead and profit, therefore additional overhead and profit were not applied in the PC OH and PC PF to those items.

TABLE CW-E18

Alternative E **Cost Worksheet:** **CW-E18**
Capital Cost Sub-Element
Reactive/GAC Placement for Technology Assignments

COST WORKSHEET

Site: Portland Harbor Superfund Site
Location: Portland, Oregon
Phase: Feasibility Study
Base Year: 2016

Prepared By: JN **Date:** 3/4/2016
Checked By: AB **Date:** 3/7/2016

Work Statement:
This sub-element involves the placement of the reactive layers for the construction of capping areas. It includes placement of the reactive layer within confined areas, open areas, and riverbanks. It includes costs for on-site labor, equipment, and materials as well as recent vendor quotes.
Quantity development presented in Appendix D.

Cost Analysis:
Cost for Reactive/GAC Placement for Technology Assignments (Lump Sum)

COST DATABASE CODE	DESCRIPTION	QTY	UNIT(S)	HPF	LABOR	ADJ LABOR	EQUIP	ADJ EQUIP	MATL	OTHER	UNMOD UC	UNMOD LIC	PC OH	PC PF	BUR LIC	COST SOURCE CITATION	COMMENTS
	AquaGate Reactive Layer																
M4	Carbon (AquaGate + PAC 10%)	77,433	TON	1.00	$0.00	$0.00	$0.00	$0.00	$456.30	$0.00	$456.30	$35,332,677.90	5%	0%	$37,099,312	V Vendor Quote	Project-specific vendor quote - AquaBlok 2015. Material cost is $/TON.
P1	Sand	81,977	LCY	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$19.75	$19.75	$1,619,045.75	0%	0%	$1,619,046	P Anchor QEA	Project-specific cost developed by Anchor QEA (2010) - see Backup Table 29A. Includes conversion from TON to LCY.
A3	Mixing Sand & Carbon for Reactive Layer	159,489	CY	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$4.76	$4.76	$759,167.64	0%	0%	$759,168	MII MII	Project-specific unit cost developed in MII.
A16	Material Placement (Confined)	21,917	CY	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$20.39	$20.39	$446,887.63	0%	0%	$446,888	MII MII	Project-specific unit cost developed in MII.
A15	Material Placement (Open)	137,572	CY	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$12.42	$12.42	$1,708,644.24	0%	0%	$1,708,644	MII MII	Project-specific unit cost developed in MII.
	AquaBlock																
M3	Carbon (AquaBlok)	5,681	TON	1.00	$0.00	$0.00	$0.00	$0.00	$202.80	$0.00	$202.80	$1,152,106.80	5%	0%	$1,209,712	V Vendor Quote	Project-specific vendor quote - AquaBlok 2015. Material cost is $/TON.
A16	Material Placement (Confined)	4,951	CY	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$20.39	$20.39	$100,950.89	0%	0%	$100,951	MII MII	Project-specific unit cost developed in MII.
												TOTAL COST:			$42,943,721		

	Representative Unit Quantity	Unit(s)	Total Cost	Unit Cost
COST WORKSHEET SUMMARY	1	LS	$42,943,721	$42,943,721

Notes:
Further information about the development of cost worksheets can be found in Attachment A - Methodology and Organization of Detailed Cost Estimates.
The quantity bolded in the QTY column is the quantity selected as the representative unit quantity for this cost worksheet. If multiple quantities are bolded, the representative unit quantity is the sum of those quantities. When the LS unit is utilized, the default representative unit quantity is 1.
HTRW productivity factor is from Exhibit B-3 or B-4 of "A Guide to Developing and Documenting Cost Estimates During the Feasibility Study", EPA 2000
EPA developed project-specific unit costs using the Micro Computer Aided Cost Engineering System (MCACES) Second Generation (MII) software version 4.2, build 3

Cost Database Code:
The Cost Database Code is a reference code for linking with line item cost information with the cost source database and is not otherwise used within these cost worksheets. The following cost source database prefixes apply:
L (EPA-Derived Labor Unit Costs), M (Project-Specific Vendor Unit Costs), P (Previously Developed Unit Costs by Anchor QEA for Portland Harbor), A (EPA-Derived MII Unit Costs), O (Unit Costs from Other Projects/Sources)

Source of Cost Data:
For citation references, the following sources apply:
ALL (Allowance), FLC (www.flcdatacenter.com), LD (Costs Derived from Lower Duwamish Waterway Final Feasibility Study), MII (MII), O (Other), P (Previously Developed by Anchor QEA for Portland Harbor), and V (Vendor Quote)

Abbreviations:

QTY	Quantity	AC	Acres
EQUIP	Equipment	CLF	100 Linear Foot
MATL	Material	CY	Cubic Yard
HPF	HTRW Productivity Factor	DY	Days
ADJ LABOR	Adjusted Labor for HFP	EA	Each
ADJ EQUIP	Adjusted Equipment for HFP	FTE	Full Time Equivalent
UNMOD UC	Unmodified Unit Cost	HR	Hours
UNMOD LIC	Unmodified Line Item Cost	LB	Pounds
UNBUR LIC	Unburdened Line Item Cost	LCY	Loose Cubic Yard
PC OH	Prime Contractor Overhead	LF	Linear Foot
PC PF	Prime Contractor Profit	LS	Lump Sum
BUR LIC	Burdened Line Item Cost	MO	Month
		SF	Square Foot
		SY	Square Yard
		TON	Tons
		YR	Years

Cost Adjustment Checklist:	**NOTES:**
FACTOR:	Field work will be in Level "D" PPE.
H&S Productivity (labor and equipment only)	MII assembly costs include HPF adjustments.
Escalation to Base Year	2016 cost sources are not escalated (EF=1.00). All other costs are escalated based on the USACE CWCCIS, EM 1110-2-1304, Sept 2015.
Area Cost Factor	An AF of 1.05 is used for Oregon, except that an AF of 1.00 (national unmodified average) is used for MII assembly costs and local vendor quotes.
Subcontractor Overhead and Profit	It is assumed that home office OH is 8% and profit is 9% for the Prime Contractor. Professional labor overhead is 100%.
Prime Contractor Overhead and Profit	Allowances and items with mandated costs such as per diem do not have overhead and profit applied.
	Items previously developed by Anchor QEA already include contractor markups, therefore overhead and profit were not applied to those items.
	It is assumed that OH is 1% and profit is 0% for vendor quotes for treatment and disposal at offsite disposal facilities. It is assumed that OH is 5% and profit is 0% for quotes for all other material vendor quotes.
	Items developed using MII already include contractor markups such as overhead and profit, therefore additional overhead and profit were not applied in the PC OH and PC PF to those items.

TABLE CW-E19

Alternative E **Cost Worksheet:** **CW-E19**
Capital Cost Sub-Element
Geofabric for Riverbanks

COST WORKSHEET

Site: Portland Harbor Superfund Site
Location: Portland, Oregon
Phase: Feasibility Study
Base Year: 2016

Prepared By: JN **Date:** 3/4/2016
Checked By: AB **Date:** 3/7/2016

Work Statement:
This sub-element involves the installation of geofabric along the riverbanks. It includes costs for on-site labor, equipment, and materials from recent vendor quotes.
Quantity development presented in Appendix D.

Cost Analysis:
Cost for Geofabric for Riverbanks (Lump Sum)

COST DATABASE CODE	DESCRIPTION	QTY	UNIT(S)	HPF	LABOR	ADJ LABOR	EQUIP	ADJ EQUIP	MATL	OTHER	UNMOD UC	UNMOD LIC	PC OH	PC PF	BUR LIC	COST SOURCE CITATION	COMMENTS
O7	Geotextile Installation	**19.9**	AC	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$7,074.14	$7,074.14	$140,775.47	8%	9%	$165,721	V Vendor Quote	Vendor Quote - Geo-Synthetics (2014). Includes labor and equipment for installation
O6	Geotextile Material	19.9	AC	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$5,698.62	$5,698.62	$113,402.46	5%	0%	$119,073	V Vendor Quote	Vendor quote obtained for project of similar scope - Geo-Synthetics, 2014.
												TOTAL COST:			$284,794		

	Representative Unit Quantity	Unit(s)	Total Cost	Unit Cost
COST WORKSHEET SUMMARY	19.9	AC	$284,794	$14,311

Notes:
Further information about the development of cost worksheets can be found in Attachment A - Methodology and Organization of Detailed Cost Estimates.
The quantity bolded in the QTY column is the quantity selected as the representative unit quantity for this cost worksheet. If multiple quantities are bolded, the representative unit quantity is the sum of those quantities. When the LS unit is utilized, the default representative unit quantity is 1.
HTRW productivity factor is from Exhibit B-3 or B-4 of "A Guide to Developing and Documenting Cost Estimates During the Feasibility Study", EPA 2000
EPA developed project-specific unit costs using the Micro Computer Aided Cost Engineering System (MCACES) Second Generation (MII) software version 4.2, build 3

Cost Database Code:
The Cost Database Code is a reference code for linking with line item cost information with the cost source database and is not otherwise used within these cost worksheets. The following cost source database prefixes apply:
L (EPA-Derived Labor Unit Costs), M (Project-Specific Vendor Unit Costs), P (Previously Developed Unit Costs by Anchor QEA for Portland Harbor), A (EPA-Derived MII Unit Costs), O (Unit Costs from Other Projects/Sources)

Source of Cost Data:
For citation references, the following sources apply:
ALL (Allowance), FLC (www.flcdatacenter.com), LD (Costs Derived from Lower Duwamish Waterway Final Feasibility Study), MII (MII), O (Other), P (Previously Developed by Anchor QEA for Portland Harbor), and V (Vendor Quote)

Abbreviations:

QTY	Quantity	AC	Acres
EQUIP	Equipment	CLF	100 Linear Foot
MATL	Material	CY	Cubic Yard
HPF	HTRW Productivity Factor	DY	Days
ADJ LABOR	Adjusted Labor for HFP	EA	Each
ADJ EQUIP	Adjusted Equipment for HFP	FTE	Full Time Equivalent
UNMOD UC	Unmodified Unit Cost	HR	Hours
UNMOD LIC	Unmodified Line Item Cost	LB	Pounds
UNBUR LIC	Unburdened Line Item Cost	LCY	Loose Cubic Yard
PC OH	Prime Contractor Overhead	LF	Linear Foot
PC PF	Prime Contractor Profit	LS	Lump Sum
BUR LIC	Burdened Line Item Cost	MO	Month
		SF	Square Foot
		SY	Square Yard
		TON	Tons
		YR	Years

Cost Adjustment Checklist:	**NOTES:**
FACTOR:	Field work will be in Level "D" PPE.
H&S Productivity (labor and equipment only)	MII assembly costs include HPF adjustments.
Escalation to Base Year	2016 cost sources are not escalated (EF=1.00). All other costs are escalated based on the USACE CWCCIS, EM 1110-2-1304, Sept 2015.
Area Cost Factor	An AF of 1.05 is used for Oregon, except that an AF of 1.00 (national unmodified average) is used for MII assembly costs and local vendor quotes.
Subcontractor Overhead and Profit	It is assumed that home office OH is 8% and profit is 9% for the Prime Contractor. Professional labor overhead is 100%.
Prime Contractor Overhead and Profit	Allowances and items with mandated costs such as per diem do not have overhead and profit applied.
	Items previously developed by Anchor QEA already include contractor markups, therefore overhead and profit were not applied to those items.
	It is assumed that OH is 1% and profit is 0% for vendor quotes for treatment and disposal at offsite disposal facilities. It is assumed that OH is 5% and profit is 0% for quotes for all other material vendor quotes.
	Items developed using MII already include contractor markups such as overhead and profit, therefore additional overhead and profit were not applied in the PC OH and PC PF to those items.

TABLE CW-E20

Alternative E **Cost Worksheet:** **CW-E20**
Capital Cost Sub-Element
Organoclay Mat Placement for Technology Assignments

COST WORKSHEET

Site: Portland Harbor Superfund Site
Location: Portland, Oregon
Phase: Feasibility Study
Base Year: 2016

Prepared By: JN **Date:** 3/4/2016
Checked By: AB **Date:** 3/7/2016

Work Statement:
This sub-element involves the placement of the organoclay mat for the construction of capping areas. It includes placement of the organoclay mat within confined areas, open areas, and riverbanks. It includes costs for on-site labor, equipment, and materials as well as recent vendor quotes.
Quantity development presented in Appendix D.

Cost Analysis:
Cost for Organoclay Mat Placement for Technology Assignments (Lump Sum)

COST DATABASE CODE	DESCRIPTION	QTY	UNIT(S)	HPF	LABOR	ADJ LABOR	EQUIP	ADJ EQUIP	MATL	OTHER	UNMOD UC	UNMOD LIC	PC OH	PC PF	BUR LIC	COST SOURCE CITATION	COMMENTS
A17	Organoclay Mat Placement	**174,300**	SF	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$3.35	$3.35	$583,905.00	0%	0%	$583,905	MII MII	Project-specific unit cost developed in MII.
P4	Organoclay Mat Material	174,300	SF	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$3.38	$3.38	$589,134.00	0%	0%	$589,134	P Anchor QEA	Project-specific cost developed by Anchor QEA (2010) - see Backup Table 29A.
												TOTAL COST:			$1,173,039		

	Representative Unit Quantity	Unit(s)	Total Cost	Unit Cost
COST WORKSHEET SUMMARY	174,300	SF	$1,173,039	$6.73

Notes:
Further information about the development of cost worksheets can be found in Attachment A - Methodology and Organization of Detailed Cost Estimates.
The quantity bolded in the QTY column is the quantity selected as the representative unit quantity for this cost worksheet. If multiple quantities are bolded, the representative unit quantity is the sum of those quantities. When the LS unit is utilized, the default representative unit quantity is 1.
HTRW productivity factor is from Exhibit B-3 or B-4 of "A Guide to Developing and Documenting Cost Estimates During the Feasibility Study", EPA 2000
EPA developed project-specific unit costs using the Micro Computer Aided Cost Engineering System (MCACES) Second Generation (MII) software version 4.2, build 3

Cost Database Code:
The Cost Database Code is a reference code for linking with line item cost information with the cost source database and is not otherwise used within these cost worksheets. The following cost source database prefixes apply:
L (EPA-Derived Labor Unit Costs), M (Project-Specific Vendor Unit Costs), P (Previously Developed Unit Costs by Anchor QEA for Portland Harbor), A (EPA-Derived MII Unit Costs), O (Unit Costs from Other Projects/Sources)

Source of Cost Data:
For citation references, the following sources apply:
ALL (Allowance), FLC (www.flcdatacenter.com), LD (Costs Derived from Lower Duwamish Waterway Final Feasibility Study), MII (MII), O (Other), P (Previously Developed by Anchor QEA for Portland Harbor), and V (Vendor Quote)

Abbreviations:

QTY	Quantity	AC	Acres
EQUIP	Equipment	CLF	100 Linear Foot
MATL	Material	CY	Cubic Yard
HPF	HTRW Productivity Factor	DY	Days
ADJ LABOR	Adjusted Labor for HFP	EA	Each
ADJ EQUIP	Adjusted Equipment for HFP	FTE	Full Time Equivalent
UNMOD UC	Unmodified Unit Cost	HR	Hours
UNMOD LIC	Unmodified Line Item Cost	LB	Pounds
UNBUR LIC	Unburdened Line Item Cost	LCY	Loose Cubic Yard
PC OH	Prime Contractor Overhead	LF	Linear Foot
PC PF	Prime Contractor Profit	LS	Lump Sum
BUR LIC	Burdened Line Item Cost	MO	Month
		SF	Square Foot
		SY	Square Yard
		TON	Tons
		YR	Years

Cost Adjustment Checklist:	**NOTES:**
FACTOR:	Field work will be in Level "D" PPE.
H&S Productivity (labor and equipment only)	MII assembly costs include HPF adjustments.
Escalation to Base Year	2016 cost sources are not escalated (EF=1.00). All other costs are escalated based on the USACE CWCCIS, EM 1110-2-1304, Sept 2015.
Area Cost Factor	An AF of 1.05 is used for Oregon, except that an AF of 1.00 (national unmodified average) is used for MII assembly costs and local vendor quotes.
Subcontractor Overhead and Profit	It is assumed that home office OH is 8% and profit is 9% for the Prime Contractor. Professional labor overhead is 100%.
Prime Contractor Overhead and Profit	Allowances and items with mandated costs such as per diem do not have overhead and profit applied.
	Items previously developed by Anchor QEA already include contractor markups, therefore overhead and profit were not applied to those items.
	It is assumed that OH is 1% and profit is 0% for vendor quotes for treatment and disposal at offsite disposal facilities. It is assumed that OH is 5% and profit is 0% for quotes for all other material vendor quotes.
	Items developed using MII already include contractor markups such as overhead and profit, therefore additional overhead and profit were not applied in the PC OH and PC PF to those items.

TABLE CW-E21

Alternative E **Cost Worksheet:** **CW-E21**
Capital Cost Sub-Element
Transload Facility Development

COST WORKSHEET

Site: Portland Harbor Superfund Site
Location: Portland, Oregon
Phase: Feasibility Study
Base Year: 2016

Prepared By: JN **Date:** 3/4/2016
Checked By: AB **Date:** 3/7/2016

Work Statement:
This sub-element involves the development of a transload facility for facilitating offsite disposal of contaminated sediments. It includes costs for on-site labor, equipment, and materials developed from previous work. Transload facility is expected to be operated for 7 years, based on estimated construction duration. Property lease quantity (20 acres) adjusted for construction duration. Labor for the annual inspections is assumed to be 2.5 times full time equivalent. Environmental monitoring is assumed to be once per quarter year for construction duration.

Cost Analysis:
Cost for Transload Facility Development (Lump Sum)

COST DATABASE CODE	DESCRIPTION	QTY	UNIT(S)	HPF	LABOR	ADJ LABOR	EQUIP	ADJ EQUIP	MATL	OTHER	UNMOD UC	UNMOD LIC	PC OH	PC PF	BUR LIC	COST SOURCE CITATION	COMMENTS
	Transload Facility Development																
P31	Transload Facility Permitting	1	LS	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$45,080.00	$45,080.00	$45,080.00	0%	0%	$45,080	P Anchor QEA	Project-specific cost developed by Anchor QEA (2010) - see Backup Table 24.
P32	Transload Facility Development	1	LS	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$4,508,000.00	$4,508,000.00	$4,508,000.00	0%	0%	$4,508,000	P Anchor QEA	Project-specific cost developed by Anchor QEA (2010) - see Backup Table 24.
P33	Yearly Property Lease	140	AC	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$26,484.50	$26,484.50	$3,707,830.00	0%	0%	$3,707,830	P Anchor QEA	Developed by Anchor QEA (2010) - see Backup Table 24. Assumes leasing of 20 acres multiplied by estimated construction duration.
	Inspection and Monitoring of Transload Facility																
P34	Labor Inspections During Operations of Transload Facility	17.5	FTE	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$84,525.00	$84,525.00	$1,479,187.50	0%	0%	$1,479,188	P Anchor QEA	Developed by Anchor QEA (2010) - see Backup Table 24. Assumes 2.5 FTE/YR multiplied by estimated construction duration.
P35	Environmental Monitoring During Offloading at Transload Facility	28	MO	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$16,905.00	$16,905.00	$473,340.00	0%	0%	$473,340	P Anchor QEA	Developed by Anchor QEA (2010) - see Backup Table 24. Assumes 4 MO/YR multiplied by estimated construction duration.
P36	Inspection and Monitoring Reporting for Transload Facility	7	YR	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$45,080.00	$45,080.00	$315,560.00	0%	0%	$315,560	P Anchor QEA	Project-specific cost developed by Anchor QEA (2010) - see Backup Table 24.
												TOTAL COST:			$10,528,998		

	Representative Unit Quantity	Unit(s)	Total Cost	Unit Cost
COST WORKSHEET SUMMARY	1	LS	$10,528,998	$10,528,998

TABLE CW-E21

Alternative E
Capital Cost Sub-Element
Transload Facility Development

Cost Worksheet: **CW-E21**

COST WORKSHEET

Site: Portland Harbor Superfund Site
Location: Portland, Oregon
Phase: Feasibility Study
Base Year: 2016

Prepared By: JN **Date:** 3/4/2016
Checked By: AB **Date:** 3/7/2016

Notes:

Further information about the development of cost worksheets can be found in Attachment A - Methodology and Organization of Detailed Cost Estimates.
The quantity bolded in the QTY column is the quantity selected as the representative unit quantity for this cost worksheet. If multiple quantities are bolded, the representative unit quantity is the sum of those quantities. When the LS unit is utilized, the default representative unit quantity is 1.
HTRW productivity factor is from Exhibit B-3 or B-4 of "A Guide to Developing and Documenting Cost Estimates During the Feasibility Study", EPA 2000
EPA developed project-specific unit costs using the Micro Computer Aided Cost Engineering System (MCACES) Second Generation (MII) software version 4.2, build 3

Cost Database Code:

The Cost Database Code is a reference code for linking with line item cost information with the cost source database and is not otherwise used within these cost worksheets. The following cost source database prefixes apply:

L (EPA-Derived Labor Unit Costs), M (Project-Specific Vendor Unit Costs), P (Previously Developed Unit Costs by Anchor QEA for Portland Harbor), A (EPA-Derived MII Unit Costs), O (Unit Costs from Other Projects/Sources)

Source of Cost Data:

For citation references, the following sources apply:

ALL (Allowance), FLC (www.flcdatacenter.com), LD (Costs Derived from Lower Duwamish Waterway Final Feasibility Study), MII (MII), O (Other), P (Previously Developed by Anchor QEA for Portland Harbor), and V (Vendor Quote)

Abbreviations:

QTY	Quantity	AC	Acres
EQUIP	Equipment	CLF	100 Linear Foot
MATL	Material	CY	Cubic Yard
HPF	HTRW Productivity Factor	DY	Days
ADJ LABOR	Adjusted Labor for HFP	EA	Each
ADJ EQUIP	Adjusted Equipment for HFP	FTE	Full Time Equivalent
UNMOD UC	Unmodified Unit Cost	HR	Hours
UNMOD LIC	Unmodified Line Item Cost	LB	Pounds
UNBUR LIC	Unburdened Line Item Cost	LCY	Loose Cubic Yard
PC OH	Prime Contractor Overhead	LF	Linear Foot
PC PF	Prime Contractor Profit	LS	Lump Sum
BUR LIC	Burdened Line Item Cost	MO	Month
		SF	Square Foot
		SY	Square Yard
		TON	Tons
		YR	Years

Cost Adjustment Checklist:	**NOTES:**
FACTOR:	Field work will be in Level "D" PPE.
H&S Productivity (labor and equipment only)	MII assembly costs include HPF adjustments.
Escalation to Base Year	2016 cost sources are not escalated (EF=1.00). All other costs are escalated based on the USACE CWCCIS, EM 1110-2-1304, Sept 2015.
Area Cost Factor	An AF of 1.05 is used for Oregon, except that an AF of 1.00 (national unmodified average) is used for MII assembly costs and local vendor quotes.
Subcontractor Overhead and Profit	It is assumed that home office OH is 8% and profit is 9% for the Prime Contractor. Professional labor overhead is 100%.
Prime Contractor Overhead and Profit	Allowances and items with mandated costs such as per diem do not have overhead and profit applied.
	Items previously developed by Anchor QEA already include contractor markups, therefore overhead and profit were not applied to those items.
	It is assumed that OH is 1% and profit is 0% for vendor quotes for treatment and disposal at offsite disposal facilities. It is assumed that OH is 5% and profit is 0% for quotes for all other material vendor quotes.
	Items developed using MII already include contractor markups such as overhead and profit, therefore additional overhead and profit were not applied in the PC OH and PC PF to those items.

TABLE CW-E22

Alternative E **Cost Worksheet: CW-E22**
Capital and Periodic Cost Sub-Element
Monitored Natural Recovery (MNR) for MNR/Enhanced Natural Recovery (ENR) and Broadcast GAC Areas

COST WORKSHEET

Site: Portland Harbor Superfund Site
Location: Portland, Oregon
Phase: Feasibility Study
Base Year: 2016

Prepared By: JN **Date:** 3/4/2016
Checked By: AB **Date:** 3/7/2016

Work Statement:
This sub-element involves sampling as part of monitored natural recovery for MNR, ENR, and Broadcast GAC areas. It includes costs for on-site labor, equipment, and materials developed from previous work.
Quantity development presented in Appendix D.

Cost Analysis:
Cost for Monitored Natural Recovery for MNR/ENR and Broadcast GAC Areas (Lump Sum)

COST DATABASE CODE	DESCRIPTION	QTY	UNIT(S)	HPF	LABOR	ADJ LABOR	EQUIP	ADJ EQUIP	MATL	OTHER	UNMOD UC	UNMOD LIC	PC OH	PC PF	BUR LIC	COST SOURCE CITATION	COMMENTS
P25	Monitored Natural Recovery	**1,898**	AC	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$3,686.33	$3,686.33	$6,996,648.34	0%	0%	$6,996,648	P Anchor QEA	Project-specific cost developed by Anchor QEA (2010) - based on Backup Table 2.
												TOTAL COST:			$6,996,648		

	Representative Unit Quantity	Unit(s)	Total Cost	Unit Cost
COST WORKSHEET SUMMARY	1,898	AC	$6,996,648	$3,686

Notes:
Further information about the development of cost worksheets can be found in Attachment A - Methodology and Organization of Detailed Cost Estimates.
The quantity bolded in the QTY column is the quantity selected as the representative unit quantity for this cost worksheet. If multiple quantities are bolded, the representative unit quantity is the sum of those quantities. When the LS unit is utilized, the default representative unit quantity is 1.
HTRW productivity factor is from Exhibit B-3 or B-4 of "A Guide to Developing and Documenting Cost Estimates During the Feasibility Study", EPA 2000
EPA developed project-specific unit costs using the Micro Computer Aided Cost Engineering System (MCACES) Second Generation (MII) software version 4.2, build 3

Cost Database Code:
The Cost Database Code is a reference code for linking with line item cost information with the cost source database and is not otherwise used within these cost worksheets. The following cost source database prefixes apply:
L (EPA-Derived Labor Unit Costs), M (Project-Specific Vendor Unit Costs), P (Previously Developed Unit Costs by Anchor QEA for Portland Harbor), A (EPA-Derived MII Unit Costs), O (Unit Costs from Other Projects/Sources)

Source of Cost Data:
For citation references, the following sources apply:
ALL (Allowance), FLC (www.flcdatacenter.com), LD (Costs Derived from Lower Duwamish Waterway Final Feasibility Study), MII (MII), O (Other), P (Previously Developed by Anchor QEA for Portland Harbor), and V (Vendor Quote)

Abbreviations:

QTY	Quantity	AC	Acres
EQUIP	Equipment	CLF	100 Linear Foot
MATL	Material	CY	Cubic Yard
HPF	HTRW Productivity Factor	DY	Days
ADJ LABOR	Adjusted Labor for HFP	EA	Each
ADJ EQUIP	Adjusted Equipment for HFP	FTE	Full Time Equivalent
UNMOD UC	Unmodified Unit Cost	HR	Hours
UNMOD LIC	Unmodified Line Item Cost	LB	Pounds
UNBUR LIC	Unburdened Line Item Cost	LCY	Loose Cubic Yard
PC OH	Prime Contractor Overhead	LF	Linear Foot
PC PF	Prime Contractor Profit	LS	Lump Sum
BUR LIC	Burdened Line Item Cost	MO	Month
		SF	Square Foot
		SY	Square Yard
		TON	Tons
		YR	Years

Cost Adjustment Checklist:	**NOTES:**
FACTOR:	Field work will be in Level "D" PPE.
H&S Productivity (labor and equipment only)	MII assembly costs include HPF adjustments.
Escalation to Base Year	2016 cost sources are not escalated (EF=1.00). All other costs are escalated based on the USACE CWCCIS, EM 1110-2-1304, Sept 2015.
Area Cost Factor	An AF of 1.05 is used for Oregon, except that an AF of 1.00 (national unmodified average) is used for MII assembly costs and local vendor quotes.
Subcontractor Overhead and Profit	It is assumed that home office OH is 8% and profit is 9% for the Prime Contractor. Professional labor overhead is 100%.
Prime Contractor Overhead and Profit	Allowances and items with mandated costs such as per diem do not have overhead and profit applied.
	Items previously developed by Anchor QEA already include contractor markups, therefore overhead and profit were not applied to those items.
	It is assumed that OH is 1% and profit is 0% for vendor quotes for treatment and disposal at offsite disposal facilities. It is assumed that OH is 5% and profit is 0% for quotes for all other material vendor quotes.
	Items developed using MII already include contractor markups such as overhead and profit, therefore additional overhead and profit were not applied in the PC OH and PC PF to those items.

TABLE CW-E23

Alternative E
Periodic Cost Sub-Element
Site-Wide Monitoring

Cost Worksheet: **CW-E23**

COST WORKSHEET

Site: Portland Harbor Superfund Site
Location: Portland, Oregon
Phase: Feasibility Study
Base Year: 2016

Prepared By: JN **Date:** 3/4/2016
Checked By: AB **Date:** 3/7/2016

Work Statement:
This sub-element involves sampling, surveying, data management, and reporting as part of sitewide monitoring. It includes costs for on-site labor, equipment, and materials developed from previous work.

Cost Analysis:
Cost for Site-Wide Monitoring (Lump Sum)

COST DATABASE CODE	DESCRIPTION	QTY	UNIT(S)	HPF	LABOR	ADJ LABOR	EQUIP	ADJ EQUIP	MATL	OTHER	UNMOD UC	UNMOD LIC	PC OH	PC PF	BUR LIC	COST SOURCE CITATION	COMMENTS
	Site-Wide Monitoring																
P26	Sitewide Monitoring	1	LS	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$957,659.23	$957,659.23	$957,659.23	0%	0%	$957,659	P Anchor QEA	Project-specific cost developed by Anchor QEA (2010) - based on Backup Table 1.
												TOTAL COST:			$957,659		

	Representative Unit Quantity	Unit(s)	Total Cost	Unit Cost
COST WORKSHEET SUMMARY	1	LS	$957,659	$957,659

Notes:
Further information about the development of cost worksheets can be found in Attachment A - Methodology and Organization of Detailed Cost Estimates.
The quantity bolded in the QTY column is the quantity selected as the representative unit quantity for this cost worksheet. If multiple quantities are bolded, the representative unit quantity is the sum of those quantities. When the LS unit is utilized, the default representative unit quantity is 1.
HTRW productivity factor is from Exhibit B-3 or B-4 of "A Guide to Developing and Documenting Cost Estimates During the Feasibility Study", EPA 2000
EPA developed project-specific unit costs using the Micro Computer Aided Cost Engineering System (MCACES) Second Generation (MII) software version 4.2, build 3

Cost Database Code:
The Cost Database Code is a reference code for linking with line item cost information with the cost source database and is not otherwise used within these cost worksheets. The following cost source database prefixes apply:
L (EPA-Derived Labor Unit Costs), M (Project-Specific Vendor Unit Costs), P (Previously Developed Unit Costs by Anchor QEA for Portland Harbor), A (EPA-Derived MII Unit Costs), O (Unit Costs from Other Projects/Sources)

Source of Cost Data:
For citation references, the following sources apply:
ALL (Allowance), FLC (www.flcdatacenter.com), LD (Costs Derived from Lower Duwamish Waterway Final Feasibility Study), MII (MII), O (Other), P (Previously Developed by Anchor QEA for Portland Harbor), and V (Vendor Quote)

Abbreviations:

QTY	Quantity	AC	Acres
EQUIP	Equipment	CLF	100 Linear Foot
MATL	Material	CY	Cubic Yard
HPF	HTRW Productivity Factor	DY	Days
ADJ LABOR	Adjusted Labor for HFP	EA	Each
ADJ EQUIP	Adjusted Equipment for HFP	FTE	Full Time Equivalent
UNMOD UC	Unmodified Unit Cost	HR	Hours
UNMOD LIC	Unmodified Line Item Cost	LB	Pounds
UNBUR LIC	Unburdened Line Item Cost	LCY	Loose Cubic Yard
PC OH	Prime Contractor Overhead	LF	Linear Foot
PC PF	Prime Contractor Profit	LS	Lump Sum
BUR LIC	Burdened Line Item Cost	MO	Month
		SF	Square Foot
		SY	Square Yard
		TON	Tons
		YR	Years

Cost Adjustment Checklist:	**NOTES:**
FACTOR:	Field work will be in Level "D" PPE.
H&S Productivity (labor and equipment only)	MII assembly costs include HPF adjustments.
Escalation to Base Year	2016 cost sources are not escalated (EF=1.00). All other costs are escalated based on the USACE CWCCIS, EM 1110-2-1304, Sept 2015.
Area Cost Factor	An AF of 1.05 is used for Oregon, except that an AF of 1.00 (national unmodified average) is used for MII assembly costs and local vendor quotes.
Subcontractor Overhead and Profit	It is assumed that home office OH is 8% and profit is 9% for the Prime Contractor. Professional labor overhead is 100%.
Prime Contractor Overhead and Profit	Allowances and items with mandated costs such as per diem do not have overhead and profit applied.
	Items previously developed by Anchor QEA already include contractor markups, therefore overhead and profit were not applied to those items.
	It is assumed that OH is 1% and profit is 0% for vendor quotes for treatment and disposal at offsite disposal facilities. It is assumed that OH is 5% and profit is 0% for quotes for all other material vendor quotes.
	Items developed using MII already include contractor markups such as overhead and profit, therefore additional overhead and profit were not applied in the PC OH and PC PF to those items.

TABLE CW-E24

Alternative E **Cost Worksheet:** **CW-E24**
Periodic Cost Sub-Element
Cap Area Monitoring and Reactive Layer Monitoring

COST WORKSHEET

Site: Portland Harbor Superfund Site
Location: Portland, Oregon
Phase: Feasibility Study
Base Year: 2016

Prepared By: JN **Date:** 3/4/2016
Checked By: AB **Date:** 3/7/2016

Work Statement:
This sub-element involves sampling, surveying, data management, and reporting as part of cap and reactive layer monitoring. It includes costs for on-site labor, equipment, and materials developed from previous work.
Quantity development presented in Appendix D.

Cost Analysis:
Cost for Cap and Reactive Layer Monitoring (Lump Sum)

COST DATABASE CODE	DESCRIPTION	QTY	UNIT(S)	HPF	LABOR	ADJ LABOR	EQUIP	ADJ EQUIP	MATL	OTHER	UNMOD UC	UNMOD LIC	PC OH	PC PF	BUR LIC	COST SOURCE CITATION	COMMENTS
	Cap Area Monitoring																
P27	Cap Monitoring	146	AC	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$78,961.34	$78,961.34	$11,528,355.51	0%	0%	$11,528,356	P Anchor QEA	Project-specific cost developed by Anchor QEA (2010) - based on Backup Table 4.
	Reactive Layer Monitoring																
P28	Reactive Layer Monitoring	109	AC	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$88,968.76	$88,968.76	$9,697,594.95	0%	0%	$9,697,595	P Anchor QEA	Project-specific cost developed by Anchor QEA (2010) - based on Backup Table 3.
												TOTAL COST:			$21,225,951		

	Representative Unit Quantity	Unit(s)	Total Cost	Unit Cost
COST WORKSHEET SUMMARY	1	LS	$21,225,951	$21,225,951

Notes:
Further information about the development of cost worksheets can be found in Attachment A - Methodology and Organization of Detailed Cost Estimates.
The quantity bolded in the QTY column is the quantity selected as the representative unit quantity for this cost worksheet. If multiple quantities are bolded, the representative unit quantity is the sum of those quantities. When the LS unit is utilized, the default representative unit quantity is 1.
HTRW productivity factor is from Exhibit B-3 or B-4 of "A Guide to Developing and Documenting Cost Estimates During the Feasibility Study", EPA 2000
EPA developed project-specific unit costs using the Micro Computer Aided Cost Engineering System (MCACES) Second Generation (MII) software version 4.2, build 3

Cost Database Code:
The Cost Database Code is a reference code for linking with line item cost information with the cost source database and is not otherwise used within these cost worksheets. The following cost source database prefixes apply:
L (EPA-Derived Labor Unit Costs), M (Project-Specific Vendor Unit Costs), P (Previously Developed Unit Costs by Anchor QEA for Portland Harbor), A (EPA-Derived MII Unit Costs), O (Unit Costs from Other Projects/Sources)

Source of Cost Data:
For citation references, the following sources apply:
ALL (Allowance), FLC (www.flcdatacenter.com), LD (Costs Derived from Lower Duwamish Waterway Final Feasibility Study), MII (MII), O (Other), P (Previously Developed by Anchor QEA for Portland Harbor), and V (Vendor Quote)

Abbreviations:

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MATL	Material	CY	Cubic Yard
HPF	HTRW Productivity Factor	DY	Days
ADJ LABOR	Adjusted Labor for HFP	EA	Each
ADJ EQUIP	Adjusted Equipment for HFP	FTE	Full Time Equivalent
UNMOD UC	Unmodified Unit Cost	HR	Hours
UNMOD LIC	Unmodified Line Item Cost	LB	Pounds
UNBUR LIC	Unburdened Line Item Cost	LCY	Loose Cubic Yard
PC OH	Prime Contractor Overhead	LF	Linear Foot
PC PF	Prime Contractor Profit	LS	Lump Sum
BUR LIC	Burdened Line Item Cost	MO	Month
		SF	Square Foot
		SY	Square Yard
		TON	Tons
		YR	Years

Cost Adjustment Checklist:	**NOTES:**
FACTOR:	Field work will be in Level "D" PPE.
H&S Productivity (labor and equipment only)	MII assembly costs include HPF adjustments.
Escalation to Base Year	2016 cost sources are not escalated (EF=1.00). All other costs are escalated based on the USACE CWCCIS, EM 1110-2-1304, Sept 2015.
Area Cost Factor	An AF of 1.05 is used for Oregon, except that an AF of 1.00 (national unmodified average) is used for MII assembly costs and local vendor quotes.
Subcontractor Overhead and Profit	It is assumed that home office OH is 8% and profit is 9% for the Prime Contractor. Professional labor overhead is 100%.
Prime Contractor Overhead and Profit	Allowances and items with mandated costs such as per diem do not have overhead and profit applied.
	Items previously developed by Anchor QEA already include contractor markups, therefore overhead and profit were not applied to those items.
	It is assumed that OH is 1% and profit is 0% for vendor quotes for treatment and disposal at offsite disposal facilities. It is assumed that OH is 5% and profit is 0% for quotes for all other material vendor quotes.
	Items developed using MII already include contractor markups such as overhead and profit, therefore additional overhead and profit were not applied in the PC OH and PC PF to those items.

TABLE CW-E25

Alternative E **Cost Worksheet:** **CW-E25**
Periodic Cost Sub-Element
Long-Term Maintenance for Capping, ENR, and In Situ Treatment

COST WORKSHEET

Site: Portland Harbor Superfund Site
Location: Portland, Oregon
Phase: Feasibility Study
Base Year: 2016

Prepared By: JN **Date:** 3/4/2016
Checked By: AB **Date:** 3/7/2016

Work Statement:
This sub-element involves replacement of 5% of the technology assignment layers as part of long-term maintenance. It includes costs for on-site labor, equipment, and materials developed from previous work.
Quantities represent 5% of material placement quantities which were developed and presented in Appendix D.

Cost Analysis:
Cost for Long-Term Maintenance (Lump Sum)

COST DATABASE CODE	DESCRIPTION	QTY	UNIT(S)	HPF	LABOR	ADJ LABOR	EQUIP	ADJ EQUIP	MATL	OTHER	UNMOD UC	UNMOD LIC	PC OH	PC PF	BUR LIC	COST SOURCE CITATION	COMMENTS
	Mobilization / Demobilization																
O2	Mobilization/Demobilization for Long Term Maintenance	1	LS	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$60,875.88	$60,875.88	$60,875.88	0%	0%	$60,876	LD Lower Duwamish	Assumes 1.6% of total capital costs per Lower Duwamish Feasibility Study. See Calculations for derivation.
	Sand Placement for Technology Assignments																
P1	Sand	33,262	LCY	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$19.75	$19.75	$656,924.50	0%	0%	$656,925	P Anchor QEA	Assume 5% of placement of additional material
	Sand Placement (Riverbanks)																
A16	Material Placement (Confined)	3,990	CY	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$20.39	$20.39	$81,356.10	0%	0%	$81,356	MII MII	Assume 5% of placement of additional material
	Sand Placement (Confined)																
A16	Material Placement (Confined)	2,512	CY	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$20.39	$20.39	$51,219.68	0%	0%	$51,220	MII MII	Assume 5% of placement of additional material
	Sand Placement (Open Water)																
A15	Material Placement (Open)	26,760	CY	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$12.42	$12.42	$332,359.20	0%	0%	$332,359	MII MII	Assume 5% of placement of additional material
	Beach Mix Placement for Technology Assignments																
P3	ODOT 100 Beach Mix	2,409	LCY	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$57.69	$57.69	$138,975.21	0%	0%	$138,975	P Anchor QEA	Assume 5% of placement of additional material
	Beach Mix Placement (Riverbanks)																
A16	Material Placement (Confined)	722	CY	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$20.39	$20.39	$14,721.58	0%	0%	$14,722	MII MII	Assume 5% of placement of additional material
	Beach Mix Placement (Confined)																
A16	Material Placement (Confined)	254	CY	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$20.39	$20.39	$5,179.06	0%	0%	$5,179	MII MII	Assume 5% of placement of additional material
	Beach Mix Placement (Open Water)																
A15	Material Placement (Open)	1,434	CY	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$12.42	$12.42	$17,810.28	0%	0%	$17,810	MII MII	Assume 5% of placement of additional material
	Armor Placement for Technology Assignments																
P2	ODOT 200 Armor	3,963	LCY	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$57.69	$57.69	$228,625.47	0%	0%	$228,625	P Anchor QEA	Assume 5% of placement of additional material
	Armor Placement (Riverbanks)																
A16	Material Placement (Confined)	79	CY	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$20.39	$20.39	$1,610.81	0%	0%	$1,611	MII MII	Assume 5% of placement of additional material
	Armor Placement (Confined)																
A16	Material Placement (Confined)	928	CY	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$20.39	$20.39	$18,921.92	0%	0%	$18,922	MII MII	Assume 5% of placement of additional material
	Armor Placement (Open Water)																
A15	Material Placement (Open)	2,956	CY	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$12.42	$12.42	$36,713.52	0%	0%	$36,714	MII MII	Assume 5% of placement of additional material
	Reactive/GAC Placement for Technology Assignments																
	AquaGate Reactive Layer																
M4	Carbon (AquaGate + PAC 10%)	3,872	TON	1.00	$0.00	$0.00	$0.00	$0.00	$456.30	$0.00	$456.30	$1,766,793.60	5%	0%	$1,855,133	V Vendor Quote	Assume 5% of placement of additional material
P1	Sand	4,099	LCY	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$19.75	$19.75	$80,955.25	0%	0%	$80,955	P Anchor QEA	Assume 5% of placement of additional material
A3	Mixing Sand & Carbon for Reactive Layer	7,974	CY	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$4.76	$4.76	$37,956.24	0%	0%	$37,956	MII MII	Assume 5% of placement of additional material
A16	Material Placement (Confined)	1,096	CY	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$20.39	$20.39	$22,347.44	0%	0%	$22,347	MII MII	Assume 5% of placement of additional material
A15	Material Placement (Open)	6,879	CY	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$12.42	$12.42	$85,437.18	0%	0%	$85,437	MII MII	Assume 5% of placement of additional material
	AquaBlock																
M3	Carbon (AquaBlok)	284	TON	1.00	$0.00	$0.00	$0.00	$0.00	$202.80	$0.00	$202.80	$57,595.20	5%	0%	$60,475	V Vendor Quote	Assume 5% of placement of additional material
A16	Material Placement (Confined)	248	CY	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$20.39	$20.39	$5,056.72	0%	0%	$5,057	MII MII	Assume 5% of placement of additional material

TABLE CW-E25

Alternative E **Cost Worksheet: CW-E25**
Periodic Cost Sub-Element
Long-Term Maintenance for Capping, ENR, and In Situ Treatment

COST WORKSHEET

Site: Portland Harbor Superfund Site
Location: Portland, Oregon
Phase: Feasibility Study
Base Year: 2016

Prepared By: JN **Date:** 3/4/2016
Checked By: AB **Date:** 3/7/2016

Work Statement:
This sub-element involves replacement of 5% of the technology assignment layers as part of long-term maintenance. It includes costs for on-site labor, equipment, and materials developed from previous work.
Quantities represent 5% of material placement quantities which were developed and presented in Appendix D.

Cost Analysis:
Cost for Long-Term Maintenance (Lump Sum)

COST DATABASE CODE	DESCRIPTION	QTY	UNIT(S)	HPF	LABOR	ADJ LABOR	EQUIP	ADJ EQUIP	MATL	OTHER	UNMOD UC	UNMOD LIC	PC OH	PC PF	BUR LIC	COST SOURCE CITATION	COMMENTS
	Geofabric for Riverbanks																
O7	Geotextile Installation	1.0	AC	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$7,074.14	$7,074.14	$7,074.14	8%	9%	$8,328	V Vendor Quote	Assume 5% of placement of additional material
O6	Geotextile Material	1.0	AC	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$5,698.62	$5,698.62	$5,698.62	5%	0%	$5,984	V Vendor Quote	Assume 5% of placement of additional material
	Organoclay Mat Placement for Technology Assignments																
A17	Organoclay Mat Placement	8,715	SF	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$3.35	$3.35	$29,195.25	0%	0%	$29,195	MII MII	Assume 5% of placement of additional material
P4	Organoclay Mat Material	8,715	SF	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$3.38	$3.38	$29,456.70	0%	0%	$29,457	P Anchor QEA	Assume 5% of placement of additional material
												TOTAL COST:			$3,865,618		

	Representative Unit Quantity	Unit(s)	Total Cost	Unit Cost
COST WORKSHEET SUMMARY	1	LS	$3,865,618	$3,865,618

Notes:
Further information about the development of cost worksheets can be found in Attachment A - Methodology and Organization of Detailed Cost Estimates.
The quantity bolded in the QTY column is the quantity selected as the representative unit quantity for this cost worksheet. If multiple quantities are bolded, the representative unit quantity is the sum of those quantities. When the LS unit is utilized, the default representative unit quantity is 1.
HTRW productivity factor is from Exhibit B-3 or B-4 of "A Guide to Developing and Documenting Cost Estimates During the Feasibility Study", EPA 2000
EPA developed project-specific unit costs using the Micro Computer Aided Cost Engineering System (MCACES) Second Generation (MII) software version 4.2, build 3

Cost Database Code:
The Cost Database Code is a reference code for linking with line item cost information with the cost source database and is not otherwise used within these cost worksheets. The following cost source database prefixes apply:
L (EPA-Derived Labor Unit Costs), M (Project-Specific Vendor Unit Costs), P (Previously Developed Unit Costs by Anchor QEA for Portland Harbor), A (EPA-Derived MII Unit Costs), O (Unit Costs from Other Projects/Sources)

Source of Cost Data:
For citation references, the following sources apply:
ALL (Allowance), FLC (www.flcdatacenter.com), LD (Costs Derived from Lower Duwamish Waterway Final Feasibility Study), MII (MII), O (Other), P (Previously Developed by Anchor QEA for Portland Harbor), and V (Vendor Quote)

Abbreviations:

QTY	Quantity	AC	Acres
EQUIP	Equipment	CLF	100 Linear Foot
MATL	Material	CY	Cubic Yard
HPF	HTRW Productivity Factor	DY	Days
ADJ LABOR	Adjusted Labor for HFP	EA	Each
ADJ EQUIP	Adjusted Equipment for HFP	FTE	Full Time Equivalent
UNMOD UC	Unmodified Unit Cost	HR	Hours
UNMOD LIC	Unmodified Line Item Cost	LB	Pounds
UNBUR LIC	Unburdened Line Item Cost	LCY	Loose Cubic Yard
PC OH	Prime Contractor Overhead	LF	Linear Foot
PC PF	Prime Contractor Profit	LS	Lump Sum
BUR LIC	Burdened Line Item Cost	MO	Month
		SF	Square Foot
		SY	Square Yard
		TON	Tons
		YR	Years

Cost Adjustment Checklist:	**NOTES:**
FACTOR:	Field work will be in Level "D" PPE.
H&S Productivity (labor and equipment only)	MII assembly costs include HPF adjustments.
Escalation to Base Year	2016 cost sources are not escalated (EF=1.00). All other costs are escalated based on the USACE CWCCIS, EM 1110-2-1304, Sept 2015.
Area Cost Factor	An AF of 1.05 is used for Oregon, except that an AF of 1.00 (national unmodified average) is used for MII assembly costs and local vendor quotes.
Subcontractor Overhead and Profit	It is assumed that home office OH is 8% and profit is 9% for the Prime Contractor. Professional labor overhead is 100%.
Prime Contractor Overhead and Profit	Allowances and items with mandated costs such as per diem do not have overhead and profit applied.
	Items previously developed by Anchor QEA already include contractor markups, therefore overhead and profit were not applied to those items.
	It is assumed that OH is 1% and profit is 0% for vendor quotes for treatment and disposal at offsite disposal facilities. It is assumed that OH is 5% and profit is 0% for quotes for all other material vendor quotes.
	Items developed using MII already include contractor markups such as overhead and profit, therefore additional overhead and profit were not applied in the PC OH and PC PF to those items.

TABLE CW-E26

Alternative E **Cost Worksheet:** **CW-E26**
Periodic Cost Sub-Element
5-Year Site Review

COST WORKSHEET

Site: Portland Harbor Superfund Site
Location: Portland, Oregon
Phase: Feasibility Study
Base Year: 2016

Prepared By: JN **Date:** 3/4/2016
Checked By: AB **Date:** 3/7/2016

Work Statement:
This sub-element involves the site visit and 5-year site review report. The following cost includes labor, material and shipping costs for site visits and 5-year site review reports.

Cost Analysis:
Cost for 5-Year Site Review (Lump Sum)

COST DATABASE CODE	DESCRIPTION	QTY	UNIT(S)	HPF	LABOR	ADJ LABOR	EQUIP	ADJ EQUIP	MATL	OTHER	UNMOD UC	UNMOD LIC	PC OH	PC PF	BUR LIC	COST SOURCE CITATION	COMMENTS
L11	Project Manager	300	HR	1.00	$82.17	$82.17	$0.00	$0.00	$0.00	$0.00	$82.17	$24,651.00	100%	9%	$53,739	FLC FLCDataCenter	Project-specific unit cost developed by EPA.
L4	Environmental Engineer	600	HR	1.00	$48.91	$48.91	$0.00	$0.00	$0.00	$0.00	$48.91	$29,346.00	100%	9%	$63,974	FLC FLCDataCenter	Project-specific unit cost developed by EPA.
L6	Environmental Scientist	900	HR	1.00	$37.70	$37.70	$0.00	$0.00	$0.00	$0.00	$37.70	$33,930.00	100%	9%	$73,967	FLC FLCDataCenter	Project-specific unit cost developed by EPA.
L12	Quality Control Engineer	120	HR	1.00	$64.99	$64.99	$0.00	$0.00	$0.00	$0.00	$64.99	$7,798.80	100%	9%	$17,001	FLC FLCDataCenter	Project-specific unit cost developed by EPA.
L1	CAD Drafter	300	HR	1.00	$31.31	$31.31	$0.00	$0.00	$0.00	$0.00	$31.31	$9,393.00	100%	9%	$20,477	FLC FLCDataCenter	Project-specific unit cost developed by EPA.
L3	Clerks, Typist, Bookkeeper & Receptionist	300	HR	1.00	$19.89	$19.89	$0.00	$0.00	$0.00	$0.00	$19.89	$5,967.00	100%	9%	$13,008	FLC FLCDataCenter	Project-specific unit cost developed by EPA.
O4	Copy and Shipping Allowance	1	LS	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$1,521.00	$1,521.00	$1,521.00	0%	0%	$1,521	ALL Allowance	
												TOTAL COST:			$243,687		

	Representative Unit Quantity	Unit(s)	Total Cost	Unit Cost
COST WORKSHEET SUMMARY	1	LS	$243,687	$243,687

Notes:
Further information about the development of cost worksheets can be found in Attachment A - Methodology and Organization of Detailed Cost Estimates.
The quantity bolded in the QTY column is the quantity selected as the representative unit quantity for this cost worksheet. If multiple quantities are bolded, the representative unit quantity is the sum of those quantities. When the LS unit is utilized, the default representative unit quantity is 1.
HTRW productivity factor is from Exhibit B-3 or B-4 of "A Guide to Developing and Documenting Cost Estimates During the Feasibility Study", EPA 2000
EPA developed project-specific unit costs using the Micro Computer Aided Cost Engineering System (MCACES) Second Generation (MII) software version 4.2, build 3

Cost Database Code:
The Cost Database Code is a reference code for linking with line item cost information with the cost source database and is not otherwise used within these cost worksheets. The following cost source database prefixes apply:
L (EPA-Derived Labor Unit Costs), M (Project-Specific Vendor Unit Costs), P (Previously Developed Unit Costs by Anchor QEA for Portland Harbor), A (EPA-Derived MII Unit Costs), O (Unit Costs from Other Projects/Sources)

Source of Cost Data:
For citation references, the following sources apply:
ALL (Allowance), FLC (www.flcdatacenter.com), LD (Costs Derived from Lower Duwamish Waterway Final Feasibility Study), MII (MII), O (Other), P (Previously Developed by Anchor QEA for Portland Harbor), and V (Vendor Quote)

Abbreviations:

QTY	Quantity	AC	Acres
EQUIP	Equipment	CLF	100 Linear Foot
MATL	Material	CY	Cubic Yard
HPF	HTRW Productivity Factor	DY	Days
ADJ LABOR	Adjusted Labor for HFP	EA	Each
ADJ EQUIP	Adjusted Equipment for HFP	FTE	Full Time Equivalent
UNMOD UC	Unmodified Unit Cost	HR	Hours
UNMOD LIC	Unmodified Line Item Cost	LB	Pounds
UNBUR LIC	Unburdened Line Item Cost	LCY	Loose Cubic Yard
PC OH	Prime Contractor Overhead	LF	Linear Foot
PC PF	Prime Contractor Profit	LS	Lump Sum
BUR LIC	Burdened Line Item Cost	MO	Month
		SF	Square Foot
		SY	Square Yard
		TON	Tons
		YR	Years

Cost Adjustment Checklist:	**NOTES:**
FACTOR:	Field work will be in Level "D" PPE.
H&S Productivity (labor and equipment only)	MII assembly costs include HPF adjustments.
Escalation to Base Year	2016 cost sources are not escalated (EF=1.00). All other costs are escalated based on the USACE CWCCIS, EM 1110-2-1304, Sept 2015.
Area Cost Factor	An AF of 1.05 is used for Oregon, except that an AF of 1.00 (national unmodified average) is used for MII assembly costs and local vendor quotes.
Subcontractor Overhead and Profit	It is assumed that home office OH is 8% and profit is 9% for the Prime Contractor. Professional labor overhead is 100%.
Prime Contractor Overhead and Profit	Allowances and items with mandated costs such as per diem do not have overhead and profit applied.
	Items previously developed by Anchor QEA already include contractor markups, therefore overhead and profit were not applied to those items.
	It is assumed that OH is 1% and profit is 0% for vendor quotes for treatment and disposal at offsite disposal facilities. It is assumed that OH is 5% and profit is 0% for quotes for all other material vendor quotes.
	Items developed using MII already include contractor markups such as overhead and profit, therefore additional overhead and profit were not applied in the PC OH and PC PF to those items.

Cost Worksheets
Alternative F

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TABLE CW-F1

Alternative F **Cost Worksheet:** **CW-F1**
Capital Cost Sub-Element
Mobilization / Demobilization

COST WORKSHEET

Site: Portland Harbor Superfund Site
Location: Portland, Oregon
Phase: Feasibility Study
Base Year: 2016

Prepared By: JN **Date:** 3/4/2016
Checked By: AB **Date:** 3/7/2016

Work Statement:
This sub-element involves mobilization and demobilization of all the required equipment to and from the site respectively.

Cost Analysis:
Cost for Mobilization/Demobilization (Lump Sum)

COST DATABASE CODE	DESCRIPTION	QTY	UNIT(S)	HPF	LABOR	ADJ LABOR	EQUIP	ADJ EQUIP	MATL	OTHER	UNMOD UC	UNMOD LIC	PC OH	PC PF	BUR LIC	COST SOURCE CITATION	COMMENTS
O1	Mobilization/Demobilization	1	LS	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$19,821,000.00	$19,821,000.00	$19,821,000.00	0%	0%	$19,821,000	LD Lower Duwamish	Assumes 1.6% of total capital costs per Lower Duwamish Feasibility Study. See Calculations for derivation.
												TOTAL COST:			$19,821,000		

	Representative Unit Quantity	Unit(s)	Total Cost	Unit Cost
COST WORKSHEET SUMMARY	1	LS	$19,821,000	$19,821,000

Notes:
Further information about the development of cost worksheets can be found in Attachment A - Methodology and Organization of Detailed Cost Estimates.
The quantity bolded in the QTY column is the quantity selected as the representative unit quantity for this cost worksheet. If multiple quantities are bolded, the representative unit quantity is the sum of those quantities. When the LS unit is utilized, the default representative unit quantity is 1.
HTRW productivity factor is from Exhibit B-3 or B-4 of "A Guide to Developing and Documenting Cost Estimates During the Feasibility Study", EPA 2000
EPA developed project-specific unit costs using the Micro Computer Aided Cost Engineering System (MCACES) Second Generation (MII) software version 4.2, build 3

Cost Database Code:
The Cost Database Code is a reference code for linking with line item cost information with the cost source database and is not otherwise used within these cost worksheets. The following cost source database prefixes apply:
L (EPA-Derived Labor Unit Costs), M (Project-Specific Vendor Unit Costs), P (Previously Developed Unit Costs by Anchor QEA for Portland Harbor), A (EPA-Derived MII Unit Costs), O (Unit Costs from Other Projects/Sources)

Source of Cost Data:
For citation references, the following sources apply:
ALL (Allowance), FLC (www.flcdatacenter.com), LD (Costs Derived from Lower Duwamish Waterway Final Feasibility Study), MII (MII), O (Other), P (Previously Developed by Anchor QEA for Portland Harbor), and V (Vendor Quote)

Abbreviations:

QTY	Quantity	AC	Acres
EQUIP	Equipment	CLF	100 Linear Foot
MATL	Material	CY	Cubic Yard
HPF	HTRW Productivity Factor	DY	Days
ADJ LABOR	Adjusted Labor for HFP	EA	Each
ADJ EQUIP	Adjusted Equipment for HFP	FTE	Full Time Equivalent
UNMOD UC	Unmodified Unit Cost	HR	Hours
UNMOD LIC	Unmodified Line Item Cost	LB	Pounds
UNBUR LIC	Unburdened Line Item Cost	LCY	Loose Cubic Yard
PC OH	Prime Contractor Overhead	LF	Linear Foot
PC PF	Prime Contractor Profit	LS	Lump Sum
BUR LIC	Burdened Line Item Cost	MO	Month
		SF	Square Foot
		SY	Square Yard
		TON	Tons
		YR	Years

Cost Adjustment Checklist:	**NOTES:**
FACTOR:	Field work will be in Level "D" PPE.
H&S Productivity (labor and equipment only)	MII assembly costs include HPF adjustments.
Escalation to Base Year	2016 cost sources are not escalated (EF=1.00). All other costs are escalated based on the USACE CWCCIS, EM 1110-2-1304, Sept 2015.
Area Cost Factor	An AF of 1.05 is used for Oregon, except that an AF of 1.00 (national unmodified average) is used for MII assembly costs and local vendor quotes.
Subcontractor Overhead and Profit	It is assumed that home office OH is 8% and profit is 9% for the Prime Contractor. Professional labor overhead is 100%.
Prime Contractor Overhead and Profit	Allowances and items with mandated costs such as per diem do not have overhead and profit applied.
	Items previously developed by Anchor QEA already include contractor markups, therefore overhead and profit were not applied to those items.
	It is assumed that OH is 1% and profit is 0% for vendor quotes for treatment and disposal at offsite disposal facilities. It is assumed that OH is 5% and profit is 0% for quotes for all other material vendor quotes.
	Items developed using MII already include contractor markups such as overhead and profit, therefore additional overhead and profit were not applied in the PC OH and PC PF to those items.

TABLE CW-F2

Alternative F **Cost Worksheet:** **CW-F2**
Capital Cost Sub-Element
Institutional Controls

COST WORKSHEET

Site: Portland Harbor Superfund Site
Location: Portland, Oregon
Phase: Feasibility Study
Base Year: 2016

Prepared By: JN **Date:** 3/4/2016
Checked By: AB **Date:** 3/7/2016

Work Statement:
This sub-element involves implementation of institutional controls for the site. The following cost includes labor and materials to develop legal documents for institutional controls and cost for document submission and recording.
Quantity development presented in Appendix D.

Cost Analysis:
Cost for Institutional Controls (Lump Sum)

COST DATABASE CODE	DESCRIPTION	QTY	UNIT(S)	HPF	LABOR	ADJ LABOR	EQUIP	ADJ EQUIP	MATL	OTHER	UNMOD UC	UNMOD LIC	PC OH	PC PF	BUR LIC	COST SOURCE CITATION	COMMENTS
	Informational Devices - Fish Consumption Advisory																
L11	Project Manager	2,080	HR	1.00	$82.17	$82.17	$0.00	$0.00	$0.00	$0.00	$82.17	$170,913.60	100%	9%	$372,592	FLC FLCDataCenter	Assumes 1 FTE for implementation of fish advisory
L4	Environmental Engineer	1,040	HR	1.00	$48.91	$48.91	$0.00	$0.00	$0.00	$0.00	$48.91	$50,866.40	100%	9%	$110,889	FLC FLCDataCenter	Assumes 0.5 FTE for implementation of fish advisory
L6	Environmental Scientist	1,040	HR	1.00	$37.70	$37.70	$0.00	$0.00	$0.00	$0.00	$37.70	$39,208.00	100%	9%	$85,473	FLC FLCDataCenter	Assumes 0.5 FTE for implementation of fish advisory
L3	Clerks, Typist, Bookkeeper & Receptionist	520	HR	1.00	$19.89	$19.89	$0.00	$0.00	$0.00	$0.00	$19.89	$10,342.80	100%	9%	$22,547	FLC FLCDataCenter	Assumes 0.25 FTE for implementation of fish advisory
L5	Environmental Lawyer	260	HR	1.00	$71.72	$71.72	$0.00	$0.00	$0.00	$0.00	$71.72	$18,647.20	100%	9%	$40,651	FLC FLCDataCenter	Assumes 0.125 FTE for implementation of fish advisory
L13	Paralegal	260	HR	1.00	$29.56	$29.56	$0.00	$0.00	$0.00	$0.00	$29.56	$7,685.60	100%	9%	$16,755	FLC FLCDataCenter	Assumes 0.125 FTE for implementation of fish advisory
M26	Signage	50	EA	1.00	$0.00	$0.00	$0.00	$0.00	$165.75	$0.00	$165.75	$8,287.50	5%	0%	$8,702	V Vendor Quote	Project-specific vendor quote - Allstate Sign & Plaque, 2016. 36" x 36" Signs
L8	Field Technician	50	HR	1.00	$31.42	$31.42	$0.00	$0.00	$0.00	$0.00	$31.42	$1,571.00	100%	9%	$3,425	FLC FLCDataCenter	Assumes 1 hr/sign for sign placement (2 technician crew)
O5	Allowance for Production & Copies for Advisories	1	LS	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$1,000.00	$1,000.00	$1,000.00	0%	0%	$1,000	ALL Allowance	
	Informational Devices - Regulated Navigation Area (RNA) Setup																
L11	Project Manager	200	HR	1.00	$82.17	$82.17	$0.00	$0.00	$0.00	$0.00	$82.17	$16,434.00	100%	9%	$35,826	FLC FLCDataCenter	Project-specific unit cost developed by EPA.
L4	Environmental Engineer	150	HR	1.00	$48.91	$48.91	$0.00	$0.00	$0.00	$0.00	$48.91	$7,336.50	100%	9%	$15,994	FLC FLCDataCenter	Project-specific unit cost developed by EPA.
L3	Clerks, Typist, Bookkeeper & Receptionist	40	HR	1.00	$19.89	$19.89	$0.00	$0.00	$0.00	$0.00	$19.89	$795.60	100%	9%	$1,734	FLC FLCDataCenter	Project-specific unit cost developed by EPA.
A1	18' Boat	468	HR	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$25.42	$25.42	$11,896.56	0%	0%	$11,897	MII MII	Assumes 2 hr/buoy for buoy setup
L17	Boat Operator	468	HR	1.00	$33.16	$33.16	$0.00	$0.00	$0.00	$0.00	$33.16	$15,518.88	100%	9%	$33,831	FLC FLCDataCenter	Assumes 2 hr/buoy for buoy setup
L8	Field Technician	936	HR	1.00	$31.42	$31.42	$0.00	$0.00	$0.00	$0.00	$31.42	$29,409.12	100%	9%	$64,112	FLC FLCDataCenter	Assumes 4 hrs/buoy for buoy setup (2 technician crew)
M21	Buoy	234	EA	1.00	$0.00	$0.00	$0.00	$0.00	$558.63	$0.00	$558.63	$130,719.42	5%	0%	$137,255	V Vendor Quote	Project-specific vendor quote - Go2Marine, 2016.
	Proprietary Controls																
L5	Environmental Lawyer	7,800	HR	1.00	$71.72	$71.72	$0.00	$0.00	$0.00	$0.00	$71.72	$559,416.00	100%	9%	$1,219,527	FLC FLCDataCenter	Assumes 150 hrs per dock/structure
L13	Paralegal	10,400	HR	1.00	$29.56	$29.56	$0.00	$0.00	$0.00	$0.00	$29.56	$307,424.00	100%	9%	$670,184	FLC FLCDataCenter	Assumes 200 hrs per dock/structure
L3	Clerks, Typist, Bookkeeper & Receptionist	5,200	HR	1.00	$19.89	$19.89	$0.00	$0.00	$0.00	$0.00	$19.89	$103,428.00	100%	9%	$225,473	FLC FLCDataCenter	Assumes 100 hrs per dock/structure
	Enforcement Tools																
L11	Project Manager	260	HR	1.00	$82.17	$82.17	$0.00	$0.00	$0.00	$0.00	$82.17	$21,364.20	100%	9%	$46,574	FLC FLCDataCenter	Assumes 0.125 FTE for implementation of enforcement tools
L5	Environmental Lawyer	2,080	HR	1.00	$71.72	$71.72	$0.00	$0.00	$0.00	$0.00	$71.72	$149,177.60	100%	9%	$325,207	FLC FLCDataCenter	Assumes 1 FTE for implementation of enforcement tools
L13	Paralegal	4,160	HR	1.00	$29.56	$29.56	$0.00	$0.00	$0.00	$0.00	$29.56	$122,969.60	100%	9%	$268,074	FLC FLCDataCenter	Assumes 2 FTE for implementation of enforcement tools
L3	Clerks, Typist, Bookkeeper & Receptionist	260	HR	1.00	$19.89	$19.89	$0.00	$0.00	$0.00	$0.00	$19.89	$5,171.40	100%	9%	$11,274	FLC FLCDataCenter	Assumes 0.125 FTE for implementation of enforcement tools
												TOTAL COST:			$3,728,996		

	Representative Unit Quantity	Unit(s)	Total Cost	Unit Cost
COST WORKSHEET SUMMARY	1	LS	$3,728,996	$3,728,996

TABLE CW-F2

Alternative F **Cost Worksheet:** **CW-F2**
Capital Cost Sub-Element
Institutional Controls

COST WORKSHEET

Site: Portland Harbor Superfund Site
Location: Portland, Oregon
Phase: Feasibility Study
Base Year: 2016

Prepared By: JN **Date:** 3/4/2016
Checked By: AB **Date:** 3/7/2016

Notes:

Further information about the development of cost worksheets can be found in Attachment A - Methodology and Organization of Detailed Cost Estimates.
The quantity bolded in the QTY column is the quantity selected as the representative unit quantity for this cost worksheet. If multiple quantities are bolded, the representative unit quantity is the sum of those quantities. When the LS unit is utilized, the default representative unit quantity is 1.
HTRW productivity factor is from Exhibit B-3 or B-4 of "A Guide to Developing and Documenting Cost Estimates During the Feasibility Study", EPA 2000
EPA developed project-specific unit costs using the Micro Computer Aided Cost Engineering System (MCACES) Second Generation (MII) software version 4.2, build 3

Cost Database Code:

The Cost Database Code is a reference code for linking with line item cost information with the cost source database and is not otherwise used within these cost worksheets. The following cost source database prefixes apply:
L (EPA-Derived Labor Unit Costs), M (Project-Specific Vendor Unit Costs), P (Previously Developed Unit Costs by Anchor QEA for Portland Harbor), A (EPA-Derived MII Unit Costs), O (Unit Costs from Other Projects/Sources)

Source of Cost Data:

For citation references, the following sources apply:
ALL (Allowance), FLC (www.flcdatacenter.com), LD (Costs Derived from Lower Duwamish Waterway Final Feasibility Study), MII (MII), O (Other), P (Previously Developed by Anchor QEA for Portland Harbor), and V (Vendor Quote)

Abbreviations:

QTY	Quantity	AC	Acres
EQUIP	Equipment	CLF	100 Linear Foot
MATL	Material	CY	Cubic Yard
HPF	HTRW Productivity Factor	DY	Days
ADJ LABOR	Adjusted Labor for HFP	EA	Each
ADJ EQUIP	Adjusted Equipment for HFP	FTE	Full Time Equivalent
UNMOD UC	Unmodified Unit Cost	HR	Hours
UNMOD LIC	Unmodified Line Item Cost	LB	Pounds
UNBUR LIC	Unburdened Line Item Cost	LCY	Loose Cubic Yard
PC OH	Prime Contractor Overhead	LF	Linear Foot
PC PF	Prime Contractor Profit	LS	Lump Sum
BUR LIC	Burdened Line Item Cost	MO	Month
		SF	Square Foot
		SY	Square Yard
		TON	Tons
		YR	Years

Cost Adjustment Checklist:	**NOTES:**
FACTOR:	Field work will be in Level "D" PPE.
H&S Productivity (labor and equipment only)	MII assembly costs include HPF adjustments.
Escalation to Base Year	2016 cost sources are not escalated (EF=1.00). All other costs are escalated based on the USACE CWCCIS, EM 1110-2-1304, Sept 2015.
Area Cost Factor	An AF of 1.05 is used for Oregon, except that an AF of 1.00 (national unmodified average) is used for MII assembly costs and local vendor quotes.
Subcontractor Overhead and Profit	It is assumed that home office OH is 8% and profit is 9% for the Prime Contractor. Professional labor overhead is 100%.
Prime Contractor Overhead and Profit	Allowances and items with mandated costs such as per diem do not have overhead and profit applied.
	Items previously developed by Anchor QEA already include contractor markups, therefore overhead and profit were not applied to those items.
	It is assumed that OH is 1% and profit is 0% for vendor quotes for treatment and disposal at offsite disposal facilities. It is assumed that OH is 5% and profit is 0% for quotes for all other material vendor quotes.
	Items developed using MII already include contractor markups such as overhead and profit, therefore additional overhead and profit were not applied in the PC OH and PC PF to those items.

TABLE CW-F3

Alternative F **Cost Worksheet:** **CW-F3**

Periodic Cost Sub-Element

Evaluating and Updating Institutional Controls

COST WORKSHEET

Site: Portland Harbor Superfund Site
Location: Portland, Oregon
Phase: Feasibility Study
Base Year: 2016

Prepared By: JN **Date:** 3/4/2016
Checked By: AB **Date:** 3/7/2016

Work Statement:
This sub-element involves evaluating and updating of institutional controls for the site. The following cost includes labor and materials to required for evaluating and updating institutional controls every 5 years.
Quantity development presented in Appendix D.

Cost Analysis:
Cost for Evaluating and Updating Institutional Controls (Lump Sum)

COST DATABASE CODE	DESCRIPTION	QTY	UNIT(S)	HPF	LABOR	ADJ LABOR	EQUIP	ADJ EQUIP	MATL	OTHER	UNMOD UC	UNMOD LIC	PC OH	PC PF	BUR LIC	COST SOURCE CITATION	COMMENTS
	Informational Devices - Fish Consumption Advisory																
L11	Project Manager	208	HR	1.00	$82.17	$82.17	$0.00	$0.00	$0.00	$0.00	$82.17	$17,091.36	100%	9%	$37,259	FLC FLCDataCenter	Assumes 10% of initial costs for updating periodically
L4	Environmental Engineer	104	HR	1.00	$48.91	$48.91	$0.00	$0.00	$0.00	$0.00	$48.91	$5,086.64	100%	9%	$11,089	FLC FLCDataCenter	Assumes 10% of initial costs for updating periodically
L6	Environmental Scientist	104	HR	1.00	$37.70	$37.70	$0.00	$0.00	$0.00	$0.00	$37.70	$3,920.80	100%	9%	$8,547	FLC FLCDataCenter	Assumes 10% of initial costs for updating periodically
L3	Clerks, Typist, Bookkeeper & Receptionist	52	HR	1.00	$19.89	$19.89	$0.00	$0.00	$0.00	$0.00	$19.89	$1,034.28	100%	9%	$2,255	FLC FLCDataCenter	Assumes 10% of initial costs for updating periodically
L5	Environmental Lawyer	26	HR	1.00	$71.72	$71.72	$0.00	$0.00	$0.00	$0.00	$71.72	$1,864.72	100%	9%	$4,065	FLC FLCDataCenter	Assumes 10% of initial costs for updating periodically
L13	Paralegal	26	HR	1.00	$29.56	$29.56	$0.00	$0.00	$0.00	$0.00	$29.56	$768.56	100%	9%	$1,675	FLC FLCDataCenter	Assumes 10% of initial costs for updating periodically
M26	Signage	50	EA	1.00	$0.00	$0.00	$0.00	$0.00	$165.75	$0.00	$165.75	$8,287.50	5%	0%	$8,702	V Vendor Quote	Assumes 100% replacement of signs every 5 years
L8	Field Technician	50	HR	1.00	$31.42	$31.42	$0.00	$0.00	$0.00	$0.00	$31.42	$1,571.00	100%	9%	$3,425	FLC FLCDataCenter	Assumes 1 hr/sign for sign placement (2 technician crew)
O5	Allowance for Production & Copies for Advisories	5	LS	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$1,000.00	$1,000.00	$5,000.00	0%	0%	$5,000	ALL Allowance	Assumes yearly allowance for production and copies during 5-yr periodic updates
	Informational Devices - Regulated Navigation Area (RNA) Setup																
L11	Project Manager	200	HR	1.00	$82.17	$82.17	$0.00	$0.00	$0.00	$0.00	$82.17	$16,434.00	100%	9%	$35,826	FLC FLCDataCenter	Project-specific unit cost developed by EPA.
L4	Environmental Engineer	150	HR	1.00	$48.91	$48.91	$0.00	$0.00	$0.00	$0.00	$48.91	$7,336.50	100%	9%	$15,994	FLC FLCDataCenter	Project-specific unit cost developed by EPA.
L3	Clerks, Typist, Bookkeeper & Receptionist	40	HR	1.00	$19.89	$19.89	$0.00	$0.00	$0.00	$0.00	$19.89	$795.60	100%	9%	$1,734	FLC FLCDataCenter	Project-specific unit cost developed by EPA.
A1	18' Boat	468	HR	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$25.42	$25.42	$11,896.56	0%	0%	$11,897	MII MII	Assumes 2 hr/buoy for buoy setup
L17	Boat Operator	468	HR	1.00	$33.16	$33.16	$0.00	$0.00	$0.00	$0.00	$33.16	$15,518.88	100%	9%	$33,831	FLC FLCDataCenter	Assumes 2 hr/buoy for buoy setup
L8	Field Technician	936	HR	1.00	$31.42	$31.42	$0.00	$0.00	$0.00	$0.00	$31.42	$29,409.12	100%	9%	$64,112	FLC FLCDataCenter	Assumes 4 hrs/buoy for buoy setup (2 technician crew)
M21	Buoy	234	EA	1.00	$0.00	$0.00	$0.00	$0.00	$558.63	$0.00	$558.63	$130,719.42	5%	0%	$137,255	V Vendor Quote	Assumes 100% replacement of buoys every 5 years. Quote - Go2Marine 2016.
	Proprietary Controls																
L5	Environmental Lawyer	780	HR	1.00	$71.72	$71.72	$0.00	$0.00	$0.00	$0.00	$71.72	$55,941.60	100%	9%	$121,953	FLC FLCDataCenter	Assumes 10% of initial costs for updating periodically
L13	Paralegal	1,040	HR	1.00	$29.56	$29.56	$0.00	$0.00	$0.00	$0.00	$29.56	$30,742.40	100%	9%	$67,018	FLC FLCDataCenter	Assumes 10% of initial costs for updating periodically
L3	Clerks, Typist, Bookkeeper & Receptionist	520	HR	1.00	$19.89	$19.89	$0.00	$0.00	$0.00	$0.00	$19.89	$10,342.80	100%	9%	$22,547	FLC FLCDataCenter	Assumes 10% of initial costs for updating periodically
	Enforcement Tools																
L11	Project Manager	26	HR	1.00	$82.17	$82.17	$0.00	$0.00	$0.00	$0.00	$82.17	$2,136.42	100%	9%	$4,657	FLC FLCDataCenter	Assumes 10% of initial costs for updating periodically
L5	Environmental Lawyer	208	HR	1.00	$71.72	$71.72	$0.00	$0.00	$0.00	$0.00	$71.72	$14,917.76	100%	9%	$32,521	FLC FLCDataCenter	Assumes 10% of initial costs for updating periodically
L13	Paralegal	416	HR	1.00	$29.56	$29.56	$0.00	$0.00	$0.00	$0.00	$29.56	$12,296.96	100%	9%	$26,807	FLC FLCDataCenter	Assumes 10% of initial costs for updating periodically
L3	Clerks, Typist, Bookkeeper & Receptionist	26	HR	1.00	$19.89	$19.89	$0.00	$0.00	$0.00	$0.00	$19.89	$517.14	100%	9%	$1,127	FLC FLCDataCenter	Assumes 10% of initial costs for updating periodically
												TOTAL COST:			$659,296		

	Representative Unit Quantity	Unit(s)	Total Cost	Unit Cost
COST WORKSHEET SUMMARY	1	LS	$659,296	$659,296

TABLE CW-F3

Alternative F **Cost Worksheet:** **CW-F3**
Periodic Cost Sub-Element
Evaluating and Updating Institutional Controls

COST WORKSHEET

Site: Portland Harbor Superfund Site
Location: Portland, Oregon
Phase: Feasibility Study
Base Year: 2016

Prepared By: JN **Date:** 3/4/2016
Checked By: AB **Date:** 3/7/2016

Notes:

Further information about the development of cost worksheets can be found in Attachment A - Methodology and Organization of Detailed Cost Estimates.
The quantity bolded in the QTY column is the quantity selected as the representative unit quantity for this cost worksheet. If multiple quantities are bolded, the representative unit quantity is the sum of those quantities. When the LS unit is utilized, the default representative unit quantity is 1.
HTRW productivity factor is from Exhibit B-3 or B-4 of "A Guide to Developing and Documenting Cost Estimates During the Feasibility Study", EPA 2000
EPA developed project-specific unit costs using the Micro Computer Aided Cost Engineering System (MCACES) Second Generation (MII) software version 4.2, build 3

Cost Database Code:

The Cost Database Code is a reference code for linking with line item cost information with the cost source database and is not otherwise used within these cost worksheets. The following cost source database prefixes apply:

L (EPA-Derived Labor Unit Costs), M (Project-Specific Vendor Unit Costs), P (Previously Developed Unit Costs by Anchor QEA for Portland Harbor), A (EPA-Derived MII Unit Costs), O (Unit Costs from Other Projects/Sources)

Source of Cost Data:

For citation references, the following sources apply:

ALL (Allowance), FLC (www.flcdatacenter.com), LD (Costs Derived from Lower Duwamish Waterway Final Feasibility Study), MII (MII), O (Other), P (Previously Developed by Anchor QEA for Portland Harbor), and V (Vendor Quote)

Abbreviations:

QTY	Quantity	AC	Acres
EQUIP	Equipment	CLF	100 Linear Foot
MATL	Material	CY	Cubic Yard
HPF	HTRW Productivity Factor	DY	Days
ADJ LABOR	Adjusted Labor for HFP	EA	Each
ADJ EQUIP	Adjusted Equipment for HFP	FTE	Full Time Equivalent
UNMOD UC	Unmodified Unit Cost	HR	Hours
UNMOD LIC	Unmodified Line Item Cost	LB	Pounds
UNBUR LIC	Unburdened Line Item Cost	LCY	Loose Cubic Yard
PC OH	Prime Contractor Overhead	LF	Linear Foot
PC PF	Prime Contractor Profit	LS	Lump Sum
BUR LIC	Burdened Line Item Cost	MO	Month
		SF	Square Foot
		SY	Square Yard
		TON	Tons
		YR	Years

Cost Adjustment Checklist:	**NOTES:**
FACTOR:	Field work will be in Level "D" PPE.
H&S Productivity (labor and equipment only)	MII assembly costs include HPF adjustments.
Escalation to Base Year	2016 cost sources are not escalated (EF=1.00). All other costs are escalated based on the USACE CWCCIS, EM 1110-2-1304, Sept 2015.
Area Cost Factor	An AF of 1.05 is used for Oregon, except that an AF of 1.00 (national unmodified average) is used for MII assembly costs and local vendor quotes.
Subcontractor Overhead and Profit	It is assumed that home office OH is 8% and profit is 9% for the Prime Contractor. Professional labor overhead is 100%.
Prime Contractor Overhead and Profit	Allowances and items with mandated costs such as per diem do not have overhead and profit applied.
	Items previously developed by Anchor QEA already include contractor markups, therefore overhead and profit were not applied to those items.
	It is assumed that OH is 1% and profit is 0% for vendor quotes for treatment and disposal at offsite disposal facilities. It is assumed that OH is 5% and profit is 0% for quotes for all other material vendor quotes.
	Items developed using MII already include contractor markups such as overhead and profit, therefore additional overhead and profit were not applied in the PC OH and PC PF to those items.

TABLE CW-F5

Alternative F **Cost Worksheet:** **CW-F5**
Capital Cost Sub-Element
Debris Removal and Disposal

COST WORKSHEET

Site: Portland Harbor Superfund Site
Location: Portland, Oregon
Phase: Feasibility Study
Base Year: 2016

Prepared By: JN **Date:** 3/4/2016
Checked By: AB **Date:** 3/7/2016

Work Statement:
This sub-element involves removal and disposal of debris for all areas prior to remedial activities. It includes costs for on-site labor, equipment, and materials developed from previous work.
Quantity development presented in Appendix D.

Cost Analysis:
Cost for Debris Removal and Disposal (Lump Sum)

COST DATABASE CODE	DESCRIPTION	QTY	UNIT(S)	HPF	LABOR	ADJ LABOR	EQUIP	ADJ EQUIP	MATL	OTHER	UNMOD UC	UNMOD LIC	PC OH	PC PF	BUR LIC	COST SOURCE CITATION	COMMENTS
P9	Debris Removal and Disposal	**534**	AC	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$13,107.01	$13,107.01	$6,999,143.34	0%	0%	$6,999,143	P Anchor QEA	Project-specific cost developed by Anchor QEA (2010) - see Backup Table 2.
												TOTAL COST:			$6,999,143		

	Representative Unit Quantity	Unit(s)	Total Cost	Unit Cost
COST WORKSHEET SUMMARY	534	AC	$6,999,143	$13,107

Notes:
Further information about the development of cost worksheets can be found in Attachment A - Methodology and Organization of Detailed Cost Estimates.
The quantity bolded in the QTY column is the quantity selected as the representative unit quantity for this cost worksheet. If multiple quantities are bolded, the representative unit quantity is the sum of those quantities. When the LS unit is utilized, the default representative unit quantity is 1.
HTRW productivity factor is from Exhibit B-3 or B-4 of "A Guide to Developing and Documenting Cost Estimates During the Feasibility Study", EPA 2000
EPA developed project-specific unit costs using the Micro Computer Aided Cost Engineering System (MCACES) Second Generation (MII) software version 4.2, build 3

Cost Database Code:
The Cost Database Code is a reference code for linking with line item cost information with the cost source database and is not otherwise used within these cost worksheets. The following cost source database prefixes apply:
L (EPA-Derived Labor Unit Costs), M (Project-Specific Vendor Unit Costs), P (Previously Developed Unit Costs by Anchor QEA for Portland Harbor), A (EPA-Derived MII Unit Costs), O (Unit Costs from Other Projects/Sources)

Source of Cost Data:
For citation references, the following sources apply:
ALL (Allowance), FLC (www.flcdatacenter.com), LD (Costs Derived from Lower Duwamish Waterway Final Feasibility Study), MII (MII), O (Other), P (Previously Developed by Anchor QEA for Portland Harbor), and V (Vendor Quote)

Abbreviations:

QTY	Quantity	AC	Acres
EQUIP	Equipment	CLF	100 Linear Foot
MATL	Material	CY	Cubic Yard
HPF	HTRW Productivity Factor	DY	Days
ADJ LABOR	Adjusted Labor for HFP	EA	Each
ADJ EQUIP	Adjusted Equipment for HFP	FTE	Full Time Equivalent
UNMOD UC	Unmodified Unit Cost	HR	Hours
UNMOD LIC	Unmodified Line Item Cost	LB	Pounds
UNBUR LIC	Unburdened Line Item Cost	LCY	Loose Cubic Yard
PC OH	Prime Contractor Overhead	LF	Linear Foot
PC PF	Prime Contractor Profit	LS	Lump Sum
BUR LIC	Burdened Line Item Cost	MO	Month
		SF	Square Foot
		SY	Square Yard
		TON	Tons
		YR	Years

Cost Adjustment Checklist:	**NOTES:**
FACTOR:	Field work will be in Level "D" PPE.
H&S Productivity (labor and equipment only)	MII assembly costs include HPF adjustments.
Escalation to Base Year	2016 cost sources are not escalated (EF=1.00). All other costs are escalated based on the USACE CWCCIS, EM 1110-2-1304, Sept 2015.
Area Cost Factor	An AF of 1.05 is used for Oregon, except that an AF of 1.00 (national unmodified average) is used for MII assembly costs and local vendor quotes.
Subcontractor Overhead and Profit	It is assumed that home office OH is 8% and profit is 9% for the Prime Contractor. Professional labor overhead is 100%.
Prime Contractor Overhead and Profit	Allowances and items with mandated costs such as per diem do not have overhead and profit applied.
	Items previously developed by Anchor QEA already include contractor markups, therefore overhead and profit were not applied to those items.
	It is assumed that OH is 1% and profit is 0% for vendor quotes for treatment and disposal at offsite disposal facilities. It is assumed that OH is 5% and profit is 0% for quotes for all other material vendor quotes.
	Items developed using MII already include contractor markups such as overhead and profit, therefore additional overhead and profit were not applied in the PC OH and PC PF to those items.

TABLE CW-F6

Alternative F **Cost Worksheet:** **CW-F6**
Capital Cost Sub-Element
Obstruction Removal and Relocation

COST WORKSHEET

Site: Portland Harbor Superfund Site
Location: Portland, Oregon
Phase: Feasibility Study
Base Year: 2016

Prepared By: JN **Date:** 3/4/2016
Checked By: AB **Date:** 3/7/2016

Work Statement:
This sub-element involves all work related to obstructions removal, relocation, and disposal. It includes all costs for labor, equipment and materials developed from previous work for pile removal and disposal, pile replacement, and temporary dock relocation.
Quantity development presented in Appendix D.

Cost Analysis:
Cost for Obstructions (Lump Sum)

COST DATABASE CODE	DESCRIPTION	QTY	UNIT(S)	HPF	LABOR	ADJ LABOR	EQUIP	ADJ EQUIP	MATL	OTHER	UNMOD UC	UNMOD LIC	PC OH	PC PF	BUR LIC	COST SOURCE CITATION	COMMENTS
P10	Pile Removal and Disposal	2,418	EA	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$715.65	$715.65	$1,730,429.61	0%	0%	$1,730,430	P Anchor QEA	Project-specific cost developed by Anchor QEA (2010) - see Backup Table 3.
P11	Pile Replacement	2,418	EA	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$7,478.77	$7,478.77	$18,083,670.70	0%	0%	$18,083,671	P Anchor QEA	Project-specific cost developed by Anchor QEA (2010) - see Backup Table 4.
P12	Temporary Dock Relocation	9	EA	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$100,497.97	$100,497.97	$904,481.74	0%	0%	$904,482	P Anchor QEA	Project-specific cost developed by Anchor QEA (2010) - see Backup Table 5.
												TOTAL COST:			$20,718,583		

	Representative Unit Quantity	Unit(s)	Total Cost	Unit Cost
COST WORKSHEET SUMMARY	1	LS	$20,718,583	$20,718,583

Notes:
Further information about the development of cost worksheets can be found in Attachment A - Methodology and Organization of Detailed Cost Estimates.
The quantity bolded in the QTY column is the quantity selected as the representative unit quantity for this cost worksheet. If multiple quantities are bolded, the representative unit quantity is the sum of those quantities. When the LS unit is utilized, the default representative unit quantity is 1.
HTRW productivity factor is from Exhibit B-3 or B-4 of "A Guide to Developing and Documenting Cost Estimates During the Feasibility Study", EPA 2000
EPA developed project-specific unit costs using the Micro Computer Aided Cost Engineering System (MCACES) Second Generation (MII) software version 4.2, build 3

Cost Database Code:
The Cost Database Code is a reference code for linking with line item cost information with the cost source database and is not otherwise used within these cost worksheets. The following cost source database prefixes apply:
L (EPA-Derived Labor Unit Costs), M (Project-Specific Vendor Unit Costs), P (Previously Developed Unit Costs by Anchor QEA for Portland Harbor), A (EPA-Derived MII Unit Costs), O (Unit Costs from Other Projects/Sources)

Source of Cost Data:
For citation references, the following sources apply:
ALL (Allowance), FLC (www.flcdatacenter.com), LD (Costs Derived from Lower Duwamish Waterway Final Feasibility Study), MII (MII), O (Other), P (Previously Developed by Anchor QEA for Portland Harbor), and V (Vendor Quote)

Abbreviations:

QTY	Quantity	AC	Acres
EQUIP	Equipment	CLF	100 Linear Foot
MATL	Material	CY	Cubic Yard
HPF	HTRW Productivity Factor	DY	Days
ADJ LABOR	Adjusted Labor for HFP	EA	Each
ADJ EQUIP	Adjusted Equipment for HFP	FTE	Full Time Equivalent
UNMOD UC	Unmodified Unit Cost	HR	Hours
UNMOD LIC	Unmodified Line Item Cost	LB	Pounds
UNBUR LIC	Unburdened Line Item Cost	LCY	Loose Cubic Yard
PC OH	Prime Contractor Overhead	LF	Linear Foot
PC PF	Prime Contractor Profit	LS	Lump Sum
BUR LIC	Burdened Line Item Cost	MO	Month
		SF	Square Foot
		SY	Square Yard
		TON	Tons
		YR	Years

Cost Adjustment Checklist:	**NOTES:**
FACTOR:	Field work will be in Level "D" PPE.
H&S Productivity (labor and equipment only)	MII assembly costs include HPF adjustments.
Escalation to Base Year	2016 cost sources are not escalated (EF=1.00). All other costs are escalated based on the USACE CWCCIS, EM 1110-2-1304, Sept 2015.
Area Cost Factor	An AF of 1.05 is used for Oregon, except that an AF of 1.00 (national unmodified average) is used for MII assembly costs and local vendor quotes.
Subcontractor Overhead and Profit	It is assumed that home office OH is 8% and profit is 9% for the Prime Contractor. Professional labor overhead is 100%.
Prime Contractor Overhead and Profit	Allowances and items with mandated costs such as per diem do not have overhead and profit applied.
	Items previously developed by Anchor QEA already include contractor markups, therefore overhead and profit were not applied to those items.
	It is assumed that OH is 1% and profit is 0% for vendor quotes for treatment and disposal at offsite disposal facilities. It is assumed that OH is 5% and profit is 0% for quotes for all other material vendor quotes.
	Items developed using MII already include contractor markups such as overhead and profit, therefore additional overhead and profit were not applied in the PC OH and PC PF to those items.

TABLE CW-F7

Alternative F **Cost Worksheet:** **CW-F7**
Capital Cost Sub-Element
Erosion/Residual Control Measures

COST WORKSHEET

Site: Portland Harbor Superfund Site
Location: Portland, Oregon
Phase: Feasibility Study
Base Year: 2016

Prepared By: JN **Date:** 3/4/2016
Checked By: AB **Date:** 3/7/2016

Work Statement:
This sub-element involves the installation, maintainance, and removal of silt curtains and sheet pile walls for erosion and residual control. It includes costs for on-site labor, equipment, and materials developed from previous work.
Quantity development presented in Appendix D.

Cost Analysis:
Cost for Erosion/Residual Control Measures (Lump Sum)

COST DATABASE CODE	DESCRIPTION	QTY	UNIT(S)	HPF	LABOR	ADJ LABOR	EQUIP	ADJ EQUIP	MATL	OTHER	UNMOD UC	UNMOD LIC	PC OH	PC PF	BUR LIC	COST SOURCE CITATION	COMMENTS
P13	Purchase, Install and Maintain Silt Curtains	67,500	LF	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$96.92	$96.92	$6,542,235.00	0%	0%	$6,542,235	P Anchor QEA	Project-specific cost developed by Anchor QEA (2010) - see Backup Table 7.
P14	Purchase, Install and Remove Sheet Pile Walls	7,500	LF	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$2,749.88	$2,749.88	$20,624,100.00	0%	0%	$20,624,100	P Anchor QEA	Project-specific cost developed by Anchor QEA (2010) - see Backup Table 6.
												TOTAL COST:			$27,166,335		

	Representative Unit Quantity	Unit(s)	Total Cost	Unit Cost
COST WORKSHEET SUMMARY	1	LS	$27,166,335	$27,166,335

Notes:
Further information about the development of cost worksheets can be found in Attachment A - Methodology and Organization of Detailed Cost Estimates.
The quantity bolded in the QTY column is the quantity selected as the representative unit quantity for this cost worksheet. If multiple quantities are bolded, the representative unit quantity is the sum of those quantities. When the LS unit is utilized, the default representative unit quantity is 1.
HTRW productivity factor is from Exhibit B-3 or B-4 of "A Guide to Developing and Documenting Cost Estimates During the Feasibility Study", EPA 2000
EPA developed project-specific unit costs using the Micro Computer Aided Cost Engineering System (MCACES) Second Generation (MII) software version 4.2, build 3

Cost Database Code:
The Cost Database Code is a reference code for linking with line item cost information with the cost source database and is not otherwise used within these cost worksheets. The following cost source database prefixes apply:
L (EPA-Derived Labor Unit Costs), M (Project-Specific Vendor Unit Costs), P (Previously Developed Unit Costs by Anchor QEA for Portland Harbor), A (EPA-Derived MII Unit Costs), O (Unit Costs from Other Projects/Sources)

Source of Cost Data:
For citation references, the following sources apply:
ALL (Allowance), FLC (www.flcdatacenter.com), LD (Costs Derived from Lower Duwamish Waterway Final Feasibility Study), MII (MII), O (Other), P (Previously Developed by Anchor QEA for Portland Harbor), and V (Vendor Quote)

Abbreviations:

QTY	Quantity	AC	Acres
EQUIP	Equipment	CLF	100 Linear Foot
MATL	Material	CY	Cubic Yard
HPF	HTRW Productivity Factor	DY	Days
ADJ LABOR	Adjusted Labor for HFP	EA	Each
ADJ EQUIP	Adjusted Equipment for HFP	FTE	Full Time Equivalent
UNMOD UC	Unmodified Unit Cost	HR	Hours
UNMOD LIC	Unmodified Line Item Cost	LB	Pounds
UNBUR LIC	Unburdened Line Item Cost	LCY	Loose Cubic Yard
PC OH	Prime Contractor Overhead	LF	Linear Foot
PC PF	Prime Contractor Profit	LS	Lump Sum
BUR LIC	Burdened Line Item Cost	MO	Month
		SF	Square Foot
		SY	Square Yard
		TON	Tons
		YR	Years

Cost Adjustment Checklist:	**NOTES:**
FACTOR:	Field work will be in Level "D" PPE.
H&S Productivity (labor and equipment only)	MII assembly costs include HPF adjustments.
Escalation to Base Year	2016 cost sources are not escalated (EF=1.00). All other costs are escalated based on the USACE CWCCIS, EM 1110-2-1304, Sept 2015.
Area Cost Factor	An AF of 1.05 is used for Oregon, except that an AF of 1.00 (national unmodified average) is used for MII assembly costs and local vendor quotes.
Subcontractor Overhead and Profit	It is assumed that home office OH is 8% and profit is 9% for the Prime Contractor. Professional labor overhead is 100%.
Prime Contractor Overhead and Profit	Allowances and items with mandated costs such as per diem do not have overhead and profit applied.
	Items previously developed by Anchor QEA already include contractor markups, therefore overhead and profit were not applied to those items.
	It is assumed that OH is 1% and profit is 0% for vendor quotes for treatment and disposal at offsite disposal facilities. It is assumed that OH is 5% and profit is 0% for quotes for all other material vendor quotes.
	Items developed using MII already include contractor markups such as overhead and profit, therefore additional overhead and profit were not applied in the PC OH and PC PF to those items.

TABLE CW-F8

Alternative F **Cost Worksheet:** **CW-F8**
Capital Cost Sub-Element
Dredging of Contaminated Sediments (Open Water)

COST WORKSHEET

Site: Portland Harbor Superfund Site
Location: Portland, Oregon
Phase: Feasibility Study
Base Year: 2016

Prepared By: JN **Date:** 3/4/2016
Checked By: AB **Date:** 3/7/2016

Work Statement:
This sub-element involves mechanical dredging of contaminated sediments in open water areas and transport to dewatering/stabilization area. It includes costs for on-site labor, equipment, and materials for open water dredging, assuming a 10 CY barge mounted crane and clamshell.
Quantity development presented in Appendix D.

Cost Analysis:
Cost for Open Water Dredging (Lump Sum)

COST DATABASE CODE	DESCRIPTION	QTY	UNIT(S)	HPF	LABOR	ADJ LABOR	EQUIP	ADJ EQUIP	MATL	OTHER	UNMOD UC	UNMOD LIC	PC OH	PC PF	BUR LIC	COST SOURCE CITATION	COMMENTS
A6	Open Water Dredging	**4,339,288**	CY	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$24.53	$24.53	$106,442,734.64	0%	0%	$106,442,735	MII MII	Project-specific unit cost developed in MII.
												TOTAL COST:			$106,442,735		

	Representative Unit Quantity	Unit(s)	Total Cost	Unit Cost
COST WORKSHEET SUMMARY	4,339,288	CY	$106,442,735	$24.53

Notes:
Further information about the development of cost worksheets can be found in Attachment A - Methodology and Organization of Detailed Cost Estimates.
The quantity bolded in the QTY column is the quantity selected as the representative unit quantity for this cost worksheet. If multiple quantities are bolded, the representative unit quantity is the sum of those quantities. When the LS unit is utilized, the default representative unit quantity is 1.
HTRW productivity factor is from Exhibit B-3 or B-4 of "A Guide to Developing and Documenting Cost Estimates During the Feasibility Study", EPA 2000
EPA developed project-specific unit costs using the Micro Computer Aided Cost Engineering System (MCACES) Second Generation (MII) software version 4.2, build 3

Cost Database Code:
The Cost Database Code is a reference code for linking with line item cost information with the cost source database and is not otherwise used within these cost worksheets. The following cost source database prefixes apply:
L (EPA-Derived Labor Unit Costs), M (Project-Specific Vendor Unit Costs), P (Previously Developed Unit Costs by Anchor QEA for Portland Harbor), A (EPA-Derived MII Unit Costs), O (Unit Costs from Other Projects/Sources)

Source of Cost Data:
For citation references, the following sources apply:
ALL (Allowance), FLC (www.flcdatacenter.com), LD (Costs Derived from Lower Duwamish Waterway Final Feasibility Study), MII (MII), O (Other), P (Previously Developed by Anchor QEA for Portland Harbor), and V (Vendor Quote)

Abbreviations:

QTY	Quantity	AC	Acres
EQUIP	Equipment	CLF	100 Linear Foot
MATL	Material	CY	Cubic Yard
HPF	HTRW Productivity Factor	DY	Days
ADJ LABOR	Adjusted Labor for HFP	EA	Each
ADJ EQUIP	Adjusted Equipment for HFP	FTE	Full Time Equivalent
UNMOD UC	Unmodified Unit Cost	HR	Hours
UNMOD LIC	Unmodified Line Item Cost	LB	Pounds
UNBUR LIC	Unburdened Line Item Cost	LCY	Loose Cubic Yard
PC OH	Prime Contractor Overhead	LF	Linear Foot
PC PF	Prime Contractor Profit	LS	Lump Sum
BUR LIC	Burdened Line Item Cost	MO	Month
		SF	Square Foot
		SY	Square Yard
		TON	Tons
		YR	Years

Cost Adjustment Checklist:	**NOTES:**
FACTOR:	Field work will be in Level "D" PPE.
H&S Productivity (labor and equipment only)	MII assembly costs include HPF adjustments.
Escalation to Base Year	2016 cost sources are not escalated (EF=1.00). All other costs are escalated based on the USACE CWCCIS, EM 1110-2-1304, Sept 2015.
Area Cost Factor	An AF of 1.05 is used for Oregon, except that an AF of 1.00 (national unmodified average) is used for MII assembly costs and local vendor quotes.
Subcontractor Overhead and Profit	It is assumed that home office OH is 8% and profit is 9% for the Prime Contractor. Professional labor overhead is 100%.
Prime Contractor Overhead and Profit	Allowances and items with mandated costs such as per diem do not have overhead and profit applied.
	Items previously developed by Anchor QEA already include contractor markups, therefore overhead and profit were not applied to those items.
	It is assumed that OH is 1% and profit is 0% for vendor quotes for treatment and disposal at offsite disposal facilities. It is assumed that OH is 5% and profit is 0% for quotes for all other material vendor quotes.
	Items developed using MII already include contractor markups such as overhead and profit, therefore additional overhead and profit were not applied in the PC OH and PC PF to those items.

TABLE CW-F9

Alternative F **Cost Worksheet:** **CW-F9**
Capital Cost Sub-Element
Dredging of Contaminated Sediments (Confined)

COST WORKSHEET

Site: Portland Harbor Superfund Site
Location: Portland, Oregon
Phase: Feasibility Study
Base Year: 2016

Prepared By: JN **Date:** 3/4/2016
Checked By: AB **Date:** 3/7/2016

Work Statement:
This sub-element involves mechanical dredging of contaminated sediments in confined areas and transport to dewatering/stabilization area. It includes costs for on-site labor, equipment, and materials for confined dredging, assuming a 4 CY barge mounted excavator.
Quantity development presented in Appendix D.

Cost Analysis:
Cost for Confined Dredging (Lump Sum)

COST DATABASE CODE	DESCRIPTION	QTY	UNIT(S)	HPF	LABOR	ADJ LABOR	EQUIP	ADJ EQUIP	MATL	OTHER	UNMOD UC	UNMOD LIC	PC OH	PC PF	BUR LIC	COST SOURCE CITATION	COMMENTS
A7	Confined Dredging	**123,286**	CY	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$31.10	$31.10	$3,834,194.60	0%	0%	$3,834,195	MII MII	Project-specific unit cost developed in MII.
												TOTAL COST:			$3,834,195		

	Representative Unit Quantity	Unit(s)	Total Cost	Unit Cost
COST WORKSHEET SUMMARY	123,286	CY	$3,834,195	$31.10

Notes:
Further information about the development of cost worksheets can be found in Attachment A - Methodology and Organization of Detailed Cost Estimates.
The quantity bolded in the QTY column is the quantity selected as the representative unit quantity for this cost worksheet. If multiple quantities are bolded, the representative unit quantity is the sum of those quantities. When the LS unit is utilized, the default representative unit quantity is 1.
HTRW productivity factor is from Exhibit B-3 or B-4 of "A Guide to Developing and Documenting Cost Estimates During the Feasibility Study", EPA 2000
EPA developed project-specific unit costs using the Micro Computer Aided Cost Engineering System (MCACES) Second Generation (MII) software version 4.2, build 3

Cost Database Code:
The Cost Database Code is a reference code for linking with line item cost information with the cost source database and is not otherwise used within these cost worksheets. The following cost source database prefixes apply:
L (EPA-Derived Labor Unit Costs), M (Project-Specific Vendor Unit Costs), P (Previously Developed Unit Costs by Anchor QEA for Portland Harbor), A (EPA-Derived MII Unit Costs), O (Unit Costs from Other Projects/Sources)

Source of Cost Data:
For citation references, the following sources apply:
ALL (Allowance), FLC (www.flcdatacenter.com), LD (Costs Derived from Lower Duwamish Waterway Final Feasibility Study), MII (MII), O (Other), P (Previously Developed by Anchor QEA for Portland Harbor), and V (Vendor Quote)

Abbreviations:

QTY	Quantity	AC	Acres
EQUIP	Equipment	CLF	100 Linear Foot
MATL	Material	CY	Cubic Yard
HPF	HTRW Productivity Factor	DY	Days
ADJ LABOR	Adjusted Labor for HFP	EA	Each
ADJ EQUIP	Adjusted Equipment for HFP	FTE	Full Time Equivalent
UNMOD UC	Unmodified Unit Cost	HR	Hours
UNMOD LIC	Unmodified Line Item Cost	LB	Pounds
UNBUR LIC	Unburdened Line Item Cost	LCY	Loose Cubic Yard
PC OH	Prime Contractor Overhead	LF	Linear Foot
PC PF	Prime Contractor Profit	LS	Lump Sum
BUR LIC	Burdened Line Item Cost	MO	Month
		SF	Square Foot
		SY	Square Yard
		TON	Tons
		YR	Years

Cost Adjustment Checklist:	**NOTES:**
FACTOR:	Field work will be in Level "D" PPE.
H&S Productivity (labor and equipment only)	MII assembly costs include HPF adjustments.
Escalation to Base Year	2016 cost sources are not escalated (EF=1.00). All other costs are escalated based on the USACE CWCCIS, EM 1110-2-1304, Sept 2015.
Area Cost Factor	An AF of 1.05 is used for Oregon, except that an AF of 1.00 (national unmodified average) is used for MII assembly costs and local vendor quotes.
Subcontractor Overhead and Profit	It is assumed that home office OH is 8% and profit is 9% for the Prime Contractor. Professional labor overhead is 100%.
Prime Contractor Overhead and Profit	Allowances and items with mandated costs such as per diem do not have overhead and profit applied.
	Items previously developed by Anchor QEA already include contractor markups, therefore overhead and profit were not applied to those items.
	It is assumed that OH is 1% and profit is 0% for vendor quotes for treatment and disposal at offsite disposal facilities. It is assumed that OH is 5% and profit is 0% for quotes for all other material vendor quotes.
	Items developed using MII already include contractor markups such as overhead and profit, therefore additional overhead and profit were not applied in the PC OH and PC PF to those items.

TABLE CW-F10

Alternative F **Cost Worksheet:** **CW-F10**
Capital Cost Sub-Element
Excavation of Riverbanks

COST WORKSHEET

Site: Portland Harbor Superfund Site
Location: Portland, Oregon
Phase: Feasibility Study
Base Year: 2016

Prepared By: JN **Date:** 3/4/2016
Checked By: AB **Date:** 3/7/2016

Work Statement:
This sub-element involves mechanical excavation of riverbank materials and transport to dewatering/stabilization area. It includes costs for on-site labor, equipment, and materials for riverbank excavation, assuming a 4 CY long-arm excavator.
Quantity development presented in Appendix D.

Cost Analysis:
Cost for Excavation from Shore for Riverbanks (Lump Sum)

COST DATABASE CODE	DESCRIPTION	QTY	UNIT(S)	HPF	LABOR	ADJ LABOR	EQUIP	ADJ EQUIP	MATL	OTHER	UNMOD UC	UNMOD LIC	PC OH	PC PF	BUR LIC	COST SOURCE CITATION	COMMENTS
A8	Riverbank Excavation	**122,827**	CY	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$5.19	$5.19	$637,471.88	0%	0%	$637,472	MII MII	Project-specific unit cost developed in MII.
												TOTAL COST:			$637,472		

	Representative Unit Quantity	Unit(s)	Total Cost	Unit Cost
COST WORKSHEET SUMMARY	122,827	CY	$637,472	$5.19

Notes:
Further information about the development of cost worksheets can be found in Attachment A - Methodology and Organization of Detailed Cost Estimates.
The quantity bolded in the QTY column is the quantity selected as the representative unit quantity for this cost worksheet. If multiple quantities are bolded, the representative unit quantity is the sum of those quantities. When the LS unit is utilized, the default representative unit quantity is 1.
HTRW productivity factor is from Exhibit B-3 or B-4 of "A Guide to Developing and Documenting Cost Estimates During the Feasibility Study", EPA 2000
EPA developed project-specific unit costs using the Micro Computer Aided Cost Engineering System (MCACES) Second Generation (MII) software version 4.2, build 3

Cost Database Code:
The Cost Database Code is a reference code for linking with line item cost information with the cost source database and is not otherwise used within these cost worksheets. The following cost source database prefixes apply:
L (EPA-Derived Labor Unit Costs), M (Project-Specific Vendor Unit Costs), P (Previously Developed Unit Costs by Anchor QEA for Portland Harbor), A (EPA-Derived MII Unit Costs), O (Unit Costs from Other Projects/Sources)

Source of Cost Data:
For citation references, the following sources apply:
ALL (Allowance), FLC (www.flcdatacenter.com), LD (Costs Derived from Lower Duwamish Waterway Final Feasibility Study), MII (MII), O (Other), P (Previously Developed by Anchor QEA for Portland Harbor), and V (Vendor Quote)

Abbreviations:

QTY	Quantity	AC	Acres
EQUIP	Equipment	CLF	100 Linear Foot
MATL	Material	CY	Cubic Yard
HPF	HTRW Productivity Factor	DY	Days
ADJ LABOR	Adjusted Labor for HFP	EA	Each
ADJ EQUIP	Adjusted Equipment for HFP	FTE	Full Time Equivalent
UNMOD UC	Unmodified Unit Cost	HR	Hours
UNMOD LIC	Unmodified Line Item Cost	LB	Pounds
UNBUR LIC	Unburdened Line Item Cost	LCY	Loose Cubic Yard
PC OH	Prime Contractor Overhead	LF	Linear Foot
PC PF	Prime Contractor Profit	LS	Lump Sum
BUR LIC	Burdened Line Item Cost	MO	Month
		SF	Square Foot
		SY	Square Yard
		TON	Tons
		YR	Years

Cost Adjustment Checklist:	**NOTES:**
FACTOR:	Field work will be in Level "D" PPE.
H&S Productivity (labor and equipment only)	MII assembly costs include HPF adjustments.
Escalation to Base Year	2016 cost sources are not escalated (EF=1.00). All other costs are escalated based on the USACE CWCCIS, EM 1110-2-1304, Sept 2015.
Area Cost Factor	An AF of 1.05 is used for Oregon, except that an AF of 1.00 (national unmodified average) is used for MII assembly costs and local vendor quotes.
Subcontractor Overhead and Profit	It is assumed that home office OH is 8% and profit is 9% for the Prime Contractor. Professional labor overhead is 100%.
Prime Contractor Overhead and Profit	Allowances and items with mandated costs such as per diem do not have overhead and profit applied.
	Items previously developed by Anchor QEA already include contractor markups, therefore overhead and profit were not applied to those items.
	It is assumed that OH is 1% and profit is 0% for vendor quotes for treatment and disposal at offsite disposal facilities. It is assumed that OH is 5% and profit is 0% for quotes for all other material vendor quotes.
	Items developed using MII already include contractor markups such as overhead and profit, therefore additional overhead and profit were not applied in the PC OH and PC PF to those items.

TABLE CW-F11

Alternative F **Cost Worksheet:** **CW-F11**
Capital Cost Sub-Element
Dewatering and Water Treatment for Dredging Operations

COST WORKSHEET

Site: Portland Harbor Superfund Site
Location: Portland, Oregon
Phase: Feasibility Study
Base Year: 2016

Prepared By: JN **Date:** 3/4/2016
Checked By: AB **Date:** 3/7/2016

Work Statement:
This sub-element involves the dewatering and water treatment for dredging operations. Assumes a temporary water treatment plant will be utilized for treatment of water generated from dewatering of sediments. It includes costs for labor, equipment, and materials for treatment of water generated from dredged sediments. Quantity development presented in Appendix D.

Cost Analysis:
Cost for Dewatering and Water Treatment for Dredging Operations (Lump Sum)

COST DATABASE CODE	DESCRIPTION	QTY	UNIT(S)	HPF	LABOR	ADJ LABOR	EQUIP	ADJ EQUIP	MATL	OTHER	UNMOD UC	UNMOD LIC	PC OH	PC PF	BUR LIC	COST SOURCE CITATION	COMMENTS
A9	Mobilization/Demobilization of Temporary Water Treatment System	13	EA	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$36,600.00	$36,600.00	$475,800.00	0%	0%	$475,800	MII MII	Project-specific unit cost developed in MII. Assumes mob/demob of treatment system will be required for each construction season
A10	Dewatering and Temporary Water Treatment System Operations	875	DY	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$21,654.00	$21,654.00	$18,947,250.00	0%	0%	$18,947,250	MII MII	Project-specific unit cost developed in MII.
														TOTAL COST:	$19,423,050		

	Representative Unit Quantity	Unit(s)	Total Cost	Unit Cost
COST WORKSHEET SUMMARY	1	LS	$19,423,050	$19,423,050

Notes:
Further information about the development of cost worksheets can be found in Attachment A - Methodology and Organization of Detailed Cost Estimates.
The quantity bolded in the QTY column is the quantity selected as the representative unit quantity for this cost worksheet. If multiple quantities are bolded, the representative unit quantity is the sum of those quantities. When the LS unit is utilized, the default representative unit quantity is 1.
HTRW productivity factor is from Exhibit B-3 or B-4 of "A Guide to Developing and Documenting Cost Estimates During the Feasibility Study", EPA 2000
EPA developed project-specific unit costs using the Micro Computer Aided Cost Engineering System (MCACES) Second Generation (MII) software version 4.2, build 3

Cost Database Code:
The Cost Database Code is a reference code for linking with line item cost information with the cost source database and is not otherwise used within these cost worksheets. The following cost source database prefixes apply:
L (EPA-Derived Labor Unit Costs), M (Project-Specific Vendor Unit Costs), P (Previously Developed Unit Costs by Anchor QEA for Portland Harbor), A (EPA-Derived MII Unit Costs), O (Unit Costs from Other Projects/Sources)

Source of Cost Data:
For citation references, the following sources apply:
ALL (Allowance), FLC (www.flcdatacenter.com), LD (Costs Derived from Lower Duwamish Waterway Final Feasibility Study), MII (MII), O (Other), P (Previously Developed by Anchor QEA for Portland Harbor), and V (Vendor Quote)

Abbreviations:

QTY	Quantity	AC	Acres
EQUIP	Equipment	CLF	100 Linear Foot
MATL	Material	CY	Cubic Yard
HPF	HTRW Productivity Factor	DY	Days
ADJ LABOR	Adjusted Labor for HFP	EA	Each
ADJ EQUIP	Adjusted Equipment for HFP	FTE	Full Time Equivalent
UNMOD UC	Unmodified Unit Cost	HR	Hours
UNMOD LIC	Unmodified Line Item Cost	LB	Pounds
UNBUR LIC	Unburdened Line Item Cost	LCY	Loose Cubic Yard
PC OH	Prime Contractor Overhead	LF	Linear Foot
PC PF	Prime Contractor Profit	LS	Lump Sum
BUR LIC	Burdened Line Item Cost	MO	Month
		SF	Square Foot
		SY	Square Yard
		TON	Tons
		YR	Years

Cost Adjustment Checklist:	**NOTES:**
FACTOR:	Field work will be in Level "D" PPE.
H&S Productivity (labor and equipment only)	MII assembly costs include HPF adjustments.
Escalation to Base Year	2016 cost sources are not escalated (EF=1.00). All other costs are escalated based on the USACE CWCCIS, EM 1110-2-1304, Sept 2015.
Area Cost Factor	An AF of 1.05 is used for Oregon, except that an AF of 1.00 (national unmodified average) is used for MII assembly costs and local vendor quotes.
Subcontractor Overhead and Profit	It is assumed that home office OH is 8% and profit is 9% for the Prime Contractor. Professional labor overhead is 100%.
Prime Contractor Overhead and Profit	Allowances and items with mandated costs such as per diem do not have overhead and profit applied.
	Items previously developed by Anchor QEA already include contractor markups, therefore overhead and profit were not applied to those items.
	It is assumed that OH is 1% and profit is 0% for vendor quotes for treatment and disposal at offsite disposal facilities. It is assumed that OH is 5% and profit is 0% for quotes for all other material vendor quotes.
	Items developed using MII already include contractor markups such as overhead and profit, therefore additional overhead and profit were not applied in the PC OH and PC PF to those items.

TABLE CW-F12

Alternative F **Cost Worksheet: CW-F12**

Capital Cost Sub-Element

Subtitle C/TSCA Disposal (Handling, Transportation, Treatment of Select PTW Materials, and Disposal)

COST WORKSHEET

Site: Portland Harbor Superfund Site
Location: Portland, Oregon
Phase: Feasibility Study
Base Year: 2016

Prepared By: JN **Date:** 5/20/2016
Checked By: AB **Date:** 5/23/2016

Work Statement:

This sub-element involves the disposal of contaminated sediments at a Subtitle C/TSCA landfill, including in-barge mixing of amendments, barge transportation of materials to a transload facility, materials handling from the barge to truck, transportation of the sediments to the Subtitle C/TSCA landfill, and disposal of contaminated sediments (including thermal treatment at the landfill facility for a portion of the volume). It includes costs for labor, equipment, and materials as well as recent vendor quotes. Costs for development of a transload facility are included in a separate cost worksheet.
Quantity development presented in Appendix D.

Cost Analysis:

Cost for Subtitle C/TSCA Disposal (Lump Sum)

COST DATABASE CODE	DESCRIPTION	QTY	UNIT(S)	HPF	LABOR	ADJ LABOR	EQUIP	ADJ EQUIP	MATL	OTHER	UNMOD UC	UNMOD LIC	PC OH	PC PF	BUR LIC	COST SOURCE CITATION	COMMENTS
Area 6W NRC/NAPL PTW																	
	Transportation																
A13	Barging to Transload Facility	218,332	CY	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$13.66	$13.66	$2,982,415.12	0%	0%	$2,982,415	MII MII	Project-specific unit cost developed in MII.
A5	Hauling Waste from Transload Facility to Landfill	218,332	CY	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$16.70	$16.70	$3,646,144.40	0%	0%	$3,646,144	MII MII	Project-specific unit cost developed in MII.
	Materials Handling at Transload Facility																
A14	Offloading of Sediments	218,332	CY	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$9.70	$9.70	$2,117,820.40	0%	0%	$2,117,820	MII MII	Project-specific unit cost developed in MII. Assumes mechanical offloading of sediments at the transload facility.
A4	Loading Trucks at Transload Facility	218,332	CY	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$2.68	$2.68	$585,129.76	0%	0%	$585,130	MII MII	Project-specific unit cost developed in MII.
	Treatment																
A11	In-Barge Stabilization / Mixing of Amendments	218,332	CY	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$24.50	$24.50	$5,349,134.00	0%	0%	$5,349,134	MII MII	Project-specific unit cost developed in MII.
P5	Diatomaceous Earth	12,655	TON	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$105.94	$105.94	$1,340,670.70	0%	0%	$1,340,671	P Anchor QEA	Project-specific cost developed by Anchor QEA (2010) - see Backup Table 24.
M25	Quicklime	17,463	TON	1.00	$0.00	$0.00	$0.00	$0.00	$239.00	$0.00	$239.00	$4,173,657.00	5%	0%	$4,382,340	V Vendor Quote	Project-specific vendor quote - Graymont, 2016.
A2	Hauling - Quicklime to Site	17,463	TON	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$5.71	$5.71	$99,713.73	0%	0%	$99,714	MII MII	Project-specific unit cost developed in MII. Assumes 10 mile one-way haul.
	Disposal at Subtitle C/TSCA Landfill																
M10	Tipping Fee at Subtitle C/TSCA Landfill	**283,209**	TON	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$86.19	$86.19	$24,409,783.71	1%	0%	$24,653,882	V Vendor Quote	Project-specific vendor quote - CWM of the Northwest, 2015.
Area 7W NRC/NAPL PTW																	
	Transportation																
A13	Barging to Transload Facility	66,633	CY	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$13.66	$13.66	$910,206.78	0%	0%	$910,207	MII MII	Project-specific unit cost developed in MII.
A5	Hauling Waste from Transload Facility to Landfill	66,633	CY	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$16.70	$16.70	$1,112,771.10	0%	0%	$1,112,771	MII MII	Project-specific unit cost developed in MII.
	Materials Handling at Transload Facility																
A14	Offloading of Sediments	66,633	CY	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$9.70	$9.70	$646,340.10	0%	0%	$646,340	MII MII	Project-specific unit cost developed in MII. Assumes mechanical offloading of sediments at the transload facility.
A4	Loading Trucks at Transload Facility	66,633	CY	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$2.68	$2.68	$178,576.44	0%	0%	$178,576	MII MII	Project-specific unit cost developed in MII.
	Treatment																
A11	In-Barge Stabilization / Mixing of Amendments	66,633	CY	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$24.50	$24.50	$1,632,508.50	0%	0%	$1,632,509	MII MII	Project-specific unit cost developed in MII.
P5	Diatomaceous Earth	5,700	TON	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$105.94	$105.94	$603,858.00	0%	0%	$603,858	P Anchor QEA	Project-specific cost developed by Anchor QEA (2010) - see Backup Table 24.
M25	Quicklime	1,573	TON	1.00	$0.00	$0.00	$0.00	$0.00	$239.00	$0.00	$239.00	$375,947.00	5%	0%	$394,744	V Vendor Quote	Project-specific vendor quote - Graymont, 2016.
A2	Hauling - Quicklime to Site	1,573	TON	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$5.71	$5.71	$8,981.83	0%	0%	$8,982	MII MII	Project-specific unit cost developed in MII. Assumes 10 mile one-way haul.
M20	Thermal Desorption Treatment at Subtitle C/TSCA Landfill (Low End of Treatment Cost Range)	12,541	TON	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$319.41	$319.41	$4,005,720.81	1%	0%	$4,045,778	V Vendor Quote	Project-specific vendor quote - CWM of the Northwest, 2015.
M9	Thermal Desorption Treatment at Subtitle C/TSCA Landfill (High End of Treatment Cost Range)	12,541	TON	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$572.91	$572.91	$7,184,864.31	1%	0%	$7,256,713	V Vendor Quote	Project-specific vendor quote - CWM of the Northwest, 2015.
	Disposal at Subtitle C/TSCA Landfill																
M10	Tipping Fee at Subtitle C/TSCA Landfill	**75,679**	TON	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$86.19	$86.19	$6,522,773.01	1%	0%	$6,588,001	V Vendor Quote	Project-specific vendor quote - CWM of the Northwest, 2015.
												TOTAL COST:			$68,535,729		

	Representative Unit Quantity	Unit(s)	Total Cost	Unit Cost
COST WORKSHEET SUMMARY	358,888	TON	$68,535,729	$191

TABLE CW-F12

Alternative F **Cost Worksheet:** **CW-F12**

Capital Cost Sub-Element

Subtitle C/TSCA Disposal (Handling, Transportation, Treatment of Select PTW Materials, and Disposal)

COST WORKSHEET

Site: Portland Harbor Superfund Site
Location: Portland, Oregon
Phase: Feasibility Study
Base Year: 2016

Prepared By: JN **Date:** 5/20/2016

Checked By: AB **Date:** 5/23/2016

Notes:

Further information about the development of cost worksheets can be found in Attachment A - Methodology and Organization of Detailed Cost Estimates.
The quantity bolded in the QTY column is the quantity selected as the representative unit quantity for this cost worksheet. If multiple quantities are bolded, the representative unit quantity is the sum of those quantities. When the LS unit is utilized, the default representative unit quantity is 1.
HTRW productivity factor is from Exhibit B-3 or B-4 of "A Guide to Developing and Documenting Cost Estimates During the Feasibility Study", EPA 2000
EPA developed project-specific unit costs using the Micro Computer Aided Cost Engineering System (MCACES) Second Generation (MII) software version 4.2, build 3

Cost Database Code:

The Cost Database Code is a reference code for linking with line item cost information with the cost source database and is not otherwise used within these cost worksheets. The following cost source database prefixes apply:

L (EPA-Derived Labor Unit Costs), M (Project-Specific Vendor Unit Costs), P (Previously Developed Unit Costs by Anchor QEA for Portland Harbor), A (EPA-Derived MII Unit Costs), O (Unit Costs from Other Projects/Sources)

Source of Cost Data:

For citation references, the following sources apply:

ALL (Allowance), FLC (www.flcdatacenter.com), LD (Costs Derived from Lower Duwamish Waterway Final Feasibility Study), MII (MII), O (Other), P (Previously Developed by Anchor QEA for Portland Harbor), and V (Vendor Quote)

Abbreviations:

QTY	Quantity	AC	Acres
EQUIP	Equipment	CLF	100 Linear Foot
MATL	Material	CY	Cubic Yard
HPF	HTRW Productivity Factor	DY	Days
ADJ LABOR	Adjusted Labor for HFP	EA	Each
ADJ EQUIP	Adjusted Equipment for HFP	FTE	Full Time Equivalent
UNMOD UC	Unmodified Unit Cost	HR	Hours
UNMOD LIC	Unmodified Line Item Cost	LB	Pounds
UNBUR LIC	Unburdened Line Item Cost	LCY	Loose Cubic Yard
PC OH	Prime Contractor Overhead	LF	Linear Foot
PC PF	Prime Contractor Profit	LS	Lump Sum
BUR LIC	Burdened Line Item Cost	MO	Month
		SF	Square Foot
		SY	Square Yard
		TON	Tons
		YR	Years

Cost Adjustment Checklist:	**NOTES:**
FACTOR:	Field work will be in Level "D" PPE.
H&S Productivity (labor and equipment only)	MII assembly costs include HPF adjustments.
Escalation to Base Year	2016 cost sources are not escalated (EF=1.00). All other costs are escalated based on the USACE CWCCIS, EM 1110-2-1304, Sept 2015.
Area Cost Factor	An AF of 1.05 is used for Oregon, except that an AF of 1.00 (national unmodified average) is used for MII assembly costs and local vendor quotes.
Subcontractor Overhead and Profit	It is assumed that home office OH is 8% and profit is 9% for the Prime Contractor. Professional labor overhead is 100%.
Prime Contractor Overhead and Profit	Allowances and items with mandated costs such as per diem do not have overhead and profit applied.
	Items previously developed by Anchor QEA already include contractor markups, therefore overhead and profit were not applied to those items.
	It is assumed that OH is 1% and profit is 0% for vendor quotes for treatment and disposal at offsite disposal facilities. It is assumed that OH is 5% and profit is 0% for quotes for all other material vendor quotes.
	Items developed using MII already include contractor markups such as overhead and profit, therefore additional overhead and profit were not applied in the PC OH and PC PF to those items.

TABLE CW-F13

Alternative F **Cost Worksheet:** **CW-F13**
Capital Cost Sub-Element
Subtitle D Disposal (Handling, Transportation, and Disposal)

COST WORKSHEET

Site: Portland Harbor Superfund Site
Location: Portland, Oregon
Phase: Feasibility Study
Base Year: 2016

Prepared By: JN **Date:** 3/4/2016
Checked By: AB **Date:** 3/7/2016

Work Statement:
This sub-element involves the disposal of contaminated sediments at a Subtitle D landfill, including barge transportation of materials to a transload facility, materials handling from the barge to truck, transportation of the sediments to the Subtitle C/TSCA landfill, and disposal of contaminated sediments (including thermal treatment at the landfill facility for a portion of the volume). It includes costs for labor, equipment, and materials as well as recent vendor quotes.
Quantity development presented in Appendix D.

Cost Analysis:
Cost for Subtitle D Disposal (Lump Sum)

COST DATABASE CODE	DESCRIPTION	QTY	UNIT(S)	HPF	LABOR	ADJ LABOR	EQUIP	ADJ EQUIP	MATL	OTHER	UNMOD UC	UNMOD LIC	PC OH	PC PF	BUR LIC	COST SOURCE CITATION	COMMENTS
	Diatomaceous Earth Amendment																
A11	In-Barge Stabilization / Mixing of Amendments	5,702,090	CY	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$24.50	$24.50	$139,701,205.00	0%	0%	$139,701,205	MII MII	Project-specific unit cost developed in MII.
P5	Diatomaceous Earth	340,436	TON	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$105.94	$105.94	$36,065,789.84	0%	0%	$36,065,790	P Anchor QEA	Project-specific cost developed by Anchor QEA (2010) - see Backup Table 24.
	Transportation to Transload Facility																
A13	Barging to Transload Facility	5,702,090	CY	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$13.66	$13.66	$77,890,549.40	0%	0%	$77,890,549	MII MII	Project-specific unit cost developed in MII.
	Transportation and Disposal at Subtitle D Landfill																
M11	Transportation and Disposal at Subtitle D Landfill	**7,149,152**	TON	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$74.53	$74.53	$532,826,298.56	1%	0%	$538,154,562	V Vendor Quote	Project-specific vendor quote - Republic Services (Roosevelt Landfill), 2015. Includes transloading of the sediments, truck transportation from the transload facility to the landfill, and disposal at the landfill.
													TOTAL COST:		$791,812,106		

	Representative Unit Quantity	Unit(s)	Total Cost	Unit Cost
COST WORKSHEET SUMMARY	7,149,152	TON	$791,812,106	$111

Notes:
Further information about the development of cost worksheets can be found in Attachment A - Methodology and Organization of Detailed Cost Estimates.
The quantity bolded in the QTY column is the quantity selected as the representative unit quantity for this cost worksheet. If multiple quantities are bolded, the representative unit quantity is the sum of those quantities. When the LS unit is utilized, the default representative unit quantity is 1.
HTRW productivity factor is from Exhibit B-3 or B-4 of "A Guide to Developing and Documenting Cost Estimates During the Feasibility Study", EPA 2000
EPA developed project-specific unit costs using the Micro Computer Aided Cost Engineering System (MCACES) Second Generation (MII) software version 4.2, build 3

Cost Database Code:
The Cost Database Code is a reference code for linking with line item cost information with the cost source database and is not otherwise used within these cost worksheets. The following cost source database prefixes apply:
L (EPA-Derived Labor Unit Costs), M (Project-Specific Vendor Unit Costs), P (Previously Developed Unit Costs by Anchor QEA for Portland Harbor), A (EPA-Derived MII Unit Costs), O (Unit Costs from Other Projects/Sources)

Source of Cost Data:
For citation references, the following sources apply:
ALL (Allowance), FLC (www.flcdatacenter.com), LD (Costs Derived from Lower Duwamish Waterway Final Feasibility Study), MII (MII), O (Other), P (Previously Developed by Anchor QEA for Portland Harbor), and V (Vendor Quote)

Abbreviations:

QTY	Quantity	AC	Acres
EQUIP	Equipment	CLF	100 Linear Foot
MATL	Material	CY	Cubic Yard
HPF	HTRW Productivity Factor	DY	Days
ADJ LABOR	Adjusted Labor for HFP	EA	Each
ADJ EQUIP	Adjusted Equipment for HFP	FTE	Full Time Equivalent
UNMOD UC	Unmodified Unit Cost	HR	Hours
UNMOD LIC	Unmodified Line Item Cost	LB	Pounds
UNBUR LIC	Unburdened Line Item Cost	LCY	Loose Cubic Yard
PC OH	Prime Contractor Overhead	LF	Linear Foot
PC PF	Prime Contractor Profit	LS	Lump Sum
BUR LIC	Burdened Line Item Cost	MO	Month
		SF	Square Foot
		SY	Square Yard
		TON	Tons
		YR	Years

Cost Adjustment Checklist:	**NOTES:**
FACTOR:	Field work will be in Level "D" PPE.
H&S Productivity (labor and equipment only)	MII assembly costs include HPF adjustments.
Escalation to Base Year	2016 cost sources are not escalated (EF=1.00). All other costs are escalated based on the USACE CWCCIS, EM 1110-2-1304, Sept 2015.
Area Cost Factor	An AF of 1.05 is used for Oregon, except that an AF of 1.00 (national unmodified average) is used for MII assembly costs and local vendor quotes.
Subcontractor Overhead and Profit	It is assumed that home office OH is 8% and profit is 9% for the Prime Contractor. Professional labor overhead is 100%.
Prime Contractor Overhead and Profit	Allowances and items with mandated costs such as per diem do not have overhead and profit applied.
	Items previously developed by Anchor QEA already include contractor markups, therefore overhead and profit were not applied to those items.
	It is assumed that OH is 1% and profit is 0% for vendor quotes for treatment and disposal at offsite disposal facilities. It is assumed that OH is 5% and profit is 0% for quotes for all other material vendor quotes.
	Items developed using MII already include contractor markups such as overhead and profit, therefore additional overhead and profit were not applied in the PC OH and PC PF to those items.

TABLE CW-F14

Alternative F
Capital Cost Sub-Element
Mitigation

Cost Worksheet: **CW-F14**

COST WORKSHEET

Site: Portland Harbor Superfund Site
Location: Portland, Oregon
Phase: Feasibility Study
Base Year: 2016

Prepared By: JN **Date:** 3/4/2016
Checked By: AB **Date:** 3/7/2016

Work Statement:
This sub-element involves mitigation of shallow water and riverbank areas. It includes costs for on-site labor, equipment, and materials developed from previous work.
Quantity development presented in Appendix D.

Cost Analysis:
Cost for Mitigation (Lump Sum)

COST DATABASE CODE	DESCRIPTION	QTY	UNIT(S)	HPF	LABOR	ADJ LABOR	EQUIP	ADJ EQUIP	MATL	OTHER	UNMOD UC	UNMOD LIC	PC OH	PC PF	BUR LIC	COST SOURCE CITATION	COMMENTS
O3	Mitigation	**60**	AC	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$1,070,827.00	$1,070,827.00	$64,249,620.00	0%	0%	$64,249,620	O Other	Average cost of projects presented in Tables 6.1-1 and 6.1-4 of the Appendix M, Attachment 1, Anchor QEA FS (2010) as well as select other projects. See Calculations for derivation.
												TOTAL COST:			$64,249,620		

	Representative Unit Quantity	Unit(s)	Total Cost	Unit Cost
COST WORKSHEET SUMMARY	60	AC	$64,249,620	$1,070,827

Notes:
Further information about the development of cost worksheets can be found in Attachment A - Methodology and Organization of Detailed Cost Estimates.
The quantity bolded in the QTY column is the quantity selected as the representative unit quantity for this cost worksheet. If multiple quantities are bolded, the representative unit quantity is the sum of those quantities. When the LS unit is utilized, the default representative unit quantity is 1.
HTRW productivity factor is from Exhibit B-3 or B-4 of "A Guide to Developing and Documenting Cost Estimates During the Feasibility Study", EPA 2000
EPA developed project-specific unit costs using the Micro Computer Aided Cost Engineering System (MCACES) Second Generation (MII) software version 4.2, build 3

Cost Database Code:
The Cost Database Code is a reference code for linking with line item cost information with the cost source database and is not otherwise used within these cost worksheets. The following cost source database prefixes apply:
L (EPA-Derived Labor Unit Costs), M (Project-Specific Vendor Unit Costs), P (Previously Developed Unit Costs by Anchor QEA for Portland Harbor), A (EPA-Derived MII Unit Costs), O (Unit Costs from Other Projects/Sources)

Source of Cost Data:
For citation references, the following sources apply:
ALL (Allowance), FLC (www.flcdatacenter.com), LD (Costs Derived from Lower Duwamish Waterway Final Feasibility Study), MII (MII), O (Other), P (Previously Developed by Anchor QEA for Portland Harbor), and V (Vendor Quote)

Abbreviations:

QTY	Quantity	AC	Acres
EQUIP	Equipment	CLF	100 Linear Foot
MATL	Material	CY	Cubic Yard
HPF	HTRW Productivity Factor	DY	Days
ADJ LABOR	Adjusted Labor for HFP	EA	Each
ADJ EQUIP	Adjusted Equipment for HFP	FTE	Full Time Equivalent
UNMOD UC	Unmodified Unit Cost	HR	Hours
UNMOD LIC	Unmodified Line Item Cost	LB	Pounds
UNBUR LIC	Unburdened Line Item Cost	LCY	Loose Cubic Yard
PC OH	Prime Contractor Overhead	LF	Linear Foot
PC PF	Prime Contractor Profit	LS	Lump Sum
BUR LIC	Burdened Line Item Cost	MO	Month
		SF	Square Foot
		SY	Square Yard
		TON	Tons
		YR	Years

Cost Adjustment Checklist:	**NOTES:**
FACTOR:	Field work will be in Level "D" PPE.
H&S Productivity (labor and equipment only)	MII assembly costs include HPF adjustments.
Escalation to Base Year	2016 cost sources are not escalated (EF=1.00). All other costs are escalated based on the USACE CWCCIS, EM 1110-2-1304, Sept 2015.
Area Cost Factor	An AF of 1.05 is used for Oregon, except that an AF of 1.00 (national unmodified average) is used for MII assembly costs and local vendor quotes.
Subcontractor Overhead and Profit	It is assumed that home office OH is 8% and profit is 9% for the Prime Contractor. Professional labor overhead is 100%.
Prime Contractor Overhead and Profit	Allowances and items with mandated costs such as per diem do not have overhead and profit applied.
	Items previously developed by Anchor QEA already include contractor markups, therefore overhead and profit were not applied to those items.
	It is assumed that OH is 1% and profit is 0% for vendor quotes for treatment and disposal at offsite disposal facilities. It is assumed that OH is 5% and profit is 0% for quotes for all other material vendor quotes.
	Items developed using MII already include contractor markups such as overhead and profit, therefore additional overhead and profit were not applied in the PC OH and PC PF to those items.

TABLE CW-F15

Alternative F **Cost Worksheet:** **CW-F15**
Capital Cost Sub-Element
Sand Placement for Technology Assignments

COST WORKSHEET

Site: Portland Harbor Superfund Site
Location: Portland, Oregon
Phase: Feasibility Study
Base Year: 2016

Prepared By: JN **Date:** 3/4/2016
Checked By: AB **Date:** 3/7/2016

Work Statement:
This sub-element involves the placement of sand for the construction of capping areas. It includes placement of sand within confined areas, open areas, and riverbanks. It includes costs for on-site labor, equipment, and materials as well as recent vendor quotes.
Quantity development presented in Appendix D.

Cost Analysis:
Cost for Sand Placement for Technology Assignments (Lump Sum)

COST DATABASE CODE	DESCRIPTION	QTY	UNIT(S)	HPF	LABOR	ADJ LABOR	EQUIP	ADJ EQUIP	MATL	OTHER	UNMOD UC	UNMOD LIC	PC OH	PC PF	BUR LIC	COST SOURCE CITATION	COMMENTS
P1	Sand	**1,119,996**	LCY	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$19.75	$19.75	$22,119,921.00	0%	0%	$22,119,921	P Anchor QEA	Project-specific cost developed by Anchor QEA (2010) - see Backup Table 29A. Includes conversion from TON to LCY.
	Sand Placement (Riverbanks)																
A16	Material Placement (Confined)	102,093	CY	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$20.39	$20.39	$2,081,676.27	0%	0%	$2,081,676	MII MII	Project-specific unit cost developed in MII.
	Sand Placement (Confined)																
A16	Material Placement (Confined)	81,653	CY	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$20.39	$20.39	$1,664,904.67	0%	0%	$1,664,905	MII MII	Project-specific unit cost developed in MII.
	Sand Placement (Open Water)																
A15	Material Placement (Open)	936,250	CY	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$12.42	$12.42	$11,628,225.00	0%	0%	$11,628,225	MII MII	Project-specific unit cost developed in MII.
												TOTAL COST:			$37,494,727		

	Representative Unit Quantity	Unit(s)	Total Cost	Unit Cost
COST WORKSHEET SUMMARY	1,119,996	CY	$37,494,727	$33.48

Notes:
Further information about the development of cost worksheets can be found in Attachment A - Methodology and Organization of Detailed Cost Estimates.
The quantity bolded in the QTY column is the quantity selected as the representative unit quantity for this cost worksheet. If multiple quantities are bolded, the representative unit quantity is the sum of those quantities. When the LS unit is utilized, the default representative unit quantity is 1.
HTRW productivity factor is from Exhibit B-3 or B-4 of "A Guide to Developing and Documenting Cost Estimates During the Feasibility Study", EPA 2000
EPA developed project-specific unit costs using the Micro Computer Aided Cost Engineering System (MCACES) Second Generation (MII) software version 4.2, build 3

Cost Database Code:
The Cost Database Code is a reference code for linking with line item cost information with the cost source database and is not otherwise used within these cost worksheets. The following cost source database prefixes apply:
L (EPA-Derived Labor Unit Costs), M (Project-Specific Vendor Unit Costs), P (Previously Developed Unit Costs by Anchor QEA for Portland Harbor), A (EPA-Derived MII Unit Costs), O (Unit Costs from Other Projects/Sources)

Source of Cost Data:
For citation references, the following sources apply:
ALL (Allowance), FLC (www.flcdatacenter.com), LD (Costs Derived from Lower Duwamish Waterway Final Feasibility Study), MII (MII), O (Other), P (Previously Developed by Anchor QEA for Portland Harbor), and V (Vendor Quote)

Abbreviations:

QTY	Quantity	AC	Acres
EQUIP	Equipment	CLF	100 Linear Foot
MATL	Material	CY	Cubic Yard
HPF	HTRW Productivity Factor	DY	Days
ADJ LABOR	Adjusted Labor for HFP	EA	Each
ADJ EQUIP	Adjusted Equipment for HFP	FTE	Full Time Equivalent
UNMOD UC	Unmodified Unit Cost	HR	Hours
UNMOD LIC	Unmodified Line Item Cost	LB	Pounds
UNBUR LIC	Unburdened Line Item Cost	LCY	Loose Cubic Yard
PC OH	Prime Contractor Overhead	LF	Linear Foot
PC PF	Prime Contractor Profit	LS	Lump Sum
BUR LIC	Burdened Line Item Cost	MO	Month
		SF	Square Foot
		SY	Square Yard
		TON	Tons
		YR	Years

Cost Adjustment Checklist:	**NOTES:**
FACTOR:	Field work will be in Level "D" PPE.
H&S Productivity (labor and equipment only)	MII assembly costs include HPF adjustments.
Escalation to Base Year	2016 cost sources are not escalated (EF=1.00). All other costs are escalated based on the USACE CWCCIS, EM 1110-2-1304, Sept 2015.
Area Cost Factor	An AF of 1.05 is used for Oregon, except that an AF of 1.00 (national unmodified average) is used for MII assembly costs and local vendor quotes.
Subcontractor Overhead and Profit	It is assumed that home office OH is 8% and profit is 9% for the Prime Contractor. Professional labor overhead is 100%.
Prime Contractor Overhead and Profit	Allowances and items with mandated costs such as per diem do not have overhead and profit applied.
	Items previously developed by Anchor QEA already include contractor markups, therefore overhead and profit were not applied to those items.
	It is assumed that OH is 1% and profit is 0% for vendor quotes for treatment and disposal at offsite disposal facilities. It is assumed that OH is 5% and profit is 0% for quotes for all other material vendor quotes.
	Items developed using MII already include contractor markups such as overhead and profit, therefore additional overhead and profit were not applied in the PC OH and PC PF to those items.

TABLE CW-F16

Alternative F **Cost Worksheet:** **CW-F16**
Capital Cost Sub-Element
Beach Mix Placement for Technology Assignments

COST WORKSHEET

Site: Portland Harbor Superfund Site
Location: Portland, Oregon
Phase: Feasibility Study
Base Year: 2016

Prepared By: JN **Date:** 3/4/2016
Checked By: AB **Date:** 3/7/2016

Work Statement:
This sub-element involves the placement of beach mix for the construction of capping areas. It includes placement of beach mix within confined areas, open areas, and riverbanks. It includes costs for on-site labor, equipment, and materials as well as recent vendor quotes.
Quantity development presented in Appendix D.

Cost Analysis:
Cost for Beach Mix Placement for Technology Assignments (Lump Sum)

COST DATABASE CODE	DESCRIPTION	QTY	UNIT(S)	HPF	LABOR	ADJ LABOR	EQUIP	ADJ EQUIP	MATL	OTHER	UNMOD UC	UNMOD LIC	PC OH	PC PF	BUR LIC	COST SOURCE CITATION	COMMENTS
P3	ODOT 100 Beach Mix	**69,510**	LCY	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$57.69	$57.69	$4,010,031.90	0%	0%	$4,010,032	P Anchor QEA	Project-specific cost developed by Anchor QEA (2010) - see Backup Table 29A. Includes conversion from TON to LCY.
	Beach Mix Placement (Riverbanks)																
A16	Material Placement (Confined)	18,895	CY	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$20.39	$20.39	$385,269.05	0%	0%	$385,269	MII MII	Project-specific unit cost developed in MII.
	Beach Mix Placement (Confined)																
A16	Material Placement (Confined)	6,013	CY	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$20.39	$20.39	$122,605.07	0%	0%	$122,605	MII MII	Project-specific unit cost developed in MII.
	Beach Mix Placement (Open Water)																
A15	Material Placement (Open)	44,602	CY	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$12.42	$12.42	$553,956.84	0%	0%	$553,957	MII MII	Project-specific unit cost developed in MII.
												TOTAL COST:			$5,071,863		

	Representative Unit Quantity	Unit(s)	Total Cost	Unit Cost
COST WORKSHEET SUMMARY	69,510	CY	$5,071,863	$72.97

Notes:
Further information about the development of cost worksheets can be found in Attachment A - Methodology and Organization of Detailed Cost Estimates.
The quantity bolded in the QTY column is the quantity selected as the representative unit quantity for this cost worksheet. If multiple quantities are bolded, the representative unit quantity is the sum of those quantities. When the LS unit is utilized, the default representative unit quantity is 1.
HTRW productivity factor is from Exhibit B-3 or B-4 of "A Guide to Developing and Documenting Cost Estimates During the Feasibility Study", EPA 2000
EPA developed project-specific unit costs using the Micro Computer Aided Cost Engineering System (MCACES) Second Generation (MII) software version 4.2, build 3

Cost Database Code:
The Cost Database Code is a reference code for linking with line item cost information with the cost source database and is not otherwise used within these cost worksheets. The following cost source database prefixes apply:
L (EPA-Derived Labor Unit Costs), M (Project-Specific Vendor Unit Costs), P (Previously Developed Unit Costs by Anchor QEA for Portland Harbor), A (EPA-Derived MII Unit Costs), O (Unit Costs from Other Projects/Sources)

Source of Cost Data:
For citation references, the following sources apply:
ALL (Allowance), FLC (www.flcdatacenter.com), LD (Costs Derived from Lower Duwamish Waterway Final Feasibility Study), MII (MII), O (Other), P (Previously Developed by Anchor QEA for Portland Harbor), and V (Vendor Quote)

Abbreviations:

QTY	Quantity	AC	Acres
EQUIP	Equipment	CLF	100 Linear Foot
MATL	Material	CY	Cubic Yard
HPF	HTRW Productivity Factor	DY	Days
ADJ LABOR	Adjusted Labor for HFP	EA	Each
ADJ EQUIP	Adjusted Equipment for HFP	FTE	Full Time Equivalent
UNMOD UC	Unmodified Unit Cost	HR	Hours
UNMOD LIC	Unmodified Line Item Cost	LB	Pounds
UNBUR LIC	Unburdened Line Item Cost	LCY	Loose Cubic Yard
PC OH	Prime Contractor Overhead	LF	Linear Foot
PC PF	Prime Contractor Profit	LS	Lump Sum
BUR LIC	Burdened Line Item Cost	MO	Month
		SF	Square Foot
		SY	Square Yard
		TON	Tons
		YR	Years

Cost Adjustment Checklist:	**NOTES:**
FACTOR:	Field work will be in Level "D" PPE.
H&S Productivity (labor and equipment only)	MII assembly costs include HPF adjustments.
Escalation to Base Year	2016 cost sources are not escalated (EF=1.00). All other costs are escalated based on the USACE CWCCIS, EM 1110-2-1304, Sept 2015.
Area Cost Factor	An AF of 1.05 is used for Oregon, except that an AF of 1.00 (national unmodified average) is used for MII assembly costs and local vendor quotes.
Subcontractor Overhead and Profit	It is assumed that home office OH is 8% and profit is 9% for the Prime Contractor. Professional labor overhead is 100%.
Prime Contractor Overhead and Profit	Allowances and items with mandated costs such as per diem do not have overhead and profit applied.
	Items previously developed by Anchor QEA already include contractor markups, therefore overhead and profit were not applied to those items.
	It is assumed that OH is 1% and profit is 0% for vendor quotes for treatment and disposal at offsite disposal facilities. It is assumed that OH is 5% and profit is 0% for quotes for all other material vendor quotes.
	Items developed using MII already include contractor markups such as overhead and profit, therefore additional overhead and profit were not applied in the PC OH and PC PF to those items.

TABLE CW-F17

Alternative F **Cost Worksheet:** **CW-F17**
Capital Cost Sub-Element
Armor Placement for Technology Assignments

COST WORKSHEET

Site: Portland Harbor Superfund Site
Location: Portland, Oregon
Phase: Feasibility Study
Base Year: 2016

Prepared By: JN **Date:** 3/4/2016
Checked By: AB **Date:** 3/7/2016

Work Statement:
This sub-element involves the placement of armor for the construction of capping areas. It includes placement of armor within confined areas, open areas, and riverbanks. It includes costs for on-site labor, equipment, and materials as well as recent vendor quotes.
Quantity development presented in Appendix D.

Cost Analysis:
Cost for Armor Placement for Technology Assignments (Lump Sum)

COST DATABASE CODE	DESCRIPTION	QTY	UNIT(S)	HPF	LABOR	ADJ LABOR	EQUIP	ADJ EQUIP	MATL	OTHER	UNMOD UC	UNMOD LIC	PC OH	PC PF	BUR LIC	COST SOURCE CITATION	COMMENTS
P2	ODOT 200 Armor	**151,909**	LCY	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$57.69	$57.69	$8,763,630.21	0%	0%	$8,763,630	P Anchor QEA	Project-specific cost developed by Anchor QEA (2010) - see Backup Table 29A. Includes conversion from TON to LCY.
	Armor Placement (Riverbanks)																
A16	Material Placement (Confined)	1,576	CY	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$20.39	$20.39	$32,134.64	0%	0%	$32,135	MII MII	Project-specific unit cost developed in MII.
	Armor Placement (Confined)																
A16	Material Placement (Confined)	33,849	CY	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$20.39	$20.39	$690,181.11	0%	0%	$690,181	MII MII	Project-specific unit cost developed in MII.
	Armor Placement (Open Water)																
A15	Material Placement (Open)	116,484	CY	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$12.42	$12.42	$1,446,731.28	0%	0%	$1,446,731	MII MII	Project-specific unit cost developed in MII.
												TOTAL COST:			$10,932,677		

	Representative Unit Quantity	Unit(s)	Total Cost	Unit Cost
COST WORKSHEET SUMMARY	151,909	CY	$10,932,677	$71.97

Notes:
Further information about the development of cost worksheets can be found in Attachment A - Methodology and Organization of Detailed Cost Estimates.
The quantity bolded in the QTY column is the quantity selected as the representative unit quantity for this cost worksheet. If multiple quantities are bolded, the representative unit quantity is the sum of those quantities. When the LS unit is utilized, the default representative unit quantity is 1.
HTRW productivity factor is from Exhibit B-3 or B-4 of "A Guide to Developing and Documenting Cost Estimates During the Feasibility Study", EPA 2000
EPA developed project-specific unit costs using the Micro Computer Aided Cost Engineering System (MCACES) Second Generation (MII) software version 4.2, build 3

Cost Database Code:
The Cost Database Code is a reference code for linking with line item cost information with the cost source database and is not otherwise used within these cost worksheets. The following cost source database prefixes apply:
L (EPA-Derived Labor Unit Costs), M (Project-Specific Vendor Unit Costs), P (Previously Developed Unit Costs by Anchor QEA for Portland Harbor), A (EPA-Derived MII Unit Costs), O (Unit Costs from Other Projects/Sources)

Source of Cost Data:
For citation references, the following sources apply:
ALL (Allowance), FLC (www.flcdatacenter.com), LD (Costs Derived from Lower Duwamish Waterway Final Feasibility Study), MII (MII), O (Other), P (Previously Developed by Anchor QEA for Portland Harbor), and V (Vendor Quote)

Abbreviations:

QTY	Quantity	AC	Acres
EQUIP	Equipment	CLF	100 Linear Foot
MATL	Material	CY	Cubic Yard
HPF	HTRW Productivity Factor	DY	Days
ADJ LABOR	Adjusted Labor for HFP	EA	Each
ADJ EQUIP	Adjusted Equipment for HFP	FTE	Full Time Equivalent
UNMOD UC	Unmodified Unit Cost	HR	Hours
UNMOD LIC	Unmodified Line Item Cost	LB	Pounds
UNBUR LIC	Unburdened Line Item Cost	LCY	Loose Cubic Yard
PC OH	Prime Contractor Overhead	LF	Linear Foot
PC PF	Prime Contractor Profit	LS	Lump Sum
BUR LIC	Burdened Line Item Cost	MO	Month
		SF	Square Foot
		SY	Square Yard
		TON	Tons
		YR	Years

Cost Adjustment Checklist:	**NOTES:**
FACTOR:	Field work will be in Level "D" PPE.
H&S Productivity (labor and equipment only)	MII assembly costs include HPF adjustments.
Escalation to Base Year	2016 cost sources are not escalated (EF=1.00). All other costs are escalated based on the USACE CWCCIS, EM 1110-2-1304, Sept 2015.
Area Cost Factor	An AF of 1.05 is used for Oregon, except that an AF of 1.00 (national unmodified average) is used for MII assembly costs and local vendor quotes.
Subcontractor Overhead and Profit	It is assumed that home office OH is 8% and profit is 9% for the Prime Contractor. Professional labor overhead is 100%.
Prime Contractor Overhead and Profit	Allowances and items with mandated costs such as per diem do not have overhead and profit applied.
	Items previously developed by Anchor QEA already include contractor markups, therefore overhead and profit were not applied to those items.
	It is assumed that OH is 1% and profit is 0% for vendor quotes for treatment and disposal at offsite disposal facilities. It is assumed that OH is 5% and profit is 0% for quotes for all other material vendor quotes.
	Items developed using MII already include contractor markups such as overhead and profit, therefore additional overhead and profit were not applied in the PC OH and PC PF to those items.

TABLE CW-F18

Alternative F **Cost Worksheet:** **CW-F18**
Capital Cost Sub-Element
Reactive/GAC Placement for Technology Assignments

COST WORKSHEET

Site: Portland Harbor Superfund Site
Location: Portland, Oregon
Phase: Feasibility Study
Base Year: 2016

Prepared By: JN **Date:** 3/4/2016
Checked By: AB **Date:** 3/7/2016

Work Statement:
This sub-element involves the placement of the reactive layers for the construction of capping areas. It includes placement of the reactive layer within confined areas, open areas, and riverbanks. It includes costs for on-site labor, equipment, and materials as well as recent vendor quotes.
Quantity development presented in Appendix D.

Cost Analysis:
Cost for Reactive/GAC Placement for Technology Assignments (Lump Sum)

COST DATABASE CODE	DESCRIPTION	QTY	UNIT(S)	HPF	LABOR	ADJ LABOR	EQUIP	ADJ EQUIP	MATL	OTHER	UNMOD UC	UNMOD LIC	PC OH	PC PF	BUR LIC	COST SOURCE CITATION	COMMENTS
	AquaGate Reactive Layer																
M4	Carbon (AquaGate + PAC 10%)	106,028	TON	1.00	$0.00	$0.00	$0.00	$0.00	$456.30	$0.00	$456.30	$48,380,576.40	5%	0%	$50,799,605	V Vendor Quote	Project-specific vendor quote - AquaBlok 2015. Material cost is $/TON.
P1	Sand	112,249	LCY	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$19.75	$19.75	$2,216,917.75	0%	0%	$2,216,918	P Anchor QEA	Project-specific cost developed by Anchor QEA (2010) - see Backup Table 29A. Includes conversion from TON to LCY.
A3	Mixing Sand & Carbon for Reactive Layer	218,384	CY	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$4.76	$4.76	$1,039,507.84	0%	0%	$1,039,508	MII MII	Project-specific unit cost developed in MII.
A16	Material Placement (Confined)	26,987	CY	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$20.39	$20.39	$550,264.93	0%	0%	$550,265	MII MII	Project-specific unit cost developed in MII.
A15	Material Placement (Open)	191,397	CY	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$12.42	$12.42	$2,377,150.74	0%	0%	$2,377,151	MII MII	Project-specific unit cost developed in MII.
	AquaBlock																
M3	Carbon (AquaBlok)	5,681	TON	1.00	$0.00	$0.00	$0.00	$0.00	$202.80	$0.00	$202.80	$1,152,106.80	5%	0%	$1,209,712	V Vendor Quote	Project-specific vendor quote - AquaBlok 2015. Material cost is $/TON.
A16	Material Placement (Confined)	4,951	CY	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$20.39	$20.39	$100,950.89	0%	0%	$100,951	MII MII	Project-specific unit cost developed in MII.
												TOTAL COST:			$58,294,110		

	Representative Unit Quantity	Unit(s)	Total Cost	Unit Cost
COST WORKSHEET SUMMARY	1	LS	$58,294,110	$58,294,110

Notes:
Further information about the development of cost worksheets can be found in Attachment A - Methodology and Organization of Detailed Cost Estimates.
The quantity bolded in the QTY column is the quantity selected as the representative unit quantity for this cost worksheet. If multiple quantities are bolded, the representative unit quantity is the sum of those quantities. When the LS unit is utilized, the default representative unit quantity is 1.
HTRW productivity factor is from Exhibit B-3 or B-4 of "A Guide to Developing and Documenting Cost Estimates During the Feasibility Study", EPA 2000
EPA developed project-specific unit costs using the Micro Computer Aided Cost Engineering System (MCACES) Second Generation (MII) software version 4.2, build 3

Cost Database Code:
The Cost Database Code is a reference code for linking with line item cost information with the cost source database and is not otherwise used within these cost worksheets. The following cost source database prefixes apply:
L (EPA-Derived Labor Unit Costs), M (Project-Specific Vendor Unit Costs), P (Previously Developed Unit Costs by Anchor QEA for Portland Harbor), A (EPA-Derived MII Unit Costs), O (Unit Costs from Other Projects/Sources)

Source of Cost Data:
For citation references, the following sources apply:
ALL (Allowance), FLC (www.flcdatacenter.com), LD (Costs Derived from Lower Duwamish Waterway Final Feasibility Study), MII (MII), O (Other), P (Previously Developed by Anchor QEA for Portland Harbor), and V (Vendor Quote)

Abbreviations:

QTY	Quantity	AC	Acres
EQUIP	Equipment	CLF	100 Linear Foot
MATL	Material	CY	Cubic Yard
HPF	HTRW Productivity Factor	DY	Days
ADJ LABOR	Adjusted Labor for HFP	EA	Each
ADJ EQUIP	Adjusted Equipment for HFP	FTE	Full Time Equivalent
UNMOD UC	Unmodified Unit Cost	HR	Hours
UNMOD LIC	Unmodified Line Item Cost	LB	Pounds
UNBUR LIC	Unburdened Line Item Cost	LCY	Loose Cubic Yard
PC OH	Prime Contractor Overhead	LF	Linear Foot
PC PF	Prime Contractor Profit	LS	Lump Sum
BUR LIC	Burdened Line Item Cost	MO	Month
		SF	Square Foot
		SY	Square Yard
		TON	Tons
		YR	Years

Cost Adjustment Checklist:	**NOTES:**
FACTOR:	Field work will be in Level "D" PPE.
H&S Productivity (labor and equipment only)	MII assembly costs include HPF adjustments.
Escalation to Base Year	2016 cost sources are not escalated (EF=1.00). All other costs are escalated based on the USACE CWCCIS, EM 1110-2-1304, Sept 2015.
Area Cost Factor	An AF of 1.05 is used for Oregon, except that an AF of 1.00 (national unmodified average) is used for MII assembly costs and local vendor quotes.
Subcontractor Overhead and Profit	It is assumed that home office OH is 8% and profit is 9% for the Prime Contractor. Professional labor overhead is 100%.
Prime Contractor Overhead and Profit	Allowances and items with mandated costs such as per diem do not have overhead and profit applied.
	Items previously developed by Anchor QEA already include contractor markups, therefore overhead and profit were not applied to those items.
	It is assumed that OH is 1% and profit is 0% for vendor quotes for treatment and disposal at offsite disposal facilities. It is assumed that OH is 5% and profit is 0% for quotes for all other material vendor quotes.
	Items developed using MII already include contractor markups such as overhead and profit, therefore additional overhead and profit were not applied in the PC OH and PC PF to those items.

TABLE CW-F19

Alternative F **Cost Worksheet:** **CW-F19**
Capital Cost Sub-Element
Geofabric for Riverbanks

COST WORKSHEET

Site: Portland Harbor Superfund Site
Location: Portland, Oregon
Phase: Feasibility Study
Base Year: 2016

Prepared By: JN **Date:** 3/4/2016
Checked By: AB **Date:** 3/7/2016

Work Statement:
This sub-element involves the installation of geofabric along the riverbanks. It includes costs for on-site labor, equipment, and materials from recent vendor quotes.
Quantity development presented in Appendix D.

Cost Analysis:
Cost for Geofabric for Riverbanks (Lump Sum)

COST DATABASE CODE	DESCRIPTION	QTY	UNIT(S)	HPF	LABOR	ADJ LABOR	EQUIP	ADJ EQUIP	MATL	OTHER	UNMOD UC	UNMOD LIC	PC OH	PC PF	BUR LIC	COST SOURCE CITATION	COMMENTS
O7	Geotextile Installation	**25.4**	AC	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$7,074.14	$7,074.14	$179,683.26	8%	9%	$211,523	V Vendor Quote	Vendor Quote - Geo-Synthetics (2014). Includes labor and equipment for installation
O6	Geotextile Material	25.4	AC	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$5,698.62	$5,698.62	$144,744.85	5%	0%	$151,982	V Vendor Quote	Vendor quote obtained for project of similar scope - Geo-Synthetics, 2014.
												TOTAL COST:			$363,505		

	Representative Unit Quantity	Unit(s)	Total Cost	Unit Cost
COST WORKSHEET SUMMARY	25.4	AC	$363,505	$14,311

Notes:
Further information about the development of cost worksheets can be found in Attachment A - Methodology and Organization of Detailed Cost Estimates.
The quantity bolded in the QTY column is the quantity selected as the representative unit quantity for this cost worksheet. If multiple quantities are bolded, the representative unit quantity is the sum of those quantities. When the LS unit is utilized, the default representative unit quantity is 1.
HTRW productivity factor is from Exhibit B-3 or B-4 of "A Guide to Developing and Documenting Cost Estimates During the Feasibility Study", EPA 2000
EPA developed project-specific unit costs using the Micro Computer Aided Cost Engineering System (MCACES) Second Generation (MII) software version 4.2, build 3

Cost Database Code:
The Cost Database Code is a reference code for linking with line item cost information with the cost source database and is not otherwise used within these cost worksheets. The following cost source database prefixes apply:
L (EPA-Derived Labor Unit Costs), M (Project-Specific Vendor Unit Costs), P (Previously Developed Unit Costs by Anchor QEA for Portland Harbor), A (EPA-Derived MII Unit Costs), O (Unit Costs from Other Projects/Sources)

Source of Cost Data:
For citation references, the following sources apply:
ALL (Allowance), FLC (www.flcdatacenter.com), LD (Costs Derived from Lower Duwamish Waterway Final Feasibility Study), MII (MII), O (Other), P (Previously Developed by Anchor QEA for Portland Harbor), and V (Vendor Quote)

Abbreviations:

QTY	Quantity	AC	Acres
EQUIP	Equipment	CLF	100 Linear Foot
MATL	Material	CY	Cubic Yard
HPF	HTRW Productivity Factor	DY	Days
ADJ LABOR	Adjusted Labor for HFP	EA	Each
ADJ EQUIP	Adjusted Equipment for HFP	FTE	Full Time Equivalent
UNMOD UC	Unmodified Unit Cost	HR	Hours
UNMOD LIC	Unmodified Line Item Cost	LB	Pounds
UNBUR LIC	Unburdened Line Item Cost	LCY	Loose Cubic Yard
PC OH	Prime Contractor Overhead	LF	Linear Foot
PC PF	Prime Contractor Profit	LS	Lump Sum
BUR LIC	Burdened Line Item Cost	MO	Month
		SF	Square Foot
		SY	Square Yard
		TON	Tons
		YR	Years

Cost Adjustment Checklist:	**NOTES:**
FACTOR:	Field work will be in Level "D" PPE.
H&S Productivity (labor and equipment only)	MII assembly costs include HPF adjustments.
Escalation to Base Year	2016 cost sources are not escalated (EF=1.00). All other costs are escalated based on the USACE CWCCIS, EM 1110-2-1304, Sept 2015.
Area Cost Factor	An AF of 1.05 is used for Oregon, except that an AF of 1.00 (national unmodified average) is used for MII assembly costs and local vendor quotes.
Subcontractor Overhead and Profit	It is assumed that home office OH is 8% and profit is 9% for the Prime Contractor. Professional labor overhead is 100%.
Prime Contractor Overhead and Profit	Allowances and items with mandated costs such as per diem do not have overhead and profit applied.
	Items previously developed by Anchor QEA already include contractor markups, therefore overhead and profit were not applied to those items.
	It is assumed that OH is 1% and profit is 0% for vendor quotes for treatment and disposal at offsite disposal facilities. It is assumed that OH is 5% and profit is 0% for quotes for all other material vendor quotes.
	Items developed using MII already include contractor markups such as overhead and profit, therefore additional overhead and profit were not applied in the PC OH and PC PF to those items.

TABLE CW-F20

Alternative F **Cost Worksheet:** **CW-F20**
Capital Cost Sub-Element
Organoclay Mat Placement for Technology Assignments

COST WORKSHEET

Site: Portland Harbor Superfund Site
Location: Portland, Oregon
Phase: Feasibility Study
Base Year: 2016

Prepared By: JN **Date:** 3/4/2016
Checked By: AB **Date:** 3/7/2016

Work Statement:
This sub-element involves the placement of the organoclay mat for the construction of capping areas. It includes placement of the organoclay mat within confined areas, open areas, and riverbanks. It includes costs for on-site labor, equipment, and materials as well as recent vendor quotes.
Quantity development presented in Appendix D.

Cost Analysis:
Cost for Organoclay Mat Placement for Technology Assignments (Lump Sum)

COST DATABASE CODE	DESCRIPTION	QTY	UNIT(S)	HPF	LABOR	ADJ LABOR	EQUIP	ADJ EQUIP	MATL	OTHER	UNMOD UC	UNMOD LIC	PC OH	PC PF	BUR LIC	COST SOURCE CITATION	COMMENTS
A17	Organoclay Mat Placement	**174,300**	SF	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$3.35	$3.35	$583,905.00	0%	0%	$583,905	MII MII	Project-specific unit cost developed in MII.
P4	Organoclay Mat Material	174,300	SF	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$3.38	$3.38	$589,134.00	0%	0%	$589,134	P Anchor QEA	Project-specific cost developed by Anchor QEA (2010) - see Backup Table 29A.
												TOTAL COST:			$1,173,039		

	Representative Unit Quantity	Unit(s)	Total Cost	Unit Cost
COST WORKSHEET SUMMARY	174,300	SF	$1,173,039	$6.73

Notes:
Further information about the development of cost worksheets can be found in Attachment A - Methodology and Organization of Detailed Cost Estimates.
The quantity bolded in the QTY column is the quantity selected as the representative unit quantity for this cost worksheet. If multiple quantities are bolded, the representative unit quantity is the sum of those quantities. When the LS unit is utilized, the default representative unit quantity is 1.
HTRW productivity factor is from Exhibit B-3 or B-4 of "A Guide to Developing and Documenting Cost Estimates During the Feasibility Study", EPA 2000
EPA developed project-specific unit costs using the Micro Computer Aided Cost Engineering System (MCACES) Second Generation (MII) software version 4.2, build 3

Cost Database Code:
The Cost Database Code is a reference code for linking with line item cost information with the cost source database and is not otherwise used within these cost worksheets. The following cost source database prefixes apply:
L (EPA-Derived Labor Unit Costs), M (Project-Specific Vendor Unit Costs), P (Previously Developed Unit Costs by Anchor QEA for Portland Harbor), A (EPA-Derived MII Unit Costs), O (Unit Costs from Other Projects/Sources)

Source of Cost Data:
For citation references, the following sources apply:
ALL (Allowance), FLC (www.flcdatacenter.com), LD (Costs Derived from Lower Duwamish Waterway Final Feasibility Study), MII (MII), O (Other), P (Previously Developed by Anchor QEA for Portland Harbor), and V (Vendor Quote)

Abbreviations:

QTY	Quantity	AC	Acres
EQUIP	Equipment	CLF	100 Linear Foot
MATL	Material	CY	Cubic Yard
HPF	HTRW Productivity Factor	DY	Days
ADJ LABOR	Adjusted Labor for HFP	EA	Each
ADJ EQUIP	Adjusted Equipment for HFP	FTE	Full Time Equivalent
UNMOD UC	Unmodified Unit Cost	HR	Hours
UNMOD LIC	Unmodified Line Item Cost	LB	Pounds
UNBUR LIC	Unburdened Line Item Cost	LCY	Loose Cubic Yard
PC OH	Prime Contractor Overhead	LF	Linear Foot
PC PF	Prime Contractor Profit	LS	Lump Sum
BUR LIC	Burdened Line Item Cost	MO	Month
		SF	Square Foot
		SY	Square Yard
		TON	Tons
		YR	Years

Cost Adjustment Checklist:	**NOTES:**
FACTOR:	Field work will be in Level "D" PPE.
H&S Productivity (labor and equipment only)	MII assembly costs include HPF adjustments.
Escalation to Base Year	2016 cost sources are not escalated (EF=1.00). All other costs are escalated based on the USACE CWCCIS, EM 1110-2-1304, Sept 2015.
Area Cost Factor	An AF of 1.05 is used for Oregon, except that an AF of 1.00 (national unmodified average) is used for MII assembly costs and local vendor quotes.
Subcontractor Overhead and Profit	It is assumed that home office OH is 8% and profit is 9% for the Prime Contractor. Professional labor overhead is 100%.
Prime Contractor Overhead and Profit	Allowances and items with mandated costs such as per diem do not have overhead and profit applied.
	Items previously developed by Anchor QEA already include contractor markups, therefore overhead and profit were not applied to those items.
	It is assumed that OH is 1% and profit is 0% for vendor quotes for treatment and disposal at offsite disposal facilities. It is assumed that OH is 5% and profit is 0% for quotes for all other material vendor quotes.
	Items developed using MII already include contractor markups such as overhead and profit, therefore additional overhead and profit were not applied in the PC OH and PC PF to those items.

TABLE CW-F21

Alternative F **Cost Worksheet:** **CW-F21**
Capital Cost Sub-Element
Transload Facility Development

COST WORKSHEET

Site: Portland Harbor Superfund Site
Location: Portland, Oregon
Phase: Feasibility Study
Base Year: 2016

Prepared By: JN **Date:** 3/4/2016
Checked By: AB **Date:** 3/7/2016

Work Statement:
This sub-element involves the development of a transload facility for facilitating offsite disposal of contaminated sediments. It includes costs for on-site labor, equipment, and materials developed from previous work. Transload facility is expected to be operated for 13 years, based on estimated construction duration. Property lease quantity (20 acres) adjusted for construction duration. Labor for the annual inspections is assumed to be 2.5 times full time equivalent. Environmental monitoring is assumed to be once per quarter year for construction duration.

Cost Analysis:
Cost for Transload Facility Development (Lump Sum)

COST DATABASE CODE	DESCRIPTION	QTY	UNIT(S)	HPF	LABOR	ADJ LABOR	EQUIP	ADJ EQUIP	MATL	OTHER	UNMOD UC	UNMOD LIC	PC OH	PC PF	BUR LIC	COST SOURCE CITATION	COMMENTS
	Transload Facility Development																
P31	Transload Facility Permitting	1	LS	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$45,080.00	$45,080.00	$45,080.00	0%	0%	$45,080	P Anchor QEA	Project-specific cost developed by Anchor QEA (2010) - see Backup Table 24.
P32	Transload Facility Development	1	LS	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$4,508,000.00	$4,508,000.00	$4,508,000.00	0%	0%	$4,508,000	P Anchor QEA	Project-specific cost developed by Anchor QEA (2010) - see Backup Table 24.
P33	Yearly Property Lease	260	AC	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$26,484.50	$26,484.50	$6,885,970.00	0%	0%	$6,885,970	P Anchor QEA	Developed by Anchor QEA (2010) - see Backup Table 24. Assumes leasing of 20 acres multiplied by estimated construction duration.
	Inspection and Monitoring of Transload Facility																
P34	Labor Inspections During Operations of Transload Facility	32.5	FTE	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$84,525.00	$84,525.00	$2,747,062.50	0%	0%	$2,747,063	P Anchor QEA	Developed by Anchor QEA (2010) - see Backup Table 24. Assumes 2.5 FTE/YR multiplied by estimated construction duration.
P35	Environmental Monitoring During Offloading at Transload Facility	52	MO	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$16,905.00	$16,905.00	$879,060.00	0%	0%	$879,060	P Anchor QEA	Developed by Anchor QEA (2010) - see Backup Table 24. Assumes 4 MO/YR multiplied by estimated construction duration.
P36	Inspection and Monitoring Reporting for Transload Facility	13	YR	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$45,080.00	$45,080.00	$586,040.00	0%	0%	$586,040	P Anchor QEA	Project-specific cost developed by Anchor QEA (2010) - see Backup Table 24.
												TOTAL COST:			$15,651,213		

	Representative Unit Quantity	Unit(s)	Total Cost	Unit Cost
COST WORKSHEET SUMMARY	1	LS	$15,651,213	$15,651,213

TABLE CW-F21

Alternative F **Cost Worksheet:** **CW-F21**
Capital Cost Sub-Element
Transload Facility Development

COST WORKSHEET

Site: Portland Harbor Superfund Site
Location: Portland, Oregon
Phase: Feasibility Study
Base Year: 2016

Prepared By: JN **Date:** 3/4/2016
Checked By: AB **Date:** 3/7/2016

Notes:

Further information about the development of cost worksheets can be found in Attachment A - Methodology and Organization of Detailed Cost Estimates.
The quantity bolded in the QTY column is the quantity selected as the representative unit quantity for this cost worksheet. If multiple quantities are bolded, the representative unit quantity is the sum of those quantities. When the LS unit is utilized, the default representative unit quantity is 1.
HTRW productivity factor is from Exhibit B-3 or B-4 of "A Guide to Developing and Documenting Cost Estimates During the Feasibility Study", EPA 2000
EPA developed project-specific unit costs using the Micro Computer Aided Cost Engineering System (MCACES) Second Generation (MII) software version 4.2, build 3

Cost Database Code:

The Cost Database Code is a reference code for linking with line item cost information with the cost source database and is not otherwise used within these cost worksheets. The following cost source database prefixes apply:

L (EPA-Derived Labor Unit Costs), M (Project-Specific Vendor Unit Costs), P (Previously Developed Unit Costs by Anchor QEA for Portland Harbor), A (EPA-Derived MII Unit Costs), O (Unit Costs from Other Projects/Sources)

Source of Cost Data:

For citation references, the following sources apply:

ALL (Allowance), FLC (www.flcdatacenter.com), LD (Costs Derived from Lower Duwamish Waterway Final Feasibility Study), MII (MII), O (Other), P (Previously Developed by Anchor QEA for Portland Harbor), and V (Vendor Quote)

Abbreviations:

QTY	Quantity
EQUIP	Equipment
MATL	Material
HPF	HTRW Productivity Factor
ADJ LABOR	Adjusted Labor for HFP
ADJ EQUIP	Adjusted Equipment for HFP
UNMOD UC	Unmodified Unit Cost
UNMOD LIC	Unmodified Line Item Cost
UNBUR LIC	Unburdened Line Item Cost
PC OH	Prime Contractor Overhead
PC PF	Prime Contractor Profit
BUR LIC	Burdened Line Item Cost
AC	Acres
CLF	100 Linear Foot
CY	Cubic Yard
DY	Days
EA	Each
FTE	Full Time Equivalent
HR	Hours
LB	Pounds
LCY	Loose Cubic Yard
LF	Linear Foot
LS	Lump Sum
MO	Month
SF	Square Foot
SY	Square Yard
TON	Tons
YR	Years

Cost Adjustment Checklist:	**NOTES:**
FACTOR:	Field work will be in Level "D" PPE.
H&S Productivity (labor and equipment only)	MII assembly costs include HPF adjustments.
Escalation to Base Year	2016 cost sources are not escalated (EF=1.00). All other costs are escalated based on the USACE CWCCIS, EM 1110-2-1304, Sept 2015.
Area Cost Factor	An AF of 1.05 is used for Oregon, except that an AF of 1.00 (national unmodified average) is used for MII assembly costs and local vendor quotes.
Subcontractor Overhead and Profit	It is assumed that home office OH is 8% and profit is 9% for the Prime Contractor. Professional labor overhead is 100%.
Prime Contractor Overhead and Profit	Allowances and items with mandated costs such as per diem do not have overhead and profit applied.
	Items previously developed by Anchor QEA already include contractor markups, therefore overhead and profit were not applied to those items.
	It is assumed that OH is 1% and profit is 0% for vendor quotes for treatment and disposal at offsite disposal facilities. It is assumed that OH is 5% and profit is 0% for quotes for all other material vendor quotes.
	Items developed using MII already include contractor markups such as overhead and profit, therefore additional overhead and profit were not applied in the PC OH and PC PF to those items.

TABLE CW-F22

Alternative F **Cost Worksheet: CW-F22**

Capital and Periodic Cost Sub-Element

Monitored Natural Recovery (MNR) for MNR/Enhanced Natural Recovery (ENR) and Broadcast GAC Areas

COST WORKSHEET

Site: Portland Harbor Superfund Site
Location: Portland, Oregon
Phase: Feasibility Study
Base Year: 2016

Prepared By: JN **Date:** 3/4/2016
Checked By: AB **Date:** 3/7/2016

Work Statement:
This sub-element involves sampling as part of monitored natural recovery for MNR, ENR, and Broadcast GAC areas. It includes costs for on-site labor, equipment, and materials developed from previous work.
Quantity development presented in Appendix D.

Cost Analysis:
Cost for Monitored Natural Recovery for MNR/ENR and Broadcast GAC Areas (Lump Sum)

COST DATABASE CODE	DESCRIPTION	QTY	UNIT(S)	HPF	LABOR	ADJ LABOR	EQUIP	ADJ EQUIP	MATL	OTHER	UNMOD UC	UNMOD LIC	PC OH	PC PF	BUR LIC	COST SOURCE CITATION	COMMENTS
P25	Monitored Natural Recovery	**1,662**	AC	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$3,686.33	$3,686.33	$6,126,675.21	0%	0%	$6,126,675	P Anchor QEA	Project-specific cost developed by Anchor QEA (2010) - based on Backup Table 2.
												TOTAL COST:			$6,126,675		

	Representative Unit Quantity	Unit(s)	Total Cost	Unit Cost
COST WORKSHEET SUMMARY	1,662	AC	$6,126,675	$3,686

Notes:
Further information about the development of cost worksheets can be found in Attachment A - Methodology and Organization of Detailed Cost Estimates.
The quantity bolded in the QTY column is the quantity selected as the representative unit quantity for this cost worksheet. If multiple quantities are bolded, the representative unit quantity is the sum of those quantities. When the LS unit is utilized, the default representative unit quantity is 1.
HTRW productivity factor is from Exhibit B-3 or B-4 of "A Guide to Developing and Documenting Cost Estimates During the Feasibility Study", EPA 2000
EPA developed project-specific unit costs using the Micro Computer Aided Cost Engineering System (MCACES) Second Generation (MII) software version 4.2, build 3

Cost Database Code:
The Cost Database Code is a reference code for linking with line item cost information with the cost source database and is not otherwise used within these cost worksheets. The following cost source database prefixes apply:
L (EPA-Derived Labor Unit Costs), M (Project-Specific Vendor Unit Costs), P (Previously Developed Unit Costs by Anchor QEA for Portland Harbor), A (EPA-Derived MII Unit Costs), O (Unit Costs from Other Projects/Sources)

Source of Cost Data:
For citation references, the following sources apply:
ALL (Allowance), FLC (www.flcdatacenter.com), LD (Costs Derived from Lower Duwamish Waterway Final Feasibility Study), MII (MII), O (Other), P (Previously Developed by Anchor QEA for Portland Harbor), and V (Vendor Quote)

Abbreviations:

QTY	Quantity	AC	Acres
EQUIP	Equipment	CLF	100 Linear Foot
MATL	Material	CY	Cubic Yard
HPF	HTRW Productivity Factor	DY	Days
ADJ LABOR	Adjusted Labor for HFP	EA	Each
ADJ EQUIP	Adjusted Equipment for HFP	FTE	Full Time Equivalent
UNMOD UC	Unmodified Unit Cost	HR	Hours
UNMOD LIC	Unmodified Line Item Cost	LB	Pounds
UNBUR LIC	Unburdened Line Item Cost	LCY	Loose Cubic Yard
PC OH	Prime Contractor Overhead	LF	Linear Foot
PC PF	Prime Contractor Profit	LS	Lump Sum
BUR LIC	Burdened Line Item Cost	MO	Month
		SF	Square Foot
		SY	Square Yard
		TON	Tons
		YR	Years

Cost Adjustment Checklist:	**NOTES:**
FACTOR:	Field work will be in Level "D" PPE.
H&S Productivity (labor and equipment only)	MII assembly costs include HPF adjustments.
Escalation to Base Year	2016 cost sources are not escalated (EF=1.00). All other costs are escalated based on the USACE CWCCIS, EM 1110-2-1304, Sept 2015.
Area Cost Factor	An AF of 1.05 is used for Oregon, except that an AF of 1.00 (national unmodified average) is used for MII assembly costs and local vendor quotes.
Subcontractor Overhead and Profit	It is assumed that home office OH is 8% and profit is 9% for the Prime Contractor. Professional labor overhead is 100%.
Prime Contractor Overhead and Profit	Allowances and items with mandated costs such as per diem do not have overhead and profit applied.
	Items previously developed by Anchor QEA already include contractor markups, therefore overhead and profit were not applied to those items.
	It is assumed that OH is 1% and profit is 0% for vendor quotes for treatment and disposal at offsite disposal facilities. It is assumed that OH is 5% and profit is 0% for quotes for all other material vendor quotes.
	Items developed using MII already include contractor markups such as overhead and profit, therefore additional overhead and profit were not applied in the PC OH and PC PF to those items.

TABLE CW-F23

Alternative F **Cost Worksheet:** **CW-F23**
Periodic Cost Sub-Element
Site-Wide Monitoring

COST WORKSHEET

Site: Portland Harbor Superfund Site
Location: Portland, Oregon
Phase: Feasibility Study
Base Year: 2016

Prepared By: JN **Date:** 3/4/2016
Checked By: AB **Date:** 3/7/2016

Work Statement:
This sub-element involves sampling, surveying, data management, and reporting as part of sitewide monitoring. It includes costs for on-site labor, equipment, and materials developed from previous work.

Cost Analysis:
Cost for Site-Wide Monitoring (Lump Sum)

COST DATABASE CODE	DESCRIPTION	QTY	UNIT(S)	HPF	LABOR	ADJ LABOR	EQUIP	ADJ EQUIP	MATL	OTHER	UNMOD UC	UNMOD LIC	PC OH	PC PF	BUR LIC	COST SOURCE CITATION	COMMENTS
	Site-Wide Monitoring																
P26	Sitewide Monitoring	1	LS	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$957,659.23	$957,659.23	$957,659.23	0%	0%	$957,659	P Anchor QEA	Project-specific cost developed by Anchor QEA (2010) - based on Backup Table 1.
												TOTAL COST:			$957,659		

	Representative Unit Quantity	Unit(s)	Total Cost	Unit Cost
COST WORKSHEET SUMMARY	1	LS	$957,659	$957,659

Notes:
Further information about the development of cost worksheets can be found in Attachment A - Methodology and Organization of Detailed Cost Estimates.
The quantity bolded in the QTY column is the quantity selected as the representative unit quantity for this cost worksheet. If multiple quantities are bolded, the representative unit quantity is the sum of those quantities. When the LS unit is utilized, the default representative unit quantity is 1.
HTRW productivity factor is from Exhibit B-3 or B-4 of "A Guide to Developing and Documenting Cost Estimates During the Feasibility Study", EPA 2000
EPA developed project-specific unit costs using the Micro Computer Aided Cost Engineering System (MCACES) Second Generation (MII) software version 4.2, build 3

Cost Database Code:
The Cost Database Code is a reference code for linking with line item cost information with the cost source database and is not otherwise used within these cost worksheets. The following cost source database prefixes apply:
L (EPA-Derived Labor Unit Costs), M (Project-Specific Vendor Unit Costs), P (Previously Developed Unit Costs by Anchor QEA for Portland Harbor), A (EPA-Derived MII Unit Costs), O (Unit Costs from Other Projects/Sources)

Source of Cost Data:
For citation references, the following sources apply:
ALL (Allowance), FLC (www.flcdatacenter.com), LD (Costs Derived from Lower Duwamish Waterway Final Feasibility Study), MII (MII), O (Other), P (Previously Developed by Anchor QEA for Portland Harbor), and V (Vendor Quote)

Abbreviations:

QTY	Quantity	AC	Acres
EQUIP	Equipment	CLF	100 Linear Foot
MATL	Material	CY	Cubic Yard
HPF	HTRW Productivity Factor	DY	Days
ADJ LABOR	Adjusted Labor for HFP	EA	Each
ADJ EQUIP	Adjusted Equipment for HFP	FTE	Full Time Equivalent
UNMOD UC	Unmodified Unit Cost	HR	Hours
UNMOD LIC	Unmodified Line Item Cost	LB	Pounds
UNBUR LIC	Unburdened Line Item Cost	LCY	Loose Cubic Yard
PC OH	Prime Contractor Overhead	LF	Linear Foot
PC PF	Prime Contractor Profit	LS	Lump Sum
BUR LIC	Burdened Line Item Cost	MO	Month
		SF	Square Foot
		SY	Square Yard
		TON	Tons
		YR	Years

Cost Adjustment Checklist:	**NOTES:**
FACTOR:	Field work will be in Level "D" PPE.
H&S Productivity (labor and equipment only)	MII assembly costs include HPF adjustments.
Escalation to Base Year	2016 cost sources are not escalated (EF=1.00). All other costs are escalated based on the USACE CWCCIS, EM 1110-2-1304, Sept 2015.
Area Cost Factor	An AF of 1.05 is used for Oregon, except that an AF of 1.00 (national unmodified average) is used for MII assembly costs and local vendor quotes.
Subcontractor Overhead and Profit	It is assumed that home office OH is 8% and profit is 9% for the Prime Contractor. Professional labor overhead is 100%.
Prime Contractor Overhead and Profit	Allowances and items with mandated costs such as per diem do not have overhead and profit applied.
	Items previously developed by Anchor QEA already include contractor markups, therefore overhead and profit were not applied to those items.
	It is assumed that OH is 1% and profit is 0% for vendor quotes for treatment and disposal at offsite disposal facilities. It is assumed that OH is 5% and profit is 0% for quotes for all other material vendor quotes.
	Items developed using MII already include contractor markups such as overhead and profit, therefore additional overhead and profit were not applied in the PC OH and PC PF to those items.

TABLE CW-F24

Alternative F **Cost Worksheet:** **CW-F24**

Periodic Cost Sub-Element

Cap Area Monitoring and Reactive Layer Monitoring

COST WORKSHEET

Site: Portland Harbor Superfund Site
Location: Portland, Oregon
Phase: Feasibility Study
Base Year: 2016

Prepared By: JN **Date:** 3/4/2016
Checked By: AB **Date:** 3/7/2016

Work Statement:
This sub-element involves sampling, surveying, data management, and reporting as part of cap and reactive layer monitoring. It includes costs for on-site labor, equipment, and materials developed from previous work.
Quantity development presented in Appendix D.

Cost Analysis:
Cost for Cap and Reactive Layer Monitoring (Lump Sum)

COST DATABASE CODE	DESCRIPTION	QTY	UNIT(S)	HPF	LABOR	ADJ LABOR	EQUIP	ADJ EQUIP	MATL	OTHER	UNMOD UC	UNMOD LIC	PC OH	PC PF	BUR LIC	COST SOURCE CITATION	COMMENTS
	Cap Area Monitoring																
P27	Cap Monitoring	234	AC	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$78,961.34	$78,961.34	$18,476,953.35	0%	0%	$18,476,953	P Anchor QEA	Project-specific cost developed by Anchor QEA (2010) - based on Backup Table 4.
	Reactive Layer Monitoring																
P28	Reactive Layer Monitoring	146	AC	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$88,968.76	$88,968.76	$12,989,439.11	0%	0%	$12,989,439	P Anchor QEA	Project-specific cost developed by Anchor QEA (2010) - based on Backup Table 3.
												TOTAL COST:			$31,466,392		

	Representative Unit Quantity	Unit(s)	Total Cost	Unit Cost
COST WORKSHEET SUMMARY	1	LS	$31,466,392	$31,466,392

Notes:
Further information about the development of cost worksheets can be found in Attachment A - Methodology and Organization of Detailed Cost Estimates.
The quantity bolded in the QTY column is the quantity selected as the representative unit quantity for this cost worksheet. If multiple quantities are bolded, the representative unit quantity is the sum of those quantities. When the LS unit is utilized, the default representative unit quantity is 1.
HTRW productivity factor is from Exhibit B-3 or B-4 of "A Guide to Developing and Documenting Cost Estimates During the Feasibility Study", EPA 2000
EPA developed project-specific unit costs using the Micro Computer Aided Cost Engineering System (MCACES) Second Generation (MII) software version 4.2, build 3

Cost Database Code:
The Cost Database Code is a reference code for linking with line item cost information with the cost source database and is not otherwise used within these cost worksheets. The following cost source database prefixes apply:
L (EPA-Derived Labor Unit Costs), M (Project-Specific Vendor Unit Costs), P (Previously Developed Unit Costs by Anchor QEA for Portland Harbor), A (EPA-Derived MII Unit Costs), O (Unit Costs from Other Projects/Sources)

Source of Cost Data:
For citation references, the following sources apply:
ALL (Allowance), FLC (www.flcdatacenter.com), LD (Costs Derived from Lower Duwamish Waterway Final Feasibility Study), MII (MII), O (Other), P (Previously Developed by Anchor QEA for Portland Harbor), and V (Vendor Quote)

Abbreviations:

QTY	Quantity	AC	Acres
EQUIP	Equipment	CLF	100 Linear Foot
MATL	Material	CY	Cubic Yard
HPF	HTRW Productivity Factor	DY	Days
ADJ LABOR	Adjusted Labor for HFP	EA	Each
ADJ EQUIP	Adjusted Equipment for HFP	FTE	Full Time Equivalent
UNMOD UC	Unmodified Unit Cost	HR	Hours
UNMOD LIC	Unmodified Line Item Cost	LB	Pounds
UNBUR LIC	Unburdened Line Item Cost	LCY	Loose Cubic Yard
PC OH	Prime Contractor Overhead	LF	Linear Foot
PC PF	Prime Contractor Profit	LS	Lump Sum
BUR LIC	Burdened Line Item Cost	MO	Month
		SF	Square Foot
		SY	Square Yard
		TON	Tons
		YR	Years

Cost Adjustment Checklist:	**NOTES:**
FACTOR:	Field work will be in Level "D" PPE.
H&S Productivity (labor and equipment only)	MII assembly costs include HPF adjustments.
Escalation to Base Year	2016 cost sources are not escalated (EF=1.00). All other costs are escalated based on the USACE CWCCIS, EM 1110-2-1304, Sept 2015.
Area Cost Factor	An AF of 1.05 is used for Oregon, except that an AF of 1.00 (national unmodified average) is used for MII assembly costs and local vendor quotes.
Subcontractor Overhead and Profit	It is assumed that home office OH is 8% and profit is 9% for the Prime Contractor. Professional labor overhead is 100%.
Prime Contractor Overhead and Profit	Allowances and items with mandated costs such as per diem do not have overhead and profit applied.
	Items previously developed by Anchor QEA already include contractor markups, therefore overhead and profit were not applied to those items.
	It is assumed that OH is 1% and profit is 0% for vendor quotes for treatment and disposal at offsite disposal facilities. It is assumed that OH is 5% and profit is 0% for quotes for all other material vendor quotes.
	Items developed using MII already include contractor markups such as overhead and profit, therefore additional overhead and profit were not applied in the PC OH and PC PF to those items.

TABLE CW-F25

Alternative F **Cost Worksheet:** **CW-F25**

Periodic Cost Sub-Element

Long-Term Maintenance for Capping, ENR, and In Situ Treatment

COST WORKSHEET

Site: Portland Harbor Superfund Site
Location: Portland, Oregon
Phase: Feasibility Study
Base Year: 2016

Prepared By: JN **Date:** 3/4/2016
Checked By: AB **Date:** 3/7/2016

Work Statement:
This sub-element involves replacement of 5% of the technology assignment layers as part of long-term maintenance. It includes costs for on-site labor, equipment, and materials developed from previous work.
Quantities represent 5% of material placement quantities which were developed and presented in Appendix D.

Cost Analysis:
Cost for Long-Term Maintenance (Lump Sum)

COST DATABASE CODE	DESCRIPTION	QTY	UNIT(S)	HPF	LABOR	ADJ LABOR	EQUIP	ADJ EQUIP	MATL	OTHER	UNMOD UC	UNMOD LIC	PC OH	PC PF	BUR LIC	COST SOURCE CITATION	COMMENTS
	Mobilization / Demobilization																
O2	Mobilization/Demobilization for Long Term Maintenance	1	LS	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$90,667.97	$90,667.97	$90,667.97	0%	0%	$90,668	LD Lower Duwamish	Assumes 1.6% of total capital costs per Lower Duwamish Feasibility Study. See Calculations for derivation.
	Sand Placement for Technology Assignments																
P1	Sand	56,000	LCY	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$19.75	$19.75	$1,106,000.00	0%	0%	$1,106,000	P Anchor QEA	Assume 5% of placement of additional material
	Sand Placement (Riverbanks)																
A16	Material Placement (Confined)	5,105	CY	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$20.39	$20.39	$104,090.95	0%	0%	$104,091	MII MII	Assume 5% of placement of additional material
	Sand Placement (Confined)																
A16	Material Placement (Confined)	4,083	CY	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$20.39	$20.39	$83,252.37	0%	0%	$83,252	MII MII	Assume 5% of placement of additional material
	Sand Placement (Open Water)																
A15	Material Placement (Open)	46,813	CY	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$12.42	$12.42	$581,417.46	0%	0%	$581,417	MII MII	Assume 5% of placement of additional material
	Beach Mix Placement for Technology Assignments																
P3	ODOT 100 Beach Mix	3,476	LCY	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$57.69	$57.69	$200,530.44	0%	0%	$200,530	P Anchor QEA	Assume 5% of placement of additional material
	Beach Mix Placement (Riverbanks)																
A16	Material Placement (Confined)	945	CY	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$20.39	$20.39	$19,268.55	0%	0%	$19,269	MII MII	Assume 5% of placement of additional material
	Beach Mix Placement (Confined)																
A16	Material Placement (Confined)	301	CY	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$20.39	$20.39	$6,137.39	0%	0%	$6,137	MII MII	Assume 5% of placement of additional material
	Beach Mix Placement (Open Water)																
A15	Material Placement (Open)	2,230	CY	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$12.42	$12.42	$27,696.60	0%	0%	$27,697	MII MII	Assume 5% of placement of additional material
	Armor Placement for Technology Assignments																
P2	ODOT 200 Armor	7,595	LCY	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$57.69	$57.69	$438,155.55	0%	0%	$438,156	P Anchor QEA	Assume 5% of placement of additional material
	Armor Placement (Riverbanks)																
A16	Material Placement (Confined)	79	CY	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$20.39	$20.39	$1,610.81	0%	0%	$1,611	MII MII	Assume 5% of placement of additional material
	Armor Placement (Confined)																
A16	Material Placement (Confined)	1,692	CY	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$20.39	$20.39	$34,499.88	0%	0%	$34,500	MII MII	Assume 5% of placement of additional material
	Armor Placement (Open Water)																
A15	Material Placement (Open)	5,824	CY	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$12.42	$12.42	$72,334.08	0%	0%	$72,334	MII MII	Assume 5% of placement of additional material
	Reactive/GAC Placement for Technology Assignments																
	AquaGate Reactive Layer																
M4	Carbon (AquaGate + PAC 10%)	5,301	TON	1.00	$0.00	$0.00	$0.00	$0.00	$456.30	$0.00	$456.30	$2,418,846.30	5%	0%	$2,539,789	V Vendor Quote	Assume 5% of placement of additional material
P1	Sand	5,612	LCY	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$19.75	$19.75	$110,837.00	0%	0%	$110,837	P Anchor QEA	Assume 5% of placement of additional material
A3	Mixing Sand & Carbon for Reactive Layer	10,919	CY	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$4.76	$4.76	$51,974.44	0%	0%	$51,974	MII MII	Assume 5% of placement of additional material
A16	Material Placement (Confined)	1,349	CY	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$20.39	$20.39	$27,506.11	0%	0%	$27,506	MII MII	Assume 5% of placement of additional material
A15	Material Placement (Open)	9,570	CY	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$12.42	$12.42	$118,859.40	0%	0%	$118,859	MII MII	Assume 5% of placement of additional material
	AquaBlock																
M3	Carbon (AquaBlok)	284	TON	1.00	$0.00	$0.00	$0.00	$0.00	$202.80	$0.00	$202.80	$57,595.20	5%	0%	$60,475	V Vendor Quote	Assume 5% of placement of additional material
A16	Material Placement (Confined)	248	CY	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$20.39	$20.39	$5,056.72	0%	0%	$5,057	MII MII	Assume 5% of placement of additional material
	Geofabric for Riverbanks																
O7	Geotextile Installation	1.3	AC	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$7,074.14	$7,074.14	$9,196.39	8%	9%	$10,826	V Vendor Quote	Assume 5% of placement of additional material
O6	Geotextile Material	1.3	AC	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$5,698.62	$5,698.62	$7,408.20	5%	0%	$7,779	V Vendor Quote	Assume 5% of placement of additional material

TABLE CW-F25

Alternative F **Cost Worksheet: CW-F25**
Periodic Cost Sub-Element
Long-Term Maintenance for Capping, ENR, and In Situ Treatment

COST WORKSHEET

Site: Portland Harbor Superfund Site
Location: Portland, Oregon
Phase: Feasibility Study
Base Year: 2016

Prepared By: JN **Date:** 3/4/2016
Checked By: AB **Date:** 3/7/2016

Work Statement:
This sub-element involves replacement of 5% of the technology assignment layers as part of long-term maintenance. It includes costs for on-site labor, equipment, and materials developed from previous work.
Quantities represent 5% of material placement quantities which were developed and presented in Appendix D.

Cost Analysis:
Cost for Long-Term Maintenance (Lump Sum)

COST DATABASE CODE	DESCRIPTION	QTY	UNIT(S)	HPF	LABOR	ADJ LABOR	EQUIP	ADJ EQUIP	MATL	OTHER	UNMOD UC	UNMOD LIC	PC OH	PC PF	BUR LIC	COST SOURCE CITATION	COMMENTS
	Organoclay Mat Placement for Technology Assignments																
A17	Organoclay Mat Placement	8,715	SF	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$3.35	$3.35	$29,195.25	0%	0%	$29,195	MII MII	Assume 5% of placement of additional material
P4	Organoclay Mat Material	8,715	SF	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$3.38	$3.38	$29,456.70	0%	0%	$29,457	P Anchor QEA	Assume 5% of placement of additional material
												TOTAL COST:			$5,757,416		

	Representative Unit Quantity	Unit(s)	Total Cost	Unit Cost
COST WORKSHEET SUMMARY	1	LS	$5,757,416	$5,757,416

Notes:
Further information about the development of cost worksheets can be found in Attachment A - Methodology and Organization of Detailed Cost Estimates.
The quantity bolded in the QTY column is the quantity selected as the representative unit quantity for this cost worksheet. If multiple quantities are bolded, the representative unit quantity is the sum of those quantities. When the LS unit is utilized, the default representative unit quantity is 1.
HTRW productivity factor is from Exhibit B-3 or B-4 of "A Guide to Developing and Documenting Cost Estimates During the Feasibility Study", EPA 2000
EPA developed project-specific unit costs using the Micro Computer Aided Cost Engineering System (MCACES) Second Generation (MII) software version 4.2, build 3

Cost Database Code:
The Cost Database Code is a reference code for linking with line item cost information with the cost source database and is not otherwise used within these cost worksheets. The following cost source database prefixes apply:
L (EPA-Derived Labor Unit Costs), M (Project-Specific Vendor Unit Costs), P (Previously Developed Unit Costs by Anchor QEA for Portland Harbor), A (EPA-Derived MII Unit Costs), O (Unit Costs from Other Projects/Sources)

Source of Cost Data:
For citation references, the following sources apply:
ALL (Allowance), FLC (www.flcdatacenter.com), LD (Costs Derived from Lower Duwamish Waterway Final Feasibility Study), MII (MII), O (Other), P (Previously Developed by Anchor QEA for Portland Harbor), and V (Vendor Quote)

Abbreviations:

QTY	Quantity	AC	Acres
EQUIP	Equipment	CLF	100 Linear Foot
MATL	Material	CY	Cubic Yard
HPF	HTRW Productivity Factor	DY	Days
ADJ LABOR	Adjusted Labor for HFP	EA	Each
ADJ EQUIP	Adjusted Equipment for HFP	FTE	Full Time Equivalent
UNMOD UC	Unmodified Unit Cost	HR	Hours
UNMOD LIC	Unmodified Line Item Cost	LB	Pounds
UNBUR LIC	Unburdened Line Item Cost	LCY	Loose Cubic Yard
PC OH	Prime Contractor Overhead	LF	Linear Foot
PC PF	Prime Contractor Profit	LS	Lump Sum
BUR LIC	Burdened Line Item Cost	MO	Month
		SF	Square Foot
		SY	Square Yard
		TON	Tons
		YR	Years

Cost Adjustment Checklist:	**NOTES:**
FACTOR:	Field work will be in Level "D" PPE.
H&S Productivity (labor and equipment only)	MII assembly costs include HPF adjustments.
Escalation to Base Year	2016 cost sources are not escalated (EF=1.00). All other costs are escalated based on the USACE CWCCIS, EM 1110-2-1304, Sept 2015.
Area Cost Factor	An AF of 1.05 is used for Oregon, except that an AF of 1.00 (national unmodified average) is used for MII assembly costs and local vendor quotes.
Subcontractor Overhead and Profit	It is assumed that home office OH is 8% and profit is 9% for the Prime Contractor. Professional labor overhead is 100%.
Prime Contractor Overhead and Profit	Allowances and items with mandated costs such as per diem do not have overhead and profit applied.
	Items previously developed by Anchor QEA already include contractor markups, therefore overhead and profit were not applied to those items.
	It is assumed that OH is 1% and profit is 0% for vendor quotes for treatment and disposal at offsite disposal facilities. It is assumed that OH is 5% and profit is 0% for quotes for all other material vendor quotes.
	Items developed using MII already include contractor markups such as overhead and profit, therefore additional overhead and profit were not applied in the PC OH and PC PF to those items.

TABLE CW-F26

Alternative F **Cost Worksheet:** **CW-F26**
Periodic Cost Sub-Element
5-Year Site Review

COST WORKSHEET

Site: Portland Harbor Superfund Site
Location: Portland, Oregon
Phase: Feasibility Study
Base Year: 2016

Prepared By: JN **Date:** 3/4/2016
Checked By: AB **Date:** 3/7/2016

Work Statement:
This sub-element involves the site visit and 5-year site review report. The following cost includes labor, material and shipping costs for site visits and 5-year site review reports.

Cost Analysis:
Cost for 5-Year Site Review (Lump Sum)

COST DATABASE CODE	DESCRIPTION	QTY	UNIT(S)	HPF	LABOR	ADJ LABOR	EQUIP	ADJ EQUIP	MATL	OTHER	UNMOD UC	UNMOD LIC	PC OH	PC PF	BUR LIC	COST SOURCE CITATION	COMMENTS
L11	Project Manager	300	HR	1.00	$82.17	$82.17	$0.00	$0.00	$0.00	$0.00	$82.17	$24,651.00	100%	9%	$53,739	FLC FLCDataCenter	Project-specific unit cost developed by EPA.
L4	Environmental Engineer	600	HR	1.00	$48.91	$48.91	$0.00	$0.00	$0.00	$0.00	$48.91	$29,346.00	100%	9%	$63,974	FLC FLCDataCenter	Project-specific unit cost developed by EPA.
L6	Environmental Scientist	900	HR	1.00	$37.70	$37.70	$0.00	$0.00	$0.00	$0.00	$37.70	$33,930.00	100%	9%	$73,967	FLC FLCDataCenter	Project-specific unit cost developed by EPA.
L12	Quality Control Engineer	120	HR	1.00	$64.99	$64.99	$0.00	$0.00	$0.00	$0.00	$64.99	$7,798.80	100%	9%	$17,001	FLC FLCDataCenter	Project-specific unit cost developed by EPA.
L1	CAD Drafter	300	HR	1.00	$31.31	$31.31	$0.00	$0.00	$0.00	$0.00	$31.31	$9,393.00	100%	9%	$20,477	FLC FLCDataCenter	Project-specific unit cost developed by EPA.
L3	Clerks, Typist, Bookkeeper & Receptionist	300	HR	1.00	$19.89	$19.89	$0.00	$0.00	$0.00	$0.00	$19.89	$5,967.00	100%	9%	$13,008	FLC FLCDataCenter	Project-specific unit cost developed by EPA.
O4	Copy and Shipping Allowance	1	LS	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$1,521.00	$1,521.00	$1,521.00	0%	0%	$1,521	ALL Allowance	
												TOTAL COST:			$243,687		

	Representative Unit Quantity	Unit(s)	Total Cost	Unit Cost
COST WORKSHEET SUMMARY	1	LS	$243,687	$243,687

Notes:
Further information about the development of cost worksheets can be found in Attachment A - Methodology and Organization of Detailed Cost Estimates.
The quantity bolded in the QTY column is the quantity selected as the representative unit quantity for this cost worksheet. If multiple quantities are bolded, the representative unit quantity is the sum of those quantities. When the LS unit is utilized, the default representative unit quantity is 1.
HTRW productivity factor is from Exhibit B-3 or B-4 of "A Guide to Developing and Documenting Cost Estimates During the Feasibility Study", EPA 2000
EPA developed project-specific unit costs using the Micro Computer Aided Cost Engineering System (MCACES) Second Generation (MII) software version 4.2, build 3

Cost Database Code:
The Cost Database Code is a reference code for linking with line item cost information with the cost source database and is not otherwise used within these cost worksheets. The following cost source database prefixes apply:
L (EPA-Derived Labor Unit Costs), M (Project-Specific Vendor Unit Costs), P (Previously Developed Unit Costs by Anchor QEA for Portland Harbor), A (EPA-Derived MII Unit Costs), O (Unit Costs from Other Projects/Sources)

Source of Cost Data:
For citation references, the following sources apply:
ALL (Allowance), FLC (www.flcdatacenter.com), LD (Costs Derived from Lower Duwamish Waterway Final Feasibility Study), MII (MII), O (Other), P (Previously Developed by Anchor QEA for Portland Harbor), and V (Vendor Quote)

Abbreviations:

QTY	Quantity	AC	Acres
EQUIP	Equipment	CLF	100 Linear Foot
MATL	Material	CY	Cubic Yard
HPF	HTRW Productivity Factor	DY	Days
ADJ LABOR	Adjusted Labor for HFP	EA	Each
ADJ EQUIP	Adjusted Equipment for HFP	FTE	Full Time Equivalent
UNMOD UC	Unmodified Unit Cost	HR	Hours
UNMOD LIC	Unmodified Line Item Cost	LB	Pounds
UNBUR LIC	Unburdened Line Item Cost	LCY	Loose Cubic Yard
PC OH	Prime Contractor Overhead	LF	Linear Foot
PC PF	Prime Contractor Profit	LS	Lump Sum
BUR LIC	Burdened Line Item Cost	MO	Month
		SF	Square Foot
		SY	Square Yard
		TON	Tons
		YR	Years

Cost Adjustment Checklist:	**NOTES:**
FACTOR:	Field work will be in Level "D" PPE.
H&S Productivity (labor and equipment only)	MII assembly costs include HPF adjustments.
Escalation to Base Year	2016 cost sources are not escalated (EF=1.00). All other costs are escalated based on the USACE CWCCIS, EM 1110-2-1304, Sept 2015.
Area Cost Factor	An AF of 1.05 is used for Oregon, except that an AF of 1.00 (national unmodified average) is used for MII assembly costs and local vendor quotes.
Subcontractor Overhead and Profit	It is assumed that home office OH is 8% and profit is 9% for the Prime Contractor. Professional labor overhead is 100%.
Prime Contractor Overhead and Profit	Allowances and items with mandated costs such as per diem do not have overhead and profit applied.
	Items previously developed by Anchor QEA already include contractor markups, therefore overhead and profit were not applied to those items.
	It is assumed that OH is 1% and profit is 0% for vendor quotes for treatment and disposal at offsite disposal facilities. It is assumed that OH is 5% and profit is 0% for quotes for all other material vendor quotes.
	Items developed using MII already include contractor markups such as overhead and profit, therefore additional overhead and profit were not applied in the PC OH and PC PF to those items.

Cost Worksheets
Alternative G

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TABLE CW-G1

Alternative G
Capital Cost Sub-Element
Mobilization / Demobilization

Cost Worksheet: **CW-G1**

COST WORKSHEET

Site: Portland Harbor Superfund Site
Location: Portland, Oregon
Phase: Feasibility Study
Base Year: 2016

Prepared By: JN **Date:** 3/4/2016
Checked By: AB **Date:** 3/7/2016

Work Statement:
This sub-element involves mobilization and demobilization of all the required equipment to and from the site respectively.

Cost Analysis:
Cost for Mobilization/Demobilization (Lump Sum)

COST DATABASE CODE	DESCRIPTION	QTY	UNIT(S)	HPF	LABOR	ADJ LABOR	EQUIP	ADJ EQUIP	MATL	OTHER	UNMOD UC	UNMOD LIC	PC OH	PC PF	BUR LIC	COST SOURCE CITATION	COMMENTS
O1	Mobilization/Demobilization	1	LS	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$30,516,000.00	$30,516,000.00	$30,516,000.00	0%	0%	$30,516,000	LD Lower Duwamish	Assumes 1.6% of total capital costs per Lower Duwamish Feasibility Study. See Calculations for derivation.
														TOTAL COST:	$30,516,000		

	Representative Unit Quantity	Unit(s)	Total Cost	Unit Cost
COST WORKSHEET SUMMARY	1	LS	$30,516,000	$30,516,000

Notes:
Further information about the development of cost worksheets can be found in Attachment A - Methodology and Organization of Detailed Cost Estimates.
The quantity bolded in the QTY column is the quantity selected as the representative unit quantity for this cost worksheet. If multiple quantities are bolded, the representative unit quantity is the sum of those quantities. When the LS unit is utilized, the default representative unit quantity is 1.
HTRW productivity factor is from Exhibit B-3 or B-4 of "A Guide to Developing and Documenting Cost Estimates During the Feasibility Study", EPA 2000
EPA developed project-specific unit costs using the Micro Computer Aided Cost Engineering System (MCACES) Second Generation (MII) software version 4.2, build 3

Cost Database Code:
The Cost Database Code is a reference code for linking with line item cost information with the cost source database and is not otherwise used within these cost worksheets. The following cost source database prefixes apply:
L (EPA-Derived Labor Unit Costs), M (Project-Specific Vendor Unit Costs), P (Previously Developed Unit Costs by Anchor QEA for Portland Harbor), A (EPA-Derived MII Unit Costs), O (Unit Costs from Other Projects/Sources)

Source of Cost Data:
For citation references, the following sources apply:
ALL (Allowance), FLC (www.flcdatacenter.com), LD (Costs Derived from Lower Duwamish Waterway Final Feasibility Study), MII (MII), O (Other), P (Previously Developed by Anchor QEA for Portland Harbor), and V (Vendor Quote)

Abbreviations:

QTY	Quantity	AC	Acres
EQUIP	Equipment	CLF	100 Linear Foot
MATL	Material	CY	Cubic Yard
HPF	HTRW Productivity Factor	DY	Days
ADJ LABOR	Adjusted Labor for HFP	EA	Each
ADJ EQUIP	Adjusted Equipment for HFP	FTE	Full Time Equivalent
UNMOD UC	Unmodified Unit Cost	HR	Hours
UNMOD LIC	Unmodified Line Item Cost	LB	Pounds
UNBUR LIC	Unburdened Line Item Cost	LCY	Loose Cubic Yard
PC OH	Prime Contractor Overhead	LF	Linear Foot
PC PF	Prime Contractor Profit	LS	Lump Sum
BUR LIC	Burdened Line Item Cost	MO	Month
		SF	Square Foot
		SY	Square Yard
		TON	Tons
		YR	Years

Cost Adjustment Checklist:	NOTES:
FACTOR:	Field work will be in Level "D" PPE.
H&S Productivity (labor and equipment only)	MII assembly costs include HPF adjustments.
Escalation to Base Year	2016 cost sources are not escalated (EF=1.00). All other costs are escalated based on the USACE CWCCIS, EM 1110-2-1304, Sept 2015.
Area Cost Factor	An AF of 1.05 is used for Oregon, except that an AF of 1.00 (national unmodified average) is used for MII assembly costs and local vendor quotes.
Subcontractor Overhead and Profit	It is assumed that home office OH is 8% and profit is 9% for the Prime Contractor. Professional labor overhead is 100%.
Prime Contractor Overhead and Profit	Allowances and items with mandated costs such as per diem do not have overhead and profit applied.
	Items previously developed by Anchor QEA already include contractor markups, therefore overhead and profit were not applied to those items.
	It is assumed that OH is 1% and profit is 0% for vendor quotes for treatment and disposal at offsite disposal facilities. It is assumed that OH is 5% and profit is 0% for quotes for all other material vendor quotes.
	Items developed using MII already include contractor markups such as overhead and profit, therefore additional overhead and profit were not applied in the PC OH and PC PF to those items.

TABLE CW-G2

Alternative G **Cost Worksheet:** **CW-G2**

Capital Cost Sub-Element

Initial Establishment of Institutional Controls

COST WORKSHEET

Site: Portland Harbor Superfund Site
Location: Portland, Oregon
Phase: Feasibility Study
Base Year: 2016

Prepared By: JN **Date:** 3/4/2016
Checked By: AB **Date:** 3/7/2016

Work Statement:
This sub-element involves implementation of institutional controls for the site. The following cost includes labor and materials to develop legal documents for institutional controls and cost for document submission and recording.
Quantity development presented in Appendix D.

Cost Analysis:
Cost for Initial Establishment of Institutional Controls (Lump Sum)

COST DATABASE CODE	DESCRIPTION	QTY	UNIT(S)	HPF	LABOR	ADJ LABOR	EQUIP	ADJ EQUIP	MATL	OTHER	UNMOD UC	UNMOD LIC	PC OH	PC PF	BUR LIC	COST SOURCE CITATION	COMMENTS
	Informational Devices - Fish Consumption Advisory																
L11	Project Manager	2,080	HR	1.00	$82.17	$82.17	$0.00	$0.00	$0.00	$0.00	$82.17	$170,913.60	100%	9%	$372,592	FLC FLCDataCenter	Assumes 1 FTE for implementation of fish advisory
L4	Environmental Engineer	1,040	HR	1.00	$48.91	$48.91	$0.00	$0.00	$0.00	$0.00	$48.91	$50,866.40	100%	9%	$110,889	FLC FLCDataCenter	Assumes 0.5 FTE for implementation of fish advisory
L6	Environmental Scientist	1,040	HR	1.00	$37.70	$37.70	$0.00	$0.00	$0.00	$0.00	$37.70	$39,208.00	100%	9%	$85,473	FLC FLCDataCenter	Assumes 0.5 FTE for implementation of fish advisory
L3	Clerks, Typist, Bookkeeper & Receptionist	520	HR	1.00	$19.89	$19.89	$0.00	$0.00	$0.00	$0.00	$19.89	$10,342.80	100%	9%	$22,547	FLC FLCDataCenter	Assumes 0.25 FTE for implementation of fish advisory
L5	Environmental Lawyer	260	HR	1.00	$71.72	$71.72	$0.00	$0.00	$0.00	$0.00	$71.72	$18,647.20	100%	9%	$40,651	FLC FLCDataCenter	Assumes 0.125 FTE for implementation of fish advisory
L13	Paralegal	260	HR	1.00	$29.56	$29.56	$0.00	$0.00	$0.00	$0.00	$29.56	$7,685.60	100%	9%	$16,755	FLC FLCDataCenter	Assumes 0.125 FTE for implementation of fish advisory
M26	Signage	50	EA	1.00	$0.00	$0.00	$0.00	$0.00	$165.75	$0.00	$165.75	$8,287.50	5%	0%	$8,702	V Vendor Quote	Project-specific vendor quote - Allstate Sign & Plaque, 2016. 36" x 36" Signs
L8	Field Technician	50	HR	1.00	$31.42	$31.42	$0.00	$0.00	$0.00	$0.00	$31.42	$1,571.00	100%	9%	$3,425	FLC FLCDataCenter	Assumes 1 hr/sign for sign placement (2 technician crew)
O5	Allowance for Production & Copies for Advisories	1	LS	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$1,000.00	$1,000.00	$1,000.00	0%	0%	$1,000	ALL Allowance	
	Informational Devices - Regulated Navigation Area (RNA) Setup																
L11	Project Manager	200	HR	1.00	$82.17	$82.17	$0.00	$0.00	$0.00	$0.00	$82.17	$16,434.00	100%	9%	$35,826	FLC FLCDataCenter	Project-specific unit cost developed by EPA.
L4	Environmental Engineer	150	HR	1.00	$48.91	$48.91	$0.00	$0.00	$0.00	$0.00	$48.91	$7,336.50	100%	9%	$15,994	FLC FLCDataCenter	Project-specific unit cost developed by EPA.
L3	Clerks, Typist, Bookkeeper & Receptionist	40	HR	1.00	$19.89	$19.89	$0.00	$0.00	$0.00	$0.00	$19.89	$795.60	100%	9%	$1,734	FLC FLCDataCenter	Project-specific unit cost developed by EPA.
A1	18' Boat	680	HR	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$25.42	$25.42	$17,285.60	0%	0%	$17,286	MII MII	Assumes 2 hr/buoy for buoy setup
L17	Boat Operator	680	HR	1.00	$33.16	$33.16	$0.00	$0.00	$0.00	$0.00	$33.16	$22,548.80	100%	9%	$49,156	FLC FLCDataCenter	Assumes 2 hr/buoy for buoy setup
L8	Field Technician	1,360	HR	1.00	$31.42	$31.42	$0.00	$0.00	$0.00	$0.00	$31.42	$42,731.20	100%	9%	$93,154	FLC FLCDataCenter	Assumes 4 hrs/buoy for buoy setup (2 technician crew)
M21	Buoy	340	EA	1.00	$0.00	$0.00	$0.00	$0.00	$558.63	$0.00	$558.63	$189,934.20	5%	0%	$199,431	V Vendor Quote	Project-specific vendor quote - Go2Marine, 2016.
	Proprietary Controls																
L5	Environmental Lawyer	8,700	HR	1.00	$71.72	$71.72	$0.00	$0.00	$0.00	$0.00	$71.72	$623,964.00	100%	9%	$1,360,242	FLC FLCDataCenter	Assumes 150 hrs per dock/structure
L13	Paralegal	11,600	HR	1.00	$29.56	$29.56	$0.00	$0.00	$0.00	$0.00	$29.56	$342,896.00	100%	9%	$747,513	FLC FLCDataCenter	Assumes 200 hrs per dock/structure
L3	Clerks, Typist, Bookkeeper & Receptionist	5,800	HR	1.00	$19.89	$19.89	$0.00	$0.00	$0.00	$0.00	$19.89	$115,362.00	100%	9%	$251,489	FLC FLCDataCenter	Assumes 100 hrs per dock/structure
	Enforcement Tools																
L11	Project Manager	260	HR	1.00	$82.17	$82.17	$0.00	$0.00	$0.00	$0.00	$82.17	$21,364.20	100%	9%	$46,574	FLC FLCDataCenter	Assumes 0.125 FTE for implementation of enforcement tools
L5	Environmental Lawyer	2,080	HR	1.00	$71.72	$71.72	$0.00	$0.00	$0.00	$0.00	$71.72	$149,177.60	100%	9%	$325,207	FLC FLCDataCenter	Assumes 1 FTE for implementation of enforcement tools
L13	Paralegal	4,160	HR	1.00	$29.56	$29.56	$0.00	$0.00	$0.00	$0.00	$29.56	$122,969.60	100%	9%	$268,074	FLC FLCDataCenter	Assumes 2 FTE for implementation of enforcement tools
L3	Clerks, Typist, Bookkeeper & Receptionist	260	HR	1.00	$19.89	$19.89	$0.00	$0.00	$0.00	$0.00	$19.89	$5,171.40	100%	9%	$11,274	FLC FLCDataCenter	Assumes 0.125 FTE for implementation of enforcement tools
												TOTAL COST:			$4,084,988		

	Representative Unit Quantity	Unit(s)	Total Cost	Unit Cost
COST WORKSHEET SUMMARY	1	LS	$4,084,988	$4,084,988

TABLE CW-G2

Alternative G **Cost Worksheet:** **CW-G2**
Capital Cost Sub-Element
Initial Establishment of Institutional Controls

COST WORKSHEET

Site: Portland Harbor Superfund Site
Location: Portland, Oregon
Phase: Feasibility Study
Base Year: 2016

Prepared By: JN **Date:** 3/4/2016
Checked By: AB **Date:** 3/7/2016

Notes:

Further information about the development of cost worksheets can be found in Attachment A - Methodology and Organization of Detailed Cost Estimates.
The quantity bolded in the QTY column is the quantity selected as the representative unit quantity for this cost worksheet. If multiple quantities are bolded, the representative unit quantity is the sum of those quantities. When the LS unit is utilized, the default representative unit quantity is 1.
HTRW productivity factor is from Exhibit B-3 or B-4 of "A Guide to Developing and Documenting Cost Estimates During the Feasibility Study", EPA 2000
EPA developed project-specific unit costs using the Micro Computer Aided Cost Engineering System (MCACES) Second Generation (MII) software version 4.2, build 3

Cost Database Code:

The Cost Database Code is a reference code for linking with line item cost information with the cost source database and is not otherwise used within these cost worksheets. The following cost source database prefixes apply:

L (EPA-Derived Labor Unit Costs), M (Project-Specific Vendor Unit Costs), P (Previously Developed Unit Costs by Anchor QEA for Portland Harbor), A (EPA-Derived MII Unit Costs), O (Unit Costs from Other Projects/Sources)

Source of Cost Data:

For citation references, the following sources apply:

ALL (Allowance), FLC (www.flcdatacenter.com), LD (Costs Derived from Lower Duwamish Waterway Final Feasibility Study), MII (MII), O (Other), P (Previously Developed by Anchor QEA for Portland Harbor), and V (Vendor Quote)

Abbreviations:

QTY	Quantity	AC	Acres
EQUIP	Equipment	CLF	100 Linear Foot
MATL	Material	CY	Cubic Yard
HPF	HTRW Productivity Factor	DY	Days
ADJ LABOR	Adjusted Labor for HFP	EA	Each
ADJ EQUIP	Adjusted Equipment for HFP	FTE	Full Time Equivalent
UNMOD UC	Unmodified Unit Cost	HR	Hours
UNMOD LIC	Unmodified Line Item Cost	LB	Pounds
UNBUR LIC	Unburdened Line Item Cost	LCY	Loose Cubic Yard
PC OH	Prime Contractor Overhead	LF	Linear Foot
PC PF	Prime Contractor Profit	LS	Lump Sum
BUR LIC	Burdened Line Item Cost	MO	Month
		SF	Square Foot
		SY	Square Yard
		TON	Tons
		YR	Years

Cost Adjustment Checklist:	**NOTES:**
FACTOR:	Field work will be in Level "D" PPE.
H&S Productivity (labor and equipment only)	MII assembly costs include HPF adjustments.
Escalation to Base Year	2016 cost sources are not escalated (EF=1.00). All other costs are escalated based on the USACE CWCCIS, EM 1110-2-1304, Sept 2015.
Area Cost Factor	An AF of 1.05 is used for Oregon, except that an AF of 1.00 (national unmodified average) is used for MII assembly costs and local vendor quotes.
Subcontractor Overhead and Profit	It is assumed that home office OH is 8% and profit is 9% for the Prime Contractor. Professional labor overhead is 100%.
Prime Contractor Overhead and Profit	Allowances and items with mandated costs such as per diem do not have overhead and profit applied.
	Items previously developed by Anchor QEA already include contractor markups, therefore overhead and profit were not applied to those items.
	It is assumed that OH is 1% and profit is 0% for vendor quotes for treatment and disposal at offsite disposal facilities. It is assumed that OH is 5% and profit is 0% for quotes for all other material vendor quotes.
	Items developed using MII already include contractor markups such as overhead and profit, therefore additional overhead and profit were not applied in the PC OH and PC PF to those items.

TABLE CW-G3

Alternative G **Cost Worksheet:** **CW-G3**

Periodic Cost Sub-Element

Evaluating and Updating Institutional Controls

COST WORKSHEET

Site: Portland Harbor Superfund Site
Location: Portland, Oregon
Phase: Feasibility Study
Base Year: 2016

Prepared By: JN **Date:** 3/4/2016
Checked By: AB **Date:** 3/7/2016

Work Statement:
This sub-element involves evaluating and updating of institutional controls for the site. The following cost includes labor and materials to required for evaluating and updating institutional controls every 5 years.
Quantity development presented in Appendix D.

Cost Analysis:
Cost for Evaluating and Updating Institutional Controls (Lump Sum)

COST DATABASE CODE	DESCRIPTION	QTY	UNIT(S)	HPF	LABOR	ADJ LABOR	EQUIP	ADJ EQUIP	MATL	OTHER	UNMOD UC	UNMOD LIC	PC OH	PC PF	BUR LIC	COST SOURCE CITATION	COMMENTS
	Informational Devices - Fish Consumption Advisory																
L11	Project Manager	208	HR	1.00	$82.17	$82.17	$0.00	$0.00	$0.00	$0.00	$82.17	$17,091.36	100%	9%	$37,259	FLC FLCDataCenter	Assumes 10% of initial costs for updating periodically
L4	Environmental Engineer	104	HR	1.00	$48.91	$48.91	$0.00	$0.00	$0.00	$0.00	$48.91	$5,086.64	100%	9%	$11,089	FLC FLCDataCenter	Assumes 10% of initial costs for updating periodically
L6	Environmental Scientist	104	HR	1.00	$37.70	$37.70	$0.00	$0.00	$0.00	$0.00	$37.70	$3,920.80	100%	9%	$8,547	FLC FLCDataCenter	Assumes 10% of initial costs for updating periodically
L3	Clerks, Typist, Bookkeeper & Receptionist	52	HR	1.00	$19.89	$19.89	$0.00	$0.00	$0.00	$0.00	$19.89	$1,034.28	100%	9%	$2,255	FLC FLCDataCenter	Assumes 10% of initial costs for updating periodically
L5	Environmental Lawyer	26	HR	1.00	$71.72	$71.72	$0.00	$0.00	$0.00	$0.00	$71.72	$1,864.72	100%	9%	$4,065	FLC FLCDataCenter	Assumes 10% of initial costs for updating periodically
L13	Paralegal	26	HR	1.00	$29.56	$29.56	$0.00	$0.00	$0.00	$0.00	$29.56	$768.56	100%	9%	$1,675	FLC FLCDataCenter	Assumes 10% of initial costs for updating periodically
M26	Signage	50	EA	1.00	$0.00	$0.00	$0.00	$0.00	$165.75	$0.00	$165.75	$8,287.50	5%	0%	$8,702	V Vendor Quote	Assumes 100% replacement of signs every 5 years
L8	Field Technician	50	HR	1.00	$31.42	$31.42	$0.00	$0.00	$0.00	$0.00	$31.42	$1,571.00	100%	9%	$3,425	FLC FLCDataCenter	Assumes 1 hr/sign for sign placement (2 technician crew)
O5	Allowance for Production & Copies for Advisories	5	LS	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$1,000.00	$1,000.00	$5,000.00	0%	0%	$5,000	ALL Allowance	Assumes yearly allowance for production and copies during 5-yr periodic updates
	Informational Devices - Regulated Navigation Area (RNA) Setup																
L11	Project Manager	200	HR	1.00	$82.17	$82.17	$0.00	$0.00	$0.00	$0.00	$82.17	$16,434.00	100%	9%	$35,826	FLC FLCDataCenter	Project-specific unit cost developed by EPA.
L4	Environmental Engineer	150	HR	1.00	$48.91	$48.91	$0.00	$0.00	$0.00	$0.00	$48.91	$7,336.50	100%	9%	$15,994	FLC FLCDataCenter	Project-specific unit cost developed by EPA.
L3	Clerks, Typist, Bookkeeper & Receptionist	40	HR	1.00	$19.89	$19.89	$0.00	$0.00	$0.00	$0.00	$19.89	$795.60	100%	9%	$1,734	FLC FLCDataCenter	Project-specific unit cost developed by EPA.
A1	18' Boat	680	HR	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$25.42	$25.42	$17,285.60	0%	0%	$17,286	MII MII	Assumes 2 hr/buoy for buoy setup
L17	Boat Operator	680	HR	1.00	$33.16	$33.16	$0.00	$0.00	$0.00	$0.00	$33.16	$22,548.80	100%	9%	$49,156	FLC FLCDataCenter	Assumes 2 hr/buoy for buoy setup
L8	Field Technician	1,360	HR	1.00	$31.42	$31.42	$0.00	$0.00	$0.00	$0.00	$31.42	$42,731.20	100%	9%	$93,154	FLC FLCDataCenter	Assumes 4 hrs/buoy for buoy setup (2 technician crew)
M21	Buoy	340	EA	1.00	$0.00	$0.00	$0.00	$0.00	$558.63	$0.00	$558.63	$189,934.20	5%	0%	$199,431	V Vendor Quote	Assumes 100% replacement of buoys every 5 years. Quote - Go2Marine 2016.
	Proprietary Controls																
L5	Environmental Lawyer	870	HR	1.00	$71.72	$71.72	$0.00	$0.00	$0.00	$0.00	$71.72	$62,396.40	100%	9%	$136,024	FLC FLCDataCenter	Assumes 10% of initial costs for updating periodically
L13	Paralegal	1,160	HR	1.00	$29.56	$29.56	$0.00	$0.00	$0.00	$0.00	$29.56	$34,289.60	100%	9%	$74,751	FLC FLCDataCenter	Assumes 10% of initial costs for updating periodically
L3	Clerks, Typist, Bookkeeper & Receptionist	580	HR	1.00	$19.89	$19.89	$0.00	$0.00	$0.00	$0.00	$19.89	$11,536.20	100%	9%	$25,149	FLC FLCDataCenter	Assumes 10% of initial costs for updating periodically
	Enforcement Tools																
L11	Project Manager	26	HR	1.00	$82.17	$82.17	$0.00	$0.00	$0.00	$0.00	$82.17	$2,136.42	100%	9%	$4,657	FLC FLCDataCenter	Assumes 10% of initial costs for updating periodically
L5	Environmental Lawyer	208	HR	1.00	$71.72	$71.72	$0.00	$0.00	$0.00	$0.00	$71.72	$14,917.76	100%	9%	$32,521	FLC FLCDataCenter	Assumes 10% of initial costs for updating periodically
L13	Paralegal	416	HR	1.00	$29.56	$29.56	$0.00	$0.00	$0.00	$0.00	$29.56	$12,296.96	100%	9%	$26,807	FLC FLCDataCenter	Assumes 10% of initial costs for updating periodically
L3	Clerks, Typist, Bookkeeper & Receptionist	26	HR	1.00	$19.89	$19.89	$0.00	$0.00	$0.00	$0.00	$19.89	$517.14	100%	9%	$1,127	FLC FLCDataCenter	Assumes 10% of initial costs for updating periodically
												TOTAL COST:			$795,634		

	Representative Unit Quantity	Unit(s)	Total Cost	Unit Cost
COST WORKSHEET SUMMARY	1	LS	$795,634	$795,634

TABLE CW-G3

Alternative G **Cost Worksheet:** **CW-G3**

Periodic Cost Sub-Element

Evaluating and Updating Institutional Controls

COST WORKSHEET

Site: Portland Harbor Superfund Site
Location: Portland, Oregon
Phase: Feasibility Study
Base Year: 2016

Prepared By: JN **Date:** 3/4/2016

Checked By: AB **Date:** 3/7/2016

Notes:

Further information about the development of cost worksheets can be found in Attachment A - Methodology and Organization of Detailed Cost Estimates.
The quantity bolded in the QTY column is the quantity selected as the representative unit quantity for this cost worksheet. If multiple quantities are bolded, the representative unit quantity is the sum of those quantities. When the LS unit is utilized, the default representative unit quantity is 1.
HTRW productivity factor is from Exhibit B-3 or B-4 of "A Guide to Developing and Documenting Cost Estimates During the Feasibility Study", EPA 2000
EPA developed project-specific unit costs using the Micro Computer Aided Cost Engineering System (MCACES) Second Generation (MII) software version 4.2, build 3

Cost Database Code:

The Cost Database Code is a reference code for linking with line item cost information with the cost source database and is not otherwise used within these cost worksheets. The following cost source database prefixes apply:

L (EPA-Derived Labor Unit Costs), M (Project-Specific Vendor Unit Costs), P (Previously Developed Unit Costs by Anchor QEA for Portland Harbor), A (EPA-Derived MII Unit Costs), O (Unit Costs from Other Projects/Sources)

Source of Cost Data:

For citation references, the following sources apply:

ALL (Allowance), FLC (www.flcdatacenter.com), LD (Costs Derived from Lower Duwamish Waterway Final Feasibility Study), MII (MII), O (Other), P (Previously Developed by Anchor QEA for Portland Harbor), and V (Vendor Quote)

Abbreviations:

QTY	Quantity	AC	Acres
EQUIP	Equipment	CLF	100 Linear Foot
MATL	Material	CY	Cubic Yard
HPF	HTRW Productivity Factor	DY	Days
ADJ LABOR	Adjusted Labor for HFP	EA	Each
ADJ EQUIP	Adjusted Equipment for HFP	FTE	Full Time Equivalent
UNMOD UC	Unmodified Unit Cost	HR	Hours
UNMOD LIC	Unmodified Line Item Cost	LB	Pounds
UNBUR LIC	Unburdened Line Item Cost	LCY	Loose Cubic Yard
PC OH	Prime Contractor Overhead	LF	Linear Foot
PC PF	Prime Contractor Profit	LS	Lump Sum
BUR LIC	Burdened Line Item Cost	MO	Month
		SF	Square Foot
		SY	Square Yard
		TON	Tons
		YR	Years

Cost Adjustment Checklist:	**NOTES:**
FACTOR:	Field work will be in Level "D" PPE.
H&S Productivity (labor and equipment only)	MII assembly costs include HPF adjustments.
Escalation to Base Year	2016 cost sources are not escalated (EF=1.00). All other costs are escalated based on the USACE CWCCIS, EM 1110-2-1304, Sept 2015.
Area Cost Factor	An AF of 1.05 is used for Oregon, except that an AF of 1.00 (national unmodified average) is used for MII assembly costs and local vendor quotes.
Subcontractor Overhead and Profit	It is assumed that home office OH is 8% and profit is 9% for the Prime Contractor. Professional labor overhead is 100%.
Prime Contractor Overhead and Profit	Allowances and items with mandated costs such as per diem do not have overhead and profit applied.
	Items previously developed by Anchor QEA already include contractor markups, therefore overhead and profit were not applied to those items.
	It is assumed that OH is 1% and profit is 0% for vendor quotes for treatment and disposal at offsite disposal facilities. It is assumed that OH is 5% and profit is 0% for quotes for all other material vendor quotes.
	Items developed using MII already include contractor markups such as overhead and profit, therefore additional overhead and profit were not applied in the PC OH and PC PF to those items.

TABLE CW-G5

Alternative G **Cost Worksheet:** **CW-G5**
Capital Cost Sub-Element
Debris Removal and Disposal

COST WORKSHEET

Site: Portland Harbor Superfund Site
Location: Portland, Oregon
Phase: Feasibility Study
Base Year: 2016

Prepared By: JN **Date:** 3/4/2016
Checked By: AB **Date:** 3/7/2016

Work Statement:
This sub-element involves removal and disposal of debris for all areas prior to remedial activities. It includes costs for on-site labor, equipment, and materials developed from previous work.
Quantity development presented in Appendix D.

Cost Analysis:
Cost for Debris Removal and Disposal (Lump Sum)

COST DATABASE CODE	DESCRIPTION	QTY	UNIT(S)	HPF	LABOR	ADJ LABOR	EQUIP	ADJ EQUIP	MATL	OTHER	UNMOD UC	UNMOD LIC	PC OH	PC PF	BUR LIC	COST SOURCE CITATION	COMMENTS
P9	Debris Removal and Disposal	**776**	AC	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$13,107.01	$13,107.01	$10,171,039.76	0%	0%	$10,171,040	P Anchor QEA	Project-specific cost developed by Anchor QEA (2010) - see Backup Table 2.
												TOTAL COST:			$10,171,040		

	Representative Unit Quantity	Unit(s)	Total Cost	Unit Cost
COST WORKSHEET SUMMARY	776	AC	$10,171,040	$13,107

Notes:
Further information about the development of cost worksheets can be found in Attachment A - Methodology and Organization of Detailed Cost Estimates.
The quantity bolded in the QTY column is the quantity selected as the representative unit quantity for this cost worksheet. If multiple quantities are bolded, the representative unit quantity is the sum of those quantities. When the LS unit is utilized, the default representative unit quantity is 1.
HTRW productivity factor is from Exhibit B-3 or B-4 of "A Guide to Developing and Documenting Cost Estimates During the Feasibility Study", EPA 2000
EPA developed project-specific unit costs using the Micro Computer Aided Cost Engineering System (MCACES) Second Generation (MII) software version 4.2, build 3

Cost Database Code:
The Cost Database Code is a reference code for linking with line item cost information with the cost source database and is not otherwise used within these cost worksheets. The following cost source database prefixes apply:
L (EPA-Derived Labor Unit Costs), M (Project-Specific Vendor Unit Costs), P (Previously Developed Unit Costs by Anchor QEA for Portland Harbor), A (EPA-Derived MII Unit Costs), O (Unit Costs from Other Projects/Sources)

Source of Cost Data:
For citation references, the following sources apply:
ALL (Allowance), FLC (www.flcdatacenter.com), LD (Costs Derived from Lower Duwamish Waterway Final Feasibility Study), MII (MII), O (Other), P (Previously Developed by Anchor QEA for Portland Harbor), and V (Vendor Quote)

Abbreviations:

QTY	Quantity	AC	Acres
EQUIP	Equipment	CLF	100 Linear Foot
MATL	Material	CY	Cubic Yard
HPF	HTRW Productivity Factor	DY	Days
ADJ LABOR	Adjusted Labor for HFP	EA	Each
ADJ EQUIP	Adjusted Equipment for HFP	FTE	Full Time Equivalent
UNMOD UC	Unmodified Unit Cost	HR	Hours
UNMOD LIC	Unmodified Line Item Cost	LB	Pounds
UNBUR LIC	Unburdened Line Item Cost	LCY	Loose Cubic Yard
PC OH	Prime Contractor Overhead	LF	Linear Foot
PC PF	Prime Contractor Profit	LS	Lump Sum
BUR LIC	Burdened Line Item Cost	MO	Month
		SF	Square Foot
		SY	Square Yard
		TON	Tons
		YR	Years

Cost Adjustment Checklist:	**NOTES:**
FACTOR:	Field work will be in Level "D" PPE.
H&S Productivity (labor and equipment only)	MII assembly costs include HPF adjustments.
Escalation to Base Year	2016 cost sources are not escalated (EF=1.00). All other costs are escalated based on the USACE CWCCIS, EM 1110-2-1304, Sept 2015.
Area Cost Factor	An AF of 1.05 is used for Oregon, except that an AF of 1.00 (national unmodified average) is used for MII assembly costs and local vendor quotes.
Subcontractor Overhead and Profit	It is assumed that home office OH is 8% and profit is 9% for the Prime Contractor. Professional labor overhead is 100%.
Prime Contractor Overhead and Profit	Allowances and items with mandated costs such as per diem do not have overhead and profit applied.
	Items previously developed by Anchor QEA already include contractor markups, therefore overhead and profit were not applied to those items.
	It is assumed that OH is 1% and profit is 0% for vendor quotes for treatment and disposal at offsite disposal facilities. It is assumed that OH is 5% and profit is 0% for quotes for all other material vendor quotes.
	Items developed using MII already include contractor markups such as overhead and profit, therefore additional overhead and profit were not applied in the PC OH and PC PF to those items.

TABLE CW-G6

Alternative G **Cost Worksheet:** **CW-G6**
Capital Cost Sub-Element
Obstruction Removal and Relocation

COST WORKSHEET

Site: Portland Harbor Superfund Site
Location: Portland, Oregon
Phase: Feasibility Study
Base Year: 2016

Prepared By: JN **Date:** 3/4/2016
Checked By: AB **Date:** 3/7/2016

Work Statement:
This sub-element involves all work related to obstructions removal, relocation, and disposal. It includes all costs for labor, equipment and materials developed from previous work for pile removal and disposal, pile replacement, and temporary dock relocation.
Quantity development presented in Appendix D.

Cost Analysis:
Cost for Obstructions (Lump Sum)

COST DATABASE CODE	DESCRIPTION	QTY	UNIT(S)	HPF	LABOR	ADJ LABOR	EQUIP	ADJ EQUIP	MATL	OTHER	UNMOD UC	UNMOD LIC	PC OH	PC PF	BUR LIC	COST SOURCE CITATION	COMMENTS
P10	Pile Removal and Disposal	2,640	EA	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$715.65	$715.65	$1,889,302.80	0%	0%	$1,889,303	P Anchor QEA	Project-specific cost developed by Anchor QEA (2010) - see Backup Table 3.
P11	Pile Replacement	2,640	EA	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$7,478.77	$7,478.77	$19,743,958.08	0%	0%	$19,743,958	P Anchor QEA	Project-specific cost developed by Anchor QEA (2010) - see Backup Table 4.
P12	Temporary Dock Relocation	10	EA	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$100,497.97	$100,497.97	$1,004,979.71	0%	0%	$1,004,980	P Anchor QEA	Project-specific cost developed by Anchor QEA (2010) - see Backup Table 5.
												TOTAL COST:			$22,638,241		

	Representative Unit Quantity	Unit(s)	Total Cost	Unit Cost
COST WORKSHEET SUMMARY	1	LS	$22,638,241	$22,638,241

Notes:
Further information about the development of cost worksheets can be found in Attachment A - Methodology and Organization of Detailed Cost Estimates.
The quantity bolded in the QTY column is the quantity selected as the representative unit quantity for this cost worksheet. If multiple quantities are bolded, the representative unit quantity is the sum of those quantities. When the LS unit is utilized, the default representative unit quantity is 1.
HTRW productivity factor is from Exhibit B-3 or B-4 of "A Guide to Developing and Documenting Cost Estimates During the Feasibility Study", EPA 2000
EPA developed project-specific unit costs using the Micro Computer Aided Cost Engineering System (MCACES) Second Generation (MII) software version 4.2, build 3

Cost Database Code:
The Cost Database Code is a reference code for linking with line item cost information with the cost source database and is not otherwise used within these cost worksheets. The following cost source database prefixes apply:
L (EPA-Derived Labor Unit Costs), M (Project-Specific Vendor Unit Costs), P (Previously Developed Unit Costs by Anchor QEA for Portland Harbor), A (EPA-Derived MII Unit Costs), O (Unit Costs from Other Projects/Sources)

Source of Cost Data:
For citation references, the following sources apply:
ALL (Allowance), FLC (www.flcdatacenter.com), LD (Costs Derived from Lower Duwamish Waterway Final Feasibility Study), MII (MII), O (Other), P (Previously Developed by Anchor QEA for Portland Harbor), and V (Vendor Quote)

Abbreviations:

QTY	Quantity	AC	Acres
EQUIP	Equipment	CLF	100 Linear Foot
MATL	Material	CY	Cubic Yard
HPF	HTRW Productivity Factor	DY	Days
ADJ LABOR	Adjusted Labor for HFP	EA	Each
ADJ EQUIP	Adjusted Equipment for HFP	FTE	Full Time Equivalent
UNMOD UC	Unmodified Unit Cost	HR	Hours
UNMOD LIC	Unmodified Line Item Cost	LB	Pounds
UNBUR LIC	Unburdened Line Item Cost	LCY	Loose Cubic Yard
PC OH	Prime Contractor Overhead	LF	Linear Foot
PC PF	Prime Contractor Profit	LS	Lump Sum
BUR LIC	Burdened Line Item Cost	MO	Month
		SF	Square Foot
		SY	Square Yard
		TON	Tons
		YR	Years

Cost Adjustment Checklist:	**NOTES:**
FACTOR:	Field work will be in Level "D" PPE.
H&S Productivity (labor and equipment only)	MII assembly costs include HPF adjustments.
Escalation to Base Year	2016 cost sources are not escalated (EF=1.00). All other costs are escalated based on the USACE CWCCIS, EM 1110-2-1304, Sept 2015.
Area Cost Factor	An AF of 1.05 is used for Oregon, except that an AF of 1.00 (national unmodified average) is used for MII assembly costs and local vendor quotes.
Subcontractor Overhead and Profit	It is assumed that home office OH is 8% and profit is 9% for the Prime Contractor. Professional labor overhead is 100%.
Prime Contractor Overhead and Profit	Allowances and items with mandated costs such as per diem do not have overhead and profit applied.
	Items previously developed by Anchor QEA already include contractor markups, therefore overhead and profit were not applied to those items.
	It is assumed that OH is 1% and profit is 0% for vendor quotes for treatment and disposal at offsite disposal facilities. It is assumed that OH is 5% and profit is 0% for quotes for all other material vendor quotes.
	Items developed using MII already include contractor markups such as overhead and profit, therefore additional overhead and profit were not applied in the PC OH and PC PF to those items.

TABLE CW-G7

Alternative G **Cost Worksheet:** **CW-G7**
Capital Cost Sub-Element
Erosion/Residual Control Measures

COST WORKSHEET

Site: Portland Harbor Superfund Site
Location: Portland, Oregon
Phase: Feasibility Study
Base Year: 2016

Prepared By: JN **Date:** 3/4/2016
Checked By: AB **Date:** 3/7/2016

Work Statement:
This sub-element involves the installation, maintainance, and removal of silt curtains and sheet pile walls for erosion and residual control. It includes costs for on-site labor, equipment, and materials developed from previous work.
Quantity development presented in Appendix D.

Cost Analysis:
Cost for Erosion/Residual Control Measures (Lump Sum)

COST DATABASE CODE	DESCRIPTION	QTY	UNIT(S)	HPF	LABOR	ADJ LABOR	EQUIP	ADJ EQUIP	MATL	OTHER	UNMOD UC	UNMOD LIC	PC OH	PC PF	BUR LIC	COST SOURCE CITATION	COMMENTS
P13	Purchase, Install and Maintain Silt Curtains	77,500	LF	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$96.92	$96.92	$7,511,455.00	0%	0%	$7,511,455	P Anchor QEA	Project-specific cost developed by Anchor QEA (2010) - see Backup Table 7.
P14	Purchase, Install and Remove Sheet Pile Walls	7,500	LF	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$2,749.88	$2,749.88	$20,624,100.00	0%	0%	$20,624,100	P Anchor QEA	Project-specific cost developed by Anchor QEA (2010) - see Backup Table 6.
												TOTAL COST:			$28,135,555		

	Representative Unit Quantity	Unit(s)	Total Cost	Unit Cost
COST WORKSHEET SUMMARY	1	LS	$28,135,555	$28,135,555

Notes:
Further information about the development of cost worksheets can be found in Attachment A - Methodology and Organization of Detailed Cost Estimates.
The quantity bolded in the QTY column is the quantity selected as the representative unit quantity for this cost worksheet. If multiple quantities are bolded, the representative unit quantity is the sum of those quantities. When the LS unit is utilized, the default representative unit quantity is 1.
HTRW productivity factor is from Exhibit B-3 or B-4 of "A Guide to Developing and Documenting Cost Estimates During the Feasibility Study", EPA 2000
EPA developed project-specific unit costs using the Micro Computer Aided Cost Engineering System (MCACES) Second Generation (MII) software version 4.2, build 3

Cost Database Code:
The Cost Database Code is a reference code for linking with line item cost information with the cost source database and is not otherwise used within these cost worksheets. The following cost source database prefixes apply:
L (EPA-Derived Labor Unit Costs), M (Project-Specific Vendor Unit Costs), P (Previously Developed Unit Costs by Anchor QEA for Portland Harbor), A (EPA-Derived MII Unit Costs), O (Unit Costs from Other Projects/Sources)

Source of Cost Data:
For citation references, the following sources apply:
ALL (Allowance), FLC (www.flcdatacenter.com), LD (Costs Derived from Lower Duwamish Waterway Final Feasibility Study), MII (MII), O (Other), P (Previously Developed by Anchor QEA for Portland Harbor), and V (Vendor Quote)

Abbreviations:

QTY	Quantity	AC	Acres
EQUIP	Equipment	CLF	100 Linear Foot
MATL	Material	CY	Cubic Yard
HPF	HTRW Productivity Factor	DY	Days
ADJ LABOR	Adjusted Labor for HFP	EA	Each
ADJ EQUIP	Adjusted Equipment for HFP	FTE	Full Time Equivalent
UNMOD UC	Unmodified Unit Cost	HR	Hours
UNMOD LIC	Unmodified Line Item Cost	LB	Pounds
UNBUR LIC	Unburdened Line Item Cost	LCY	Loose Cubic Yard
PC OH	Prime Contractor Overhead	LF	Linear Foot
PC PF	Prime Contractor Profit	LS	Lump Sum
BUR LIC	Burdened Line Item Cost	MO	Month
		SF	Square Foot
		SY	Square Yard
		TON	Tons
		YR	Years

Cost Adjustment Checklist:	NOTES:
FACTOR:	Field work will be in Level "D" PPE.
H&S Productivity (labor and equipment only)	MII assembly costs include HPF adjustments.
Escalation to Base Year	2016 cost sources are not escalated (EF=1.00). All other costs are escalated based on the USACE CWCCIS, EM 1110-2-1304, Sept 2015.
Area Cost Factor	An AF of 1.05 is used for Oregon, except that an AF of 1.00 (national unmodified average) is used for MII assembly costs and local vendor quotes.
Subcontractor Overhead and Profit	It is assumed that home office OH is 8% and profit is 9% for the Prime Contractor. Professional labor overhead is 100%.
Prime Contractor Overhead and Profit	Allowances and items with mandated costs such as per diem do not have overhead and profit applied.
	Items previously developed by Anchor QEA already include contractor markups, therefore overhead and profit were not applied to those items.
	It is assumed that OH is 1% and profit is 0% for vendor quotes for treatment and disposal at offsite disposal facilities. It is assumed that OH is 5% and profit is 0% for quotes for all other material vendor quotes.
	Items developed using MII already include contractor markups such as overhead and profit, therefore additional overhead and profit were not applied in the PC OH and PC PF to those items.

TABLE CW-G8

Alternative G **Cost Worksheet:** **CW-G8**
Capital Cost Sub-Element
Dredging of Contaminated Sediments (Open Water)

COST WORKSHEET

Site: Portland Harbor Superfund Site
Location: Portland, Oregon
Phase: Feasibility Study
Base Year: 2016

Prepared By: JN **Date:** 3/4/2016
Checked By: AB **Date:** 3/7/2016

Work Statement:
This sub-element involves mechanical dredging of contaminated sediments in open water areas and transport to dewatering/stabilization area. It includes costs for on-site labor, equipment, and materials for open water dredging, assuming a 10 CY barge mounted crane and clamshell.
Quantity development presented in Appendix D.

Cost Analysis:
Cost for Open Water Dredging (Lump Sum)

COST DATABASE CODE	DESCRIPTION	QTY	UNIT(S)	HPF	LABOR	ADJ LABOR	EQUIP	ADJ EQUIP	MATL	OTHER	UNMOD UC	UNMOD LIC	PC OH	PC PF	BUR LIC	COST SOURCE CITATION	COMMENTS
A6	Open Water Dredging	**7,110,364**	CY	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$24.53	$24.53	$174,417,228.92	0%	0%	$174,417,229	MII MII	Project-specific unit cost developed in MII.
												TOTAL COST:			$174,417,229		

	Representative Unit Quantity	Unit(s)	Total Cost	Unit Cost
COST WORKSHEET SUMMARY	7,110,364	CY	$174,417,229	$24.53

Notes:
Further information about the development of cost worksheets can be found in Attachment A - Methodology and Organization of Detailed Cost Estimates.
The quantity bolded in the QTY column is the quantity selected as the representative unit quantity for this cost worksheet. If multiple quantities are bolded, the representative unit quantity is the sum of those quantities. When the LS unit is utilized, the default representative unit quantity is 1.
HTRW productivity factor is from Exhibit B-3 or B-4 of "A Guide to Developing and Documenting Cost Estimates During the Feasibility Study", EPA 2000
EPA developed project-specific unit costs using the Micro Computer Aided Cost Engineering System (MCACES) Second Generation (MII) software version 4.2, build 3

Cost Database Code:
The Cost Database Code is a reference code for linking with line item cost information with the cost source database and is not otherwise used within these cost worksheets. The following cost source database prefixes apply:
L (EPA-Derived Labor Unit Costs), M (Project-Specific Vendor Unit Costs), P (Previously Developed Unit Costs by Anchor QEA for Portland Harbor), A (EPA-Derived MII Unit Costs), O (Unit Costs from Other Projects/Sources)

Source of Cost Data:
For citation references, the following sources apply:
ALL (Allowance), FLC (www.flcdatacenter.com), LD (Costs Derived from Lower Duwamish Waterway Final Feasibility Study), MII (MII), O (Other), P (Previously Developed by Anchor QEA for Portland Harbor), and V (Vendor Quote)

Abbreviations:

QTY	Quantity	AC	Acres
EQUIP	Equipment	CLF	100 Linear Foot
MATL	Material	CY	Cubic Yard
HPF	HTRW Productivity Factor	DY	Days
ADJ LABOR	Adjusted Labor for HFP	EA	Each
ADJ EQUIP	Adjusted Equipment for HFP	FTE	Full Time Equivalent
UNMOD UC	Unmodified Unit Cost	HR	Hours
UNMOD LIC	Unmodified Line Item Cost	LB	Pounds
UNBUR LIC	Unburdened Line Item Cost	LCY	Loose Cubic Yard
PC OH	Prime Contractor Overhead	LF	Linear Foot
PC PF	Prime Contractor Profit	LS	Lump Sum
BUR LIC	Burdened Line Item Cost	MO	Month
		SF	Square Foot
		SY	Square Yard
		TON	Tons
		YR	Years

Cost Adjustment Checklist:	**NOTES:**
FACTOR:	Field work will be in Level "D" PPE.
H&S Productivity (labor and equipment only)	MII assembly costs include HPF adjustments.
Escalation to Base Year	2016 cost sources are not escalated (EF=1.00). All other costs are escalated based on the USACE CWCCIS, EM 1110-2-1304, Sept 2015.
Area Cost Factor	An AF of 1.05 is used for Oregon, except that an AF of 1.00 (national unmodified average) is used for MII assembly costs and local vendor quotes.
Subcontractor Overhead and Profit	It is assumed that home office OH is 8% and profit is 9% for the Prime Contractor. Professional labor overhead is 100%.
Prime Contractor Overhead and Profit	Allowances and items with mandated costs such as per diem do not have overhead and profit applied.
	Items previously developed by Anchor QEA already include contractor markups, therefore overhead and profit were not applied to those items.
	It is assumed that OH is 1% and profit is 0% for vendor quotes for treatment and disposal at offsite disposal facilities. It is assumed that OH is 5% and profit is 0% for quotes for all other material vendor quotes.
	Items developed using MII already include contractor markups such as overhead and profit, therefore additional overhead and profit were not applied in the PC OH and PC PF to those items.

TABLE CW-G9

Alternative G **Cost Worksheet:** **CW-G9**
Capital Cost Sub-Element
Dredging of Contaminated Sediments (Confined)

COST WORKSHEET

Site: Portland Harbor Superfund Site
Location: Portland, Oregon
Phase: Feasibility Study
Base Year: 2016

Prepared By: JN **Date:** 3/4/2016
Checked By: AB **Date:** 3/7/2016

Work Statement:
This sub-element involves mechanical dredging of contaminated sediments in confined areas and transport to dewatering/stabilization area. It includes costs for on-site labor, equipment, and materials for confined dredging, assuming a 4 CY barge mounted excavator.
Quantity development presented in Appendix D.

Cost Analysis:
Cost for Confined Dredging (Lump Sum)

COST DATABASE CODE	DESCRIPTION	QTY	UNIT(S)	HPF	LABOR	ADJ LABOR	EQUIP	ADJ EQUIP	MATL	OTHER	UNMOD UC	UNMOD LIC	PC OH	PC PF	BUR LIC	COST SOURCE CITATION	COMMENTS
A7	Confined Dredging	**147,293**	CY	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$31.10	$31.10	$4,580,812.30	0%	0%	$4,580,812	MII MII	Project-specific unit cost developed in MII.
												TOTAL COST:			$4,580,812		

	Representative Unit Quantity	Unit(s)	Total Cost	Unit Cost
COST WORKSHEET SUMMARY	147,293	CY	$4,580,812	$31.10

Notes:
Further information about the development of cost worksheets can be found in Attachment A - Methodology and Organization of Detailed Cost Estimates.
The quantity bolded in the QTY column is the quantity selected as the representative unit quantity for this cost worksheet. If multiple quantities are bolded, the representative unit quantity is the sum of those quantities. When the LS unit is utilized, the default representative unit quantity is 1.
HTRW productivity factor is from Exhibit B-3 or B-4 of "A Guide to Developing and Documenting Cost Estimates During the Feasibility Study", EPA 2000
EPA developed project-specific unit costs using the Micro Computer Aided Cost Engineering System (MCACES) Second Generation (MII) software version 4.2, build 3

Cost Database Code:
The Cost Database Code is a reference code for linking with line item cost information with the cost source database and is not otherwise used within these cost worksheets. The following cost source database prefixes apply:
L (EPA-Derived Labor Unit Costs), M (Project-Specific Vendor Unit Costs), P (Previously Developed Unit Costs by Anchor QEA for Portland Harbor), A (EPA-Derived MII Unit Costs), O (Unit Costs from Other Projects/Sources)

Source of Cost Data:
For citation references, the following sources apply:
ALL (Allowance), FLC (www.flcdatacenter.com), LD (Costs Derived from Lower Duwamish Waterway Final Feasibility Study), MII (MII), O (Other), P (Previously Developed by Anchor QEA for Portland Harbor), and V (Vendor Quote)

Abbreviations:

QTY	Quantity	AC	Acres
EQUIP	Equipment	CLF	100 Linear Foot
MATL	Material	CY	Cubic Yard
HPF	HTRW Productivity Factor	DY	Days
ADJ LABOR	Adjusted Labor for HFP	EA	Each
ADJ EQUIP	Adjusted Equipment for HFP	FTE	Full Time Equivalent
UNMOD UC	Unmodified Unit Cost	HR	Hours
UNMOD LIC	Unmodified Line Item Cost	LB	Pounds
UNBUR LIC	Unburdened Line Item Cost	LCY	Loose Cubic Yard
PC OH	Prime Contractor Overhead	LF	Linear Foot
PC PF	Prime Contractor Profit	LS	Lump Sum
BUR LIC	Burdened Line Item Cost	MO	Month
		SF	Square Foot
		SY	Square Yard
		TON	Tons
		YR	Years

Cost Adjustment Checklist:	**NOTES:**
FACTOR:	Field work will be in Level "D" PPE.
H&S Productivity (labor and equipment only)	MII assembly costs include HPF adjustments.
Escalation to Base Year	2016 cost sources are not escalated (EF=1.00). All other costs are escalated based on the USACE CWCCIS, EM 1110-2-1304, Sept 2015.
Area Cost Factor	An AF of 1.05 is used for Oregon, except that an AF of 1.00 (national unmodified average) is used for MII assembly costs and local vendor quotes.
Subcontractor Overhead and Profit	It is assumed that home office OH is 8% and profit is 9% for the Prime Contractor. Professional labor overhead is 100%.
Prime Contractor Overhead and Profit	Allowances and items with mandated costs such as per diem do not have overhead and profit applied.
	Items previously developed by Anchor QEA already include contractor markups, therefore overhead and profit were not applied to those items.
	It is assumed that OH is 1% and profit is 0% for vendor quotes for treatment and disposal at offsite disposal facilities. It is assumed that OH is 5% and profit is 0% for quotes for all other material vendor quotes.
	Items developed using MII already include contractor markups such as overhead and profit, therefore additional overhead and profit were not applied in the PC OH and PC PF to those items.

TABLE CW-G10

Alternative G
Capital Cost Sub-Element
Excavation of Riverbanks

Cost Worksheet: **CW-G10**

COST WORKSHEET

Site: Portland Harbor Superfund Site
Location: Portland, Oregon
Phase: Feasibility Study
Base Year: 2016

Prepared By: JN **Date:** 3/4/2016
Checked By: AB **Date:** 3/7/2016

Work Statement:
This sub-element involves mechanical excavation of riverbank materials and transport to dewatering/stabilization area. It includes costs for on-site labor, equipment, and materials for riverbank excavation, assuming a 4 CY long-arm excavator.
Quantity development presented in Appendix D.

Cost Analysis:
Cost for Excavation from Shore for Riverbanks (Lump Sum)

COST DATABASE CODE	DESCRIPTION	QTY	UNIT(S)	HPF	LABOR	ADJ LABOR	EQUIP	ADJ EQUIP	MATL	OTHER	UNMOD UC	UNMOD LIC	PC OH	PC PF	BUR LIC	COST SOURCE CITATION	COMMENTS
A8	Riverbank Excavation	**138,942**	CY	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$5.19	$5.19	$721,106.56	0%	0%	$721,107	MII MII	Project-specific unit cost developed in MII.
												TOTAL COST:			$721,107		

	Representative Unit Quantity	Unit(s)	Total Cost	Unit Cost
COST WORKSHEET SUMMARY	138,942	CY	$721,107	$5.19

Notes:
Further information about the development of cost worksheets can be found in Attachment A - Methodology and Organization of Detailed Cost Estimates.
The quantity bolded in the QTY column is the quantity selected as the representative unit quantity for this cost worksheet. If multiple quantities are bolded, the representative unit quantity is the sum of those quantities. When the LS unit is utilized, the default representative unit quantity is 1.
HTRW productivity factor is from Exhibit B-3 or B-4 of "A Guide to Developing and Documenting Cost Estimates During the Feasibility Study", EPA 2000
EPA developed project-specific unit costs using the Micro Computer Aided Cost Engineering System (MCACES) Second Generation (MII) software version 4.2, build 3

Cost Database Code:
The Cost Database Code is a reference code for linking with line item cost information with the cost source database and is not otherwise used within these cost worksheets. The following cost source database prefixes apply:
L (EPA-Derived Labor Unit Costs), M (Project-Specific Vendor Unit Costs), P (Previously Developed Unit Costs by Anchor QEA for Portland Harbor), A (EPA-Derived MII Unit Costs), O (Unit Costs from Other Projects/Sources)

Source of Cost Data:
For citation references, the following sources apply:
ALL (Allowance), FLC (www.flcdatacenter.com), LD (Costs Derived from Lower Duwamish Waterway Final Feasibility Study), MII (MII), O (Other), P (Previously Developed by Anchor QEA for Portland Harbor), and V (Vendor Quote)

Abbreviations:

QTY	Quantity	AC	Acres
EQUIP	Equipment	CLF	100 Linear Foot
MATL	Material	CY	Cubic Yard
HPF	HTRW Productivity Factor	DY	Days
ADJ LABOR	Adjusted Labor for HFP	EA	Each
ADJ EQUIP	Adjusted Equipment for HFP	FTE	Full Time Equivalent
UNMOD UC	Unmodified Unit Cost	HR	Hours
UNMOD LIC	Unmodified Line Item Cost	LB	Pounds
UNBUR LIC	Unburdened Line Item Cost	LCY	Loose Cubic Yard
PC OH	Prime Contractor Overhead	LF	Linear Foot
PC PF	Prime Contractor Profit	LS	Lump Sum
BUR LIC	Burdened Line Item Cost	MO	Month
		SF	Square Foot
		SY	Square Yard
		TON	Tons
		YR	Years

Cost Adjustment Checklist:	**NOTES:**
FACTOR:	Field work will be in Level "D" PPE.
H&S Productivity (labor and equipment only)	MII assembly costs include HPF adjustments.
Escalation to Base Year	2016 cost sources are not escalated (EF=1.00). All other costs are escalated based on the USACE CWCCIS, EM 1110-2-1304, Sept 2015.
Area Cost Factor	An AF of 1.05 is used for Oregon, except that an AF of 1.00 (national unmodified average) is used for MII assembly costs and local vendor quotes.
Subcontractor Overhead and Profit	It is assumed that home office OH is 8% and profit is 9% for the Prime Contractor. Professional labor overhead is 100%.
Prime Contractor Overhead and Profit	Allowances and items with mandated costs such as per diem do not have overhead and profit applied.
	Items previously developed by Anchor QEA already include contractor markups, therefore overhead and profit were not applied to those items.
	It is assumed that OH is 1% and profit is 0% for vendor quotes for treatment and disposal at offsite disposal facilities. It is assumed that OH is 5% and profit is 0% for quotes for all other material vendor quotes.
	Items developed using MII already include contractor markups such as overhead and profit, therefore additional overhead and profit were not applied in the PC OH and PC PF to those items.

TABLE CW-G11

Alternative G **Cost Worksheet:** **CW-G11**
Capital Cost Sub-Element
Dewatering and Water Treatment for Dredging Operations

COST WORKSHEET

Site: Portland Harbor Superfund Site
Location: Portland, Oregon
Phase: Feasibility Study
Base Year: 2016

Prepared By: JN **Date:** 3/4/2016
Checked By: AB **Date:** 3/7/2016

Work Statement:
This sub-element involves the dewatering and water treatment for dredging operations. Assumes a temporary water treatment plant will be utilized for treatment of water generated from dewatering of sediments. It includes costs for labor, equipment, and materials for treatment of water generated from dredged sediments. Quantity development presented in Appendix D.

Cost Analysis:
Cost for Dewatering and Water Treatment for Dredging Operations (Lump Sum)

COST DATABASE CODE	DESCRIPTION	QTY	UNIT(S)	HPF	LABOR	ADJ LABOR	EQUIP	ADJ EQUIP	MATL	OTHER	UNMOD UC	UNMOD LIC	PC OH	PC PF	BUR LIC	COST SOURCE CITATION	COMMENTS
A9	Mobilization/Demobilization of Temporary Water Treatment System	19	EA	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$36,600.00	$36,600.00	$695,400.00	0%	0%	$695,400	MII MII	Project-specific unit cost developed in MII. Assumes mob/demob of treatment system will be required for each construction season
A10	Dewatering and Temporary Water Treatment System Operations	1,423	DY	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$21,654.00	$21,654.00	$30,815,807.40	0%	0%	$30,815,807	MII MII	Project-specific unit cost developed in MII.
												TOTAL COST:			$31,511,207		

	Representative Unit Quantity	Unit(s)	Total Cost	Unit Cost
COST WORKSHEET SUMMARY	1	LS	$31,511,207	$31,511,207

Notes:
Further information about the development of cost worksheets can be found in Attachment A - Methodology and Organization of Detailed Cost Estimates.
The quantity bolded in the QTY column is the quantity selected as the representative unit quantity for this cost worksheet. If multiple quantities are bolded, the representative unit quantity is the sum of those quantities. When the LS unit is utilized, the default representative unit quantity is 1.
HTRW productivity factor is from Exhibit B-3 or B-4 of "A Guide to Developing and Documenting Cost Estimates During the Feasibility Study", EPA 2000
EPA developed project-specific unit costs using the Micro Computer Aided Cost Engineering System (MCACES) Second Generation (MII) software version 4.2, build 3

Cost Database Code:
The Cost Database Code is a reference code for linking with line item cost information with the cost source database and is not otherwise used within these cost worksheets. The following cost source database prefixes apply:
L (EPA-Derived Labor Unit Costs), M (Project-Specific Vendor Unit Costs), P (Previously Developed Unit Costs by Anchor QEA for Portland Harbor), A (EPA-Derived MII Unit Costs), O (Unit Costs from Other Projects/Sources)

Source of Cost Data:
For citation references, the following sources apply:
ALL (Allowance), FLC (www.flcdatacenter.com), LD (Costs Derived from Lower Duwamish Waterway Final Feasibility Study), MII (MII), O (Other), P (Previously Developed by Anchor QEA for Portland Harbor), and V (Vendor Quote)

Abbreviations:

QTY	Quantity	AC	Acres
EQUIP	Equipment	CLF	100 Linear Foot
MATL	Material	CY	Cubic Yard
HPF	HTRW Productivity Factor	DY	Days
ADJ LABOR	Adjusted Labor for HFP	EA	Each
ADJ EQUIP	Adjusted Equipment for HFP	FTE	Full Time Equivalent
UNMOD UC	Unmodified Unit Cost	HR	Hours
UNMOD LIC	Unmodified Line Item Cost	LB	Pounds
UNBUR LIC	Unburdened Line Item Cost	LCY	Loose Cubic Yard
PC OH	Prime Contractor Overhead	LF	Linear Foot
PC PF	Prime Contractor Profit	LS	Lump Sum
BUR LIC	Burdened Line Item Cost	MO	Month
		SF	Square Foot
		SY	Square Yard
		TON	Tons
		YR	Years

Cost Adjustment Checklist:	**NOTES:**
FACTOR:	Field work will be in Level "D" PPE.
H&S Productivity (labor and equipment only)	MII assembly costs include HPF adjustments.
Escalation to Base Year	2016 cost sources are not escalated (EF=1.00). All other costs are escalated based on the USACE CWCCIS, EM 1110-2-1304, Sept 2015.
Area Cost Factor	An AF of 1.05 is used for Oregon, except that an AF of 1.00 (national unmodified average) is used for MII assembly costs and local vendor quotes.
Subcontractor Overhead and Profit	It is assumed that home office OH is 8% and profit is 9% for the Prime Contractor. Professional labor overhead is 100%.
Prime Contractor Overhead and Profit	Allowances and items with mandated costs such as per diem do not have overhead and profit applied.
	Items previously developed by Anchor QEA already include contractor markups, therefore overhead and profit were not applied to those items.
	It is assumed that OH is 1% and profit is 0% for vendor quotes for treatment and disposal at offsite disposal facilities. It is assumed that OH is 5% and profit is 0% for quotes for all other material vendor quotes.
	Items developed using MII already include contractor markups such as overhead and profit, therefore additional overhead and profit were not applied in the PC OH and PC PF to those items.

TABLE CW-G12

Alternative G **Cost Worksheet:** **CW-G12**

Capital Cost Sub-Element

Subtitle C/TSCA Disposal (Handling, Transportation, Treatment of Select PTW Materials, and Disposal)

COST WORKSHEET

Site: Portland Harbor Superfund Site
Location: Portland, Oregon
Phase: Feasibility Study
Base Year: 2016

Prepared By: JN **Date:** 5/20/2016
Checked By: AB **Date:** 5/23/2016

Work Statement:
This sub-element involves the disposal of contaminated sediments at a Subtitle C/TSCA landfill, including in-barge mixing of amendments, barge transportation of materials to a transload facility, materials handling from the barge to truck, transportation of the sediments to the Subtitle C/TSCA landfill, and disposal of contaminated sediments (including thermal treatment at the landfill facility for a portion of the volume). It includes costs for labor, equipment, and materials as well as recent vendor quotes. Costs for development of a transload facility are included in a separate cost worksheet.
Quantity development presented in Appendix D.

Cost Analysis:
Cost for Subtitle C/TSCA Disposal (Lump Sum)

COST DATABASE CODE	DESCRIPTION	QTY	UNIT(S)	HPF	LABOR	ADJ LABOR	EQUIP	ADJ EQUIP	MATL	OTHER	UNMOD UC	UNMOD LIC	PC OH	PC PF	BUR LIC	COST SOURCE CITATION	COMMENTS
Area 6W NRC/NAPL PTW																	
	Transportation																
A13	Barging to Transload Facility	218,332	CY	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$13.66	$13.66	$2,982,415.12	0%	0%	$2,982,415	MII MII	Project-specific unit cost developed in MII.
A5	Hauling Waste from Transload Facility to Landfill	218,332	CY	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$16.70	$16.70	$3,646,144.40	0%	0%	$3,646,144	MII MII	Project-specific unit cost developed in MII.
	Materials Handling at Transload Facility																
A14	Offloading of Sediments	218,332	CY	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$9.70	$9.70	$2,117,820.40	0%	0%	$2,117,820	MII MII	Project-specific unit cost developed in MII. Assumes mechanical offloading of sediments at the transload facility.
A4	Loading Trucks at Transload Facility	218,332	CY	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$2.68	$2.68	$585,129.76	0%	0%	$585,130	MII MII	Project-specific unit cost developed in MII.
	Treatment																
A11	In-Barge Stabilization / Mixing of Amendments	218,332	CY	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$24.50	$24.50	$5,349,134.00	0%	0%	$5,349,134	MII MII	Project-specific unit cost developed in MII.
P5	Diatomaceous Earth	12,655	TON	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$105.94	$105.94	$1,340,670.70	0%	0%	$1,340,671	P Anchor QEA	Project-specific cost developed by Anchor QEA (2010) - see Backup Table 24.
M25	Quicklime	17,463	TON	1.00	$0.00	$0.00	$0.00	$0.00	$239.00	$0.00	$239.00	$4,173,657.00	5%	0%	$4,382,340	V Vendor Quote	Project-specific vendor quote - Graymont, 2016.
A2	Hauling - Quicklime to Site	17,463	TON	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$5.71	$5.71	$99,713.73	0%	0%	$99,714	MII MII	Project-specific unit cost developed in MII. Assumes 10 mile one-way haul.
	Disposal at Subtitle C/TSCA Landfill																
M10	Tipping Fee at Subtitle C/TSCA Landfill	**283,209**	TON	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$86.19	$86.19	$24,409,783.71	1%	0%	$24,653,882	V Vendor Quote	Project-specific vendor quote - CWM of the Northwest, 2015.
Area 7W NRC/NAPL PTW																	
	Transportation																
A13	Barging to Transload Facility	66,633	CY	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$13.66	$13.66	$910,206.78	0%	0%	$910,207	MII MII	Project-specific unit cost developed in MII.
A5	Hauling Waste from Transload Facility to Landfill	66,633	CY	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$16.70	$16.70	$1,112,771.10	0%	0%	$1,112,771	MII MII	Project-specific unit cost developed in MII.
	Materials Handling at Transload Facility																
A14	Offloading of Sediments	66,633	CY	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$9.70	$9.70	$646,340.10	0%	0%	$646,340	MII MII	Project-specific unit cost developed in MII. Assumes mechanical offloading of sediments at the transload facility.
A4	Loading Trucks at Transload Facility	66,633	CY	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$2.68	$2.68	$178,576.44	0%	0%	$178,576	MII MII	Project-specific unit cost developed in MII.
	Treatment																
A11	In-Barge Stabilization / Mixing of Amendments	66,633	CY	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$24.50	$24.50	$1,632,508.50	0%	0%	$1,632,509	MII MII	Project-specific unit cost developed in MII.
P5	Diatomaceous Earth	5,700	TON	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$105.94	$105.94	$603,858.00	0%	0%	$603,858	P Anchor QEA	Project-specific cost developed by Anchor QEA (2010) - see Backup Table 24.
M25	Quicklime	1,573	TON	1.00	$0.00	$0.00	$0.00	$0.00	$239.00	$0.00	$239.00	$375,947.00	5%	0%	$394,744	V Vendor Quote	Project-specific vendor quote - Graymont, 2016.
A2	Hauling - Quicklime to Site	1,573	TON	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$5.71	$5.71	$8,981.83	0%	0%	$8,982	MII MII	Project-specific unit cost developed in MII. Assumes 10 mile one-way haul.
M20	Thermal Desorption Treatment at Subtitle C/TSCA Landfill (Low End of Treatment Cost Range)	12,541	TON	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$319.41	$319.41	$4,005,720.81	1%	0%	$4,045,778	V Vendor Quote	Project-specific vendor quote - CWM of the Northwest, 2015.
M9	Thermal Desorption Treatment at Subtitle C/TSCA Landfill (High End of Treatment Cost Range)	12,541	TON	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$572.91	$572.91	$7,184,864.31	1%	0%	$7,256,713	V Vendor Quote	Project-specific vendor quote - CWM of the Northwest, 2015.
	Disposal at Subtitle C/TSCA Landfill																
M10	Tipping Fee at Subtitle C/TSCA Landfill	**75,679**	TON	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$86.19	$86.19	$6,522,773.01	1%	0%	$6,588,001	V Vendor Quote	Project-specific vendor quote - CWM of the Northwest, 2015.
												TOTAL COST:			$68,535,729		

	Representative Unit Quantity	Unit(s)	Total Cost	Unit Cost
COST WORKSHEET SUMMARY	358,888	TON	$68,535,729	$191

TABLE CW-G12

Alternative G **Cost Worksheet:** **CW-G12**

Capital Cost Sub-Element

Subtitle C/TSCA Disposal (Handling, Transportation, Treatment of Select PTW Materials, and Disposal)

COST WORKSHEET

Site: Portland Harbor Superfund Site
Location: Portland, Oregon
Phase: Feasibility Study
Base Year: 2016

Prepared By: JN **Date:** 5/20/2016
Checked By: AB **Date:** 5/23/2016

Notes:

Further information about the development of cost worksheets can be found in Attachment A - Methodology and Organization of Detailed Cost Estimates.
The quantity bolded in the QTY column is the quantity selected as the representative unit quantity for this cost worksheet. If multiple quantities are bolded, the representative unit quantity is the sum of those quantities. When the LS unit is utilized, the default representative unit quantity is 1.
HTRW productivity factor is from Exhibit B-3 or B-4 of "A Guide to Developing and Documenting Cost Estimates During the Feasibility Study", EPA 2000
EPA developed project-specific unit costs using the Micro Computer Aided Cost Engineering System (MCACES) Second Generation (MII) software version 4.2, build 3

Cost Database Code:

The Cost Database Code is a reference code for linking with line item cost information with the cost source database and is not otherwise used within these cost worksheets. The following cost source database prefixes apply:

L (EPA-Derived Labor Unit Costs), M (Project-Specific Vendor Unit Costs), P (Previously Developed Unit Costs by Anchor QEA for Portland Harbor), A (EPA-Derived MII Unit Costs), O (Unit Costs from Other Projects/Sources)

Source of Cost Data:

For citation references, the following sources apply:

ALL (Allowance), FLC (www.flcdatacenter.com), LD (Costs Derived from Lower Duwamish Waterway Final Feasibility Study), MII (MII), O (Other), P (Previously Developed by Anchor QEA for Portland Harbor), and V (Vendor Quote)

Abbreviations:

QTY	Quantity	AC	Acres
EQUIP	Equipment	CLF	100 Linear Foot
MATL	Material	CY	Cubic Yard
HPF	HTRW Productivity Factor	DY	Days
ADJ LABOR	Adjusted Labor for HFP	EA	Each
ADJ EQUIP	Adjusted Equipment for HFP	FTE	Full Time Equivalent
UNMOD UC	Unmodified Unit Cost	HR	Hours
UNMOD LIC	Unmodified Line Item Cost	LB	Pounds
UNBUR LIC	Unburdened Line Item Cost	LCY	Loose Cubic Yard
PC OH	Prime Contractor Overhead	LF	Linear Foot
PC PF	Prime Contractor Profit	LS	Lump Sum
BUR LIC	Burdened Line Item Cost	MO	Month
		SF	Square Foot
		SY	Square Yard
		TON	Tons
		YR	Years

Cost Adjustment Checklist:	**NOTES:**
FACTOR:	Field work will be in Level "D" PPE.
H&S Productivity (labor and equipment only)	MII assembly costs include HPF adjustments.
Escalation to Base Year	2016 cost sources are not escalated (EF=1.00). All other costs are escalated based on the USACE CWCCIS, EM 1110-2-1304, Sept 2015.
Area Cost Factor	An AF of 1.05 is used for Oregon, except that an AF of 1.00 (national unmodified average) is used for MII assembly costs and local vendor quotes.
Subcontractor Overhead and Profit	It is assumed that home office OH is 8% and profit is 9% for the Prime Contractor. Professional labor overhead is 100%.
Prime Contractor Overhead and Profit	Allowances and items with mandated costs such as per diem do not have overhead and profit applied.
	Items previously developed by Anchor QEA already include contractor markups, therefore overhead and profit were not applied to those items.
	It is assumed that OH is 1% and profit is 0% for vendor quotes for treatment and disposal at offsite disposal facilities. It is assumed that OH is 5% and profit is 0% for quotes for all other material vendor quotes.
	Items developed using MII already include contractor markups such as overhead and profit, therefore additional overhead and profit were not applied in the PC OH and PC PF to those items.

TABLE CW-G13

Alternative G **Cost Worksheet:** **CW-G13**
Capital Cost Sub-Element
Subtitle D Disposal (Handling, Transportation, and Disposal)

COST WORKSHEET

Site: Portland Harbor Superfund Site
Location: Portland, Oregon
Phase: Feasibility Study
Base Year: 2016

Prepared By: JN **Date:** 3/4/2016
Checked By: AB **Date:** 3/7/2016

Work Statement:
This sub-element involves the disposal of contaminated sediments at a Subtitle D landfill, including barge transportation of materials to a transload facility, materials handling from the barge to truck, transportation of the sediments to the Subtitle C/TSCA landfill, and disposal of contaminated sediments (including thermal treatment at the landfill facility for a portion of the volume). It includes costs for labor, equipment, and materials as well as recent vendor quotes.
Quantity development presented in Appendix D.

Cost Analysis:
Cost for Subtitle D Disposal (Lump Sum)

COST DATABASE CODE	DESCRIPTION	QTY	UNIT(S)	HPF	LABOR	ADJ LABOR	EQUIP	ADJ EQUIP	MATL	OTHER	UNMOD UC	UNMOD LIC	PC OH	PC PF	BUR LIC	COST SOURCE CITATION	COMMENTS
	Diatomaceous Earth Amendment																
A11	In-Barge Stabilization / Mixing of Amendments	9,353,751	CY	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$24.50	$24.50	$229,166,899.50	0%	0%	$229,166,900	MII MII	Project-specific unit cost developed in MII.
P5	Diatomaceous Earth	558,454	TON	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$105.94	$105.94	$59,162,616.76	0%	0%	$59,162,617	P Anchor QEA	Project-specific cost developed by Anchor QEA (2010) - see Backup Table 24.
	Transportation to Transload Facility																
A13	Barging to Transload Facility	9,353,751	CY	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$13.66	$13.66	$127,772,238.66	0%	0%	$127,772,239	MII MII	Project-specific unit cost developed in MII.
	Transportation and Disposal at Subtitle D Landfill																
M11	Transportation and Disposal at Subtitle D Landfill	**11,727,524**	TON	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$74.53	$74.53	$874,052,363.72	1%	0%	$882,792,887	V Vendor Quote	Project-specific vendor quote - Republic Services (Roosevelt Landfill), 2015. Includes transloading of the sediments, truck transportation from the transload facility to the landfill, and disposal at the landfill.
														TOTAL COST:	$1,298,894,643		

	Representative Unit Quantity	Unit(s)	Total Cost	Unit Cost
COST WORKSHEET SUMMARY	11,727,524	TON	$1,298,894,643	$111

Notes:
Further information about the development of cost worksheets can be found in Attachment A - Methodology and Organization of Detailed Cost Estimates.
The quantity bolded in the QTY column is the quantity selected as the representative unit quantity for this cost worksheet. If multiple quantities are bolded, the representative unit quantity is the sum of those quantities. When the LS unit is utilized, the default representative unit quantity is 1.
HTRW productivity factor is from Exhibit B-3 or B-4 of "A Guide to Developing and Documenting Cost Estimates During the Feasibility Study", EPA 2000
EPA developed project-specific unit costs using the Micro Computer Aided Cost Engineering System (MCACES) Second Generation (MII) software version 4.2, build 3

Cost Database Code:
The Cost Database Code is a reference code for linking with line item cost information with the cost source database and is not otherwise used within these cost worksheets. The following cost source database prefixes apply:
L (EPA-Derived Labor Unit Costs), M (Project-Specific Vendor Unit Costs), P (Previously Developed Unit Costs by Anchor QEA for Portland Harbor), A (EPA-Derived MII Unit Costs), O (Unit Costs from Other Projects/Sources)

Source of Cost Data:
For citation references, the following sources apply:
ALL (Allowance), FLC (www.flcdatacenter.com), LD (Costs Derived from Lower Duwamish Waterway Final Feasibility Study), MII (MII), O (Other), P (Previously Developed by Anchor QEA for Portland Harbor), and V (Vendor Quote)

Abbreviations:

QTY	Quantity	AC	Acres
EQUIP	Equipment	CLF	100 Linear Foot
MATL	Material	CY	Cubic Yard
HPF	HTRW Productivity Factor	DY	Days
ADJ LABOR	Adjusted Labor for HFP	EA	Each
ADJ EQUIP	Adjusted Equipment for HFP	FTE	Full Time Equivalent
UNMOD UC	Unmodified Unit Cost	HR	Hours
UNMOD LIC	Unmodified Line Item Cost	LB	Pounds
UNBUR LIC	Unburdened Line Item Cost	LCY	Loose Cubic Yard
PC OH	Prime Contractor Overhead	LF	Linear Foot
PC PF	Prime Contractor Profit	LS	Lump Sum
BUR LIC	Burdened Line Item Cost	MO	Month
		SF	Square Foot
		SY	Square Yard
		TON	Tons
		YR	Years

Cost Adjustment Checklist:	**NOTES:**
FACTOR:	Field work will be in Level "D" PPE.
H&S Productivity (labor and equipment only)	MII assembly costs include HPF adjustments.
Escalation to Base Year	2016 cost sources are not escalated (EF=1.00). All other costs are escalated based on the USACE CWCCIS, EM 1110-2-1304, Sept 2015.
Area Cost Factor	An AF of 1.05 is used for Oregon, except that an AF of 1.00 (national unmodified average) is used for MII assembly costs and local vendor quotes.
Subcontractor Overhead and Profit	It is assumed that home office OH is 8% and profit is 9% for the Prime Contractor. Professional labor overhead is 100%.
Prime Contractor Overhead and Profit	Allowances and items with mandated costs such as per diem do not have overhead and profit applied.
	Items previously developed by Anchor QEA already include contractor markups, therefore overhead and profit were not applied to those items.
	It is assumed that OH is 1% and profit is 0% for vendor quotes for treatment and disposal at offsite disposal facilities. It is assumed that OH is 5% and profit is 0% for quotes for all other material vendor quotes.
	Items developed using MII already include contractor markups such as overhead and profit, therefore additional overhead and profit were not applied in the PC OH and PC PF to those items.

TABLE CW-G14

Alternative G
Capital Cost Sub-Element
Mitigation

Cost Worksheet: **CW-G14**

COST WORKSHEET

Site: Portland Harbor Superfund Site
Location: Portland, Oregon
Phase: Feasibility Study
Base Year: 2016

Prepared By: JN **Date:** 3/4/2016
Checked By: AB **Date:** 3/7/2016

Work Statement:
This sub-element involves mitigation of shallow water and riverbank areas. It includes costs for on-site labor, equipment, and materials developed from previous work.
Quantity development presented in Appendix D.

Cost Analysis:
Cost for Mitigation (Lump Sum)

COST DATABASE CODE	DESCRIPTION	QTY	UNIT(S)	HPF	LABOR	ADJ LABOR	EQUIP	ADJ EQUIP	MATL	OTHER	UNMOD UC	UNMOD LIC	PC OH	PC PF	BUR LIC	COST SOURCE CITATION	COMMENTS
O3	Mitigation	**86**	AC	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$1,070,827.00	$1,070,827.00	$92,091,122.00	0%	0%	$92,091,122	O Other	Average cost of projects presented in Tables 6.1-1 and 6.1-4 of the Appendix M, Attachment 1, Anchor QEA FS (2010) as well as select other projects. See Calculations for derivation.
												TOTAL COST:			$92,091,122		

	Representative Unit Quantity	Unit(s)	Total Cost	Unit Cost
COST WORKSHEET SUMMARY	86	AC	$92,091,122	$1,070,827

Notes:
Further information about the development of cost worksheets can be found in Attachment A - Methodology and Organization of Detailed Cost Estimates.
The quantity bolded in the QTY column is the quantity selected as the representative unit quantity for this cost worksheet. If multiple quantities are bolded, the representative unit quantity is the sum of those quantities. When the LS unit is utilized, the default representative unit quantity is 1.
HTRW productivity factor is from Exhibit B-3 or B-4 of "A Guide to Developing and Documenting Cost Estimates During the Feasibility Study", EPA 2000
EPA developed project-specific unit costs using the Micro Computer Aided Cost Engineering System (MCACES) Second Generation (MII) software version 4.2, build 3

Cost Database Code:
The Cost Database Code is a reference code for linking with line item cost information with the cost source database and is not otherwise used within these cost worksheets. The following cost source database prefixes apply:
L (EPA-Derived Labor Unit Costs), M (Project-Specific Vendor Unit Costs), P (Previously Developed Unit Costs by Anchor QEA for Portland Harbor), A (EPA-Derived MII Unit Costs), O (Unit Costs from Other Projects/Sources)

Source of Cost Data:
For citation references, the following sources apply:
ALL (Allowance), FLC (www.flcdatacenter.com), LD (Costs Derived from Lower Duwamish Waterway Final Feasibility Study), MII (MII), O (Other), P (Previously Developed by Anchor QEA for Portland Harbor), and V (Vendor Quote)

Abbreviations:

QTY	Quantity	AC	Acres
EQUIP	Equipment	CLF	100 Linear Foot
MATL	Material	CY	Cubic Yard
HPF	HTRW Productivity Factor	DY	Days
ADJ LABOR	Adjusted Labor for HFP	EA	Each
ADJ EQUIP	Adjusted Equipment for HFP	FTE	Full Time Equivalent
UNMOD UC	Unmodified Unit Cost	HR	Hours
UNMOD LIC	Unmodified Line Item Cost	LB	Pounds
UNBUR LIC	Unburdened Line Item Cost	LCY	Loose Cubic Yard
PC OH	Prime Contractor Overhead	LF	Linear Foot
PC PF	Prime Contractor Profit	LS	Lump Sum
BUR LIC	Burdened Line Item Cost	MO	Month
		SF	Square Foot
		SY	Square Yard
		TON	Tons
		YR	Years

Cost Adjustment Checklist:	**NOTES:**
FACTOR:	Field work will be in Level "D" PPE.
H&S Productivity (labor and equipment only)	MII assembly costs include HPF adjustments.
Escalation to Base Year	2016 cost sources are not escalated (EF=1.00). All other costs are escalated based on the USACE CWCCIS, EM 1110-2-1304, Sept 2015.
Area Cost Factor	An AF of 1.05 is used for Oregon, except that an AF of 1.00 (national unmodified average) is used for MII assembly costs and local vendor quotes.
Subcontractor Overhead and Profit	It is assumed that home office OH is 8% and profit is 9% for the Prime Contractor. Professional labor overhead is 100%.
Prime Contractor Overhead and Profit	Allowances and items with mandated costs such as per diem do not have overhead and profit applied.
	Items previously developed by Anchor QEA already include contractor markups, therefore overhead and profit were not applied to those items.
	It is assumed that OH is 1% and profit is 0% for vendor quotes for treatment and disposal at offsite disposal facilities. It is assumed that OH is 5% and profit is 0% for quotes for all other material vendor quotes.
	Items developed using MII already include contractor markups such as overhead and profit, therefore additional overhead and profit were not applied in the PC OH and PC PF to those items.

TABLE CW-G15

Alternative G **Cost Worksheet:** **CW-G15**
Capital Cost Sub-Element
Sand Placement for Technology Assignments

COST WORKSHEET

Site: Portland Harbor Superfund Site
Location: Portland, Oregon
Phase: Feasibility Study
Base Year: 2016

Prepared By: JN **Date:** 3/4/2016
Checked By: AB **Date:** 3/7/2016

Work Statement:
This sub-element involves the placement of sand for the construction of capping areas. It includes placement of sand within confined areas, open areas, and riverbanks. It includes costs for on-site labor, equipment, and materials as well as recent vendor quotes.
Quantity development presented in Appendix D.

Cost Analysis:
Cost for Sand Placement for Technology Assignments (Lump Sum)

COST DATABASE CODE	DESCRIPTION	QTY	UNIT(S)	HPF	LABOR	ADJ LABOR	EQUIP	ADJ EQUIP	MATL	OTHER	UNMOD UC	UNMOD LIC	PC OH	PC PF	BUR LIC	COST SOURCE CITATION	COMMENTS
P1	Sand	**1,634,210**	LCY	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$19.75	$19.75	$32,275,647.50	0%	0%	$32,275,648	P Anchor QEA	Project-specific cost developed by Anchor QEA (2010) - see Backup Table 29A. Includes conversion from TON to LCY.
	Sand Placement (Riverbanks)																
A16	Material Placement (Confined)	115,522	CY	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$20.39	$20.39	$2,355,493.58	0%	0%	$2,355,494	MII MII	Project-specific unit cost developed in MII.
	Sand Placement (Confined)																
A16	Material Placement (Confined)	101,811	CY	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$20.39	$20.39	$2,075,926.29	0%	0%	$2,075,926	MII MII	Project-specific unit cost developed in MII.
	Sand Placement (Open Water)																
A15	Material Placement (Open)	1,416,877	CY	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$12.42	$12.42	$17,597,612.34	0%	0%	$17,597,612	MII MII	Project-specific unit cost developed in MII.
												TOTAL COST:			$54,304,680		

	Representative Unit Quantity	Unit(s)	Total Cost	Unit Cost
COST WORKSHEET SUMMARY	1,634,210	CY	$54,304,680	$33.23

Notes:
Further information about the development of cost worksheets can be found in Attachment A - Methodology and Organization of Detailed Cost Estimates.
The quantity bolded in the QTY column is the quantity selected as the representative unit quantity for this cost worksheet. If multiple quantities are bolded, the representative unit quantity is the sum of those quantities. When the LS unit is utilized, the default representative unit quantity is 1.
HTRW productivity factor is from Exhibit B-3 or B-4 of "A Guide to Developing and Documenting Cost Estimates During the Feasibility Study", EPA 2000
EPA developed project-specific unit costs using the Micro Computer Aided Cost Engineering System (MCACES) Second Generation (MII) software version 4.2, build 3

Cost Database Code:
The Cost Database Code is a reference code for linking with line item cost information with the cost source database and is not otherwise used within these cost worksheets. The following cost source database prefixes apply:
L (EPA-Derived Labor Unit Costs), M (Project-Specific Vendor Unit Costs), P (Previously Developed Unit Costs by Anchor QEA for Portland Harbor), A (EPA-Derived MII Unit Costs), O (Unit Costs from Other Projects/Sources)

Source of Cost Data:
For citation references, the following sources apply:
ALL (Allowance), FLC (www.flcdatacenter.com), LD (Costs Derived from Lower Duwamish Waterway Final Feasibility Study), MII (MII), O (Other), P (Previously Developed by Anchor QEA for Portland Harbor), and V (Vendor Quote)

Abbreviations:

QTY	Quantity	AC	Acres
EQUIP	Equipment	CLF	100 Linear Foot
MATL	Material	CY	Cubic Yard
HPF	HTRW Productivity Factor	DY	Days
ADJ LABOR	Adjusted Labor for HFP	EA	Each
ADJ EQUIP	Adjusted Equipment for HFP	FTE	Full Time Equivalent
UNMOD UC	Unmodified Unit Cost	HR	Hours
UNMOD LIC	Unmodified Line Item Cost	LB	Pounds
UNBUR LIC	Unburdened Line Item Cost	LCY	Loose Cubic Yard
PC OH	Prime Contractor Overhead	LF	Linear Foot
PC PF	Prime Contractor Profit	LS	Lump Sum
BUR LIC	Burdened Line Item Cost	MO	Month
		SF	Square Foot
		SY	Square Yard
		TON	Tons
		YR	Years

Cost Adjustment Checklist:	**NOTES:**
FACTOR:	Field work will be in Level "D" PPE.
H&S Productivity (labor and equipment only)	MII assembly costs include HPF adjustments.
Escalation to Base Year	2016 cost sources are not escalated (EF=1.00). All other costs are escalated based on the USACE CWCCIS, EM 1110-2-1304, Sept 2015.
Area Cost Factor	An AF of 1.05 is used for Oregon, except that an AF of 1.00 (national unmodified average) is used for MII assembly costs and local vendor quotes.
Subcontractor Overhead and Profit	It is assumed that home office OH is 8% and profit is 9% for the Prime Contractor. Professional labor overhead is 100%.
Prime Contractor Overhead and Profit	Allowances and items with mandated costs such as per diem do not have overhead and profit applied.
	Items previously developed by Anchor QEA already include contractor markups, therefore overhead and profit were not applied to those items.
	It is assumed that OH is 1% and profit is 0% for vendor quotes for treatment and disposal at offsite disposal facilities. It is assumed that OH is 5% and profit is 0% for quotes for all other material vendor quotes.
	Items developed using MII already include contractor markups such as overhead and profit, therefore additional overhead and profit were not applied in the PC OH and PC PF to those items.

TABLE CW-G16

Alternative G **Cost Worksheet:** **CW-G16**
Capital Cost Sub-Element
Beach Mix Placement for Technology Assignments

COST WORKSHEET

Site: Portland Harbor Superfund Site
Location: Portland, Oregon
Phase: Feasibility Study
Base Year: 2016

Prepared By: JN **Date:** 3/4/2016
Checked By: AB **Date:** 3/7/2016

Work Statement:
This sub-element involves the placement of beach mix for the construction of capping areas. It includes placement of beach mix within confined areas, open areas, and riverbanks. It includes costs for on-site labor, equipment, and materials as well as recent vendor quotes.
Quantity development presented in Appendix D.

Cost Analysis:
Cost for Beach Mix Placement for Technology Assignments (Lump Sum)

COST DATABASE CODE	DESCRIPTION	QTY	UNIT(S)	HPF	LABOR	ADJ LABOR	EQUIP	ADJ EQUIP	MATL	OTHER	UNMOD UC	UNMOD LIC	PC OH	PC PF	BUR LIC	COST SOURCE CITATION	COMMENTS
P3	ODOT 100 Beach Mix	**90,647**	LCY	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$57.69	$57.69	$5,229,425.43	0%	0%	$5,229,425	P Anchor QEA	Project-specific cost developed by Anchor QEA (2010) - see Backup Table 29A. Includes conversion from TON to LCY.
	Beach Mix Placement (Riverbanks)																
A16	Material Placement (Confined)	21,581	CY	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$20.39	$20.39	$440,036.59	0%	0%	$440,037	MII MII	Project-specific unit cost developed in MII.
	Beach Mix Placement (Confined)																
A16	Material Placement (Confined)	7,271	CY	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$20.39	$20.39	$148,255.69	0%	0%	$148,256	MII MII	Project-specific unit cost developed in MII.
	Beach Mix Placement (Open Water)																
A15	Material Placement (Open)	61,795	CY	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$12.42	$12.42	$767,493.90	0%	0%	$767,494	MII MII	Project-specific unit cost developed in MII.
												TOTAL COST:			$6,585,212		

	Representative Unit Quantity	Unit(s)	Total Cost	Unit Cost
COST WORKSHEET SUMMARY	90,647	CY	$6,585,212	$72.65

Notes:
Further information about the development of cost worksheets can be found in Attachment A - Methodology and Organization of Detailed Cost Estimates.
The quantity bolded in the QTY column is the quantity selected as the representative unit quantity for this cost worksheet. If multiple quantities are bolded, the representative unit quantity is the sum of those quantities. When the LS unit is utilized, the default representative unit quantity is 1.
HTRW productivity factor is from Exhibit B-3 or B-4 of "A Guide to Developing and Documenting Cost Estimates During the Feasibility Study", EPA 2000
EPA developed project-specific unit costs using the Micro Computer Aided Cost Engineering System (MCACES) Second Generation (MII) software version 4.2, build 3

Cost Database Code:
The Cost Database Code is a reference code for linking with line item cost information with the cost source database and is not otherwise used within these cost worksheets. The following cost source database prefixes apply:
L (EPA-Derived Labor Unit Costs), M (Project-Specific Vendor Unit Costs), P (Previously Developed Unit Costs by Anchor QEA for Portland Harbor), A (EPA-Derived MII Unit Costs), O (Unit Costs from Other Projects/Sources)

Source of Cost Data:
For citation references, the following sources apply:
ALL (Allowance), FLC (www.flcdatacenter.com), LD (Costs Derived from Lower Duwamish Waterway Final Feasibility Study), MII (MII), O (Other), P (Previously Developed by Anchor QEA for Portland Harbor), and V (Vendor Quote)

Abbreviations:

QTY	Quantity	AC	Acres
EQUIP	Equipment	CLF	100 Linear Foot
MATL	Material	CY	Cubic Yard
HPF	HTRW Productivity Factor	DY	Days
ADJ LABOR	Adjusted Labor for HFP	EA	Each
ADJ EQUIP	Adjusted Equipment for HFP	FTE	Full Time Equivalent
UNMOD UC	Unmodified Unit Cost	HR	Hours
UNMOD LIC	Unmodified Line Item Cost	LB	Pounds
UNBUR LIC	Unburdened Line Item Cost	LCY	Loose Cubic Yard
PC OH	Prime Contractor Overhead	LF	Linear Foot
PC PF	Prime Contractor Profit	LS	Lump Sum
BUR LIC	Burdened Line Item Cost	MO	Month
		SF	Square Foot
		SY	Square Yard
		TON	Tons
		YR	Years

Cost Adjustment Checklist:	**NOTES:**
FACTOR:	Field work will be in Level "D" PPE.
H&S Productivity (labor and equipment only)	MII assembly costs include HPF adjustments.
Escalation to Base Year	2016 cost sources are not escalated (EF=1.00). All other costs are escalated based on the USACE CWCCIS, EM 1110-2-1304, Sept 2015.
Area Cost Factor	An AF of 1.05 is used for Oregon, except that an AF of 1.00 (national unmodified average) is used for MII assembly costs and local vendor quotes.
Subcontractor Overhead and Profit	It is assumed that home office OH is 8% and profit is 9% for the Prime Contractor. Professional labor overhead is 100%.
Prime Contractor Overhead and Profit	Allowances and items with mandated costs such as per diem do not have overhead and profit applied.
	Items previously developed by Anchor QEA already include contractor markups, therefore overhead and profit were not applied to those items.
	It is assumed that OH is 1% and profit is 0% for vendor quotes for treatment and disposal at offsite disposal facilities. It is assumed that OH is 5% and profit is 0% for quotes for all other material vendor quotes.
	Items developed using MII already include contractor markups such as overhead and profit, therefore additional overhead and profit were not applied in the PC OH and PC PF to those items.

TABLE CW-G17

Alternative G **Cost Worksheet:** **CW-G17**
Capital Cost Sub-Element
Armor Placement for Technology Assignments

COST WORKSHEET

Site: Portland Harbor Superfund Site
Location: Portland, Oregon
Phase: Feasibility Study
Base Year: 2016

Prepared By: JN **Date:** 3/4/2016
Checked By: AB **Date:** 3/7/2016

Work Statement:
This sub-element involves the placement of armor for the construction of capping areas. It includes placement of armor within confined areas, open areas, and riverbanks. It includes costs for on-site labor, equipment, and materials as well as recent vendor quotes.
Quantity development presented in Appendix D.

Cost Analysis:
Cost for Armor Placement for Technology Assignments (Lump Sum)

COST DATABASE CODE	DESCRIPTION	QTY	UNIT(S)	HPF	LABOR	ADJ LABOR	EQUIP	ADJ EQUIP	MATL	OTHER	UNMOD UC	UNMOD LIC	PC OH	PC PF	BUR LIC	COST SOURCE CITATION	COMMENTS
P2	ODOT 200 Armor	**245,586**	LCY	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$57.69	$57.69	$14,167,856.34	0%	0%	$14,167,856	P Anchor QEA	Project-specific cost developed by Anchor QEA (2010) - see Backup Table 29A. Includes conversion from TON to LCY.
	Armor Placement (Riverbanks)																
A16	Material Placement (Confined)	1,576	CY	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$20.39	$20.39	$32,134.64	0%	0%	$32,135	MII MII	Project-specific unit cost developed in MII.
	Armor Placement (Confined)																
A16	Material Placement (Confined)	43,467	CY	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$20.39	$20.39	$886,292.13	0%	0%	$886,292	MII MII	Project-specific unit cost developed in MII.
	Armor Placement (Open Water)																
A15	Material Placement (Open)	200,543	CY	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$12.42	$12.42	$2,490,744.06	0%	0%	$2,490,744	MII MII	Project-specific unit cost developed in MII.
												TOTAL COST:			$17,577,027		

	Representative Unit Quantity	Unit(s)	Total Cost	Unit Cost
COST WORKSHEET SUMMARY	245,586	CY	$17,577,027	$71.57

Notes:
Further information about the development of cost worksheets can be found in Attachment A - Methodology and Organization of Detailed Cost Estimates.
The quantity bolded in the QTY column is the quantity selected as the representative unit quantity for this cost worksheet. If multiple quantities are bolded, the representative unit quantity is the sum of those quantities. When the LS unit is utilized, the default representative unit quantity is 1.
HTRW productivity factor is from Exhibit B-3 or B-4 of "A Guide to Developing and Documenting Cost Estimates During the Feasibility Study", EPA 2000
EPA developed project-specific unit costs using the Micro Computer Aided Cost Engineering System (MCACES) Second Generation (MII) software version 4.2, build 3

Cost Database Code:
The Cost Database Code is a reference code for linking with line item cost information with the cost source database and is not otherwise used within these cost worksheets. The following cost source database prefixes apply:
L (EPA-Derived Labor Unit Costs), M (Project-Specific Vendor Unit Costs), P (Previously Developed Unit Costs by Anchor QEA for Portland Harbor), A (EPA-Derived MII Unit Costs), O (Unit Costs from Other Projects/Sources)

Source of Cost Data:
For citation references, the following sources apply:
ALL (Allowance), FLC (www.flcdatacenter.com), LD (Costs Derived from Lower Duwamish Waterway Final Feasibility Study), MII (MII), O (Other), P (Previously Developed by Anchor QEA for Portland Harbor), and V (Vendor Quote)

Abbreviations:

QTY	Quantity	AC	Acres
EQUIP	Equipment	CLF	100 Linear Foot
MATL	Material	CY	Cubic Yard
HPF	HTRW Productivity Factor	DY	Days
ADJ LABOR	Adjusted Labor for HFP	EA	Each
ADJ EQUIP	Adjusted Equipment for HFP	FTE	Full Time Equivalent
UNMOD UC	Unmodified Unit Cost	HR	Hours
UNMOD LIC	Unmodified Line Item Cost	LB	Pounds
UNBUR LIC	Unburdened Line Item Cost	LCY	Loose Cubic Yard
PC OH	Prime Contractor Overhead	LF	Linear Foot
PC PF	Prime Contractor Profit	LS	Lump Sum
BUR LIC	Burdened Line Item Cost	MO	Month
		SF	Square Foot
		SY	Square Yard
		TON	Tons
		YR	Years

Cost Adjustment Checklist:	**NOTES:**
FACTOR:	Field work will be in Level "D" PPE.
H&S Productivity (labor and equipment only)	MII assembly costs include HPF adjustments.
Escalation to Base Year	2016 cost sources are not escalated (EF=1.00). All other costs are escalated based on the USACE CWCCIS, EM 1110-2-1304, Sept 2015.
Area Cost Factor	An AF of 1.05 is used for Oregon, except that an AF of 1.00 (national unmodified average) is used for MII assembly costs and local vendor quotes.
Subcontractor Overhead and Profit	It is assumed that home office OH is 8% and profit is 9% for the Prime Contractor. Professional labor overhead is 100%.
Prime Contractor Overhead and Profit	Allowances and items with mandated costs such as per diem do not have overhead and profit applied.
	Items previously developed by Anchor QEA already include contractor markups, therefore overhead and profit were not applied to those items.
	It is assumed that OH is 1% and profit is 0% for vendor quotes for treatment and disposal at offsite disposal facilities. It is assumed that OH is 5% and profit is 0% for quotes for all other material vendor quotes.
	Items developed using MII already include contractor markups such as overhead and profit, therefore additional overhead and profit were not applied in the PC OH and PC PF to those items.

TABLE CW-G18

Alternative G **Cost Worksheet:** **CW-G18**
Capital Cost Sub-Element
Reactive/GAC Placement for Technology Assignments

COST WORKSHEET

Site: Portland Harbor Superfund Site
Location: Portland, Oregon
Phase: Feasibility Study
Base Year: 2016

Prepared By: JN **Date:** 3/4/2016
Checked By: AB **Date:** 3/7/2016

Work Statement:
This sub-element involves the placement of the reactive layers for the construction of capping areas. It includes placement of the reactive layer within confined areas, open areas, and riverbanks. It includes costs for on-site labor, equipment, and materials as well as recent vendor quotes.
Quantity development presented in Appendix D.

Cost Analysis:
Cost for Reactive/GAC Placement for Technology Assignments (Lump Sum)

COST DATABASE CODE	DESCRIPTION	QTY	UNIT(S)	HPF	LABOR	ADJ LABOR	EQUIP	ADJ EQUIP	MATL	OTHER	UNMOD UC	UNMOD LIC	PC OH	PC PF	BUR LIC	COST SOURCE CITATION	COMMENTS
	AquaGate Reactive Layer																
M4	Carbon (AquaGate + PAC 10%)	136,655	TON	1.00	$0.00	$0.00	$0.00	$0.00	$456.30	$0.00	$456.30	$62,355,676.50	5%	0%	$65,473,460	V Vendor Quote	Project-specific vendor quote - AquaBlok 2015. Material cost is $/TON.
P1	Sand	144,673	LCY	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$19.75	$19.75	$2,857,291.75	0%	0%	$2,857,292	P Anchor QEA	Project-specific cost developed by Anchor QEA (2010) - see Backup Table 29A. Includes conversion from TON to LCY.
A3	Mixing Sand & Carbon for Reactive Layer	281,466	CY	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$4.76	$4.76	$1,339,778.16	0%	0%	$1,339,778	MII MII	Project-specific unit cost developed in MII.
A16	Material Placement (Confined)	31,516	CY	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$20.39	$20.39	$642,611.24	0%	0%	$642,611	MII MII	Project-specific unit cost developed in MII.
A15	Material Placement (Open)	249,950	CY	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$12.42	$12.42	$3,104,379.00	0%	0%	$3,104,379	MII MII	Project-specific unit cost developed in MII.
	AquaBlock																
M3	Carbon (AquaBlok)	5,681	TON	1.00	$0.00	$0.00	$0.00	$0.00	$202.80	$0.00	$202.80	$1,152,106.80	5%	0%	$1,209,712	V Vendor Quote	Project-specific vendor quote - AquaBlok 2015. Material cost is $/TON.
A16	Material Placement (Confined)	4,951	CY	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$20.39	$20.39	$100,950.89	0%	0%	$100,951	MII MII	Project-specific unit cost developed in MII.
												TOTAL COST:			$74,728,183		

	Representative Unit Quantity	Unit(s)	Total Cost	Unit Cost
COST WORKSHEET SUMMARY	1	LS	$74,728,183	$74,728,183

Notes:
Further information about the development of cost worksheets can be found in Attachment A - Methodology and Organization of Detailed Cost Estimates.
The quantity bolded in the QTY column is the quantity selected as the representative unit quantity for this cost worksheet. If multiple quantities are bolded, the representative unit quantity is the sum of those quantities. When the LS unit is utilized, the default representative unit quantity is 1.
HTRW productivity factor is from Exhibit B-3 or B-4 of "A Guide to Developing and Documenting Cost Estimates During the Feasibility Study", EPA 2000
EPA developed project-specific unit costs using the Micro Computer Aided Cost Engineering System (MCACES) Second Generation (MII) software version 4.2, build 3

Cost Database Code:
The Cost Database Code is a reference code for linking with line item cost information with the cost source database and is not otherwise used within these cost worksheets. The following cost source database prefixes apply:
L (EPA-Derived Labor Unit Costs), M (Project-Specific Vendor Unit Costs), P (Previously Developed Unit Costs by Anchor QEA for Portland Harbor), A (EPA-Derived MII Unit Costs), O (Unit Costs from Other Projects/Sources)

Source of Cost Data:
For citation references, the following sources apply:
ALL (Allowance), FLC (www.flcdatacenter.com), LD (Costs Derived from Lower Duwamish Waterway Final Feasibility Study), MII (MII), O (Other), P (Previously Developed by Anchor QEA for Portland Harbor), and V (Vendor Quote)

Abbreviations:

QTY	Quantity	AC	Acres
EQUIP	Equipment	CLF	100 Linear Foot
MATL	Material	CY	Cubic Yard
HPF	HTRW Productivity Factor	DY	Days
ADJ LABOR	Adjusted Labor for HFP	EA	Each
ADJ EQUIP	Adjusted Equipment for HFF	FTE	Full Time Equivalen
UNMOD UC	Unmodified Unit Cost	HR	Hours
UNMOD LIC	Unmodified Line Item Cost	LB	Pounds
UNBUR LIC	Unburdened Line Item Cost	LCY	Loose Cubic Yard
PC OH	Prime Contractor Overhead	LF	Linear Foot
PC PF	Prime Contractor Profit	LS	Lump Sum
BUR LIC	Burdened Line Item Cost	MO	Month
		SF	Square Foot
		SY	Square Yard
		TON	Tons
		YR	Years

Cost Adjustment Checklist:	**NOTES:**
FACTOR:	Field work will be in Level "D" PPE.
H&S Productivity (labor and equipment only)	MII assembly costs include HPF adjustments.
Escalation to Base Year	2016 cost sources are not escalated (EF=1.00). All other costs are escalated based on the USACE CWCCIS, EM 1110-2-1304, Sept 2015.
Area Cost Factor	An AF of 1.05 is used for Oregon, except that an AF of 1.00 (national unmodified average) is used for MII assembly costs and local vendor quotes.
Subcontractor Overhead and Profit	It is assumed that home office OH is 8% and profit is 9% for the Prime Contractor. Professional labor overhead is 100%.
Prime Contractor Overhead and Profit	Allowances and items with mandated costs such as per diem do not have overhead and profit applied.
	Items previously developed by Anchor QEA already include contractor markups, therefore overhead and profit were not applied to those items.
	It is assumed that OH is 1% and profit is 0% for vendor quotes for treatment and disposal at offsite disposal facilities. It is assumed that OH is 5% and profit is 0% for quotes for all other material vendor quotes.
	Items developed using MII already include contractor markups such as overhead and profit, therefore additional overhead and profit were not applied in the PC OH and PC PF to those items.

TABLE CW-G19

Alternative G **Cost Worksheet:** **CW-G19**
Capital Cost Sub-Element
Geofabric for Riverbanks

COST WORKSHEET

Site: Portland Harbor Superfund Site
Location: Portland, Oregon
Phase: Feasibility Study
Base Year: 2016

Prepared By: JN **Date:** 3/4/2016
Checked By: AB **Date:** 3/7/2016

Work Statement:
This sub-element involves the installation of geofabric along the riverbanks. It includes costs for on-site labor, equipment, and materials from recent vendor quotes.
Quantity development presented in Appendix D.

Cost Analysis:
Cost for Geofabric for Riverbanks (Lump Sum)

COST DATABASE CODE	DESCRIPTION	QTY	UNIT(S)	HPF	LABOR	ADJ LABOR	EQUIP	ADJ EQUIP	MATL	OTHER	UNMOD UC	UNMOD LIC	PC OH	PC PF	BUR LIC	COST SOURCE CITATION	COMMENTS
O7	Geotextile Installation	**28.7**	AC	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$7,074.14	$7,074.14	$203,027.93	8%	9%	$239,004	V Vendor Quote	Vendor Quote - Geo-Synthetics (2014). Includes labor and equipment for installation
O6	Geotextile Material	28.7	AC	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$5,698.62	$5,698.62	$163,550.28	5%	0%	$171,728	V Vendor Quote	Vendor quote obtained for project of similar scope - Geo-Synthetics, 2014.
												TOTAL COST:			$410,732		

	Representative Unit Quantity	Unit(s)	Total Cost	Unit Cost
COST WORKSHEET SUMMARY	28.7	AC	$410,732	$14,311

Notes:
Further information about the development of cost worksheets can be found in Attachment A - Methodology and Organization of Detailed Cost Estimates.
The quantity bolded in the QTY column is the quantity selected as the representative unit quantity for this cost worksheet. If multiple quantities are bolded, the representative unit quantity is the sum of those quantities. When the LS unit is utilized, the default representative unit quantity is 1.
HTRW productivity factor is from Exhibit B-3 or B-4 of "A Guide to Developing and Documenting Cost Estimates During the Feasibility Study", EPA 2000
EPA developed project-specific unit costs using the Micro Computer Aided Cost Engineering System (MCACES) Second Generation (MII) software version 4.2, build 3

Cost Database Code:
The Cost Database Code is a reference code for linking with line item cost information with the cost source database and is not otherwise used within these cost worksheets. The following cost source database prefixes apply:
L (EPA-Derived Labor Unit Costs), M (Project-Specific Vendor Unit Costs), P (Previously Developed Unit Costs by Anchor QEA for Portland Harbor), A (EPA-Derived MII Unit Costs), O (Unit Costs from Other Projects/Sources)

Source of Cost Data:
For citation references, the following sources apply:
ALL (Allowance), FLC (www.flcdatacenter.com), LD (Costs Derived from Lower Duwamish Waterway Final Feasibility Study), MII (MII), O (Other), P (Previously Developed by Anchor QEA for Portland Harbor), and V (Vendor Quote)

Abbreviations:

QTY	Quantity	AC	Acres
EQUIP	Equipment	CLF	100 Linear Foot
MATL	Material	CY	Cubic Yard
HPF	HTRW Productivity Factor	DY	Days
ADJ LABOR	Adjusted Labor for HFP	EA	Each
ADJ EQUIP	Adjusted Equipment for HFP	FTE	Full Time Equivalent
UNMOD UC	Unmodified Unit Cost	HR	Hours
UNMOD LIC	Unmodified Line Item Cost	LB	Pounds
UNBUR LIC	Unburdened Line Item Cost	LCY	Loose Cubic Yard
PC OH	Prime Contractor Overhead	LF	Linear Foot
PC PF	Prime Contractor Profit	LS	Lump Sum
BUR LIC	Burdened Line Item Cost	MO	Month
		SF	Square Foot
		SY	Square Yard
		TON	Tons
		YR	Years

Cost Adjustment Checklist:	**NOTES:**
FACTOR:	Field work will be in Level "D" PPE.
H&S Productivity (labor and equipment only)	MII assembly costs include HPF adjustments.
Escalation to Base Year	2016 cost sources are not escalated (EF=1.00). All other costs are escalated based on the USACE CWCCIS, EM 1110-2-1304, Sept 2015.
Area Cost Factor	An AF of 1.05 is used for Oregon, except that an AF of 1.00 (national unmodified average) is used for MII assembly costs and local vendor quotes.
Subcontractor Overhead and Profit	It is assumed that home office OH is 8% and profit is 9% for the Prime Contractor. Professional labor overhead is 100%.
Prime Contractor Overhead and Profit	Allowances and items with mandated costs such as per diem do not have overhead and profit applied.
	Items previously developed by Anchor QEA already include contractor markups, therefore overhead and profit were not applied to those items.
	It is assumed that OH is 1% and profit is 0% for vendor quotes for treatment and disposal at offsite disposal facilities. It is assumed that OH is 5% and profit is 0% for quotes for all other material vendor quotes.
	Items developed using MII already include contractor markups such as overhead and profit, therefore additional overhead and profit were not applied in the PC OH and PC PF to those items.

TABLE CW-G20

Alternative G **Cost Worksheet:** **CW-G20**
Capital Cost Sub-Element
Organoclay Mat Placement for Technology Assignments

COST WORKSHEET

Site: Portland Harbor Superfund Site
Location: Portland, Oregon
Phase: Feasibility Study
Base Year: 2016

Prepared By: JN **Date:** 3/4/2016
Checked By: AB **Date:** 3/7/2016

Work Statement:
This sub-element involves the placement of the organoclay mat for the construction of capping areas. It includes placement of the organoclay mat within confined areas, open areas, and riverbanks. It includes costs for on-site labor, equipment, and materials as well as recent vendor quotes.
Quantity development presented in Appendix D.

Cost Analysis:
Cost for Organoclay Mat Placement for Technology Assignments (Lump Sum)

COST DATABASE CODE	DESCRIPTION	QTY	UNIT(S)	HPF	LABOR	ADJ LABOR	EQUIP	ADJ EQUIP	MATL	OTHER	UNMOD UC	UNMOD LIC	PC OH	PC PF	BUR LIC	COST SOURCE CITATION	COMMENTS
A17	Organoclay Mat Placement	**174,300**	SF	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$3.35	$3.35	$583,905.00	0%	0%	$583,905	MII MII	Project-specific unit cost developed in MII.
P4	Organoclay Mat Material	174,300	SF	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$3.38	$3.38	$589,134.00	0%	0%	$589,134	P Anchor QEA	Project-specific cost developed by Anchor QEA (2010) - see Backup Table 29A.
												TOTAL COST:			$1,173,039		

	Representative Unit Quantity	Unit(s)	Total Cost	Unit Cost
COST WORKSHEET SUMMARY	174,300	SF	$1,173,039	$6.73

Notes:
Further information about the development of cost worksheets can be found in Attachment A - Methodology and Organization of Detailed Cost Estimates.
The quantity bolded in the QTY column is the quantity selected as the representative unit quantity for this cost worksheet. If multiple quantities are bolded, the representative unit quantity is the sum of those quantities. When the LS unit is utilized, the default representative unit quantity is 1.
HTRW productivity factor is from Exhibit B-3 or B-4 of "A Guide to Developing and Documenting Cost Estimates During the Feasibility Study", EPA 2000
EPA developed project-specific unit costs using the Micro Computer Aided Cost Engineering System (MCACES) Second Generation (MII) software version 4.2, build 3

Cost Database Code:
The Cost Database Code is a reference code for linking with line item cost information with the cost source database and is not otherwise used within these cost worksheets. The following cost source database prefixes apply:
L (EPA-Derived Labor Unit Costs), M (Project-Specific Vendor Unit Costs), P (Previously Developed Unit Costs by Anchor QEA for Portland Harbor), A (EPA-Derived MII Unit Costs), O (Unit Costs from Other Projects/Sources)

Source of Cost Data:
For citation references, the following sources apply:
ALL (Allowance), FLC (www.flcdatacenter.com), LD (Costs Derived from Lower Duwamish Waterway Final Feasibility Study), MII (MII), O (Other), P (Previously Developed by Anchor QEA for Portland Harbor), and V (Vendor Quote)

Abbreviations:

QTY	Quantity	AC	Acres
EQUIP	Equipment	CLF	100 Linear Foot
MATL	Material	CY	Cubic Yard
HPF	HTRW Productivity Factor	DY	Days
ADJ LABOR	Adjusted Labor for HFP	EA	Each
ADJ EQUIP	Adjusted Equipment for HFP	FTE	Full Time Equivalent
UNMOD UC	Unmodified Unit Cost	HR	Hours
UNMOD LIC	Unmodified Line Item Cost	LB	Pounds
UNBUR LIC	Unburdened Line Item Cost	LCY	Loose Cubic Yard
PC OH	Prime Contractor Overhead	LF	Linear Foot
PC PF	Prime Contractor Profit	LS	Lump Sum
BUR LIC	Burdened Line Item Cost	MO	Month
		SF	Square Foot
		SY	Square Yard
		TON	Tons
		YR	Years

Cost Adjustment Checklist:	**NOTES:**
FACTOR:	Field work will be in Level "D" PPE.
H&S Productivity (labor and equipment only)	MII assembly costs include HPF adjustments.
Escalation to Base Year	2016 cost sources are not escalated (EF=1.00). All other costs are escalated based on the USACE CWCCIS, EM 1110-2-1304, Sept 2015.
Area Cost Factor	An AF of 1.05 is used for Oregon, except that an AF of 1.00 (national unmodified average) is used for MII assembly costs and local vendor quotes.
Subcontractor Overhead and Profit	It is assumed that home office OH is 8% and profit is 9% for the Prime Contractor. Professional labor overhead is 100%.
Prime Contractor Overhead and Profit	Allowances and items with mandated costs such as per diem do not have overhead and profit applied.
	Items previously developed by Anchor QEA already include contractor markups, therefore overhead and profit were not applied to those items.
	It is assumed that OH is 1% and profit is 0% for vendor quotes for treatment and disposal at offsite disposal facilities. It is assumed that OH is 5% and profit is 0% for quotes for all other material vendor quotes.
	Items developed using MII already include contractor markups such as overhead and profit, therefore additional overhead and profit were not applied in the PC OH and PC PF to those items.

TABLE CW-G21

Alternative G
Capital Cost Sub-Element
Transload Facility Development

Cost Worksheet: **CW-G21**

COST WORKSHEET

Site: Portland Harbor Superfund Site
Location: Portland, Oregon
Phase: Feasibility Study
Base Year: 2016

Prepared By: JN **Date:** 3/4/2016
Checked By: AB **Date:** 3/7/2016

Work Statement:
This sub-element involves the development of a transload facility for facilitating offsite disposal of contaminated sediments. It includes costs for on-site labor, equipment, and materials developed from previous work. Transload facility is expected to be operated for 19 years, based on estimated construction duration. Property lease quantity (20 acres) adjusted for construction duration. Labor for the annual inspections is assumed to be 2.5 times full time equivalent. Environmental monitoring is assumed to be once per quarter year for construction duration.

Cost Analysis:
Cost for Transload Facility Development (Lump Sum)

COST DATABASE CODE	DESCRIPTION	QTY	UNIT(S)	HPF	LABOR	ADJ LABOR	EQUIP	ADJ EQUIP	MATL	OTHER	UNMOD UC	UNMOD LIC	PC OH	PC PF	BUR LIC	COST SOURCE CITATION	COMMENTS
	Transload Facility Development																
P31	Transload Facility Permitting	1	LS	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$45,080.00	$45,080.00	$45,080.00	0%	0%	$45,080	P Anchor QEA	Project-specific cost developed by Anchor QEA (2010) - see Backup Table 24.
P32	Transload Facility Development	1	LS	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$4,508,000.00	$4,508,000.00	$4,508,000.00	0%	0%	$4,508,000	P Anchor QEA	Project-specific cost developed by Anchor QEA (2010) - see Backup Table 24.
P33	Yearly Property Lease	380	AC	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$26,484.50	$26,484.50	$10,064,110.00	0%	0%	$10,064,110	P Anchor QEA	Developed by Anchor QEA (2010) - see Backup Table 24. Assumes leasing of 20 acres multiplied by estimated construction duration.
	Inspection and Monitoring of Transload Facility																
P34	Labor Inspections During Operations of Transload Facility	47.5	FTE	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$84,525.00	$84,525.00	$4,014,937.50	0%	0%	$4,014,938	P Anchor QEA	Developed by Anchor QEA (2010) - see Backup Table 24. Assumes 2.5 FTE/YR multiplied by estimated construction duration.
P35	Environmental Monitoring During Offloading at Transload Facility	76	MO	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$16,905.00	$16,905.00	$1,284,780.00	0%	0%	$1,284,780	P Anchor QEA	Developed by Anchor QEA (2010) - see Backup Table 24. Assumes 4 MO/YR multiplied by estimated construction duration.
P36	Inspection and Monitoring Reporting for Transload Facility	19	YR	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$45,080.00	$45,080.00	$856,520.00	0%	0%	$856,520	P Anchor QEA	Project-specific cost developed by Anchor QEA (2010) - see Backup Table 24.
												TOTAL COST:			$20,773,428		

	Representative Unit Quantity	Unit(s)	Total Cost	Unit Cost
COST WORKSHEET SUMMARY	1	LS	$20,773,428	$20,773,428

TABLE CW-G21

Alternative G **Cost Worksheet:** **CW-G21**
Capital Cost Sub-Element
Transload Facility Development

COST WORKSHEET

Site: Portland Harbor Superfund Site
Location: Portland, Oregon
Phase: Feasibility Study
Base Year: 2016

Prepared By: JN **Date:** 3/4/2016
Checked By: AB **Date:** 3/7/2016

Notes:

Further information about the development of cost worksheets can be found in Attachment A - Methodology and Organization of Detailed Cost Estimates.
The quantity bolded in the QTY column is the quantity selected as the representative unit quantity for this cost worksheet. If multiple quantities are bolded, the representative unit quantity is the sum of those quantities. When the LS unit is utilized, the default representative unit quantity is 1.
HTRW productivity factor is from Exhibit B-3 or B-4 of "A Guide to Developing and Documenting Cost Estimates During the Feasibility Study", EPA 2000
EPA developed project-specific unit costs using the Micro Computer Aided Cost Engineering System (MCACES) Second Generation (MII) software version 4.2, build 3

Cost Database Code:

The Cost Database Code is a reference code for linking with line item cost information with the cost source database and is not otherwise used within these cost worksheets. The following cost source database prefixes apply:

L (EPA-Derived Labor Unit Costs), M (Project-Specific Vendor Unit Costs), P (Previously Developed Unit Costs by Anchor QEA for Portland Harbor), A (EPA-Derived MII Unit Costs), O (Unit Costs from Other Projects/Sources)

Source of Cost Data:

For citation references, the following sources apply:

ALL (Allowance), FLC (www.flcdatacenter.com), LD (Costs Derived from Lower Duwamish Waterway Final Feasibility Study), MII (MII), O (Other), P (Previously Developed by Anchor QEA for Portland Harbor), and V (Vendor Quote)

Abbreviations:

QTY	Quantity	AC	Acres
EQUIP	Equipment	CLF	100 Linear Foot
MATL	Material	CY	Cubic Yard
HPF	HTRW Productivity Factor	DY	Days
ADJ LABOR	Adjusted Labor for HFP	EA	Each
ADJ EQUIP	Adjusted Equipment for HFP	FTE	Full Time Equivalent
UNMOD UC	Unmodified Unit Cost	HR	Hours
UNMOD LIC	Unmodified Line Item Cost	LB	Pounds
UNBUR LIC	Unburdened Line Item Cost	LCY	Loose Cubic Yard
PC OH	Prime Contractor Overhead	LF	Linear Foot
PC PF	Prime Contractor Profit	LS	Lump Sum
BUR LIC	Burdened Line Item Cost	MO	Month
		SF	Square Foot
		SY	Square Yard
		TON	Tons
		YR	Years

Cost Adjustment Checklist:	**NOTES:**
FACTOR:	Field work will be in Level "D" PPE.
H&S Productivity (labor and equipment only)	MII assembly costs include HPF adjustments.
Escalation to Base Year	2016 cost sources are not escalated (EF=1.00). All other costs are escalated based on the USACE CWCCIS, EM 1110-2-1304, Sept 2015.
Area Cost Factor	An AF of 1.05 is used for Oregon, except that an AF of 1.00 (national unmodified average) is used for MII assembly costs and local vendor quotes.
Subcontractor Overhead and Profit	It is assumed that home office OH is 8% and profit is 9% for the Prime Contractor. Professional labor overhead is 100%.
Prime Contractor Overhead and Profit	Allowances and items with mandated costs such as per diem do not have overhead and profit applied.
	Items previously developed by Anchor QEA already include contractor markups, therefore overhead and profit were not applied to those items.
	It is assumed that OH is 1% and profit is 0% for vendor quotes for treatment and disposal at offsite disposal facilities. It is assumed that OH is 5% and profit is 0% for quotes for all other material vendor quotes.
	Items developed using MII already include contractor markups such as overhead and profit, therefore additional overhead and profit were not applied in the PC OH and PC PF to those items.

TABLE CW-G22

Alternative G **Cost Worksheet: CW-G22**
Capital and Periodic Cost Sub-Element
Monitored Natural Recovery (MNR) for MNR/Enhanced Natural Recovery (ENR) and Broadcast GAC Areas

COST WORKSHEET

Site: Portland Harbor Superfund Site
Location: Portland, Oregon
Phase: Feasibility Study
Base Year: 2016

Prepared By: JN **Date:** 3/4/2016
Checked By: AB **Date:** 3/7/2016

Work Statement:
This sub-element involves sampling as part of monitored natural recovery for MNR, ENR, and Broadcast GAC areas. It includes costs for on-site labor, equipment, and materials developed from previous work.
Quantity development presented in Appendix D.

Cost Analysis:
Cost for Monitored Natural Recovery for MNR/ENR and Broadcast GAC Areas (Lump Sum)

COST DATABASE CODE	DESCRIPTION	QTY	UNIT(S)	HPF	LABOR	ADJ LABOR	EQUIP	ADJ EQUIP	MATL	OTHER	UNMOD UC	UNMOD LIC	PC OH	PC PF	BUR LIC	COST SOURCE CITATION	COMMENTS
P25	Monitored Natural Recovery	**1,411**	AC	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$3,686.33	$3,686.33	$5,201,407.17	0%	0%	$5,201,407	P Anchor QEA	Project-specific cost developed by Anchor QEA (2010) - based on Backup Table 2.
												TOTAL COST:			$5,201,407		

	Representative Unit Quantity	Unit(s)	Total Cost	Unit Cost
COST WORKSHEET SUMMARY	1,411	AC	$5,201,407	$3,686

Notes:
Further information about the development of cost worksheets can be found in Attachment A - Methodology and Organization of Detailed Cost Estimates.
The quantity bolded in the QTY column is the quantity selected as the representative unit quantity for this cost worksheet. If multiple quantities are bolded, the representative unit quantity is the sum of those quantities. When the LS unit is utilized, the default representative unit quantity is 1.
HTRW productivity factor is from Exhibit B-3 or B-4 of "A Guide to Developing and Documenting Cost Estimates During the Feasibility Study", EPA 2000
EPA developed project-specific unit costs using the Micro Computer Aided Cost Engineering System (MCACES) Second Generation (MII) software version 4.2, build 3

Cost Database Code:
The Cost Database Code is a reference code for linking with line item cost information with the cost source database and is not otherwise used within these cost worksheets. The following cost source database prefixes apply:
L (EPA-Derived Labor Unit Costs), M (Project-Specific Vendor Unit Costs), P (Previously Developed Unit Costs by Anchor QEA for Portland Harbor), A (EPA-Derived MII Unit Costs), O (Unit Costs from Other Projects/Sources)

Source of Cost Data:
For citation references, the following sources apply:
ALL (Allowance), FLC (www.flcdatacenter.com), LD (Costs Derived from Lower Duwamish Waterway Final Feasibility Study), MII (MII), O (Other), P (Previously Developed by Anchor QEA for Portland Harbor), and V (Vendor Quote)

Abbreviations:

QTY	Quantity	AC	Acres
EQUIP	Equipment	CLF	100 Linear Foot
MATL	Material	CY	Cubic Yard
HPF	HTRW Productivity Factor	DY	Days
ADJ LABOR	Adjusted Labor for HFP	EA	Each
ADJ EQUIP	Adjusted Equipment for HFP	FTE	Full Time Equivalent
UNMOD UC	Unmodified Unit Cost	HR	Hours
UNMOD LIC	Unmodified Line Item Cost	LB	Pounds
UNBUR LIC	Unburdened Line Item Cost	LCY	Loose Cubic Yard
PC OH	Prime Contractor Overhead	LF	Linear Foot
PC PF	Prime Contractor Profit	LS	Lump Sum
BUR LIC	Burdened Line Item Cost	MO	Month
		SF	Square Foot
		SY	Square Yard
		TON	Tons
		YR	Years

Cost Adjustment Checklist:	**NOTES:**
FACTOR:	Field work will be in Level "D" PPE.
H&S Productivity (labor and equipment only)	MII assembly costs include HPF adjustments.
Escalation to Base Year	2016 cost sources are not escalated (EF=1.00). All other costs are escalated based on the USACE CWCCIS, EM 1110-2-1304, Sept 2015.
Area Cost Factor	An AF of 1.05 is used for Oregon, except that an AF of 1.00 (national unmodified average) is used for MII assembly costs and local vendor quotes.
Subcontractor Overhead and Profit	It is assumed that home office OH is 8% and profit is 9% for the Prime Contractor. Professional labor overhead is 100%.
Prime Contractor Overhead and Profit	Allowances and items with mandated costs such as per diem do not have overhead and profit applied.
	Items previously developed by Anchor QEA already include contractor markups, therefore overhead and profit were not applied to those items.
	It is assumed that OH is 1% and profit is 0% for vendor quotes for treatment and disposal at offsite disposal facilities. It is assumed that OH is 5% and profit is 0% for quotes for all other material vendor quotes.
	Items developed using MII already include contractor markups such as overhead and profit, therefore additional overhead and profit were not applied in the PC OH and PC PF to those items.

TABLE CW-G23

Alternative G **Cost Worksheet:** **CW-G23**
Periodic Cost Sub-Element
Site-Wide Monitoring

COST WORKSHEET

Site: Portland Harbor Superfund Site
Location: Portland, Oregon
Phase: Feasibility Study
Base Year: 2016

Prepared By: JN **Date:** 3/4/2016
Checked By: AB **Date:** 3/7/2016

Work Statement:
This sub-element involves sampling, surveying, data management, and reporting as part of sitewide monitoring. It includes costs for on-site labor, equipment, and materials developed from previous work.

Cost Analysis:
Cost for Site-Wide Monitoring (Lump Sum)

COST DATABASE CODE	DESCRIPTION	QTY	UNIT(S)	HPF	LABOR	ADJ LABOR	EQUIP	ADJ EQUIP	MATL	OTHER	UNMOD UC	UNMOD LIC	PC OH	PC PF	BUR LIC	COST SOURCE CITATION	COMMENTS
	Site-Wide Monitoring																
P26	Sitewide Monitoring	1	LS	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$957,659.23	$957,659.23	$957,659.23	0%	0%	$957,659	P Anchor QEA	Project-specific cost developed by Anchor QEA (2010) - based on Backup Table 1.
												TOTAL COST:			$957,659		

	Representative Unit Quantity	Unit(s)	Total Cost	Unit Cost
COST WORKSHEET SUMMARY	1	LS	$957,659	$957,659

Notes:
Further information about the development of cost worksheets can be found in Attachment A - Methodology and Organization of Detailed Cost Estimates.
The quantity bolded in the QTY column is the quantity selected as the representative unit quantity for this cost worksheet. If multiple quantities are bolded, the representative unit quantity is the sum of those quantities. When the LS unit is utilized, the default representative unit quantity is 1.
HTRW productivity factor is from Exhibit B-3 or B-4 of "A Guide to Developing and Documenting Cost Estimates During the Feasibility Study", EPA 2000
EPA developed project-specific unit costs using the Micro Computer Aided Cost Engineering System (MCACES) Second Generation (MII) software version 4.2, build 3

Cost Database Code:
The Cost Database Code is a reference code for linking with line item cost information with the cost source database and is not otherwise used within these cost worksheets. The following cost source database prefixes apply:
L (EPA-Derived Labor Unit Costs), M (Project-Specific Vendor Unit Costs), P (Previously Developed Unit Costs by Anchor QEA for Portland Harbor), A (EPA-Derived MII Unit Costs), O (Unit Costs from Other Projects/Sources)

Source of Cost Data:
For citation references, the following sources apply:
ALL (Allowance), FLC (www.flcdatacenter.com), LD (Costs Derived from Lower Duwamish Waterway Final Feasibility Study), MII (MII), O (Other), P (Previously Developed by Anchor QEA for Portland Harbor), and V (Vendor Quote)

Abbreviations:

QTY	Quantity	AC	Acres
EQUIP	Equipment	CLF	100 Linear Foot
MATL	Material	CY	Cubic Yard
HPF	HTRW Productivity Factor	DY	Days
ADJ LABOR	Adjusted Labor for HFP	EA	Each
ADJ EQUIP	Adjusted Equipment for HFP	FTE	Full Time Equivalent
UNMOD UC	Unmodified Unit Cost	HR	Hours
UNMOD LIC	Unmodified Line Item Cost	LB	Pounds
UNBUR LIC	Unburdened Line Item Cost	LCY	Loose Cubic Yard
PC OH	Prime Contractor Overhead	LF	Linear Foot
PC PF	Prime Contractor Profit	LS	Lump Sum
BUR LIC	Burdened Line Item Cost	MO	Month
		SF	Square Foot
		SY	Square Yard
		TON	Tons
		YR	Years

Cost Adjustment Checklist:	**NOTES:**
FACTOR:	Field work will be in Level "D" PPE.
H&S Productivity (labor and equipment only)	MII assembly costs include HPF adjustments.
Escalation to Base Year	2016 cost sources are not escalated (EF=1.00). All other costs are escalated based on the USACE CWCCIS, EM 1110-2-1304, Sept 2015.
Area Cost Factor	An AF of 1.05 is used for Oregon, except that an AF of 1.00 (national unmodified average) is used for MII assembly costs and local vendor quotes.
Subcontractor Overhead and Profit	It is assumed that home office OH is 8% and profit is 9% for the Prime Contractor. Professional labor overhead is 100%.
Prime Contractor Overhead and Profit	Allowances and items with mandated costs such as per diem do not have overhead and profit applied.
	Items previously developed by Anchor QEA already include contractor markups, therefore overhead and profit were not applied to those items.
	It is assumed that OH is 1% and profit is 0% for vendor quotes for treatment and disposal at offsite disposal facilities. It is assumed that OH is 5% and profit is 0% for quotes for all other material vendor quotes.
	Items developed using MII already include contractor markups such as overhead and profit, therefore additional overhead and profit were not applied in the PC OH and PC PF to those items.

TABLE CW-G24

Alternative G **Cost Worksheet:** **CW-G24**
Periodic Cost Sub-Element
Cap Area Monitoring and Reactive Layer Monitoring

COST WORKSHEET

Site: Portland Harbor Superfund Site
Location: Portland, Oregon
Phase: Feasibility Study
Base Year: 2016

Prepared By: JN **Date:** 3/4/2016
Checked By: AB **Date:** 3/7/2016

Work Statement:
This sub-element involves sampling, surveying, data management, and reporting as part of cap and reactive layer monitoring. It includes costs for on-site labor, equipment, and materials developed from previous work.
Quantity development presented in Appendix D.

Cost Analysis:
Cost for Cap and Reactive Layer Monitoring (Lump Sum)

COST DATABASE CODE	DESCRIPTION	QTY	UNIT(S)	HPF	LABOR	ADJ LABOR	EQUIP	ADJ EQUIP	MATL	OTHER	UNMOD UC	UNMOD LIC	PC OH	PC PF	BUR LIC	COST SOURCE CITATION	COMMENTS
	Cap Area Monitoring																
P27	Cap Monitoring	340	AC	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$78,961.34	$78,961.34	$26,846,855.29	0%	0%	$26,846,855	P Anchor QEA	Project-specific cost developed by Anchor QEA (2010) - based on Backup Table 4.
	Reactive Layer Monitoring																
P28	Reactive Layer Monitoring	185	AC	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$88,968.76	$88,968.76	$16,459,220.79	0%	0%	$16,459,221	P Anchor QEA	Project-specific cost developed by Anchor QEA (2010) - based on Backup Table 3.
												TOTAL COST:			$43,306,076		

	Representative Unit Quantity	Unit(s)	Total Cost	Unit Cost
COST WORKSHEET SUMMARY	1	LS	$43,306,076	$43,306,076

Notes:
Further information about the development of cost worksheets can be found in Attachment A - Methodology and Organization of Detailed Cost Estimates.
The quantity bolded in the QTY column is the quantity selected as the representative unit quantity for this cost worksheet. If multiple quantities are bolded, the representative unit quantity is the sum of those quantities. When the LS unit is utilized, the default representative unit quantity is 1.
HTRW productivity factor is from Exhibit B-3 or B-4 of "A Guide to Developing and Documenting Cost Estimates During the Feasibility Study", EPA 2000
EPA developed project-specific unit costs using the Micro Computer Aided Cost Engineering System (MCACES) Second Generation (MII) software version 4.2, build 3

Cost Database Code:
The Cost Database Code is a reference code for linking with line item cost information with the cost source database and is not otherwise used within these cost worksheets. The following cost source database prefixes apply:
L (EPA-Derived Labor Unit Costs), M (Project-Specific Vendor Unit Costs), P (Previously Developed Unit Costs by Anchor QEA for Portland Harbor), A (EPA-Derived MII Unit Costs), O (Unit Costs from Other Projects/Sources)

Source of Cost Data:
For citation references, the following sources apply:
ALL (Allowance), FLC (www.flcdatacenter.com), LD (Costs Derived from Lower Duwamish Waterway Final Feasibility Study), MII (MII), O (Other), P (Previously Developed by Anchor QEA for Portland Harbor), and V (Vendor Quote)

Abbreviations:

QTY	Quantity	AC	Acres
EQUIP	Equipment	CLF	100 Linear Foot
MATL	Material	CY	Cubic Yard
HPF	HTRW Productivity Factor	DY	Days
ADJ LABOR	Adjusted Labor for HFP	EA	Each
ADJ EQUIP	Adjusted Equipment for HFP	FTE	Full Time Equivalent
UNMOD UC	Unmodified Unit Cost	HR	Hours
UNMOD LIC	Unmodified Line Item Cost	LB	Pounds
UNBUR LIC	Unburdened Line Item Cost	LCY	Loose Cubic Yard
PC OH	Prime Contractor Overhead	LF	Linear Foot
PC PF	Prime Contractor Profit	LS	Lump Sum
BUR LIC	Burdened Line Item Cost	MO	Month
		SF	Square Foot
		SY	Square Yard
		TON	Tons
		YR	Years

Cost Adjustment Checklist:	**NOTES:**
FACTOR:	Field work will be in Level "D" PPE.
H&S Productivity (labor and equipment only)	MII assembly costs include HPF adjustments.
Escalation to Base Year	2016 cost sources are not escalated (EF=1.00). All other costs are escalated based on the USACE CWCCIS, EM 1110-2-1304, Sept 2015.
Area Cost Factor	An AF of 1.05 is used for Oregon, except that an AF of 1.00 (national unmodified average) is used for MII assembly costs and local vendor quotes.
Subcontractor Overhead and Profit	It is assumed that home office OH is 8% and profit is 9% for the Prime Contractor. Professional labor overhead is 100%.
Prime Contractor Overhead and Profit	Allowances and items with mandated costs such as per diem do not have overhead and profit applied.
	Items previously developed by Anchor QEA already include contractor markups, therefore overhead and profit were not applied to those items.
	It is assumed that OH is 1% and profit is 0% for vendor quotes for treatment and disposal at offsite disposal facilities. It is assumed that OH is 5% and profit is 0% for quotes for all other material vendor quotes.
	Items developed using MII already include contractor markups such as overhead and profit, therefore additional overhead and profit were not applied in the PC OH and PC PF to those items.

TABLE CW-G25

Alternative G **Cost Worksheet:** **CW-G25**

Periodic Cost Sub-Element

Long-Term Maintenance for Capping, ENR, and In Situ Treatment

COST WORKSHEET

Site: Portland Harbor Superfund Site
Location: Portland, Oregon
Phase: Feasibility Study
Base Year: 2016

Prepared By: JN **Date:** 3/4/2016
Checked By: AB **Date:** 3/7/2016

Work Statement:
This sub-element involves replacement of 5% of the technology assignment layers as part of long-term maintenance. It includes costs for on-site labor, equipment, and materials developed from previous work.
Quantities represent 5% of material placement quantities which were developed and presented in Appendix D.

Cost Analysis:
Cost for Long-Term Maintenance (Lump Sum)

COST DATABASE CODE	DESCRIPTION	QTY	UNIT(S)	HPF	LABOR	ADJ LABOR	EQUIP	ADJ EQUIP	MATL	OTHER	UNMOD UC	UNMOD LIC	PC OH	PC PF	BUR LIC	COST SOURCE CITATION	COMMENTS
	Mobilization / Demobilization																
O2	Mobilization/Demobilization for Long Term Maintenance	1	LS	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$123,817.04	$123,817.04	$123,817.04	0%	0%	$123,817	LD Lower Duwamish	Assumes 1.6% of total capital costs per Lower Duwamish Feasibility Study. See Calculations for derivation.
	Sand Placement for Technology Assignments																
P1	Sand	81,711	LCY	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$19.75	$19.75	$1,613,792.25	0%	0%	$1,613,792	P Anchor QEA	Assume 5% of placement of additional material
	Sand Placement (Riverbanks)																
A16	Material Placement (Confined)	5,776	CY	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$20.39	$20.39	$117,772.64	0%	0%	$117,773	MII MII	Assume 5% of placement of additional material
	Sand Placement (Confined)																
A16	Material Placement (Confined)	5,091	CY	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$20.39	$20.39	$103,805.49	0%	0%	$103,805	MII MII	Assume 5% of placement of additional material
	Sand Placement (Open Water)																
A15	Material Placement (Open)	70,844	CY	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$12.42	$12.42	$879,882.48	0%	0%	$879,882	MII MII	Assume 5% of placement of additional material
	Beach Mix Placement for Technology Assignments																
P3	ODOT 100 Beach Mix	4,532	LCY	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$57.69	$57.69	$261,451.08	0%	0%	$261,451	P Anchor QEA	Assume 5% of placement of additional material
	Beach Mix Placement (Riverbanks)																
A16	Material Placement (Confined)	1,079	CY	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$20.39	$20.39	$22,000.81	0%	0%	$22,001	MII MII	Assume 5% of placement of additional material
	Beach Mix Placement (Confined)																
A16	Material Placement (Confined)	364	CY	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$20.39	$20.39	$7,421.96	0%	0%	$7,422	MII MII	Assume 5% of placement of additional material
	Beach Mix Placement (Open Water)																
A15	Material Placement (Open)	3,090	CY	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$12.42	$12.42	$38,377.80	0%	0%	$38,378	MII MII	Assume 5% of placement of additional material
	Armor Placement for Technology Assignments																
P2	ODOT 200 Armor	12,279	LCY	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$57.69	$57.69	$708,375.51	0%	0%	$708,376	P Anchor QEA	Assume 5% of placement of additional material
	Armor Placement (Riverbanks)																
A16	Material Placement (Confined)	79	CY	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$20.39	$20.39	$1,610.81	0%	0%	$1,611	MII MII	Assume 5% of placement of additional material
	Armor Placement (Confined)																
A16	Material Placement (Confined)	2,173	CY	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$20.39	$20.39	$44,307.47	0%	0%	$44,307	MII MII	Assume 5% of placement of additional material
	Armor Placement (Open Water)																
A15	Material Placement (Open)	10,027	CY	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$12.42	$12.42	$124,535.34	0%	0%	$124,535	MII MII	Assume 5% of placement of additional material
	Reactive/GAC Placement for Technology Assignments																
	AquaGate Reactive Layer																
M4	Carbon (AquaGate + PAC 10%)	6,833	TON	1.00	$0.00	$0.00	$0.00	$0.00	$456.30	$0.00	$456.30	$3,117,897.90	5%	0%	$3,273,793	V Vendor Quote	Assume 5% of placement of additional material
P1	Sand	7,234	LCY	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$19.75	$19.75	$142,871.50	0%	0%	$142,872	P Anchor QEA	Assume 5% of placement of additional material
A3	Mixing Sand & Carbon for Reactive Layer	14,073	CY	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$4.76	$4.76	$66,987.48	0%	0%	$66,987	MII MII	Assume 5% of placement of additional material
A16	Material Placement (Confined)	1,576	CY	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$20.39	$20.39	$32,134.64	0%	0%	$32,135	MII MII	Assume 5% of placement of additional material
A15	Material Placement (Open)	12,498	CY	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$12.42	$12.42	$155,225.16	0%	0%	$155,225	MII MII	Assume 5% of placement of additional material

TABLE CW-G25

Alternative G **Cost Worksheet: CW-G25**
Periodic Cost Sub-Element
Long-Term Maintenance for Capping, ENR, and In Situ Treatment

COST WORKSHEET

Site: Portland Harbor Superfund Site
Location: Portland, Oregon
Phase: Feasibility Study
Base Year: 2016

Prepared By: JN **Date:** 3/4/2016
Checked By: AB **Date:** 3/7/2016

Work Statement:
This sub-element involves replacement of 5% of the technology assignment layers as part of long-term maintenance. It includes costs for on-site labor, equipment, and materials developed from previous work.
Quantities represent 5% of material placement quantities which were developed and presented in Appendix D.

Cost Analysis:
Cost for Long-Term Maintenance (Lump Sum)

COST DATABASE CODE	DESCRIPTION	QTY	UNIT(S)	HPF	LABOR	ADJ LABOR	EQUIP	ADJ EQUIP	MATL	OTHER	UNMOD UC	UNMOD LIC	PC OH	PC PF	BUR LIC	COST SOURCE CITATION	COMMENTS
	AquaBlock																
M3	Carbon (AquaBlok)	284	TON	1.00	$0.00	$0.00	$0.00	$0.00	$202.80	$0.00	$202.80	$57,595.20	5%	0%	$60,475	V Vendor Quote	Assume 5% of placement of additional material
A16	Material Placement (Confined)	248	CY	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$20.39	$20.39	$5,056.72	0%	0%	$5,057	MII MII	Assume 5% of placement of additional material
	Geofabric for Riverbanks																
O7	Geotextile Installation	1.4	AC	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$7,074.14	$7,074.14	$9,903.80	8%	9%	$11,659	V Vendor Quote	Assume 5% of placement of additional material
O6	Geotextile Material	1.4	AC	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$5,698.62	$5,698.62	$7,978.06	5%	0%	$8,377	V Vendor Quote	Assume 5% of placement of additional material
	Organoclay Mat Placement for Technology Assignments																
A17	Organoclay Mat Placement	8,715	SF	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$3.35	$3.35	$29,195.25	0%	0%	$29,195	MII MII	Assume 5% of placement of additional material
P4	Organoclay Mat Material	8,715	SF	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$3.38	$3.38	$29,456.70	0%	0%	$29,457	P Anchor QEA	Assume 5% of placement of additional material
												TOTAL COST:			$7,862,382		

	Representative Unit Quantity	Unit(s)	Total Cost	Unit Cost
COST WORKSHEET SUMMARY	1	LS	$7,862,382	$7,862,382

Notes:
Further information about the development of cost worksheets can be found in Attachment A - Methodology and Organization of Detailed Cost Estimates.
The quantity bolded in the QTY column is the quantity selected as the representative unit quantity for this cost worksheet. If multiple quantities are bolded, the representative unit quantity is the sum of those quantities. When the LS unit is utilized, the default representative unit quantity is 1.
HTRW productivity factor is from Exhibit B-3 or B-4 of "A Guide to Developing and Documenting Cost Estimates During the Feasibility Study", EPA 2000
EPA developed project-specific unit costs using the Micro Computer Aided Cost Engineering System (MCACES) Second Generation (MII) software version 4.2, build 3

Cost Database Code:
The Cost Database Code is a reference code for linking with line item cost information with the cost source database and is not otherwise used within these cost worksheets. The following cost source database prefixes apply:
L (EPA-Derived Labor Unit Costs), M (Project-Specific Vendor Unit Costs), P (Previously Developed Unit Costs by Anchor QEA for Portland Harbor), A (EPA-Derived MII Unit Costs), O (Unit Costs from Other Projects/Sources)

Source of Cost Data:
For citation references, the following sources apply:
ALL (Allowance), FLC (www.flcdatacenter.com), LD (Costs Derived from Lower Duwamish Waterway Final Feasibility Study), MII (MII), O (Other), P (Previously Developed by Anchor QEA for Portland Harbor), and V (Vendor Quote)

Abbreviations:

QTY	Quantity	AC	Acres
EQUIP	Equipment	CLF	100 Linear Foot
MATL	Material	CY	Cubic Yard
HPF	HTRW Productivity Factor	DY	Days
ADJ LABOR	Adjusted Labor for HFP	EA	Each
ADJ EQUIP	Adjusted Equipment for HFP	FTE	Full Time Equivalent
UNMOD UC	Unmodified Unit Cost	HR	Hours
UNMOD LIC	Unmodified Line Item Cost	LB	Pounds
UNBUR LIC	Unburdened Line Item Cost	LCY	Loose Cubic Yard
PC OH	Prime Contractor Overhead	LF	Linear Foot
PC PF	Prime Contractor Profit	LS	Lump Sum
BUR LIC	Burdened Line Item Cost	MO	Month
		SF	Square Foot
		SY	Square Yard
		TON	Tons
		YR	Years

Cost Adjustment Checklist: **NOTES:**

FACTOR:	Field work will be in Level "D" PPE.
H&S Productivity (labor and equipment only)	MII assembly costs include HPF adjustments.
Escalation to Base Year	2016 cost sources are not escalated (EF=1.00). All other costs are escalated based on the USACE CWCCIS, EM 1110-2-1304, Sept 2015.
Area Cost Factor	An AF of 1.05 is used for Oregon, except that an AF of 1.00 (national unmodified average) is used for MII assembly costs and local vendor quotes.
Subcontractor Overhead and Profit	It is assumed that home office OH is 8% and profit is 9% for the Prime Contractor. Professional labor overhead is 100%.
Prime Contractor Overhead and Profit	Allowances and items with mandated costs such as per diem do not have overhead and profit applied.
	Items previously developed by Anchor QEA already include contractor markups, therefore overhead and profit were not applied to those items.
	It is assumed that OH is 1% and profit is 0% for vendor quotes for treatment and disposal at offsite disposal facilities. It is assumed that OH is 5% and profit is 0% for quotes for all other material vendor quotes.
	Items developed using MII already include contractor markups such as overhead and profit, therefore additional overhead and profit were not applied in the PC OH and PC PF to those items.

TABLE CW-G26

Alternative G **Cost Worksheet:** **CW-G26**
Periodic Cost Sub-Element
5-Year Site Review

COST WORKSHEET

Site: Portland Harbor Superfund Site
Location: Portland, Oregon
Phase: Feasibility Study
Base Year: 2016

Prepared By: JN **Date:** 3/4/2016
Checked By: AB **Date:** 3/7/2016

Work Statement:
This sub-element involves the site visit and 5-year site review report. The following cost includes labor, material and shipping costs for site visits and 5-year site review reports.

Cost Analysis:
Cost for 5-Year Site Review (Lump Sum)

COST DATABASE CODE	DESCRIPTION	QTY	UNIT(S)	HPF	LABOR	ADJ LABOR	EQUIP	ADJ EQUIP	MATL	OTHER	UNMOD UC	UNMOD LIC	PC OH	PC PF	BUR LIC	COST SOURCE CITATION	COMMENTS
L11	Project Manager	300	HR	1.00	$82.17	$82.17	$0.00	$0.00	$0.00	$0.00	$82.17	$24,651.00	100%	9%	$53,739	FLC FLCDataCenter	Project-specific unit cost developed by EPA.
L4	Environmental Engineer	600	HR	1.00	$48.91	$48.91	$0.00	$0.00	$0.00	$0.00	$48.91	$29,346.00	100%	9%	$63,974	FLC FLCDataCenter	Project-specific unit cost developed by EPA.
L6	Environmental Scientist	900	HR	1.00	$37.70	$37.70	$0.00	$0.00	$0.00	$0.00	$37.70	$33,930.00	100%	9%	$73,967	FLC FLCDataCenter	Project-specific unit cost developed by EPA.
L12	Quality Control Engineer	120	HR	1.00	$64.99	$64.99	$0.00	$0.00	$0.00	$0.00	$64.99	$7,798.80	100%	9%	$17,001	FLC FLCDataCenter	Project-specific unit cost developed by EPA.
L1	CAD Drafter	300	HR	1.00	$31.31	$31.31	$0.00	$0.00	$0.00	$0.00	$31.31	$9,393.00	100%	9%	$20,477	FLC FLCDataCenter	Project-specific unit cost developed by EPA.
L3	Clerks, Typist, Bookkeeper & Receptionist	300	HR	1.00	$19.89	$19.89	$0.00	$0.00	$0.00	$0.00	$19.89	$5,967.00	100%	9%	$13,008	FLC FLCDataCenter	Project-specific unit cost developed by EPA.
O4	Copy and Shipping Allowance	1	LS	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$1,521.00	$1,521.00	$1,521.00	0%	0%	$1,521	ALL Allowance	
												TOTAL COST:			$243,687		

	Representative Unit Quantity	Unit(s)	Total Cost	Unit Cost
COST WORKSHEET SUMMARY	1	LS	$243,687	$243,687

Notes:
Further information about the development of cost worksheets can be found in Attachment A - Methodology and Organization of Detailed Cost Estimates.
The quantity bolded in the QTY column is the quantity selected as the representative unit quantity for this cost worksheet. If multiple quantities are bolded, the representative unit quantity is the sum of those quantities. When the LS unit is utilized, the default representative unit quantity is 1.
HTRW productivity factor is from Exhibit B-3 or B-4 of "A Guide to Developing and Documenting Cost Estimates During the Feasibility Study", EPA 2000
EPA developed project-specific unit costs using the Micro Computer Aided Cost Engineering System (MCACES) Second Generation (MII) software version 4.2, build 3

Cost Database Code:
The Cost Database Code is a reference code for linking with line item cost information with the cost source database and is not otherwise used within these cost worksheets. The following cost source database prefixes apply:
L (EPA-Derived Labor Unit Costs), M (Project-Specific Vendor Unit Costs), P (Previously Developed Unit Costs by Anchor QEA for Portland Harbor), A (EPA-Derived MII Unit Costs), O (Unit Costs from Other Projects/Sources)

Source of Cost Data:
For citation references, the following sources apply:
ALL (Allowance), FLC (www.flcdatacenter.com), LD (Costs Derived from Lower Duwamish Waterway Final Feasibility Study), MII (MII), O (Other), P (Previously Developed by Anchor QEA for Portland Harbor), and V (Vendor Quote)

Abbreviations:

QTY	Quantity	AC	Acres
EQUIP	Equipment	CLF	100 Linear Foot
MATL	Material	CY	Cubic Yard
HPF	HTRW Productivity Factor	DY	Days
ADJ LABOR	Adjusted Labor for HFP	EA	Each
ADJ EQUIP	Adjusted Equipment for HFP	FTE	Full Time Equivalent
UNMOD UC	Unmodified Unit Cost	HR	Hours
UNMOD LIC	Unmodified Line Item Cost	LB	Pounds
UNBUR LIC	Unburdened Line Item Cost	LCY	Loose Cubic Yard
PC OH	Prime Contractor Overhead	LF	Linear Foot
PC PF	Prime Contractor Profit	LS	Lump Sum
BUR LIC	Burdened Line Item Cost	MO	Month
		SF	Square Foot
		SY	Square Yard
		TON	Tons
		YR	Years

Cost Adjustment Checklist:	**NOTES:**
FACTOR:	Field work will be in Level "D" PPE.
H&S Productivity (labor and equipment only)	MII assembly costs include HPF adjustments.
Escalation to Base Year	2016 cost sources are not escalated (EF=1.00). All other costs are escalated based on the USACE CWCCIS, EM 1110-2-1304, Sept 2015.
Area Cost Factor	An AF of 1.05 is used for Oregon, except that an AF of 1.00 (national unmodified average) is used for MII assembly costs and local vendor quotes.
Subcontractor Overhead and Profit	It is assumed that home office OH is 8% and profit is 9% for the Prime Contractor. Professional labor overhead is 100%.
Prime Contractor Overhead and Profit	Allowances and items with mandated costs such as per diem do not have overhead and profit applied.
	Items previously developed by Anchor QEA already include contractor markups, therefore overhead and profit were not applied to those items.
	It is assumed that OH is 1% and profit is 0% for vendor quotes for treatment and disposal at offsite disposal facilities. It is assumed that OH is 5% and profit is 0% for quotes for all other material vendor quotes.
	Items developed using MII already include contractor markups such as overhead and profit, therefore additional overhead and profit were not applied in the PC OH and PC PF to those items.

Cost Worksheets
Alternative H

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TABLE CW-H1

Alternative H **Cost Worksheet:** **CW-H1**
Capital Cost Sub-Element
Mobilization / Demobilization

COST WORKSHEET

Site: Portland Harbor Superfund Site
Location: Portland, Oregon
Phase: Feasibility Study
Base Year: 2016

Prepared By: JN **Date:** 3/4/2016
Checked By: AB **Date:** 3/7/2016

Work Statement:
This sub-element involves mobilization and demobilization of all the required equipment to and from the site respectively.

Cost Analysis:
Cost for Mobilization/Demobilization (Lump Sum)

COST DATABASE CODE	DESCRIPTION	QTY	UNIT(S)	HPF	LABOR	ADJ LABOR	EQUIP	ADJ EQUIP	MATL	OTHER	UNMOD UC	UNMOD LIC	PC OH	PC PF	BUR LIC	COST SOURCE CITATION	COMMENTS
O1	Mobilization/Demobilization	1	LS	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$109,679,000.00	$109,679,000.00	$109,679,000.00	0%	0%	$109,679,000	LD Lower Duwamish	Assumes 1.6% of total capital costs per Lower Duwamish Feasibility Study. See Calculations for derivation.
												TOTAL COST:			$109,679,000		

	Representative Unit Quantity	Unit(s)	Total Cost	Unit Cost
COST WORKSHEET SUMMARY	1	LS	$109,679,000	$109,679,000

Notes:
Further information about the development of cost worksheets can be found in Attachment A - Methodology and Organization of Detailed Cost Estimates.
The quantity bolded in the QTY column is the quantity selected as the representative unit quantity for this cost worksheet. If multiple quantities are bolded, the representative unit quantity is the sum of those quantities. When the LS unit is utilized, the default representative unit quantity is 1.
HTRW productivity factor is from Exhibit B-3 or B-4 of "A Guide to Developing and Documenting Cost Estimates During the Feasibility Study", EPA 2000
EPA developed project-specific unit costs using the Micro Computer Aided Cost Engineering System (MCACES) Second Generation (MII) software version 4.2, build 3

Cost Database Code:
The Cost Database Code is a reference code for linking with line item cost information with the cost source database and is not otherwise used within these cost worksheets. The following cost source database prefixes apply:
L (EPA-Derived Labor Unit Costs), M (Project-Specific Vendor Unit Costs), P (Previously Developed Unit Costs by Anchor QEA for Portland Harbor), A (EPA-Derived MII Unit Costs), O (Unit Costs from Other Projects/Sources)

Source of Cost Data:
For citation references, the following sources apply:
ALL (Allowance), FLC (www.flcdatacenter.com), LD (Costs Derived from Lower Duwamish Waterway Final Feasibility Study), MII (MII), O (Other), P (Previously Developed by Anchor QEA for Portland Harbor), and V (Vendor Quote)

Abbreviations:

QTY	Quantity	AC	Acres
EQUIP	Equipment	CLF	100 Linear Foot
MATL	Material	CY	Cubic Yard
HPF	HTRW Productivity Factor	DY	Days
ADJ LABOR	Adjusted Labor for HFP	EA	Each
ADJ EQUIP	Adjusted Equipment for HFP	FTE	Full Time Equivalent
UNMOD UC	Unmodified Unit Cost	HR	Hours
UNMOD LIC	Unmodified Line Item Cost	LB	Pounds
UNBUR LIC	Unburdened Line Item Cost	LCY	Loose Cubic Yard
PC OH	Prime Contractor Overhead	LF	Linear Foot
PC PF	Prime Contractor Profit	LS	Lump Sum
BUR LIC	Burdened Line Item Cost	MO	Month
		SF	Square Foot
		SY	Square Yard
		TON	Tons
		YR	Years

Cost Adjustment Checklist:	**NOTES:**
FACTOR:	Field work will be in Level "D" PPE.
H&S Productivity (labor and equipment only)	MII assembly costs include HPF adjustments.
Escalation to Base Year	2016 cost sources are not escalated (EF=1.00). All other costs are escalated based on the USACE CWCCIS, EM 1110-2-1304, Sept 2015.
Area Cost Factor	An AF of 1.05 is used for Oregon, except that an AF of 1.00 (national unmodified average) is used for MII assembly costs and local vendor quotes.
Subcontractor Overhead and Profit	It is assumed that home office OH is 8% and profit is 9% for the Prime Contractor. Professional labor overhead is 100%.
Prime Contractor Overhead and Profit	Allowances and items with mandated costs such as per diem do not have overhead and profit applied.
	Items previously developed by Anchor QEA already include contractor markups, therefore overhead and profit were not applied to those items.
	It is assumed that OH is 1% and profit is 0% for vendor quotes for treatment and disposal at offsite disposal facilities. It is assumed that OH is 5% and profit is 0% for quotes for all other material vendor quotes.
	Items developed using MII already include contractor markups such as overhead and profit, therefore additional overhead and profit were not applied in the PC OH and PC PF to those items.

TABLE CW-H2

Alternative H **Cost Worksheet:** **CW-H2**

Capital Cost Sub-Element

Initial Establishment of Institutional Controls

COST WORKSHEET

Site: Portland Harbor Superfund Site
Location: Portland, Oregon
Phase: Feasibility Study
Base Year: 2016

Prepared By: JN **Date:** 3/4/2016
Checked By: AB **Date:** 3/7/2016

Work Statement:
This sub-element involves implementation of institutional controls for the site. The following cost includes labor and materials to develop legal documents for institutional controls and cost for document submission and recording.
Quantity development presented in Appendix D.

Cost Analysis:
Cost for Initial Establishment of Institutional Controls (Lump Sum)

COST DATABASE CODE	DESCRIPTION	QTY	UNIT(S)	HPF	LABOR	ADJ LABOR	EQUIP	ADJ EQUIP	MATL	OTHER	UNMOD UC	UNMOD LIC	PC OH	PC PF	BUR LIC	COST SOURCE CITATION	COMMENTS
	Informational Devices - Fish Consumption Advisory																
L11	Project Manager	2,080	HR	1.00	$82.17	$82.17	$0.00	$0.00	$0.00	$0.00	$82.17	$170,913.60	100%	9%	$372,592	FLC FLCDataCenter	Assumes 1 FTE for implementation of fish advisory
L4	Environmental Engineer	1,040	HR	1.00	$48.91	$48.91	$0.00	$0.00	$0.00	$0.00	$48.91	$50,866.40	100%	9%	$110,889	FLC FLCDataCenter	Assumes 0.5 FTE for implementation of fish advisory
L6	Environmental Scientist	1,040	HR	1.00	$37.70	$37.70	$0.00	$0.00	$0.00	$0.00	$37.70	$39,208.00	100%	9%	$85,473	FLC FLCDataCenter	Assumes 0.5 FTE for implementation of fish advisory
L3	Clerks, Typist, Bookkeeper & Receptionist	520	HR	1.00	$19.89	$19.89	$0.00	$0.00	$0.00	$0.00	$19.89	$10,342.80	100%	9%	$22,547	FLC FLCDataCenter	Assumes 0.25 FTE for implementation of fish advisory
L5	Environmental Lawyer	260	HR	1.00	$71.72	$71.72	$0.00	$0.00	$0.00	$0.00	$71.72	$18,647.20	100%	9%	$40,651	FLC FLCDataCenter	Assumes 0.125 FTE for implementation of fish advisory
L13	Paralegal	260	HR	1.00	$29.56	$29.56	$0.00	$0.00	$0.00	$0.00	$29.56	$7,685.60	100%	9%	$16,755	FLC FLCDataCenter	Assumes 0.125 FTE for implementation of fish advisory
M26	Signage	50	EA	1.00	$0.00	$0.00	$0.00	$0.00	$165.75	$0.00	$165.75	$8,287.50	5%	0%	$8,702	V Vendor Quote	Project-specific vendor quote - Allstate Sign & Plaque, 2016. 36" x 36" Signs
L8	Field Technician	50	HR	1.00	$31.42	$31.42	$0.00	$0.00	$0.00	$0.00	$31.42	$1,571.00	100%	9%	$3,425	FLC FLCDataCenter	Assumes 1 hr/sign for sign placement (2 technician crew)
O5	Allowance for Production & Copies for Advisories	1	LS	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$1,000.00	$1,000.00	$1,000.00	0%	0%	$1,000	ALL Allowance	
	Informational Devices - Regulated Navigation Area (RNA) Setup																
L11	Project Manager	200	HR	1.00	$82.17	$82.17	$0.00	$0.00	$0.00	$0.00	$82.17	$16,434.00	100%	9%	$35,826	FLC FLCDataCenter	Project-specific unit cost developed by EPA.
L4	Environmental Engineer	150	HR	1.00	$48.91	$48.91	$0.00	$0.00	$0.00	$0.00	$48.91	$7,336.50	100%	9%	$15,994	FLC FLCDataCenter	Project-specific unit cost developed by EPA.
L3	Clerks, Typist, Bookkeeper & Receptionist	40	HR	1.00	$19.89	$19.89	$0.00	$0.00	$0.00	$0.00	$19.89	$795.60	100%	9%	$1,734	FLC FLCDataCenter	Project-specific unit cost developed by EPA.
A1	18' Boat	1,612	HR	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$25.42	$25.42	$40,977.04	0%	0%	$40,977	MII MII	Assumes 2 hr/buoy for buoy setup
L17	Boat Operator	1,612	HR	1.00	$33.16	$33.16	$0.00	$0.00	$0.00	$0.00	$33.16	$53,453.92	100%	9%	$116,530	FLC FLCDataCenter	Assumes 2 hr/buoy for buoy setup
L8	Field Technician	3,224	HR	1.00	$31.42	$31.42	$0.00	$0.00	$0.00	$0.00	$31.42	$101,298.08	100%	9%	$220,830	FLC FLCDataCenter	Assumes 4 hrs/buoy for buoy setup (2 technician crew)
M21	Buoy	806	EA	1.00	$0.00	$0.00	$0.00	$0.00	$558.63	$0.00	$558.63	$450,255.78	5%	0%	$472,769	V Vendor Quote	Project-specific vendor quote - Go2Marine, 2016.
	Proprietary Controls																
L5	Environmental Lawyer	9,900	HR	1.00	$71.72	$71.72	$0.00	$0.00	$0.00	$0.00	$71.72	$710,028.00	100%	9%	$1,547,861	FLC FLCDataCenter	Assumes 150 hrs per dock/structure
L13	Paralegal	13,200	HR	1.00	$29.56	$29.56	$0.00	$0.00	$0.00	$0.00	$29.56	$390,192.00	100%	9%	$850,619	FLC FLCDataCenter	Assumes 200 hrs per dock/structure
L3	Clerks, Typist, Bookkeeper & Receptionist	6,600	HR	1.00	$19.89	$19.89	$0.00	$0.00	$0.00	$0.00	$19.89	$131,274.00	100%	9%	$286,177	FLC FLCDataCenter	Assumes 100 hrs per dock/structure
	Enforcement Tools																
L11	Project Manager	260	HR	1.00	$82.17	$82.17	$0.00	$0.00	$0.00	$0.00	$82.17	$21,364.20	100%	9%	$46,574	FLC FLCDataCenter	Assumes 0.125 FTE for implementation of enforcement tools
L5	Environmental Lawyer	2,080	HR	1.00	$71.72	$71.72	$0.00	$0.00	$0.00	$0.00	$71.72	$149,177.60	100%	9%	$325,207	FLC FLCDataCenter	Assumes 1 FTE for implementation of enforcement tools
L13	Paralegal	4,160	HR	1.00	$29.56	$29.56	$0.00	$0.00	$0.00	$0.00	$29.56	$122,969.60	100%	9%	$268,074	FLC FLCDataCenter	Assumes 2 FTE for implementation of enforcement tools
L3	Clerks, Typist, Bookkeeper & Receptionist	260	HR	1.00	$19.89	$19.89	$0.00	$0.00	$0.00	$0.00	$19.89	$5,171.40	100%	9%	$11,274	FLC FLCDataCenter	Assumes 0.125 FTE for implementation of enforcement tools
												TOTAL COST:			$4,902,480		

	Representative Unit Quantity	Unit(s)	Total Cost	Unit Cost
COST WORKSHEET SUMMARY	1	LS	$4,902,480	$4,902,480

TABLE CW-H2

Alternative H **Cost Worksheet:** **CW-H2**

Capital Cost Sub-Element

Initial Establishment of Institutional Controls

COST WORKSHEET

Site: Portland Harbor Superfund Site
Location: Portland, Oregon
Phase: Feasibility Study
Base Year: 2016

Prepared By: JN **Date:** 3/4/2016

Checked By: AB **Date:** 3/7/2016

Notes:

Further information about the development of cost worksheets can be found in Attachment A - Methodology and Organization of Detailed Cost Estimates.
The quantity bolded in the QTY column is the quantity selected as the representative unit quantity for this cost worksheet. If multiple quantities are bolded, the representative unit quantity is the sum of those quantities. When the LS unit is utilized, the default representative unit quantity is 1.
HTRW productivity factor is from Exhibit B-3 or B-4 of "A Guide to Developing and Documenting Cost Estimates During the Feasibility Study", EPA 2000
EPA developed project-specific unit costs using the Micro Computer Aided Cost Engineering System (MCACES) Second Generation (MII) software version 4.2, build 3

Cost Database Code:

The Cost Database Code is a reference code for linking with line item cost information with the cost source database and is not otherwise used within these cost worksheets. The following cost source database prefixes apply:

L (EPA-Derived Labor Unit Costs), M (Project-Specific Vendor Unit Costs), P (Previously Developed Unit Costs by Anchor QEA for Portland Harbor), A (EPA-Derived MII Unit Costs), O (Unit Costs from Other Projects/Sources)

Source of Cost Data:

For citation references, the following sources apply:

ALL (Allowance), FLC (www.flcdatacenter.com), LD (Costs Derived from Lower Duwamish Waterway Final Feasibility Study), MII (MII), O (Other), P (Previously Developed by Anchor QEA for Portland Harbor), and V (Vendor Quote)

Abbreviations:

QTY	Quantity
EQUIP	Equipment
MATL	Material
HPF	HTRW Productivity Factor
ADJ LABOR	Adjusted Labor for HFP
ADJ EQUIP	Adjusted Equipment for HFP
UNMOD UC	Unmodified Unit Cost
UNMOD LIC	Unmodified Line Item Cost
UNBUR LIC	Unburdened Line Item Cost
PC OH	Prime Contractor Overhead
PC PF	Prime Contractor Profit
BUR LIC	Burdened Line Item Cost
AC	Acres
CLF	100 Linear Foot
CY	Cubic Yard
DY	Days
EA	Each
FTE	Full Time Equivalent
HR	Hours
LB	Pounds
LCY	Loose Cubic Yard
LF	Linear Foot
LS	Lump Sum
MO	Month
SF	Square Foot
SY	Square Yard
TON	Tons
YR	Years

Cost Adjustment Checklist:	**NOTES:**
FACTOR:	Field work will be in Level "D" PPE.
H&S Productivity (labor and equipment only)	MII assembly costs include HPF adjustments.
Escalation to Base Year	2016 cost sources are not escalated (EF=1.00). All other costs are escalated based on the USACE CWCCIS, EM 1110-2-1304, Sept 2015.
Area Cost Factor	An AF of 1.05 is used for Oregon, except that an AF of 1.00 (national unmodified average) is used for MII assembly costs and local vendor quotes.
Subcontractor Overhead and Profit	It is assumed that home office OH is 8% and profit is 9% for the Prime Contractor. Professional labor overhead is 100%.
Prime Contractor Overhead and Profit	Allowances and items with mandated costs such as per diem do not have overhead and profit applied.
	Items previously developed by Anchor QEA already include contractor markups, therefore overhead and profit were not applied to those items.
	It is assumed that OH is 1% and profit is 0% for vendor quotes for treatment and disposal at offsite disposal facilities. It is assumed that OH is 5% and profit is 0% for quotes for all other material vendor quotes.
	Items developed using MII already include contractor markups such as overhead and profit, therefore additional overhead and profit were not applied in the PC OH and PC PF to those items.

TABLE CW-H3

Alternative H **Cost Worksheet:** **CW-H3**

Periodic Cost Sub-Element

Evaluating and Updating Institutional Controls

COST WORKSHEET

Site: Portland Harbor Superfund Site
Location: Portland, Oregon
Phase: Feasibility Study
Base Year: 2016

Prepared By: JN **Date:** 3/4/2016
Checked By: AB **Date:** 3/7/2016

Work Statement:
This sub-element involves evaluating and updating of institutional controls for the site. The following cost includes labor and materials to required for evaluating and updating institutional controls every 5 years.
Quantity development presented in Appendix D.

Cost Analysis:
Cost for Evaluating and Updating Institutional Controls (Lump Sum)

COST DATABASE CODE	DESCRIPTION	QTY	UNIT(S)	HPF	LABOR	ADJ LABOR	EQUIP	ADJ EQUIP	MATL	OTHER	UNMOD UC	UNMOD LIC	PC OH	PC PF	BUR LIC	COST SOURCE CITATION	COMMENTS
	Informational Devices - Fish Consumption Advisory																
L11	Project Manager	208	HR	1.00	$82.17	$82.17	$0.00	$0.00	$0.00	$0.00	$82.17	$17,091.36	100%	9%	$37,259	FLC FLCDataCenter	Assumes 10% of initial costs for updating periodically
L4	Environmental Engineer	104	HR	1.00	$48.91	$48.91	$0.00	$0.00	$0.00	$0.00	$48.91	$5,086.64	100%	9%	$11,089	FLC FLCDataCenter	Assumes 10% of initial costs for updating periodically
L6	Environmental Scientist	104	HR	1.00	$37.70	$37.70	$0.00	$0.00	$0.00	$0.00	$37.70	$3,920.80	100%	9%	$8,547	FLC FLCDataCenter	Assumes 10% of initial costs for updating periodically
L3	Clerks, Typist, Bookkeeper & Receptionist	52	HR	1.00	$19.89	$19.89	$0.00	$0.00	$0.00	$0.00	$19.89	$1,034.28	100%	9%	$2,255	FLC FLCDataCenter	Assumes 10% of initial costs for updating periodically
L5	Environmental Lawyer	26	HR	1.00	$71.72	$71.72	$0.00	$0.00	$0.00	$0.00	$71.72	$1,864.72	100%	9%	$4,065	FLC FLCDataCenter	Assumes 10% of initial costs for updating periodically
L13	Paralegal	26	HR	1.00	$29.56	$29.56	$0.00	$0.00	$0.00	$0.00	$29.56	$768.56	100%	9%	$1,675	FLC FLCDataCenter	Assumes 10% of initial costs for updating periodically
M26	Signage	50	EA	1.00	$0.00	$0.00	$0.00	$0.00	$165.75	$0.00	$165.75	$8,287.50	5%	0%	$8,702	V Vendor Quote	Assumes 100% replacement of signs every 5 years
L8	Field Technician	50	HR	1.00	$31.42	$31.42	$0.00	$0.00	$0.00	$0.00	$31.42	$1,571.00	100%	9%	$3,425	FLC FLCDataCenter	Assumes 1 hr/sign for sign placement (2 technician crew)
O5	Allowance for Production & Copies for Advisories	5	LS	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$1,000.00	$1,000.00	$5,000.00	0%	0%	$5,000	ALL Allowance	Assumes yearly allowance for production and copies during 5-yr periodic updates
	Informational Devices - Regulated Navigation Area (RNA) Setup																
L11	Project Manager	200	HR	1.00	$82.17	$82.17	$0.00	$0.00	$0.00	$0.00	$82.17	$16,434.00	100%	9%	$35,826	FLC FLCDataCenter	Project-specific unit cost developed by EPA.
L4	Environmental Engineer	150	HR	1.00	$48.91	$48.91	$0.00	$0.00	$0.00	$0.00	$48.91	$7,336.50	100%	9%	$15,994	FLC FLCDataCenter	Project-specific unit cost developed by EPA.
L3	Clerks, Typist, Bookkeeper & Receptionist	40	HR	1.00	$19.89	$19.89	$0.00	$0.00	$0.00	$0.00	$19.89	$795.60	100%	9%	$1,734	FLC FLCDataCenter	Project-specific unit cost developed by EPA.
A1	18' Boat	1,612	HR	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$25.42	$25.42	$40,977.04	0%	0%	$40,977	MII MII	Assumes 2 hr/buoy for buoy setup
L17	Boat Operator	1,612	HR	1.00	$33.16	$33.16	$0.00	$0.00	$0.00	$0.00	$33.16	$53,453.92	100%	9%	$116,530	FLC FLCDataCenter	Assumes 2 hr/buoy for buoy setup
L8	Field Technician	3,224	HR	1.00	$31.42	$31.42	$0.00	$0.00	$0.00	$0.00	$31.42	$101,298.08	100%	9%	$220,830	FLC FLCDataCenter	Assumes 4 hrs/buoy for buoy setup (2 technician crew)
M21	Buoy	806	EA	1.00	$0.00	$0.00	$0.00	$0.00	$558.63	$0.00	$558.63	$450,255.78	5%	0%	$472,769	V Vendor Quote	Assumes 100% replacement of buoys every 5 years. Quote - Go2Marine 2016.
	Proprietary Controls																
L5	Environmental Lawyer	990	HR	1.00	$71.72	$71.72	$0.00	$0.00	$0.00	$0.00	$71.72	$71,002.80	100%	9%	$154,786	FLC FLCDataCenter	Assumes 10% of initial costs for updating periodically
L13	Paralegal	1,320	HR	1.00	$29.56	$29.56	$0.00	$0.00	$0.00	$0.00	$29.56	$39,019.20	100%	9%	$85,062	FLC FLCDataCenter	Assumes 10% of initial costs for updating periodically
L3	Clerks, Typist, Bookkeeper & Receptionist	660	HR	1.00	$19.89	$19.89	$0.00	$0.00	$0.00	$0.00	$19.89	$13,127.40	100%	9%	$28,618	FLC FLCDataCenter	Assumes 10% of initial costs for updating periodically
	Enforcement Tools																
L11	Project Manager	26	HR	1.00	$82.17	$82.17	$0.00	$0.00	$0.00	$0.00	$82.17	$2,136.42	100%	9%	$4,657	FLC FLCDataCenter	Assumes 10% of initial costs for updating periodically
L5	Environmental Lawyer	208	HR	1.00	$71.72	$71.72	$0.00	$0.00	$0.00	$0.00	$71.72	$14,917.76	100%	9%	$32,521	FLC FLCDataCenter	Assumes 10% of initial costs for updating periodically
L13	Paralegal	416	HR	1.00	$29.56	$29.56	$0.00	$0.00	$0.00	$0.00	$29.56	$12,296.96	100%	9%	$26,807	FLC FLCDataCenter	Assumes 10% of initial costs for updating periodically
L3	Clerks, Typist, Bookkeeper & Receptionist	26	HR	1.00	$19.89	$19.89	$0.00	$0.00	$0.00	$0.00	$19.89	$517.14	100%	9%	$1,127	FLC FLCDataCenter	Assumes 10% of initial costs for updating periodically
												TOTAL COST:			$1,320,255		

	Representative Unit Quantity	Unit(s)	Total Cost	Unit Cost
COST WORKSHEET SUMMARY	1	LS	$1,320,255	$1,320,255

TABLE CW-H3

Alternative H **Cost Worksheet:** **CW-H3**
Periodic Cost Sub-Element
Evaluating and Updating Institutional Controls

COST WORKSHEET

Site: Portland Harbor Superfund Site
Location: Portland, Oregon
Phase: Feasibility Study
Base Year: 2016

Prepared By: JN **Date:** 3/4/2016
Checked By: AB **Date:** 3/7/2016

Notes:

Further information about the development of cost worksheets can be found in Attachment A - Methodology and Organization of Detailed Cost Estimates.
The quantity bolded in the QTY column is the quantity selected as the representative unit quantity for this cost worksheet. If multiple quantities are bolded, the representative unit quantity is the sum of those quantities. When the LS unit is utilized, the default representative unit quantity is 1.
HTRW productivity factor is from Exhibit B-3 or B-4 of "A Guide to Developing and Documenting Cost Estimates During the Feasibility Study", EPA 2000
EPA developed project-specific unit costs using the Micro Computer Aided Cost Engineering System (MCACES) Second Generation (MII) software version 4.2, build 3

Cost Database Code:

The Cost Database Code is a reference code for linking with line item cost information with the cost source database and is not otherwise used within these cost worksheets. The following cost source database prefixes apply:

L (EPA-Derived Labor Unit Costs), M (Project-Specific Vendor Unit Costs), P (Previously Developed Unit Costs by Anchor QEA for Portland Harbor), A (EPA-Derived MII Unit Costs), O (Unit Costs from Other Projects/Sources)

Source of Cost Data:

For citation references, the following sources apply:

ALL (Allowance), FLC (www.flcdatacenter.com), LD (Costs Derived from Lower Duwamish Waterway Final Feasibility Study), MII (MII), O (Other), P (Previously Developed by Anchor QEA for Portland Harbor), and V (Vendor Quote)

Abbreviations:

QTY	Quantity	AC	Acres
EQUIP	Equipment	CLF	100 Linear Foot
MATL	Material	CY	Cubic Yard
HPF	HTRW Productivity Factor	DY	Days
ADJ LABOR	Adjusted Labor for HFP	EA	Each
ADJ EQUIP	Adjusted Equipment for HFP	FTE	Full Time Equivalent
UNMOD UC	Unmodified Unit Cost	HR	Hours
UNMOD LIC	Unmodified Line Item Cost	LB	Pounds
UNBUR LIC	Unburdened Line Item Cost	LCY	Loose Cubic Yard
PC OH	Prime Contractor Overhead	LF	Linear Foot
PC PF	Prime Contractor Profit	LS	Lump Sum
BUR LIC	Burdened Line Item Cost	MO	Month
		SF	Square Foot
		SY	Square Yard
		TON	Tons
		YR	Years

Cost Adjustment Checklist:	**NOTES:**
FACTOR:	Field work will be in Level "D" PPE.
H&S Productivity (labor and equipment only)	MII assembly costs include HPF adjustments.
Escalation to Base Year	2016 cost sources are not escalated (EF=1.00). All other costs are escalated based on the USACE CWCCIS, EM 1110-2-1304, Sept 2015.
Area Cost Factor	An AF of 1.05 is used for Oregon, except that an AF of 1.00 (national unmodified average) is used for MII assembly costs and local vendor quotes.
Subcontractor Overhead and Profit	It is assumed that home office OH is 8% and profit is 9% for the Prime Contractor. Professional labor overhead is 100%.
Prime Contractor Overhead and Profit	Allowances and items with mandated costs such as per diem do not have overhead and profit applied.
	Items previously developed by Anchor QEA already include contractor markups, therefore overhead and profit were not applied to those items.
	It is assumed that OH is 1% and profit is 0% for vendor quotes for treatment and disposal at offsite disposal facilities. It is assumed that OH is 5% and profit is 0% for quotes for all other material vendor quotes.
	Items developed using MII already include contractor markups such as overhead and profit, therefore additional overhead and profit were not applied in the PC OH and PC PF to those items.

TABLE CW-H5

Alternative H **Cost Worksheet:** **CW-H5**
Capital Cost Sub-Element
Debris Removal and Disposal

COST WORKSHEET

Site: Portland Harbor Superfund Site
Location: Portland, Oregon
Phase: Feasibility Study
Base Year: 2016

Prepared By: JN **Date:** 3/4/2016
Checked By: AB **Date:** 3/7/2016

Work Statement:
This sub-element involves removal and disposal of debris for all areas prior to remedial activities. It includes costs for on-site labor, equipment, and materials developed from previous work.
Quantity development presented in Appendix D.

Cost Analysis:
Cost for Debris Removal and Disposal (Lump Sum)

COST DATABASE CODE	DESCRIPTION	QTY	UNIT(S)	HPF	LABOR	ADJ LABOR	EQUIP	ADJ EQUIP	MATL	OTHER	UNMOD UC	UNMOD LIC	PC OH	PC PF	BUR LIC	COST SOURCE CITATION	COMMENTS
P9	Debris Removal and Disposal	**2,168**	AC	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$13,107.01	$13,107.01	$28,415,997.68	0%	0%	$28,415,998	P Anchor QEA	Project-specific cost developed by Anchor QEA (2010) - see Backup Table 2.
												TOTAL COST:			$28,415,998		

	Representative Unit Quantity	Unit(s)	Total Cost	Unit Cost
COST WORKSHEET SUMMARY	2,168	AC	$28,415,998	$13,107

Notes:
Further information about the development of cost worksheets can be found in Attachment A - Methodology and Organization of Detailed Cost Estimates.
The quantity bolded in the QTY column is the quantity selected as the representative unit quantity for this cost worksheet. If multiple quantities are bolded, the representative unit quantity is the sum of those quantities. When the LS unit is utilized, the default representative unit quantity is 1.
HTRW productivity factor is from Exhibit B-3 or B-4 of "A Guide to Developing and Documenting Cost Estimates During the Feasibility Study", EPA 2000
EPA developed project-specific unit costs using the Micro Computer Aided Cost Engineering System (MCACES) Second Generation (MII) software version 4.2, build 3

Cost Database Code:
The Cost Database Code is a reference code for linking with line item cost information with the cost source database and is not otherwise used within these cost worksheets. The following cost source database prefixes apply:
L (EPA-Derived Labor Unit Costs), M (Project-Specific Vendor Unit Costs), P (Previously Developed Unit Costs by Anchor QEA for Portland Harbor), A (EPA-Derived MII Unit Costs), O (Unit Costs from Other Projects/Sources)

Source of Cost Data:
For citation references, the following sources apply:
ALL (Allowance), FLC (www.flcdatacenter.com), LD (Costs Derived from Lower Duwamish Waterway Final Feasibility Study), MII (MII), O (Other), P (Previously Developed by Anchor QEA for Portland Harbor), and V (Vendor Quote)

Abbreviations:

QTY	Quantity	AC	Acres
EQUIP	Equipment	CLF	100 Linear Foot
MATL	Material	CY	Cubic Yard
HPF	HTRW Productivity Factor	DY	Days
ADJ LABOR	Adjusted Labor for HFP	EA	Each
ADJ EQUIP	Adjusted Equipment for HFP	FTE	Full Time Equivalent
UNMOD UC	Unmodified Unit Cost	HR	Hours
UNMOD LIC	Unmodified Line Item Cost	LB	Pounds
UNBUR LIC	Unburdened Line Item Cost	LCY	Loose Cubic Yard
PC OH	Prime Contractor Overhead	LF	Linear Foot
PC PF	Prime Contractor Profit	LS	Lump Sum
BUR LIC	Burdened Line Item Cost	MO	Month
		SF	Square Foot
		SY	Square Yard
		TON	Tons
		YR	Years

Cost Adjustment Checklist:	**NOTES:**
FACTOR:	Field work will be in Level "D" PPE.
H&S Productivity (labor and equipment only)	MII assembly costs include HPF adjustments.
Escalation to Base Year	2016 cost sources are not escalated (EF=1.00). All other costs are escalated based on the USACE CWCCIS, EM 1110-2-1304, Sept 2015.
Area Cost Factor	An AF of 1.05 is used for Oregon, except that an AF of 1.00 (national unmodified average) is used for MII assembly costs and local vendor quotes.
Subcontractor Overhead and Profit	It is assumed that home office OH is 8% and profit is 9% for the Prime Contractor. Professional labor overhead is 100%.
Prime Contractor Overhead and Profit	Allowances and items with mandated costs such as per diem do not have overhead and profit applied.
	Items previously developed by Anchor QEA already include contractor markups, therefore overhead and profit were not applied to those items.
	It is assumed that OH is 1% and profit is 0% for vendor quotes for treatment and disposal at offsite disposal facilities. It is assumed that OH is 5% and profit is 0% for quotes for all other material vendor quotes.
	Items developed using MII already include contractor markups such as overhead and profit, therefore additional overhead and profit were not applied in the PC OH and PC PF to those items.

TABLE CW-H6

Alternative H **Cost Worksheet:** **CW-H6**
Capital Cost Sub-Element
Obstruction Removal and Relocation

COST WORKSHEET

Site: Portland Harbor Superfund Site
Location: Portland, Oregon
Phase: Feasibility Study
Base Year: 2016

Prepared By: JN **Date:** 3/4/2016
Checked By: AB **Date:** 3/7/2016

Work Statement:
This sub-element involves all work related to obstructions removal, relocation, and disposal. It includes all costs for labor, equipment and materials developed from previous work for pile removal and disposal, pile replacement, and temporary dock relocation.
Quantity development presented in Appendix D.

Cost Analysis:
Cost for Obstructions (Lump Sum)

COST DATABASE CODE	DESCRIPTION	QTY	UNIT(S)	HPF	LABOR	ADJ LABOR	EQUIP	ADJ EQUIP	MATL	OTHER	UNMOD UC	UNMOD LIC	PC OH	PC PF	BUR LIC	COST SOURCE CITATION	COMMENTS
P10	Pile Removal and Disposal	3,618	EA	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$715.65	$715.65	$2,589,203.61	0%	0%	$2,589,204	P Anchor QEA	Project-specific cost developed by Anchor QEA (2010) - see Backup Table 3.
P11	Pile Replacement	3,618	EA	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$7,478.77	$7,478.77	$27,058,197.10	0%	0%	$27,058,197	P Anchor QEA	Project-specific cost developed by Anchor QEA (2010) - see Backup Table 4.
P12	Temporary Dock Relocation	10	EA	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$100,497.97	$100,497.97	$1,004,979.71	0%	0%	$1,004,980	P Anchor QEA	Project-specific cost developed by Anchor QEA (2010) - see Backup Table 5.
												TOTAL COST:			$30,652,381		

	Representative Unit Quantity	Unit(s)	Total Cost	Unit Cost
COST WORKSHEET SUMMARY	1	LS	$30,652,381	$30,652,381

Notes:
Further information about the development of cost worksheets can be found in Attachment A - Methodology and Organization of Detailed Cost Estimates.
The quantity bolded in the QTY column is the quantity selected as the representative unit quantity for this cost worksheet. If multiple quantities are bolded, the representative unit quantity is the sum of those quantities. When the LS unit is utilized, the default representative unit quantity is 1.
HTRW productivity factor is from Exhibit B-3 or B-4 of "A Guide to Developing and Documenting Cost Estimates During the Feasibility Study", EPA 2000
EPA developed project-specific unit costs using the Micro Computer Aided Cost Engineering System (MCACES) Second Generation (MII) software version 4.2, build 3

Cost Database Code:
The Cost Database Code is a reference code for linking with line item cost information with the cost source database and is not otherwise used within these cost worksheets. The following cost source database prefixes apply:
L (EPA-Derived Labor Unit Costs), M (Project-Specific Vendor Unit Costs), P (Previously Developed Unit Costs by Anchor QEA for Portland Harbor), A (EPA-Derived MII Unit Costs), O (Unit Costs from Other Projects/Sources)

Source of Cost Data:
For citation references, the following sources apply:
ALL (Allowance), FLC (www.flcdatacenter.com), LD (Costs Derived from Lower Duwamish Waterway Final Feasibility Study), MII (MII), O (Other), P (Previously Developed by Anchor QEA for Portland Harbor), and V (Vendor Quote)

Abbreviations:

QTY	Quantity	AC	Acres
EQUIP	Equipment	CLF	100 Linear Foot
MATL	Material	CY	Cubic Yard
HPF	HTRW Productivity Factor	DY	Days
ADJ LABOR	Adjusted Labor for HFP	EA	Each
ADJ EQUIP	Adjusted Equipment for HFP	FTE	Full Time Equivalent
UNMOD UC	Unmodified Unit Cost	HR	Hours
UNMOD LIC	Unmodified Line Item Cost	LB	Pounds
UNBUR LIC	Unburdened Line Item Cost	LCY	Loose Cubic Yard
PC OH	Prime Contractor Overhead	LF	Linear Foot
PC PF	Prime Contractor Profit	LS	Lump Sum
BUR LIC	Burdened Line Item Cost	MO	Month
		SF	Square Foot
		SY	Square Yard
		TON	Tons
		YR	Years

Cost Adjustment Checklist:	**NOTES:**
FACTOR:	Field work will be in Level "D" PPE.
H&S Productivity (labor and equipment only)	MII assembly costs include HPF adjustments.
Escalation to Base Year	2016 cost sources are not escalated (EF=1.00). All other costs are escalated based on the USACE CWCCIS, EM 1110-2-1304, Sept 2015.
Area Cost Factor	An AF of 1.05 is used for Oregon, except that an AF of 1.00 (national unmodified average) is used for MII assembly costs and local vendor quotes.
Subcontractor Overhead and Profit	It is assumed that home office OH is 8% and profit is 9% for the Prime Contractor. Professional labor overhead is 100%.
Prime Contractor Overhead and Profit	Allowances and items with mandated costs such as per diem do not have overhead and profit applied.
	Items previously developed by Anchor QEA already include contractor markups, therefore overhead and profit were not applied to those items.
	It is assumed that OH is 1% and profit is 0% for vendor quotes for treatment and disposal at offsite disposal facilities. It is assumed that OH is 5% and profit is 0% for quotes for all other material vendor quotes.
	Items developed using MII already include contractor markups such as overhead and profit, therefore additional overhead and profit were not applied in the PC OH and PC PF to those items.

TABLE CW-H7

Alternative H **Cost Worksheet:** **CW-H7**
Capital Cost Sub-Element
Erosion/Residual Control Measures

COST WORKSHEET

Site: Portland Harbor Superfund Site
Location: Portland, Oregon
Phase: Feasibility Study
Base Year: 2016

Prepared By: JN **Date:** 3/4/2016
Checked By: AB **Date:** 3/7/2016

Work Statement:
This sub-element involves the installation, maintainance, and removal of silt curtains and sheet pile walls for erosion and residual control. It includes costs for on-site labor, equipment, and materials developed from previous work.
Quantity development presented in Appendix D.

Cost Analysis:
Cost for Erosion/Residual Control Measures (Lump Sum)

COST DATABASE CODE	DESCRIPTION	QTY	UNIT(S)	HPF	LABOR	ADJ LABOR	EQUIP	ADJ EQUIP	MATL	OTHER	UNMOD UC	UNMOD LIC	PC OH	PC PF	BUR LIC	COST SOURCE CITATION	COMMENTS
P13	Purchase, Install and Maintain Silt Curtains	117,500	LF	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$96.92	$96.92	$11,388,335.00	0%	0%	$11,388,335	P Anchor QEA	Project-specific cost developed by Anchor QEA (2010) - see Backup Table 7.
P14	Purchase, Install and Remove Sheet Pile Walls	7,500	LF	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$2,749.88	$2,749.88	$20,624,100.00	0%	0%	$20,624,100	P Anchor QEA	Project-specific cost developed by Anchor QEA (2010) - see Backup Table 6.
												TOTAL COST:			$32,012,435		

	Representative Unit Quantity	Unit(s)	Total Cost	Unit Cost
COST WORKSHEET SUMMARY	1	LS	$32,012,435	$32,012,435

Notes:
Further information about the development of cost worksheets can be found in Attachment A - Methodology and Organization of Detailed Cost Estimates.
The quantity bolded in the QTY column is the quantity selected as the representative unit quantity for this cost worksheet. If multiple quantities are bolded, the representative unit quantity is the sum of those quantities. When the LS unit is utilized, the default representative unit quantity is 1.
HTRW productivity factor is from Exhibit B-3 or B-4 of "A Guide to Developing and Documenting Cost Estimates During the Feasibility Study", EPA 2000
EPA developed project-specific unit costs using the Micro Computer Aided Cost Engineering System (MCACES) Second Generation (MII) software version 4.2, build 3

Cost Database Code:
The Cost Database Code is a reference code for linking with line item cost information with the cost source database and is not otherwise used within these cost worksheets. The following cost source database prefixes apply:
L (EPA-Derived Labor Unit Costs), M (Project-Specific Vendor Unit Costs), P (Previously Developed Unit Costs by Anchor QEA for Portland Harbor), A (EPA-Derived MII Unit Costs), O (Unit Costs from Other Projects/Sources)

Source of Cost Data:
For citation references, the following sources apply:
ALL (Allowance), FLC (www.flcdatacenter.com), LD (Costs Derived from Lower Duwamish Waterway Final Feasibility Study), MII (MII), O (Other), P (Previously Developed by Anchor QEA for Portland Harbor), and V (Vendor Quote)

Abbreviations:

QTY	Quantity	AC	Acres
EQUIP	Equipment	CLF	100 Linear Foot
MATL	Material	CY	Cubic Yard
HPF	HTRW Productivity Factor	DY	Days
ADJ LABOR	Adjusted Labor for HFP	EA	Each
ADJ EQUIP	Adjusted Equipment for HFP	FTE	Full Time Equivalent
UNMOD UC	Unmodified Unit Cost	HR	Hours
UNMOD LIC	Unmodified Line Item Cost	LB	Pounds
UNBUR LIC	Unburdened Line Item Cost	LCY	Loose Cubic Yard
PC OH	Prime Contractor Overhead	LF	Linear Foot
PC PF	Prime Contractor Profit	LS	Lump Sum
BUR LIC	Burdened Line Item Cost	MO	Month
		SF	Square Foot
		SY	Square Yard
		TON	Tons
		YR	Years

Cost Adjustment Checklist:	**NOTES:**
FACTOR:	Field work will be in Level "D" PPE.
H&S Productivity (labor and equipment only)	MII assembly costs include HPF adjustments.
Escalation to Base Year	2016 cost sources are not escalated (EF=1.00). All other costs are escalated based on the USACE CWCCIS, EM 1110-2-1304, Sept 2015.
Area Cost Factor	An AF of 1.05 is used for Oregon, except that an AF of 1.00 (national unmodified average) is used for MII assembly costs and local vendor quotes.
Subcontractor Overhead and Profit	It is assumed that home office OH is 8% and profit is 9% for the Prime Contractor. Professional labor overhead is 100%.
Prime Contractor Overhead and Profit	Allowances and items with mandated costs such as per diem do not have overhead and profit applied.
	Items previously developed by Anchor QEA already include contractor markups, therefore overhead and profit were not applied to those items.
	It is assumed that OH is 1% and profit is 0% for vendor quotes for treatment and disposal at offsite disposal facilities. It is assumed that OH is 5% and profit is 0% for quotes for all other material vendor quotes.
	Items developed using MII already include contractor markups such as overhead and profit, therefore additional overhead and profit were not applied in the PC OH and PC PF to those items.

TABLE CW-H8

Alternative H **Cost Worksheet:** **CW-H8**
Capital Cost Sub-Element
Dredging of Contaminated Sediments (Open Water)

COST WORKSHEET

Site: Portland Harbor Superfund Site
Location: Portland, Oregon
Phase: Feasibility Study
Base Year: 2016

Prepared By: JN **Date:** 3/4/2016
Checked By: AB **Date:** 3/7/2016

Work Statement:
This sub-element involves mechanical dredging of contaminated sediments in open water areas and transport to dewatering/stabilization area. It includes costs for on-site labor, equipment, and materials for open water dredging, assuming a 10 CY barge mounted crane and clamshell.
Quantity development presented in Appendix D.

Cost Analysis:
Cost for Open Water Dredging (Lump Sum)

COST DATABASE CODE	DESCRIPTION	QTY	UNIT(S)	HPF	LABOR	ADJ LABOR	EQUIP	ADJ EQUIP	MATL	OTHER	UNMOD UC	UNMOD LIC	PC OH	PC PF	BUR LIC	COST SOURCE CITATION	COMMENTS
A6	Open Water Dredging	**29,111,838**	CY	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$24.53	$24.53	$714,113,386.14	0%	0%	$714,113,386	MII MII	Project-specific unit cost developed in MII.
												TOTAL COST:			$714,113,386		

	Representative Unit Quantity	Unit(s)	Total Cost	Unit Cost
COST WORKSHEET SUMMARY	29,111,838	CY	$714,113,386	$24.53

Notes:
Further information about the development of cost worksheets can be found in Attachment A - Methodology and Organization of Detailed Cost Estimates.
The quantity bolded in the QTY column is the quantity selected as the representative unit quantity for this cost worksheet. If multiple quantities are bolded, the representative unit quantity is the sum of those quantities. When the LS unit is utilized, the default representative unit quantity is 1.
HTRW productivity factor is from Exhibit B-3 or B-4 of "A Guide to Developing and Documenting Cost Estimates During the Feasibility Study", EPA 2000
EPA developed project-specific unit costs using the Micro Computer Aided Cost Engineering System (MCACES) Second Generation (MII) software version 4.2, build 3

Cost Database Code:
The Cost Database Code is a reference code for linking with line item cost information with the cost source database and is not otherwise used within these cost worksheets. The following cost source database prefixes apply:
L (EPA-Derived Labor Unit Costs), M (Project-Specific Vendor Unit Costs), P (Previously Developed Unit Costs by Anchor QEA for Portland Harbor), A (EPA-Derived MII Unit Costs), O (Unit Costs from Other Projects/Sources)

Source of Cost Data:
For citation references, the following sources apply:
ALL (Allowance), FLC (www.flcdatacenter.com), LD (Costs Derived from Lower Duwamish Waterway Final Feasibility Study), MII (MII), O (Other), P (Previously Developed by Anchor QEA for Portland Harbor), and V (Vendor Quote)

Abbreviations:

QTY	Quantity	AC	Acres
EQUIP	Equipment	CLF	100 Linear Foot
MATL	Material	CY	Cubic Yard
HPF	HTRW Productivity Factor	DY	Days
ADJ LABOR	Adjusted Labor for HFP	EA	Each
ADJ EQUIP	Adjusted Equipment for HFP	FTE	Full Time Equivalent
UNMOD UC	Unmodified Unit Cost	HR	Hours
UNMOD LIC	Unmodified Line Item Cost	LB	Pounds
UNBUR LIC	Unburdened Line Item Cost	LCY	Loose Cubic Yard
PC OH	Prime Contractor Overhead	LF	Linear Foot
PC PF	Prime Contractor Profit	LS	Lump Sum
BUR LIC	Burdened Line Item Cost	MO	Month
		SF	Square Foot
		SY	Square Yard
		TON	Tons
		YR	Years

Cost Adjustment Checklist:	**NOTES:**
FACTOR:	Field work will be in Level "D" PPE.
H&S Productivity (labor and equipment only)	MII assembly costs include HPF adjustments.
Escalation to Base Year	2016 cost sources are not escalated (EF=1.00). All other costs are escalated based on the USACE CWCCIS, EM 1110-2-1304, Sept 2015.
Area Cost Factor	An AF of 1.05 is used for Oregon, except that an AF of 1.00 (national unmodified average) is used for MII assembly costs and local vendor quotes.
Subcontractor Overhead and Profit	It is assumed that home office OH is 8% and profit is 9% for the Prime Contractor. Professional labor overhead is 100%.
Prime Contractor Overhead and Profit	Allowances and items with mandated costs such as per diem do not have overhead and profit applied.
	Items previously developed by Anchor QEA already include contractor markups, therefore overhead and profit were not applied to those items.
	It is assumed that OH is 1% and profit is 0% for vendor quotes for treatment and disposal at offsite disposal facilities. It is assumed that OH is 5% and profit is 0% for quotes for all other material vendor quotes.
	Items developed using MII already include contractor markups such as overhead and profit, therefore additional overhead and profit were not applied in the PC OH and PC PF to those items.

TABLE CW-H9

Alternative H **Cost Worksheet:** **CW-H9**
Capital Cost Sub-Element
Dredging of Contaminated Sediments (Confined)

COST WORKSHEET

Site: Portland Harbor Superfund Site
Location: Portland, Oregon
Phase: Feasibility Study
Base Year: 2016

Prepared By: JN **Date:** 3/4/2016
Checked By: AB **Date:** 3/7/2016

Work Statement:
This sub-element involves mechanical dredging of contaminated sediments in confined areas and transport to dewatering/stabilization area. It includes costs for on-site labor, equipment, and materials for confined dredging, assuming a 4 CY barge mounted excavator.
Quantity development presented in Appendix D.

Cost Analysis:
Cost for Confined Dredging (Lump Sum)

COST DATABASE CODE	DESCRIPTION	QTY	UNIT(S)	HPF	LABOR	ADJ LABOR	EQUIP	ADJ EQUIP	MATL	OTHER	UNMOD UC	UNMOD LIC	PC OH	PC PF	BUR LIC	COST SOURCE CITATION	COMMENTS
A7	Confined Dredging	**189,478**	CY	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$31.10	$31.10	$5,892,765.80	0%	0%	$5,892,766	MII MII	Project-specific unit cost developed in MII.
												TOTAL COST:			$5,892,766		

	Representative Unit Quantity	Unit(s)	Total Cost	Unit Cost
COST WORKSHEET SUMMARY	189,478	CY	$5,892,766	$31.10

Notes:
Further information about the development of cost worksheets can be found in Attachment A - Methodology and Organization of Detailed Cost Estimates.
The quantity bolded in the QTY column is the quantity selected as the representative unit quantity for this cost worksheet. If multiple quantities are bolded, the representative unit quantity is the sum of those quantities. When the LS unit is utilized, the default representative unit quantity is 1.
HTRW productivity factor is from Exhibit B-3 or B-4 of "A Guide to Developing and Documenting Cost Estimates During the Feasibility Study", EPA 2000
EPA developed project-specific unit costs using the Micro Computer Aided Cost Engineering System (MCACES) Second Generation (MII) software version 4.2, build 3

Cost Database Code:
The Cost Database Code is a reference code for linking with line item cost information with the cost source database and is not otherwise used within these cost worksheets. The following cost source database prefixes apply:
L (EPA-Derived Labor Unit Costs), M (Project-Specific Vendor Unit Costs), P (Previously Developed Unit Costs by Anchor QEA for Portland Harbor), A (EPA-Derived MII Unit Costs), O (Unit Costs from Other Projects/Sources)

Source of Cost Data:
For citation references, the following sources apply:
ALL (Allowance), FLC (www.flcdatacenter.com), LD (Costs Derived from Lower Duwamish Waterway Final Feasibility Study), MII (MII), O (Other), P (Previously Developed by Anchor QEA for Portland Harbor), and V (Vendor Quote)

Abbreviations:

QTY	Quantity	AC	Acres
EQUIP	Equipment	CLF	100 Linear Foot
MATL	Material	CY	Cubic Yard
HPF	HTRW Productivity Factor	DY	Days
ADJ LABOR	Adjusted Labor for HFP	EA	Each
ADJ EQUIP	Adjusted Equipment for HFP	FTE	Full Time Equivalent
UNMOD UC	Unmodified Unit Cost	HR	Hours
UNMOD LIC	Unmodified Line Item Cost	LB	Pounds
UNBUR LIC	Unburdened Line Item Cost	LCY	Loose Cubic Yard
PC OH	Prime Contractor Overhead	LF	Linear Foot
PC PF	Prime Contractor Profit	LS	Lump Sum
BUR LIC	Burdened Line Item Cost	MO	Month
		SF	Square Foot
		SY	Square Yard
		TON	Tons
		YR	Years

Cost Adjustment Checklist:	**NOTES:**
FACTOR:	Field work will be in Level "D" PPE.
H&S Productivity (labor and equipment only)	MII assembly costs include HPF adjustments.
Escalation to Base Year	2016 cost sources are not escalated (EF=1.00). All other costs are escalated based on the USACE CWCCIS, EM 1110-2-1304, Sept 2015.
Area Cost Factor	An AF of 1.05 is used for Oregon, except that an AF of 1.00 (national unmodified average) is used for MII assembly costs and local vendor quotes.
Subcontractor Overhead and Profit	It is assumed that home office OH is 8% and profit is 9% for the Prime Contractor. Professional labor overhead is 100%.
Prime Contractor Overhead and Profit	Allowances and items with mandated costs such as per diem do not have overhead and profit applied.
	Items previously developed by Anchor QEA already include contractor markups, therefore overhead and profit were not applied to those items.
	It is assumed that OH is 1% and profit is 0% for vendor quotes for treatment and disposal at offsite disposal facilities. It is assumed that OH is 5% and profit is 0% for quotes for all other material vendor quotes.
	Items developed using MII already include contractor markups such as overhead and profit, therefore additional overhead and profit were not applied in the PC OH and PC PF to those items.

TABLE CW-H10

Alternative H
Capital Cost Sub-Element
Excavation of Riverbanks

Cost Worksheet: **CW-H10**

COST WORKSHEET

Site: Portland Harbor Superfund Site
Location: Portland, Oregon
Phase: Feasibility Study
Base Year: 2016

Prepared By: JN **Date:** 3/4/2016
Checked By: AB **Date:** 3/7/2016

Work Statement:
This sub-element involves mechanical excavation of riverbank materials and transport to dewatering/stabilization area. It includes costs for on-site labor, equipment, and materials for riverbank excavation, assuming a 4 CY long-arm excavator.
Quantity development presented in Appendix D.

Cost Analysis:
Cost for Excavation from Shore for Riverbanks (Lump Sum)

COST DATABASE CODE	DESCRIPTION	QTY	UNIT(S)	HPF	LABOR	ADJ LABOR	EQUIP	ADJ EQUIP	MATL	OTHER	UNMOD UC	UNMOD LIC	PC OH	PC PF	BUR LIC	COST SOURCE CITATION	COMMENTS
A8	Riverbank Excavation	**158,368**	CY	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$5.19	$5.19	$821,932.22	0%	0%	$821,932	MII MII	Project-specific unit cost developed in MII.
												TOTAL COST:			$821,932		

	Representative Unit Quantity	Unit(s)	Total Cost	Unit Cost
COST WORKSHEET SUMMARY	158,368	CY	$821,932	$5.19

Notes:
Further information about the development of cost worksheets can be found in Attachment A - Methodology and Organization of Detailed Cost Estimates.
The quantity bolded in the QTY column is the quantity selected as the representative unit quantity for this cost worksheet. If multiple quantities are bolded, the representative unit quantity is the sum of those quantities. When the LS unit is utilized, the default representative unit quantity is 1.
HTRW productivity factor is from Exhibit B-3 or B-4 of "A Guide to Developing and Documenting Cost Estimates During the Feasibility Study", EPA 2000
EPA developed project-specific unit costs using the Micro Computer Aided Cost Engineering System (MCACES) Second Generation (MII) software version 4.2, build 3

Cost Database Code:
The Cost Database Code is a reference code for linking with line item cost information with the cost source database and is not otherwise used within these cost worksheets. The following cost source database prefixes apply:
L (EPA-Derived Labor Unit Costs), M (Project-Specific Vendor Unit Costs), P (Previously Developed Unit Costs by Anchor QEA for Portland Harbor), A (EPA-Derived MII Unit Costs), O (Unit Costs from Other Projects/Sources)

Source of Cost Data:
For citation references, the following sources apply:
ALL (Allowance), FLC (www.flcdatacenter.com), LD (Costs Derived from Lower Duwamish Waterway Final Feasibility Study), MII (MII), O (Other), P (Previously Developed by Anchor QEA for Portland Harbor), and V (Vendor Quote)

Abbreviations:

QTY	Quantity	AC	Acres
EQUIP	Equipment	CLF	100 Linear Foot
MATL	Material	CY	Cubic Yard
HPF	HTRW Productivity Factor	DY	Days
ADJ LABOR	Adjusted Labor for HFP	EA	Each
ADJ EQUIP	Adjusted Equipment for HFP	FTE	Full Time Equivalent
UNMOD UC	Unmodified Unit Cost	HR	Hours
UNMOD LIC	Unmodified Line Item Cost	LB	Pounds
UNBUR LIC	Unburdened Line Item Cost	LCY	Loose Cubic Yard
PC OH	Prime Contractor Overhead	LF	Linear Foot
PC PF	Prime Contractor Profit	LS	Lump Sum
BUR LIC	Burdened Line Item Cost	MO	Month
		SF	Square Foot
		SY	Square Yard
		TON	Tons
		YR	Years

Cost Adjustment Checklist:	**NOTES:**
FACTOR:	Field work will be in Level "D" PPE.
H&S Productivity (labor and equipment only)	MII assembly costs include HPF adjustments.
Escalation to Base Year	2016 cost sources are not escalated (EF=1.00). All other costs are escalated based on the USACE CWCCIS, EM 1110-2-1304, Sept 2015.
Area Cost Factor	An AF of 1.05 is used for Oregon, except that an AF of 1.00 (national unmodified average) is used for MII assembly costs and local vendor quotes.
Subcontractor Overhead and Profit	It is assumed that home office OH is 8% and profit is 9% for the Prime Contractor. Professional labor overhead is 100%.
Prime Contractor Overhead and Profit	Allowances and items with mandated costs such as per diem do not have overhead and profit applied.
	Items previously developed by Anchor QEA already include contractor markups, therefore overhead and profit were not applied to those items.
	It is assumed that OH is 1% and profit is 0% for vendor quotes for treatment and disposal at offsite disposal facilities. It is assumed that OH is 5% and profit is 0% for quotes for all other material vendor quotes.
	Items developed using MII already include contractor markups such as overhead and profit, therefore additional overhead and profit were not applied in the PC OH and PC PF to those items.

TABLE CW-H11

Alternative H **Cost Worksheet:** **CW-H11**
Capital Cost Sub-Element
Dewatering and Water Treatment for Dredging Operations

COST WORKSHEET

Site: Portland Harbor Superfund Site
Location: Portland, Oregon
Phase: Feasibility Study
Base Year: 2016

Prepared By: JN **Date:** 3/4/2016
Checked By: AB **Date:** 3/7/2016

Work Statement:
This sub-element involves the dewatering and water treatment for dredging operations. Assumes a temporary water treatment plant will be utilized for treatment of water generated from dewatering of sediments. It includes costs for labor, equipment, and materials for treatment of water generated from dredged sediments. Quantity development presented in Appendix D.

Cost Analysis:
Cost for Dewatering and Water Treatment for Dredging Operations (Lump Sum)

COST DATABASE CODE	DESCRIPTION	QTY	UNIT(S)	HPF	LABOR	ADJ LABOR	EQUIP	ADJ EQUIP	MATL	OTHER	UNMOD UC	UNMOD LIC	PC OH	PC PF	BUR LIC	COST SOURCE CITATION	COMMENTS
A9	Mobilization/Demobilization of Temporary Water Treatment System	62	EA	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$36,600.00	$36,600.00	$2,269,200.00	0%	0%	$2,269,200	MII MII	Project-specific unit cost developed in MII. Assumes mob/demob of treatment system will be required for each construction season
A10	Dewatering and Temporary Water Treatment System Operations	5,745	DY	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$21,654.00	$21,654.00	$124,410,891.60	0%	0%	$124,410,892	MII MII	Project-specific unit cost developed in MII.
														TOTAL COST:	$126,680,092		

	Representative Unit Quantity	Unit(s)	Total Cost	Unit Cost
COST WORKSHEET SUMMARY	1	LS	$126,680,092	$126,680,092

Notes:
Further information about the development of cost worksheets can be found in Attachment A - Methodology and Organization of Detailed Cost Estimates.
The quantity bolded in the QTY column is the quantity selected as the representative unit quantity for this cost worksheet. If multiple quantities are bolded, the representative unit quantity is the sum of those quantities. When the LS unit is utilized, the default representative unit quantity is 1.
HTRW productivity factor is from Exhibit B-3 or B-4 of "A Guide to Developing and Documenting Cost Estimates During the Feasibility Study", EPA 2000
EPA developed project-specific unit costs using the Micro Computer Aided Cost Engineering System (MCACES) Second Generation (MII) software version 4.2, build 3

Cost Database Code:
The Cost Database Code is a reference code for linking with line item cost information with the cost source database and is not otherwise used within these cost worksheets. The following cost source database prefixes apply:
L (EPA-Derived Labor Unit Costs), M (Project-Specific Vendor Unit Costs), P (Previously Developed Unit Costs by Anchor QEA for Portland Harbor), A (EPA-Derived MII Unit Costs), O (Unit Costs from Other Projects/Sources)

Source of Cost Data:
For citation references, the following sources apply:
ALL (Allowance), FLC (www.flcdatacenter.com), LD (Costs Derived from Lower Duwamish Waterway Final Feasibility Study), MII (MII), O (Other), P (Previously Developed by Anchor QEA for Portland Harbor), and V (Vendor Quote)

Abbreviations:

QTY	Quantity	AC	Acres
EQUIP	Equipment	CLF	100 Linear Foot
MATL	Material	CY	Cubic Yard
HPF	HTRW Productivity Factor	DY	Days
ADJ LABOR	Adjusted Labor for HFP	EA	Each
ADJ EQUIP	Adjusted Equipment for HFP	FTE	Full Time Equivalent
UNMOD UC	Unmodified Unit Cost	HR	Hours
UNMOD LIC	Unmodified Line Item Cost	LB	Pounds
UNBUR LIC	Unburdened Line Item Cost	LCY	Loose Cubic Yard
PC OH	Prime Contractor Overhead	LF	Linear Foot
PC PF	Prime Contractor Profit	LS	Lump Sum
BUR LIC	Burdened Line Item Cost	MO	Month
		SF	Square Foot
		SY	Square Yard
		TON	Tons
		YR	Years

Cost Adjustment Checklist:	**NOTES:**
FACTOR:	Field work will be in Level "D" PPE.
H&S Productivity (labor and equipment only)	MII assembly costs include HPF adjustments.
Escalation to Base Year	2016 cost sources are not escalated (EF=1.00). All other costs are escalated based on the USACE CWCCIS, EM 1110-2-1304, Sept 2015.
Area Cost Factor	An AF of 1.05 is used for Oregon, except that an AF of 1.00 (national unmodified average) is used for MII assembly costs and local vendor quotes.
Subcontractor Overhead and Profit	It is assumed that home office OH is 8% and profit is 9% for the Prime Contractor. Professional labor overhead is 100%.
Prime Contractor Overhead and Profit	Allowances and items with mandated costs such as per diem do not have overhead and profit applied.
	Items previously developed by Anchor QEA already include contractor markups, therefore overhead and profit were not applied to those items.
	It is assumed that OH is 1% and profit is 0% for vendor quotes for treatment and disposal at offsite disposal facilities. It is assumed that OH is 5% and profit is 0% for quotes for all other material vendor quotes.
	Items developed using MII already include contractor markups such as overhead and profit, therefore additional overhead and profit were not applied in the PC OH and PC PF to those items.

TABLE CW-H12

Alternative H **Cost Worksheet:** **CW-H12**

Capital Cost Sub-Element

Subtitle C/TSCA Disposal (Handling, Transportation, Treatment of Select PTW Materials, and Disposal)

COST WORKSHEET

Site: Portland Harbor Superfund Site
Location: Portland, Oregon
Phase: Feasibility Study
Base Year: 2016

Prepared By: JN **Date:** 5/20/2016
Checked By: AB **Date:** 5/23/2016

Work Statement:
This sub-element involves the disposal of contaminated sediments at a Subtitle C/TSCA landfill, including in-barge mixing of amendments, barge transportation of materials to a transload facility, materials handling from the barge to truck, transportation of the sediments to the Subtitle C/TSCA landfill, and disposal of contaminated sediments (including thermal treatment at the landfill facility for a portion of the volume). It includes costs for labor, equipment, and materials as well as recent vendor quotes. Costs for development of a transload facility are included in a separate cost worksheet.
Quantity development presented in Appendix D.

Cost Analysis:
Cost for Subtitle C/TSCA Disposal (Lump Sum)

COST DATABASE CODE	DESCRIPTION	QTY	UNIT(S)	HPF	LABOR	ADJ LABOR	EQUIP	ADJ EQUIP	MATL	OTHER	UNMOD UC	UNMOD LIC	PC OH	PC PF	BUR LIC	COST SOURCE CITATION	COMMENTS
Area 6W NRC/NAPL PTW																	
	Transportation																
A13	Barging to Transload Facility	218,332	CY	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$13.66	$13.66	$2,982,415.12	0%	0%	$2,982,415	MII MII	Project-specific unit cost developed in MII.
A5	Hauling Waste from Transload Facility to Landfill	218,332	CY	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$16.70	$16.70	$3,646,144.40	0%	0%	$3,646,144	MII MII	Project-specific unit cost developed in MII.
	Materials Handling at Transload Facility																
A14	Offloading of Sediments	218,332	CY	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$9.70	$9.70	$2,117,820.40	0%	0%	$2,117,820	MII MII	Project-specific unit cost developed in MII. Assumes mechanical offloading of sediments at the transload facility.
A4	Loading Trucks at Transload Facility	218,332	CY	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$2.68	$2.68	$585,129.76	0%	0%	$585,130	MII MII	Project-specific unit cost developed in MII.
	Treatment																
A11	In-Barge Stabilization / Mixing of Amendments	218,332	CY	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$24.50	$24.50	$5,349,134.00	0%	0%	$5,349,134	MII MII	Project-specific unit cost developed in MII.
P5	Diatomaceous Earth	12,655	TON	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$105.94	$105.94	$1,340,670.70	0%	0%	$1,340,671	P Anchor QEA	Project-specific cost developed by Anchor QEA (2010) - see Backup Table 24.
M25	Quicklime	17,463	TON	1.00	$0.00	$0.00	$0.00	$0.00	$239.00	$0.00	$239.00	$4,173,657.00	5%	0%	$4,382,340	V Vendor Quote	Project-specific vendor quote - Graymont, 2016.
A2	Hauling - Quicklime to Site	17,463	TON	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$5.71	$5.71	$99,713.73	0%	0%	$99,714	MII MII	Project-specific unit cost developed in MII. Assumes 10 mile one-way haul.
	Disposal at Subtitle C/TSCA Landfill																
M10	Tipping Fee at Subtitle C/TSCA Landfill	**283,209**	TON	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$86.19	$86.19	$24,409,783.71	1%	0%	$24,653,882	V Vendor Quote	Project-specific vendor quote - CWM of the Northwest, 2015.
Area 7W NRC/NAPL PTW																	
	Transportation																
A13	Barging to Transload Facility	66,633	CY	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$13.66	$13.66	$910,206.78	0%	0%	$910,207	MII MII	Project-specific unit cost developed in MII.
A5	Hauling Waste from Transload Facility to Landfill	66,633	CY	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$16.70	$16.70	$1,112,771.10	0%	0%	$1,112,771	MII MII	Project-specific unit cost developed in MII.
	Materials Handling at Transload Facility																
A14	Offloading of Sediments	66,633	CY	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$9.70	$9.70	$646,340.10	0%	0%	$646,340	MII MII	Project-specific unit cost developed in MII. Assumes mechanical offloading of sediments at the transload facility.
A4	Loading Trucks at Transload Facility	66,633	CY	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$2.68	$2.68	$178,576.44	0%	0%	$178,576	MII MII	Project-specific unit cost developed in MII.
	Treatment																
A11	In-Barge Stabilization / Mixing of Amendments	66,633	CY	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$24.50	$24.50	$1,632,508.50	0%	0%	$1,632,509	MII MII	Project-specific unit cost developed in MII.
P5	Diatomaceous Earth	5,700	TON	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$105.94	$105.94	$603,858.00	0%	0%	$603,858	P Anchor QEA	Project-specific cost developed by Anchor QEA (2010) - see Backup Table 24.
M25	Quicklime	1,573	TON	1.00	$0.00	$0.00	$0.00	$0.00	$239.00	$0.00	$239.00	$375,947.00	5%	0%	$394,744	V Vendor Quote	Project-specific vendor quote - Graymont, 2016.
A2	Hauling - Quicklime to Site	1,573	TON	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$5.71	$5.71	$8,981.83	0%	0%	$8,982	MII MII	Project-specific unit cost developed in MII. Assumes 10 mile one-way haul.
M20	Thermal Desorption Treatment at Subtitle C/TSCA Landfill (Low End of Treatment Cost Range)	12,541	TON	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$319.41	$319.41	$4,005,720.81	1%	0%	$4,045,778	V Vendor Quote	Project-specific vendor quote - CWM of the Northwest, 2015.
M9	Thermal Desorption Treatment at Subtitle C/TSCA Landfill (High End of Treatment Cost Range)	12,541	TON	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$572.91	$572.91	$7,184,864.31	1%	0%	$7,256,713	V Vendor Quote	Project-specific vendor quote - CWM of the Northwest, 2015.
	Disposal at Subtitle C/TSCA Landfill																
M10	Tipping Fee at Subtitle C/TSCA Landfill	**75,679**	TON	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$86.19	$86.19	$6,522,773.01	1%	0%	$6,588,001	V Vendor Quote	Project-specific vendor quote - CWM of the Northwest, 2015.
												TOTAL COST:			$68,535,729		

	Representative Unit Quantity	Unit(s)	Total Cost	Unit Cost
COST WORKSHEET SUMMARY	358,888	TON	$68,535,729	$191

TABLE CW-H12

Alternative H **Cost Worksheet:** **CW-H12**

Capital Cost Sub-Element

Subtitle C/TSCA Disposal (Handling, Transportation, Treatment of Select PTW Materials, and Disposal)

COST WORKSHEET

Site: Portland Harbor Superfund Site
Location: Portland, Oregon
Phase: Feasibility Study
Base Year: 2016

Prepared By: JN **Date:** 5/20/2016
Checked By: AB **Date:** 5/23/2016

Notes:

Further information about the development of cost worksheets can be found in Attachment A - Methodology and Organization of Detailed Cost Estimates.
The quantity bolded in the QTY column is the quantity selected as the representative unit quantity for this cost worksheet. If multiple quantities are bolded, the representative unit quantity is the sum of those quantities. When the LS unit is utilized, the default representative unit quantity is 1.
HTRW productivity factor is from Exhibit B-3 or B-4 of "A Guide to Developing and Documenting Cost Estimates During the Feasibility Study", EPA 2000
EPA developed project-specific unit costs using the Micro Computer Aided Cost Engineering System (MCACES) Second Generation (MII) software version 4.2, build 3

Cost Database Code:

The Cost Database Code is a reference code for linking with line item cost information with the cost source database and is not otherwise used within these cost worksheets. The following cost source database prefixes apply:

L (EPA-Derived Labor Unit Costs), M (Project-Specific Vendor Unit Costs), P (Previously Developed Unit Costs by Anchor QEA for Portland Harbor), A (EPA-Derived MII Unit Costs), O (Unit Costs from Other Projects/Sources)

Source of Cost Data:

For citation references, the following sources apply:

ALL (Allowance), FLC (www.flcdatacenter.com), LD (Costs Derived from Lower Duwamish Waterway Final Feasibility Study), MII (MII), O (Other), P (Previously Developed by Anchor QEA for Portland Harbor), and V (Vendor Quote)

Abbreviations:

QTY	Quantity	AC	Acres
EQUIP	Equipment	CLF	100 Linear Foot
MATL	Material	CY	Cubic Yard
HPF	HTRW Productivity Factor	DY	Days
ADJ LABOR	Adjusted Labor for HFP	EA	Each
ADJ EQUIP	Adjusted Equipment for HFP	FTE	Full Time Equivalent
UNMOD UC	Unmodified Unit Cost	HR	Hours
UNMOD LIC	Unmodified Line Item Cost	LB	Pounds
UNBUR LIC	Unburdened Line Item Cost	LCY	Loose Cubic Yard
PC OH	Prime Contractor Overhead	LF	Linear Foot
PC PF	Prime Contractor Profit	LS	Lump Sum
BUR LIC	Burdened Line Item Cost	MO	Month
		SF	Square Foot
		SY	Square Yard
		TON	Tons
		YR	Years

Cost Adjustment Checklist:	**NOTES:**
FACTOR:	Field work will be in Level "D" PPE.
H&S Productivity (labor and equipment only)	MII assembly costs include HPF adjustments.
Escalation to Base Year	2016 cost sources are not escalated (EF=1.00). All other costs are escalated based on the USACE CWCCIS, EM 1110-2-1304, Sept 2015.
Area Cost Factor	An AF of 1.05 is used for Oregon, except that an AF of 1.00 (national unmodified average) is used for MII assembly costs and local vendor quotes.
Subcontractor Overhead and Profit	It is assumed that home office OH is 8% and profit is 9% for the Prime Contractor. Professional labor overhead is 100%.
Prime Contractor Overhead and Profit	Allowances and items with mandated costs such as per diem do not have overhead and profit applied.
	Items previously developed by Anchor QEA already include contractor markups, therefore overhead and profit were not applied to those items.
	It is assumed that OH is 1% and profit is 0% for vendor quotes for treatment and disposal at offsite disposal facilities. It is assumed that OH is 5% and profit is 0% for quotes for all other material vendor quotes.
	Items developed using MII already include contractor markups such as overhead and profit, therefore additional overhead and profit were not applied in the PC OH and PC PF to those items.

TABLE CW-H13

Alternative H **Cost Worksheet:** **CW-H13**

Capital Cost Sub-Element

Subtitle D Disposal (Handling, Transportation, and Disposal)

COST WORKSHEET

Site: Portland Harbor Superfund Site
Location: Portland, Oregon
Phase: Feasibility Study
Base Year: 2016

Prepared By: JN **Date:** 3/4/2016
Checked By: AB **Date:** 3/7/2016

Work Statement:

This sub-element involves the disposal of contaminated sediments at a Subtitle D landfill, including barge transportation of materials to a transload facility, materials handling from the barge to truck, transportation of the sediments to the Subtitle C/TSCA landfill, and disposal of contaminated sediments (including thermal treatment at the landfill facility for a portion of the volume). It includes costs for labor, equipment, and materials as well as recent vendor quotes.
Quantity development presented in Appendix D.

Cost Analysis:

Cost for Subtitle D Disposal (Lump Sum)

COST DATABASE CODE	DESCRIPTION	QTY	UNIT(S)	HPF	LABOR	ADJ LABOR	EQUIP	ADJ EQUIP	MATL	OTHER	UNMOD UC	UNMOD LIC	PC OH	PC PF	BUR LIC	COST SOURCE CITATION	COMMENTS
	Diatomaceous Earth Amendment																
A11	In-Barge Stabilization / Mixing of Amendments	37,996,357	CY	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$24.50	$24.50	$930,910,746.50	0%	0%	$930,910,747	MII MII	Project-specific unit cost developed in MII.
P5	Diatomaceous Earth	2,268,523	TON	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$105.94	$105.94	$240,327,326.62	0%	0%	$240,327,327	P Anchor QEA	Project-specific cost developed by Anchor QEA (2010) - see Backup Table 24.
	Transportation to Transload Facility																
A13	Barging to Transload Facility	37,996,357	CY	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$13.66	$13.66	$519,030,236.62	0%	0%	$519,030,237	MII MII	Project-specific unit cost developed in MII.
	Transportation and Disposal at Subtitle D Landfill																
M11	Transportation and Disposal at Subtitle D Landfill	**47,638,989**	TON	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$74.53	$74.53	$3,550,533,850.17	1%	0%	$3,586,039,189	V Vendor Quote	Project-specific vendor quote - Republic Services (Roosevelt Landfill), 2015. Includes transloading of the sediments, truck transportation from the transload facility to the landfill, and disposal at the landfill.
													TOTAL COST:		$5,276,307,500		

	Representative Unit Quantity	Unit(s)	Total Cost	Unit Cost
COST WORKSHEET SUMMARY	47,638,989	TON	$5,276,307,500	$111

Notes:

Further information about the development of cost worksheets can be found in Attachment A - Methodology and Organization of Detailed Cost Estimates.
The quantity bolded in the QTY column is the quantity selected as the representative unit quantity for this cost worksheet. If multiple quantities are bolded, the representative unit quantity is the sum of those quantities. When the LS unit is utilized, the default representative unit quantity is 1.
HTRW productivity factor is from Exhibit B-3 or B-4 of "A Guide to Developing and Documenting Cost Estimates During the Feasibility Study", EPA 2000
EPA developed project-specific unit costs using the Micro Computer Aided Cost Engineering System (MCACES) Second Generation (MII) software version 4.2, build 3

Cost Database Code:

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L (EPA-Derived Labor Unit Costs), M (Project-Specific Vendor Unit Costs), P (Previously Developed Unit Costs by Anchor QEA for Portland Harbor), A (EPA-Derived MII Unit Costs), O (Unit Costs from Other Projects/Sources)

Source of Cost Data:

For citation references, the following sources apply:

ALL (Allowance), FLC (www.flcdatacenter.com), LD (Costs Derived from Lower Duwamish Waterway Final Feasibility Study), MII (MII), O (Other), P (Previously Developed by Anchor QEA for Portland Harbor), and V (Vendor Quote)

Abbreviations:

QTY	Quantity	AC	Acres
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ADJ LABOR	Adjusted Labor for HFP	EA	Each
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UNMOD UC	Unmodified Unit Cost	HR	Hours
UNMOD LIC	Unmodified Line Item Cost	LB	Pounds
UNBUR LIC	Unburdened Line Item Cost	LCY	Loose Cubic Yard
PC OH	Prime Contractor Overhead	LF	Linear Foot
PC PF	Prime Contractor Profit	LS	Lump Sum
BUR LIC	Burdened Line Item Cost	MO	Month
		SF	Square Foot
		SY	Square Yard
		TON	Tons
		YR	Years

Cost Adjustment Checklist:	**NOTES:**
FACTOR:	Field work will be in Level "D" PPE.
H&S Productivity (labor and equipment only)	MII assembly costs include HPF adjustments.
Escalation to Base Year	2016 cost sources are not escalated (EF=1.00). All other costs are escalated based on the USACE CWCCIS, EM 1110-2-1304, Sept 2015.
Area Cost Factor	An AF of 1.05 is used for Oregon, except that an AF of 1.00 (national unmodified average) is used for MII assembly costs and local vendor quotes.
Subcontractor Overhead and Profit	It is assumed that home office OH is 8% and profit is 9% for the Prime Contractor. Professional labor overhead is 100%.
Prime Contractor Overhead and Profit	Allowances and items with mandated costs such as per diem do not have overhead and profit applied.
	Items previously developed by Anchor QEA already include contractor markups, therefore overhead and profit were not applied to those items.
	It is assumed that OH is 1% and profit is 0% for vendor quotes for treatment and disposal at offsite disposal facilities. It is assumed that OH is 5% and profit is 0% for quotes for all other material vendor quotes.
	Items developed using MII already include contractor markups such as overhead and profit, therefore additional overhead and profit were not applied in the PC OH and PC PF to those items.

TABLE CW-H14

Alternative H
Capital Cost Sub-Element
Mitigation

Cost Worksheet: **CW-H14**

COST WORKSHEET

Site: Portland Harbor Superfund Site
Location: Portland, Oregon
Phase: Feasibility Study
Base Year: 2016

Prepared By: JN **Date:** 3/4/2016
Checked By: AB **Date:** 3/7/2016

Work Statement:
This sub-element involves mitigation of shallow water and riverbank areas. It includes costs for on-site labor, equipment, and materials developed from previous work.
Quantity development presented in Appendix D.

Cost Analysis:
Cost for Mitigation (Lump Sum)

COST DATABASE CODE	DESCRIPTION	QTY	UNIT(S)	HPF	LABOR	ADJ LABOR	EQUIP	ADJ EQUIP	MATL	OTHER	UNMOD UC	UNMOD LIC	PC OH	PC PF	BUR LIC	COST SOURCE CITATION	COMMENTS
O3	Mitigation	**174**	AC	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$1,070,827.00	$1,070,827.00	$186,323,898.00	0%	0%	$186,323,898	O Other	Average cost of projects presented in Tables 6.1-1 and 6.1-4 of the Appendix M, Attachment 1, Anchor QEA FS (2010) as well as select other projects. See Calculations for derivation.
												TOTAL COST:			$186,323,898		

	Representative Unit Quantity	Unit(s)	Total Cost	Unit Cost
COST WORKSHEET SUMMARY	174	AC	$186,323,898	$1,070,827

Notes:
Further information about the development of cost worksheets can be found in Attachment A - Methodology and Organization of Detailed Cost Estimates.
The quantity bolded in the QTY column is the quantity selected as the representative unit quantity for this cost worksheet. If multiple quantities are bolded, the representative unit quantity is the sum of those quantities. When the LS unit is utilized, the default representative unit quantity is 1.
HTRW productivity factor is from Exhibit B-3 or B-4 of "A Guide to Developing and Documenting Cost Estimates During the Feasibility Study", EPA 2000
EPA developed project-specific unit costs using the Micro Computer Aided Cost Engineering System (MCACES) Second Generation (MII) software version 4.2, build 3

Cost Database Code:
The Cost Database Code is a reference code for linking with line item cost information with the cost source database and is not otherwise used within these cost worksheets. The following cost source database prefixes apply:
L (EPA-Derived Labor Unit Costs), M (Project-Specific Vendor Unit Costs), P (Previously Developed Unit Costs by Anchor QEA for Portland Harbor), A (EPA-Derived MII Unit Costs), O (Unit Costs from Other Projects/Sources)

Source of Cost Data:
For citation references, the following sources apply:
ALL (Allowance), FLC (www.flcdatacenter.com), LD (Costs Derived from Lower Duwamish Waterway Final Feasibility Study), MII (MII), O (Other), P (Previously Developed by Anchor QEA for Portland Harbor), and V (Vendor Quote)

Abbreviations:

QTY	Quantity	AC	Acres
EQUIP	Equipment	CLF	100 Linear Foot
MATL	Material	CY	Cubic Yard
HPF	HTRW Productivity Factor	DY	Days
ADJ LABOR	Adjusted Labor for HFP	EA	Each
ADJ EQUIP	Adjusted Equipment for HFP	FTE	Full Time Equivalent
UNMOD UC	Unmodified Unit Cost	HR	Hours
UNMOD LIC	Unmodified Line Item Cost	LB	Pounds
UNBUR LIC	Unburdened Line Item Cost	LCY	Loose Cubic Yard
PC OH	Prime Contractor Overhead	LF	Linear Foot
PC PF	Prime Contractor Profit	LS	Lump Sum
BUR LIC	Burdened Line Item Cost	MO	Month
		SF	Square Foot
		SY	Square Yard
		TON	Tons
		YR	Years

Cost Adjustment Checklist:	**NOTES:**
FACTOR:	Field work will be in Level "D" PPE.
H&S Productivity (labor and equipment only)	MII assembly costs include HPF adjustments.
Escalation to Base Year	2016 cost sources are not escalated (EF=1.00). All other costs are escalated based on the USACE CWCCIS, EM 1110-2-1304, Sept 2015.
Area Cost Factor	An AF of 1.05 is used for Oregon, except that an AF of 1.00 (national unmodified average) is used for MII assembly costs and local vendor quotes.
Subcontractor Overhead and Profit	It is assumed that home office OH is 8% and profit is 9% for the Prime Contractor. Professional labor overhead is 100%.
Prime Contractor Overhead and Profit	Allowances and items with mandated costs such as per diem do not have overhead and profit applied.
	Items previously developed by Anchor QEA already include contractor markups, therefore overhead and profit were not applied to those items.
	It is assumed that OH is 1% and profit is 0% for vendor quotes for treatment and disposal at offsite disposal facilities. It is assumed that OH is 5% and profit is 0% for quotes for all other material vendor quotes.
	Items developed using MII already include contractor markups such as overhead and profit, therefore additional overhead and profit were not applied in the PC OH and PC PF to those items.

TABLE CW-H15

Alternative H **Cost Worksheet:** **CW-H15**
Capital Cost Sub-Element
Sand Placement for Technology Assignments

COST WORKSHEET

Site: Portland Harbor Superfund Site
Location: Portland, Oregon
Phase: Feasibility Study
Base Year: 2016

Prepared By: JN **Date:** 3/4/2016
Checked By: AB **Date:** 3/7/2016

Work Statement:
This sub-element involves the placement of sand for the construction of capping areas. It includes placement of sand within confined areas, open areas, and riverbanks. It includes costs for on-site labor, equipment, and materials as well as recent vendor quotes.
Quantity development presented in Appendix D.

Cost Analysis:
Cost for Sand Placement for Technology Assignments (Lump Sum)

COST DATABASE CODE	DESCRIPTION	QTY	UNIT(S)	HPF	LABOR	ADJ LABOR	EQUIP	ADJ EQUIP	MATL	OTHER	UNMOD UC	UNMOD LIC	PC OH	PC PF	BUR LIC	COST SOURCE CITATION	COMMENTS
P1	Sand	**4,641,736**	LCY	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$19.75	$19.75	$91,674,286.00	0%	0%	$91,674,286	P Anchor QEA	Project-specific cost developed by Anchor QEA (2010) - see Backup Table 29A. Includes conversion from TON to LCY.
	Sand Placement (Riverbanks)																
A16	Material Placement (Confined)	131,711	CY	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$20.39	$20.39	$2,685,587.29	0%	0%	$2,685,587	MII MII	Project-specific unit cost developed in MII.
	Sand Placement (Confined)																
A16	Material Placement (Confined)	125,424	CY	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$20.39	$20.39	$2,557,395.36	0%	0%	$2,557,395	MII MII	Project-specific unit cost developed in MII.
	Sand Placement (Open Water)																
A15	Material Placement (Open)	4,384,601	CY	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$12.42	$12.42	$54,456,744.42	0%	0%	$54,456,744	MII MII	Project-specific unit cost developed in MII.
												TOTAL COST:			$151,374,012		

	Representative Unit Quantity	Unit(s)	Total Cost	Unit Cost
COST WORKSHEET SUMMARY	4,641,736	CY	$151,374,012	$32.61

Notes:
Further information about the development of cost worksheets can be found in Attachment A - Methodology and Organization of Detailed Cost Estimates.
The quantity bolded in the QTY column is the quantity selected as the representative unit quantity for this cost worksheet. If multiple quantities are bolded, the representative unit quantity is the sum of those quantities. When the LS unit is utilized, the default representative unit quantity is 1.
HTRW productivity factor is from Exhibit B-3 or B-4 of "A Guide to Developing and Documenting Cost Estimates During the Feasibility Study", EPA 2000
EPA developed project-specific unit costs using the Micro Computer Aided Cost Engineering System (MCACES) Second Generation (MII) software version 4.2, build 3

Cost Database Code:
The Cost Database Code is a reference code for linking with line item cost information with the cost source database and is not otherwise used within these cost worksheets. The following cost source database prefixes apply:
L (EPA-Derived Labor Unit Costs), M (Project-Specific Vendor Unit Costs), P (Previously Developed Unit Costs by Anchor QEA for Portland Harbor), A (EPA-Derived MII Unit Costs), O (Unit Costs from Other Projects/Sources)

Source of Cost Data:
For citation references, the following sources apply:
ALL (Allowance), FLC (www.flcdatacenter.com), LD (Costs Derived from Lower Duwamish Waterway Final Feasibility Study), MII (MII), O (Other), P (Previously Developed by Anchor QEA for Portland Harbor), and V (Vendor Quote)

Abbreviations:

QTY	Quantity	AC	Acres
EQUIP	Equipment	CLF	100 Linear Foot
MATL	Material	CY	Cubic Yard
HPF	HTRW Productivity Factor	DY	Days
ADJ LABOR	Adjusted Labor for HFP	EA	Each
ADJ EQUIP	Adjusted Equipment for HFP	FTE	Full Time Equivalent
UNMOD UC	Unmodified Unit Cost	HR	Hours
UNMOD LIC	Unmodified Line Item Cost	LB	Pounds
UNBUR LIC	Unburdened Line Item Cost	LCY	Loose Cubic Yard
PC OH	Prime Contractor Overhead	LF	Linear Foot
PC PF	Prime Contractor Profit	LS	Lump Sum
BUR LIC	Burdened Line Item Cost	MO	Month
		SF	Square Foot
		SY	Square Yard
		TON	Tons
		YR	Years

Cost Adjustment Checklist:	**NOTES:**
FACTOR:	Field work will be in Level "D" PPE.
H&S Productivity (labor and equipment only)	MII assembly costs include HPF adjustments.
Escalation to Base Year	2016 cost sources are not escalated (EF=1.00). All other costs are escalated based on the USACE CWCCIS, EM 1110-2-1304, Sept 2015.
Area Cost Factor	An AF of 1.05 is used for Oregon, except that an AF of 1.00 (national unmodified average) is used for MII assembly costs and local vendor quotes.
Subcontractor Overhead and Profit	It is assumed that home office OH is 8% and profit is 9% for the Prime Contractor. Professional labor overhead is 100%.
Prime Contractor Overhead and Profit	Allowances and items with mandated costs such as per diem do not have overhead and profit applied.
	Items previously developed by Anchor QEA already include contractor markups, therefore overhead and profit were not applied to those items.
	It is assumed that OH is 1% and profit is 0% for vendor quotes for treatment and disposal at offsite disposal facilities. It is assumed that OH is 5% and profit is 0% for quotes for all other material vendor quotes.
	Items developed using MII already include contractor markups such as overhead and profit, therefore additional overhead and profit were not applied in the PC OH and PC PF to those items.

TABLE CW-H16

Alternative H **Cost Worksheet:** **CW-H16**
Capital Cost Sub-Element
Beach Mix Placement for Technology Assignments

COST WORKSHEET

Site: Portland Harbor Superfund Site
Location: Portland, Oregon
Phase: Feasibility Study
Base Year: 2016

Prepared By: JN **Date:** 3/4/2016
Checked By: AB **Date:** 3/7/2016

Work Statement:
This sub-element involves the placement of beach mix for the construction of capping areas. It includes placement of beach mix within confined areas, open areas, and riverbanks. It includes costs for on-site labor, equipment, and materials as well as recent vendor quotes.
Quantity development presented in Appendix D.

Cost Analysis:
Cost for Beach Mix Placement for Technology Assignments (Lump Sum)

COST DATABASE CODE	DESCRIPTION	QTY	UNIT(S)	HPF	LABOR	ADJ LABOR	EQUIP	ADJ EQUIP	MATL	OTHER	UNMOD UC	UNMOD LIC	PC OH	PC PF	BUR LIC	COST SOURCE CITATION	COMMENTS
P3	ODOT 100 Beach Mix	**162,557**	LCY	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$57.69	$57.69	$9,377,913.33	0%	0%	$9,377,913	P Anchor QEA	Project-specific cost developed by Anchor QEA (2010) - see Backup Table 29A. Includes conversion from TON to LCY.
	Beach Mix Placement (Riverbanks)																
A16	Material Placement (Confined)	24,819	CY	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$20.39	$20.39	$506,059.41	0%	0%	$506,059	MII MII	Project-specific unit cost developed in MII.
	Beach Mix Placement (Confined)																
A16	Material Placement (Confined)	8,619	CY	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$20.39	$20.39	$175,741.41	0%	0%	$175,741	MII MII	Project-specific unit cost developed in MII.
	Beach Mix Placement (Open Water)																
A15	Material Placement (Open)	129,119	CY	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$12.42	$12.42	$1,603,657.98	0%	0%	$1,603,658	MII MII	Project-specific unit cost developed in MII.
												TOTAL COST:			$11,663,371		

	Representative Unit Quantity	Unit(s)	Total Cost	Unit Cost
COST WORKSHEET SUMMARY	162,557	CY	$11,663,371	$71.75

Notes:
Further information about the development of cost worksheets can be found in Attachment A - Methodology and Organization of Detailed Cost Estimates.
The quantity bolded in the QTY column is the quantity selected as the representative unit quantity for this cost worksheet. If multiple quantities are bolded, the representative unit quantity is the sum of those quantities. When the LS unit is utilized, the default representative unit quantity is 1.
HTRW productivity factor is from Exhibit B-3 or B-4 of "A Guide to Developing and Documenting Cost Estimates During the Feasibility Study", EPA 2000
EPA developed project-specific unit costs using the Micro Computer Aided Cost Engineering System (MCACES) Second Generation (MII) software version 4.2, build 3

Cost Database Code:
The Cost Database Code is a reference code for linking with line item cost information with the cost source database and is not otherwise used within these cost worksheets. The following cost source database prefixes apply:
L (EPA-Derived Labor Unit Costs), M (Project-Specific Vendor Unit Costs), P (Previously Developed Unit Costs by Anchor QEA for Portland Harbor), A (EPA-Derived MII Unit Costs), O (Unit Costs from Other Projects/Sources)

Source of Cost Data:
For citation references, the following sources apply:
ALL (Allowance), FLC (www.flcdatacenter.com), LD (Costs Derived from Lower Duwamish Waterway Final Feasibility Study), MII (MII), O (Other), P (Previously Developed by Anchor QEA for Portland Harbor), and V (Vendor Quote)

Abbreviations:

QTY	Quantity	AC	Acres
EQUIP	Equipment	CLF	100 Linear Foot
MATL	Material	CY	Cubic Yard
HPF	HTRW Productivity Factor	DY	Days
ADJ LABOR	Adjusted Labor for HFP	EA	Each
ADJ EQUIP	Adjusted Equipment for HFP	FTE	Full Time Equivalent
UNMOD UC	Unmodified Unit Cost	HR	Hours
UNMOD LIC	Unmodified Line Item Cost	LB	Pounds
UNBUR LIC	Unburdened Line Item Cost	LCY	Loose Cubic Yard
PC OH	Prime Contractor Overhead	LF	Linear Foot
PC PF	Prime Contractor Profit	LS	Lump Sum
BUR LIC	Burdened Line Item Cost	MO	Month
		SF	Square Foot
		SY	Square Yard
		TON	Tons
		YR	Years

Cost Adjustment Checklist:	**NOTES:**
FACTOR:	Field work will be in Level "D" PPE.
H&S Productivity (labor and equipment only)	MII assembly costs include HPF adjustments.
Escalation to Base Year	2016 cost sources are not escalated (EF=1.00). All other costs are escalated based on the USACE CWCCIS, EM 1110-2-1304, Sept 2015.
Area Cost Factor	An AF of 1.05 is used for Oregon, except that an AF of 1.00 (national unmodified average) is used for MII assembly costs and local vendor quotes.
Subcontractor Overhead and Profit	It is assumed that home office OH is 8% and profit is 9% for the Prime Contractor. Professional labor overhead is 100%.
Prime Contractor Overhead and Profit	Allowances and items with mandated costs such as per diem do not have overhead and profit applied.
	Items previously developed by Anchor QEA already include contractor markups, therefore overhead and profit were not applied to those items.
	It is assumed that OH is 1% and profit is 0% for vendor quotes for treatment and disposal at offsite disposal facilities. It is assumed that OH is 5% and profit is 0% for quotes for all other material vendor quotes.
	Items developed using MII already include contractor markups such as overhead and profit, therefore additional overhead and profit were not applied in the PC OH and PC PF to those items.

TABLE CW-H17

Alternative H **Cost Worksheet:** **CW-H17**
Capital Cost Sub-Element
Armor Placement for Technology Assignments

COST WORKSHEET

Site: Portland Harbor Superfund Site
Location: Portland, Oregon
Phase: Feasibility Study
Base Year: 2016

Prepared By: JN **Date:** 3/4/2016
Checked By: AB **Date:** 3/7/2016

Work Statement:
This sub-element involves the placement of armor for the construction of capping areas. It includes placement of armor within confined areas, open areas, and riverbanks. It includes costs for on-site labor, equipment, and materials as well as recent vendor quotes.
Quantity development presented in Appendix D.

Cost Analysis:
Cost for Armor Placement for Technology Assignments (Lump Sum)

COST DATABASE CODE	DESCRIPTION	QTY	UNIT(S)	HPF	LABOR	ADJ LABOR	EQUIP	ADJ EQUIP	MATL	OTHER	UNMOD UC	UNMOD LIC	PC OH	PC PF	BUR LIC	COST SOURCE CITATION	COMMENTS
P2	ODOT 200 Armor	**760,401**	LCY	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$57.69	$57.69	$43,867,533.69	0%	0%	$43,867,534	P Anchor QEA	Project-specific cost developed by Anchor QEA (2010) - see Backup Table 29A. Includes conversion from TON to LCY.
	Armor Placement (Riverbanks)																
A16	Material Placement (Confined)	1,576	CY	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$20.39	$20.39	$32,134.64	0%	0%	$32,135	MII MII	Project-specific unit cost developed in MII.
	Armor Placement (Confined)																
A16	Material Placement (Confined)	57,867	CY	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$20.39	$20.39	$1,179,908.13	0%	0%	$1,179,908	MII MII	Project-specific unit cost developed in MII.
	Armor Placement (Open Water)																
A15	Material Placement (Open)	700,958	CY	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$12.42	$12.42	$8,705,898.36	0%	0%	$8,705,898	MII MII	Project-specific unit cost developed in MII.
												TOTAL COST:			$53,785,475		

	Representative Unit Quantity	Unit(s)	Total Cost	Unit Cost
COST WORKSHEET SUMMARY	760,401	CY	$53,785,475	$70.73

Notes:
Further information about the development of cost worksheets can be found in Attachment A - Methodology and Organization of Detailed Cost Estimates.
The quantity bolded in the QTY column is the quantity selected as the representative unit quantity for this cost worksheet. If multiple quantities are bolded, the representative unit quantity is the sum of those quantities. When the LS unit is utilized, the default representative unit quantity is 1.
HTRW productivity factor is from Exhibit B-3 or B-4 of "A Guide to Developing and Documenting Cost Estimates During the Feasibility Study", EPA 2000
EPA developed project-specific unit costs using the Micro Computer Aided Cost Engineering System (MCACES) Second Generation (MII) software version 4.2, build 3

Cost Database Code:
The Cost Database Code is a reference code for linking with line item cost information with the cost source database and is not otherwise used within these cost worksheets. The following cost source database prefixes apply:
L (EPA-Derived Labor Unit Costs), M (Project-Specific Vendor Unit Costs), P (Previously Developed Unit Costs by Anchor QEA for Portland Harbor), A (EPA-Derived MII Unit Costs), O (Unit Costs from Other Projects/Sources)

Source of Cost Data:
For citation references, the following sources apply:
ALL (Allowance), FLC (www.flcdatacenter.com), LD (Costs Derived from Lower Duwamish Waterway Final Feasibility Study), MII (MII), O (Other), P (Previously Developed by Anchor QEA for Portland Harbor), and V (Vendor Quote)

Abbreviations:

QTY	Quantity	AC	Acres
EQUIP	Equipment	CLF	100 Linear Foot
MATL	Material	CY	Cubic Yard
HPF	HTRW Productivity Factor	DY	Days
ADJ LABOR	Adjusted Labor for HFP	EA	Each
ADJ EQUIP	Adjusted Equipment for HFP	FTE	Full Time Equivalent
UNMOD UC	Unmodified Unit Cost	HR	Hours
UNMOD LIC	Unmodified Line Item Cost	LB	Pounds
UNBUR LIC	Unburdened Line Item Cost	LCY	Loose Cubic Yard
PC OH	Prime Contractor Overhead	LF	Linear Foot
PC PF	Prime Contractor Profit	LS	Lump Sum
BUR LIC	Burdened Line Item Cost	MO	Month
		SF	Square Foot
		SY	Square Yard
		TON	Tons
		YR	Years

Cost Adjustment Checklist:	**NOTES:**
FACTOR:	Field work will be in Level "D" PPE.
H&S Productivity (labor and equipment only)	MII assembly costs include HPF adjustments.
Escalation to Base Year	2016 cost sources are not escalated (EF=1.00). All other costs are escalated based on the USACE CWCCIS, EM 1110-2-1304, Sept 2015.
Area Cost Factor	An AF of 1.05 is used for Oregon, except that an AF of 1.00 (national unmodified average) is used for MII assembly costs and local vendor quotes.
Subcontractor Overhead and Profit	It is assumed that home office OH is 8% and profit is 9% for the Prime Contractor. Professional labor overhead is 100%.
Prime Contractor Overhead and Profit	Allowances and items with mandated costs such as per diem do not have overhead and profit applied.
	Items previously developed by Anchor QEA already include contractor markups, therefore overhead and profit were not applied to those items.
	It is assumed that OH is 1% and profit is 0% for vendor quotes for treatment and disposal at offsite disposal facilities. It is assumed that OH is 5% and profit is 0% for quotes for all other material vendor quotes.
	Items developed using MII already include contractor markups such as overhead and profit, therefore additional overhead and profit were not applied in the PC OH and PC PF to those items.

TABLE CW-H18

Alternative H **Cost Worksheet:** **CW-H18**
Capital Cost Sub-Element
Reactive/GAC Placement for Technology Assignments

COST WORKSHEET

Site: Portland Harbor Superfund Site
Location: Portland, Oregon
Phase: Feasibility Study
Base Year: 2016

Prepared By: JN **Date:** 3/4/2016
Checked By: AB **Date:** 3/7/2016

Work Statement:
This sub-element involves the placement of the reactive layers for the construction of capping areas. It includes placement of the reactive layer within confined areas, open areas, and riverbanks. It includes costs for on-site labor, equipment, and materials as well as recent vendor quotes.
Quantity development presented in Appendix D.

Cost Analysis:
Cost for Reactive/GAC Placement for Technology Assignments (Lump Sum)

COST DATABASE CODE	DESCRIPTION	QTY	UNIT(S)	HPF	LABOR	ADJ LABOR	EQUIP	ADJ EQUIP	MATL	OTHER	UNMOD UC	UNMOD LIC	PC OH	PC PF	BUR LIC	COST SOURCE CITATION	COMMENTS
	AquaGate Reactive Layer																
M4	Carbon (AquaGate + PAC 10%)	200,985	TON	1.00	$0.00	$0.00	$0.00	$0.00	$456.30	$0.00	$456.30	$91,709,455.50	5%	0%	$96,294,928	V Vendor Quote	Project-specific vendor quote - AquaBlok 2015. Material cost is $/TON.
P1	Sand	212,778	LCY	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$19.75	$19.75	$4,202,365.50	0%	0%	$4,202,366	P Anchor QEA	Project-specific cost developed by Anchor QEA (2010) - see Backup Table 29A. Includes conversion from TON to LCY.
A3	Mixing Sand & Carbon for Reactive Layer	413,966	CY	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$4.76	$4.76	$1,970,478.16	0%	0%	$1,970,478	MII MII	Project-specific unit cost developed in MII.
A16	Material Placement (Confined)	36,812	CY	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$20.39	$20.39	$750,596.68	0%	0%	$750,597	MII MII	Project-specific unit cost developed in MII.
A15	Material Placement (Open)	377,154	CY	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$12.42	$12.42	$4,684,252.68	0%	0%	$4,684,253	MII MII	Project-specific unit cost developed in MII.
	AquaBlock																
M3	Carbon (AquaBlok)	5,681	TON	1.00	$0.00	$0.00	$0.00	$0.00	$202.80	$0.00	$202.80	$1,152,106.80	5%	0%	$1,209,712	V Vendor Quote	Project-specific vendor quote - AquaBlok 2015. Material cost is $/TON.
A16	Material Placement (Confined)	4,951	CY	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$20.39	$20.39	$100,950.89	0%	0%	$100,951	MII MII	Project-specific unit cost developed in MII.
												TOTAL COST:			$109,213,285		

	Representative Unit Quantity	Unit(s)	Total Cost	Unit Cost
COST WORKSHEET SUMMARY	1	LS	$109,213,285	$109,213,285

Notes:
Further information about the development of cost worksheets can be found in Attachment A - Methodology and Organization of Detailed Cost Estimates.
The quantity bolded in the QTY column is the quantity selected as the representative unit quantity for this cost worksheet. If multiple quantities are bolded, the representative unit quantity is the sum of those quantities. When the LS unit is utilized, the default representative unit quantity is 1.
HTRW productivity factor is from Exhibit B-3 or B-4 of "A Guide to Developing and Documenting Cost Estimates During the Feasibility Study", EPA 2000
EPA developed project-specific unit costs using the Micro Computer Aided Cost Engineering System (MCACES) Second Generation (MII) software version 4.2, build 3

Cost Database Code:
The Cost Database Code is a reference code for linking with line item cost information with the cost source database and is not otherwise used within these cost worksheets. The following cost source database prefixes apply:
L (EPA-Derived Labor Unit Costs), M (Project-Specific Vendor Unit Costs), P (Previously Developed Unit Costs by Anchor QEA for Portland Harbor), A (EPA-Derived MII Unit Costs), O (Unit Costs from Other Projects/Sources)

Source of Cost Data:
For citation references, the following sources apply:
ALL (Allowance), FLC (www.flcdatacenter.com), LD (Costs Derived from Lower Duwamish Waterway Final Feasibility Study), MII (MII), O (Other), P (Previously Developed by Anchor QEA for Portland Harbor), and V (Vendor Quote)

Abbreviations:

QTY	Quantity	AC	Acres
EQUIP	Equipment	CLF	100 Linear Foot
MATL	Material	CY	Cubic Yard
HPF	HTRW Productivity Factor	DY	Days
ADJ LABOR	Adjusted Labor for HFP	EA	Each
ADJ EQUIP	Adjusted Equipment for HFP	FTE	Full Time Equivalent
UNMOD UC	Unmodified Unit Cost	HR	Hours
UNMOD LIC	Unmodified Line Item Cost	LB	Pounds
UNBUR LIC	Unburdened Line Item Cost	LCY	Loose Cubic Yard
PC OH	Prime Contractor Overhead	LF	Linear Foot
PC PF	Prime Contractor Profit	LS	Lump Sum
BUR LIC	Burdened Line Item Cost	MO	Month
		SF	Square Foot
		SY	Square Yard
		TON	Tons
		YR	Years

Cost Adjustment Checklist:	**NOTES:**
FACTOR:	Field work will be in Level "D" PPE.
H&S Productivity (labor and equipment only)	MII assembly costs include HPF adjustments.
Escalation to Base Year	2016 cost sources are not escalated (EF=1.00). All other costs are escalated based on the USACE CWCCIS, EM 1110-2-1304, Sept 2015.
Area Cost Factor	An AF of 1.05 is used for Oregon, except that an AF of 1.00 (national unmodified average) is used for MII assembly costs and local vendor quotes.
Subcontractor Overhead and Profit	It is assumed that home office OH is 8% and profit is 9% for the Prime Contractor. Professional labor overhead is 100%.
Prime Contractor Overhead and Profit	Allowances and items with mandated costs such as per diem do not have overhead and profit applied.
	Items previously developed by Anchor QEA already include contractor markups, therefore overhead and profit were not applied to those items.
	It is assumed that OH is 1% and profit is 0% for vendor quotes for treatment and disposal at offsite disposal facilities. It is assumed that OH is 5% and profit is 0% for quotes for all other material vendor quotes.
	Items developed using MII already include contractor markups such as overhead and profit, therefore additional overhead and profit were not applied in the PC OH and PC PF to those items.

TABLE CW-H19

Alternative H **Cost Worksheet:** **CW-H19**
Capital Cost Sub-Element
Geofabric for Riverbanks

COST WORKSHEET

Site: Portland Harbor Superfund Site
Location: Portland, Oregon
Phase: Feasibility Study
Base Year: 2016

Prepared By: JN **Date:** 3/4/2016
Checked By: AB **Date:** 3/7/2016

Work Statement:
This sub-element involves the installation of geofabric along the riverbanks. It includes costs for on-site labor, equipment, and materials from recent vendor quotes.
Quantity development presented in Appendix D.

Cost Analysis:
Cost for Geofabric for Riverbanks (Lump Sum)

COST DATABASE CODE	DESCRIPTION	QTY	UNIT(S)	HPF	LABOR	ADJ LABOR	EQUIP	ADJ EQUIP	MATL	OTHER	UNMOD UC	UNMOD LIC	PC OH	PC PF	BUR LIC	COST SOURCE CITATION	COMMENTS
O7	Geotextile Installation	**32.7**	AC	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$7,074.14	$7,074.14	$231,324.51	8%	9%	$272,315	V Vendor Quote	Vendor Quote - Geo-Synthetics (2014). Includes labor and equipment for installation
O6	Geotextile Material	32.7	AC	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$5,698.62	$5,698.62	$186,344.74	5%	0%	$195,662	V Vendor Quote	Vendor quote obtained for project of similar scope - Geo-Synthetics, 2014.
												TOTAL COST:			$467,977		

	Representative Unit Quantity	Unit(s)	Total Cost	Unit Cost
COST WORKSHEET SUMMARY	32.7	AC	$467,977	$14,311

Notes:
Further information about the development of cost worksheets can be found in Attachment A - Methodology and Organization of Detailed Cost Estimates.
The quantity bolded in the QTY column is the quantity selected as the representative unit quantity for this cost worksheet. If multiple quantities are bolded, the representative unit quantity is the sum of those quantities. When the LS unit is utilized, the default representative unit quantity is 1.
HTRW productivity factor is from Exhibit B-3 or B-4 of "A Guide to Developing and Documenting Cost Estimates During the Feasibility Study", EPA 2000
EPA developed project-specific unit costs using the Micro Computer Aided Cost Engineering System (MCACES) Second Generation (MII) software version 4.2, build 3

Cost Database Code:
The Cost Database Code is a reference code for linking with line item cost information with the cost source database and is not otherwise used within these cost worksheets. The following cost source database prefixes apply:
L (EPA-Derived Labor Unit Costs), M (Project-Specific Vendor Unit Costs), P (Previously Developed Unit Costs by Anchor QEA for Portland Harbor), A (EPA-Derived MII Unit Costs), O (Unit Costs from Other Projects/Sources)

Source of Cost Data:
For citation references, the following sources apply:
ALL (Allowance), FLC (www.flcdatacenter.com), LD (Costs Derived from Lower Duwamish Waterway Final Feasibility Study), MII (MII), O (Other), P (Previously Developed by Anchor QEA for Portland Harbor), and V (Vendor Quote)

Abbreviations:

QTY	Quantity	AC	Acres
EQUIP	Equipment	CLF	100 Linear Foot
MATL	Material	CY	Cubic Yard
HPF	HTRW Productivity Factor	DY	Days
ADJ LABOR	Adjusted Labor for HFP	EA	Each
ADJ EQUIP	Adjusted Equipment for HFP	FTE	Full Time Equivalent
UNMOD UC	Unmodified Unit Cost	HR	Hours
UNMOD LIC	Unmodified Line Item Cost	LB	Pounds
UNBUR LIC	Unburdened Line Item Cost	LCY	Loose Cubic Yard
PC OH	Prime Contractor Overhead	LF	Linear Foot
PC PF	Prime Contractor Profit	LS	Lump Sum
BUR LIC	Burdened Line Item Cost	MO	Month
		SF	Square Foot
		SY	Square Yard
		TON	Tons
		YR	Years

Cost Adjustment Checklist:	**NOTES:**
FACTOR:	Field work will be in Level "D" PPE.
H&S Productivity (labor and equipment only)	MII assembly costs include HPF adjustments.
Escalation to Base Year	2016 cost sources are not escalated (EF=1.00). All other costs are escalated based on the USACE CWCCIS, EM 1110-2-1304, Sept 2015.
Area Cost Factor	An AF of 1.05 is used for Oregon, except that an AF of 1.00 (national unmodified average) is used for MII assembly costs and local vendor quotes.
Subcontractor Overhead and Profit	It is assumed that home office OH is 8% and profit is 9% for the Prime Contractor. Professional labor overhead is 100%.
Prime Contractor Overhead and Profit	Allowances and items with mandated costs such as per diem do not have overhead and profit applied.
	Items previously developed by Anchor QEA already include contractor markups, therefore overhead and profit were not applied to those items.
	It is assumed that OH is 1% and profit is 0% for vendor quotes for treatment and disposal at offsite disposal facilities. It is assumed that OH is 5% and profit is 0% for quotes for all other material vendor quotes.
	Items developed using MII already include contractor markups such as overhead and profit, therefore additional overhead and profit were not applied in the PC OH and PC PF to those items.

TABLE CW-H20

Alternative H **Cost Worksheet:** **CW-H20**
Capital Cost Sub-Element
Organoclay Mat Placement for Technology Assignments

COST WORKSHEET

Site: Portland Harbor Superfund Site
Location: Portland, Oregon
Phase: Feasibility Study
Base Year: 2016

Prepared By: JN **Date:** 3/4/2016
Checked By: AB **Date:** 3/7/2016

Work Statement:
This sub-element involves the placement of the organoclay mat for the construction of capping areas. It includes placement of the organoclay mat within confined areas, open areas, and riverbanks. It includes costs for on-site labor, equipment, and materials as well as recent vendor quotes.
Quantity development presented in Appendix D.

Cost Analysis:
Cost for Organoclay Mat Placement for Technology Assignments (Lump Sum)

COST DATABASE CODE	DESCRIPTION	QTY	UNIT(S)	HPF	LABOR	ADJ LABOR	EQUIP	ADJ EQUIP	MATL	OTHER	UNMOD UC	UNMOD LIC	PC OH	PC PF	BUR LIC	COST SOURCE CITATION	COMMENTS
A17	Organoclay Mat Placement	**174,300**	SF	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$3.35	$3.35	$583,905.00	0%	0%	$583,905	MII MII	Project-specific unit cost developed in MII.
P4	Organoclay Mat Material	174,300	SF	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$3.38	$3.38	$589,134.00	0%	0%	$589,134	P Anchor QEA	Project-specific cost developed by Anchor QEA (2010) - see Backup Table 29A.
												TOTAL COST:			$1,173,039		

	Representative Unit Quantity	Unit(s)	Total Cost	Unit Cost
COST WORKSHEET SUMMARY	174,300	SF	$1,173,039	$6.73

Notes:
Further information about the development of cost worksheets can be found in Attachment A - Methodology and Organization of Detailed Cost Estimates.
The quantity bolded in the QTY column is the quantity selected as the representative unit quantity for this cost worksheet. If multiple quantities are bolded, the representative unit quantity is the sum of those quantities. When the LS unit is utilized, the default representative unit quantity is 1.
HTRW productivity factor is from Exhibit B-3 or B-4 of "A Guide to Developing and Documenting Cost Estimates During the Feasibility Study", EPA 2000
EPA developed project-specific unit costs using the Micro Computer Aided Cost Engineering System (MCACES) Second Generation (MII) software version 4.2, build 3

Cost Database Code:
The Cost Database Code is a reference code for linking with line item cost information with the cost source database and is not otherwise used within these cost worksheets. The following cost source database prefixes apply:
L (EPA-Derived Labor Unit Costs), M (Project-Specific Vendor Unit Costs), P (Previously Developed Unit Costs by Anchor QEA for Portland Harbor), A (EPA-Derived MII Unit Costs), O (Unit Costs from Other Projects/Sources)

Source of Cost Data:
For citation references, the following sources apply:
ALL (Allowance), FLC (www.flcdatacenter.com), LD (Costs Derived from Lower Duwamish Waterway Final Feasibility Study), MII (MII), O (Other), P (Previously Developed by Anchor QEA for Portland Harbor), and V (Vendor Quote)

Abbreviations:

QTY	Quantity	AC	Acres
EQUIP	Equipment	CLF	100 Linear Foot
MATL	Material	CY	Cubic Yard
HPF	HTRW Productivity Factor	DY	Days
ADJ LABOR	Adjusted Labor for HFP	EA	Each
ADJ EQUIP	Adjusted Equipment for HFP	FTE	Full Time Equivalent
UNMOD UC	Unmodified Unit Cost	HR	Hours
UNMOD LIC	Unmodified Line Item Cost	LB	Pounds
UNBUR LIC	Unburdened Line Item Cost	LCY	Loose Cubic Yard
PC OH	Prime Contractor Overhead	LF	Linear Foot
PC PF	Prime Contractor Profit	LS	Lump Sum
BUR LIC	Burdened Line Item Cost	MO	Month
		SF	Square Foot
		SY	Square Yard
		TON	Tons
		YR	Years

Cost Adjustment Checklist:	**NOTES:**
FACTOR:	Field work will be in Level "D" PPE.
H&S Productivity (labor and equipment only)	MII assembly costs include HPF adjustments.
Escalation to Base Year	2016 cost sources are not escalated (EF=1.00). All other costs are escalated based on the USACE CWCCIS, EM 1110-2-1304, Sept 2015.
Area Cost Factor	An AF of 1.05 is used for Oregon, except that an AF of 1.00 (national unmodified average) is used for MII assembly costs and local vendor quotes.
Subcontractor Overhead and Profit	It is assumed that home office OH is 8% and profit is 9% for the Prime Contractor. Professional labor overhead is 100%.
Prime Contractor Overhead and Profit	Allowances and items with mandated costs such as per diem do not have overhead and profit applied.
	Items previously developed by Anchor QEA already include contractor markups, therefore overhead and profit were not applied to those items.
	It is assumed that OH is 1% and profit is 0% for vendor quotes for treatment and disposal at offsite disposal facilities. It is assumed that OH is 5% and profit is 0% for quotes for all other material vendor quotes.
	Items developed using MII already include contractor markups such as overhead and profit, therefore additional overhead and profit were not applied in the PC OH and PC PF to those items.

TABLE CW-H21

Alternative H
Capital Cost Sub-Element
Transload Facility Development

Cost Worksheet: **CW-H21**

COST WORKSHEET

Site: Portland Harbor Superfund Site
Location: Portland, Oregon
Phase: Feasibility Study
Base Year: 2016

Prepared By: JN **Date:** 3/4/2016
Checked By: AB **Date:** 3/7/2016

Work Statement:
This sub-element involves the development of a transload facility for facilitating offsite disposal of contaminated sediments. It includes costs for on-site labor, equipment, and materials developed from previous work. Transload facility is expected to be operated for 62 years, based on estimated construction duration. Property lease quantity (20 acres) adjusted for construction duration. Labor for the annual inspections is assumed to be 2.5 times full time equivalent. Environmental monitoring is assumed to be once per quarter year for construction duration.

Cost Analysis:
Cost for Transload Facility Development (Lump Sum)

COST DATABASE CODE	DESCRIPTION	QTY	UNIT(S)	HPF	LABOR	ADJ LABOR	EQUIP	ADJ EQUIP	MATL	OTHER	UNMOD UC	UNMOD LIC	PC OH	PC PF	BUR LIC	COST SOURCE CITATION	COMMENTS
	Transload Facility Development																
P31	Transload Facility Permitting	1	LS	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$45,080.00	$45,080.00	$45,080.00	0%	0%	$45,080	P Anchor QEA	Project-specific cost developed by Anchor QEA (2010) - see Backup Table 24.
P32	Transload Facility Development	1	LS	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$4,508,000.00	$4,508,000.00	$4,508,000.00	0%	0%	$4,508,000	P Anchor QEA	Project-specific cost developed by Anchor QEA (2010) - see Backup Table 24.
P33	Yearly Property Lease	1,240	AC	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$26,484.50	$26,484.50	$32,840,780.00	0%	0%	$32,840,780	P Anchor QEA	Developed by Anchor QEA (2010) - see Backup Table 24. Assumes leasing of 20 acres multiplied by estimated construction duration.
	Inspection and Monitoring of Transload Facility																
P34	Labor Inspections During Operations of Transload Facility	155.0	FTE	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$84,525.00	$84,525.00	$13,101,375.00	0%	0%	$13,101,375	P Anchor QEA	Developed by Anchor QEA (2010) - see Backup Table 24. Assumes 2.5 FTE/YR multiplied by estimated construction duration.
P35	Environmental Monitoring During Offloading at Transload Facility	248	MO	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$16,905.00	$16,905.00	$4,192,440.00	0%	0%	$4,192,440	P Anchor QEA	Developed by Anchor QEA (2010) - see Backup Table 24. Assumes 4 MO/YR multiplied by estimated construction duration.
P36	Inspection and Monitoring Reporting for Transload Facility	62	YR	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$45,080.00	$45,080.00	$2,794,960.00	0%	0%	$2,794,960	P Anchor QEA	Project-specific cost developed by Anchor QEA (2010) - see Backup Table 24.
												TOTAL COST:			$57,482,635		

	Representative Unit Quantity	Unit(s)	Total Cost	Unit Cost
COST WORKSHEET SUMMARY	1	LS	$57,482,635	$57,482,635

TABLE CW-H21

Alternative H **Cost Worksheet:** **CW-H21**
Capital Cost Sub-Element
Transload Facility Development

COST WORKSHEET

Site: Portland Harbor Superfund Site
Location: Portland, Oregon
Phase: Feasibility Study
Base Year: 2016

Prepared By: JN **Date:** 3/4/2016
Checked By: AB **Date:** 3/7/2016

Notes:

Further information about the development of cost worksheets can be found in Attachment A - Methodology and Organization of Detailed Cost Estimates.
The quantity bolded in the QTY column is the quantity selected as the representative unit quantity for this cost worksheet. If multiple quantities are bolded, the representative unit quantity is the sum of those quantities. When the LS unit is utilized, the default representative unit quantity is 1.
HTRW productivity factor is from Exhibit B-3 or B-4 of "A Guide to Developing and Documenting Cost Estimates During the Feasibility Study", EPA 2000
EPA developed project-specific unit costs using the Micro Computer Aided Cost Engineering System (MCACES) Second Generation (MII) software version 4.2, build 3

Cost Database Code:

The Cost Database Code is a reference code for linking with line item cost information with the cost source database and is not otherwise used within these cost worksheets. The following cost source database prefixes apply:

L (EPA-Derived Labor Unit Costs), M (Project-Specific Vendor Unit Costs), P (Previously Developed Unit Costs by Anchor QEA for Portland Harbor), A (EPA-Derived MII Unit Costs), O (Unit Costs from Other Projects/Sources)

Source of Cost Data:

For citation references, the following sources apply:

ALL (Allowance), FLC (www.flcdatacenter.com), LD (Costs Derived from Lower Duwamish Waterway Final Feasibility Study), MII (MII), O (Other), P (Previously Developed by Anchor QEA for Portland Harbor), and V (Vendor Quote)

Abbreviations:

QTY	Quantity	AC	Acres
EQUIP	Equipment	CLF	100 Linear Foot
MATL	Material	CY	Cubic Yard
HPF	HTRW Productivity Factor	DY	Days
ADJ LABOR	Adjusted Labor for HFP	EA	Each
ADJ EQUIP	Adjusted Equipment for HFP	FTE	Full Time Equivalent
UNMOD UC	Unmodified Unit Cost	HR	Hours
UNMOD LIC	Unmodified Line Item Cost	LB	Pounds
UNBUR LIC	Unburdened Line Item Cost	LCY	Loose Cubic Yard
PC OH	Prime Contractor Overhead	LF	Linear Foot
PC PF	Prime Contractor Profit	LS	Lump Sum
BUR LIC	Burdened Line Item Cost	MO	Month
		SF	Square Foot
		SY	Square Yard
		TON	Tons
		YR	Years

Cost Adjustment Checklist:	**NOTES:**
FACTOR:	Field work will be in Level "D" PPE.
H&S Productivity (labor and equipment only)	MII assembly costs include HPF adjustments.
Escalation to Base Year	2016 cost sources are not escalated (EF=1.00). All other costs are escalated based on the USACE CWCCIS, EM 1110-2-1304, Sept 2015.
Area Cost Factor	An AF of 1.05 is used for Oregon, except that an AF of 1.00 (national unmodified average) is used for MII assembly costs and local vendor quotes.
Subcontractor Overhead and Profit	It is assumed that home office OH is 8% and profit is 9% for the Prime Contractor. Professional labor overhead is 100%.
Prime Contractor Overhead and Profit	Allowances and items with mandated costs such as per diem do not have overhead and profit applied.
	Items previously developed by Anchor QEA already include contractor markups, therefore overhead and profit were not applied to those items.
	It is assumed that OH is 1% and profit is 0% for vendor quotes for treatment and disposal at offsite disposal facilities. It is assumed that OH is 5% and profit is 0% for quotes for all other material vendor quotes.
	Items developed using MII already include contractor markups such as overhead and profit, therefore additional overhead and profit were not applied in the PC OH and PC PF to those items.

TABLE CW-H22

Alternative H **Cost Worksheet: CW-H22**
Capital and Periodic Cost Sub-Element
Monitored Natural Recovery (MNR) for MNR/Enhanced Natural Recovery (ENR) and Broadcast GAC Areas

COST WORKSHEET

Site: Portland Harbor Superfund Site
Location: Portland, Oregon
Phase: Feasibility Study
Base Year: 2016

Prepared By: JN **Date:** 3/4/2016
Checked By: AB **Date:** 3/7/2016

Work Statement:
This sub-element involves sampling as part of monitored natural recovery for MNR, ENR, and Broadcast GAC areas. It includes costs for on-site labor, equipment, and materials developed from previous work.
Quantity development presented in Appendix D.

Cost Analysis:
Cost for Monitored Natural Recovery for MNR/ENR and Broadcast GAC Areas (Lump Sum)

COST DATABASE CODE	DESCRIPTION	QTY	UNIT(S)	HPF	LABOR	ADJ LABOR	EQUIP	ADJ EQUIP	MATL	OTHER	UNMOD UC	UNMOD LIC	PC OH	PC PF	BUR LIC	COST SOURCE CITATION	COMMENTS
P25	Monitored Natural Recovery	**0**	AC	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$3,686.33	$3,686.33	$0.00	0%	0%	$0	P Anchor QEA	Project-specific cost developed by Anchor QEA (2010) - based on Backup Table 2.
												TOTAL COST:			$0		

	Representative Unit Quantity	Unit(s)	Total Cost	Unit Cost
COST WORKSHEET SUMMARY	0	AC	$0	$0

Notes:
Further information about the development of cost worksheets can be found in Attachment A - Methodology and Organization of Detailed Cost Estimates.
The quantity bolded in the QTY column is the quantity selected as the representative unit quantity for this cost worksheet. If multiple quantities are bolded, the representative unit quantity is the sum of those quantities. When the LS unit is utilized, the default representative unit quantity is 1.
HTRW productivity factor is from Exhibit B-3 or B-4 of "A Guide to Developing and Documenting Cost Estimates During the Feasibility Study", EPA 2000
EPA developed project-specific unit costs using the Micro Computer Aided Cost Engineering System (MCACES) Second Generation (MII) software version 4.2, build 3

Cost Database Code:
The Cost Database Code is a reference code for linking with line item cost information with the cost source database and is not otherwise used within these cost worksheets. The following cost source database prefixes apply:
L (EPA-Derived Labor Unit Costs), M (Project-Specific Vendor Unit Costs), P (Previously Developed Unit Costs by Anchor QEA for Portland Harbor), A (EPA-Derived MII Unit Costs), O (Unit Costs from Other Projects/Sources)

Source of Cost Data:
For citation references, the following sources apply:
ALL (Allowance), FLC (www.flcdatacenter.com), LD (Costs Derived from Lower Duwamish Waterway Final Feasibility Study), MII (MII), O (Other), P (Previously Developed by Anchor QEA for Portland Harbor), and V (Vendor Quote)

Abbreviations:

QTY	Quantity	AC	Acres
EQUIP	Equipment	CLF	100 Linear Foot
MATL	Material	CY	Cubic Yard
HPF	HTRW Productivity Factor	DY	Days
ADJ LABOR	Adjusted Labor for HFP	EA	Each
ADJ EQUIP	Adjusted Equipment for HFP	FTE	Full Time Equivalent
UNMOD UC	Unmodified Unit Cost	HR	Hours
UNMOD LIC	Unmodified Line Item Cost	LB	Pounds
UNBUR LIC	Unburdened Line Item Cost	LCY	Loose Cubic Yard
PC OH	Prime Contractor Overhead	LF	Linear Foot
PC PF	Prime Contractor Profit	LS	Lump Sum
BUR LIC	Burdened Line Item Cost	MO	Month
		SF	Square Foot
		SY	Square Yard
		TON	Tons
		YR	Years

Cost Adjustment Checklist:	**NOTES:**
FACTOR:	Field work will be in Level "D" PPE.
H&S Productivity (labor and equipment only)	MII assembly costs include HPF adjustments.
Escalation to Base Year	2016 cost sources are not escalated (EF=1.00). All other costs are escalated based on the USACE CWCCIS, EM 1110-2-1304, Sept 2015.
Area Cost Factor	An AF of 1.05 is used for Oregon, except that an AF of 1.00 (national unmodified average) is used for MII assembly costs and local vendor quotes.
Subcontractor Overhead and Profit	It is assumed that home office OH is 8% and profit is 9% for the Prime Contractor. Professional labor overhead is 100%.
Prime Contractor Overhead and Profit	Allowances and items with mandated costs such as per diem do not have overhead and profit applied.
	Items previously developed by Anchor QEA already include contractor markups, therefore overhead and profit were not applied to those items.
	It is assumed that OH is 1% and profit is 0% for vendor quotes for treatment and disposal at offsite disposal facilities. It is assumed that OH is 5% and profit is 0% for quotes for all other material vendor quotes.
	Items developed using MII already include contractor markups such as overhead and profit, therefore additional overhead and profit were not applied in the PC OH and PC PF to those items.

TABLE CW-H23

Alternative H **Cost Worksheet:** **CW-H23**
Periodic Cost Sub-Element
Site-Wide Monitoring

COST WORKSHEET

Site: Portland Harbor Superfund Site
Location: Portland, Oregon
Phase: Feasibility Study
Base Year: 2016

Prepared By: JN **Date:** 3/4/2016
Checked By: AB **Date:** 3/7/2016

Work Statement:
This sub-element involves sampling, surveying, data management, and reporting as part of sitewide monitoring. It includes costs for on-site labor, equipment, and materials developed from previous work.

Cost Analysis:
Cost for Site-Wide Monitoring (Lump Sum)

COST DATABASE CODE	DESCRIPTION	QTY	UNIT(S)	HPF	LABOR	ADJ LABOR	EQUIP	ADJ EQUIP	MATL	OTHER	UNMOD UC	UNMOD LIC	PC OH	PC PF	BUR LIC	COST SOURCE CITATION	COMMENTS
	Site-Wide Monitoring																
P26	Sitewide Monitoring	1	LS	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$957,659.23	$957,659.23	$957,659.23	0%	0%	$957,659	P Anchor QEA	Project-specific cost developed by Anchor QEA (2010) - based on Backup Table 1.
												TOTAL COST:			$957,659		

	Representative Unit Quantity	Unit(s)	Total Cost	Unit Cost
COST WORKSHEET SUMMARY	1	LS	$957,659	$957,659

Notes:
Further information about the development of cost worksheets can be found in Attachment A - Methodology and Organization of Detailed Cost Estimates.
The quantity bolded in the QTY column is the quantity selected as the representative unit quantity for this cost worksheet. If multiple quantities are bolded, the representative unit quantity is the sum of those quantities. When the LS unit is utilized, the default representative unit quantity is 1.
HTRW productivity factor is from Exhibit B-3 or B-4 of "A Guide to Developing and Documenting Cost Estimates During the Feasibility Study", EPA 2000
EPA developed project-specific unit costs using the Micro Computer Aided Cost Engineering System (MCACES) Second Generation (MII) software version 4.2, build 3

Cost Database Code:
The Cost Database Code is a reference code for linking with line item cost information with the cost source database and is not otherwise used within these cost worksheets. The following cost source database prefixes apply:
L (EPA-Derived Labor Unit Costs), M (Project-Specific Vendor Unit Costs), P (Previously Developed Unit Costs by Anchor QEA for Portland Harbor), A (EPA-Derived MII Unit Costs), O (Unit Costs from Other Projects/Sources)

Source of Cost Data:
For citation references, the following sources apply:
ALL (Allowance), FLC (www.flcdatacenter.com), LD (Costs Derived from Lower Duwamish Waterway Final Feasibility Study), MII (MII), O (Other), P (Previously Developed by Anchor QEA for Portland Harbor), and V (Vendor Quote)

Abbreviations:

QTY	Quantity	AC	Acres
EQUIP	Equipment	CLF	100 Linear Foot
MATL	Material	CY	Cubic Yard
HPF	HTRW Productivity Factor	DY	Days
ADJ LABOR	Adjusted Labor for HFP	EA	Each
ADJ EQUIP	Adjusted Equipment for HFP	FTE	Full Time Equivalent
UNMOD UC	Unmodified Unit Cost	HR	Hours
UNMOD LIC	Unmodified Line Item Cost	LB	Pounds
UNBUR LIC	Unburdened Line Item Cost	LCY	Loose Cubic Yard
PC OH	Prime Contractor Overhead	LF	Linear Foot
PC PF	Prime Contractor Profit	LS	Lump Sum
BUR LIC	Burdened Line Item Cost	MO	Month
		SF	Square Foot
		SY	Square Yard
		TON	Tons
		YR	Years

Cost Adjustment Checklist:	**NOTES:**
FACTOR:	Field work will be in Level "D" PPE.
H&S Productivity (labor and equipment only)	MII assembly costs include HPF adjustments.
Escalation to Base Year	2016 cost sources are not escalated (EF=1.00). All other costs are escalated based on the USACE CWCCIS, EM 1110-2-1304, Sept 2015.
Area Cost Factor	An AF of 1.05 is used for Oregon, except that an AF of 1.00 (national unmodified average) is used for MII assembly costs and local vendor quotes.
Subcontractor Overhead and Profit	It is assumed that home office OH is 8% and profit is 9% for the Prime Contractor. Professional labor overhead is 100%.
Prime Contractor Overhead and Profit	Allowances and items with mandated costs such as per diem do not have overhead and profit applied.
	Items previously developed by Anchor QEA already include contractor markups, therefore overhead and profit were not applied to those items.
	It is assumed that OH is 1% and profit is 0% for vendor quotes for treatment and disposal at offsite disposal facilities. It is assumed that OH is 5% and profit is 0% for quotes for all other material vendor quotes.
	Items developed using MII already include contractor markups such as overhead and profit, therefore additional overhead and profit were not applied in the PC OH and PC PF to those items.

TABLE CW-H24

Alternative H **Cost Worksheet:** **CW-H24**
Periodic Cost Sub-Element
Cap Area Monitoring and Reactive Layer Monitoring

COST WORKSHEET

Site: Portland Harbor Superfund Site
Location: Portland, Oregon
Phase: Feasibility Study
Base Year: 2016

Prepared By: JN **Date:** 3/4/2016
Checked By: AB **Date:** 3/7/2016

Work Statement:
This sub-element involves sampling, surveying, data management, and reporting as part of cap and reactive layer monitoring. It includes costs for on-site labor, equipment, and materials developed from previous work.
Quantity development presented in Appendix D.

Cost Analysis:
Cost for Cap and Reactive Layer Monitoring (Lump Sum)

COST DATABASE CODE	DESCRIPTION	QTY	UNIT(S)	HPF	LABOR	ADJ LABOR	EQUIP	ADJ EQUIP	MATL	OTHER	UNMOD UC	UNMOD LIC	PC OH	PC PF	BUR LIC	COST SOURCE CITATION	COMMENTS
	Cap Area Monitoring																
P27	Cap Monitoring	806	AC	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$78,961.34	$78,961.34	$63,642,839.31	0%	0%	$63,642,839	P Anchor QEA	Project-specific cost developed by Anchor QEA (2010) - based on Backup Table 4.
	Reactive Layer Monitoring																
P28	Reactive Layer Monitoring	267	AC	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$88,968.76	$88,968.76	$23,754,659.19	0%	0%	$23,754,659	P Anchor QEA	Project-specific cost developed by Anchor QEA (2010) - based on Backup Table 3.
												TOTAL COST:			$87,397,498		

	Representative Unit Quantity	Unit(s)	Total Cost	Unit Cost
COST WORKSHEET SUMMARY	1	LS	$87,397,498	$87,397,498

Notes:
Further information about the development of cost worksheets can be found in Attachment A - Methodology and Organization of Detailed Cost Estimates.
The quantity bolded in the QTY column is the quantity selected as the representative unit quantity for this cost worksheet. If multiple quantities are bolded, the representative unit quantity is the sum of those quantities. When the LS unit is utilized, the default representative unit quantity is 1.
HTRW productivity factor is from Exhibit B-3 or B-4 of "A Guide to Developing and Documenting Cost Estimates During the Feasibility Study", EPA 2000
EPA developed project-specific unit costs using the Micro Computer Aided Cost Engineering System (MCACES) Second Generation (MII) software version 4.2, build 3

Cost Database Code:
The Cost Database Code is a reference code for linking with line item cost information with the cost source database and is not otherwise used within these cost worksheets. The following cost source database prefixes apply:
L (EPA-Derived Labor Unit Costs), M (Project-Specific Vendor Unit Costs), P (Previously Developed Unit Costs by Anchor QEA for Portland Harbor), A (EPA-Derived MII Unit Costs), O (Unit Costs from Other Projects/Sources)

Source of Cost Data:
For citation references, the following sources apply:
ALL (Allowance), FLC (www.flcdatacenter.com), LD (Costs Derived from Lower Duwamish Waterway Final Feasibility Study), MII (MII), O (Other), P (Previously Developed by Anchor QEA for Portland Harbor), and V (Vendor Quote)

Abbreviations:

QTY	Quantity	AC	Acres
EQUIP	Equipment	CLF	100 Linear Foot
MATL	Material	CY	Cubic Yard
HPF	HTRW Productivity Factor	DY	Days
ADJ LABOR	Adjusted Labor for HFP	EA	Each
ADJ EQUIP	Adjusted Equipment for HFP	FTE	Full Time Equivalent
UNMOD UC	Unmodified Unit Cost	HR	Hours
UNMOD LIC	Unmodified Line Item Cost	LB	Pounds
UNBUR LIC	Unburdened Line Item Cost	LCY	Loose Cubic Yard
PC OH	Prime Contractor Overhead	LF	Linear Foot
PC PF	Prime Contractor Profit	LS	Lump Sum
BUR LIC	Burdened Line Item Cost	MO	Month
		SF	Square Foot
		SY	Square Yard
		TON	Tons
		YR	Years

Cost Adjustment Checklist:	**NOTES:**
FACTOR:	Field work will be in Level "D" PPE.
H&S Productivity (labor and equipment only)	MII assembly costs include HPF adjustments.
Escalation to Base Year	2016 cost sources are not escalated (EF=1.00). All other costs are escalated based on the USACE CWCCIS, EM 1110-2-1304, Sept 2015.
Area Cost Factor	An AF of 1.05 is used for Oregon, except that an AF of 1.00 (national unmodified average) is used for MII assembly costs and local vendor quotes.
Subcontractor Overhead and Profit	It is assumed that home office OH is 8% and profit is 9% for the Prime Contractor. Professional labor overhead is 100%.
Prime Contractor Overhead and Profit	Allowances and items with mandated costs such as per diem do not have overhead and profit applied.
	Items previously developed by Anchor QEA already include contractor markups, therefore overhead and profit were not applied to those items.
	It is assumed that OH is 1% and profit is 0% for vendor quotes for treatment and disposal at offsite disposal facilities. It is assumed that OH is 5% and profit is 0% for quotes for all other material vendor quotes.
	Items developed using MII already include contractor markups such as overhead and profit, therefore additional overhead and profit were not applied in the PC OH and PC PF to those items.

TABLE CW-H25

Alternative H **Cost Worksheet:** **CW-H25**
Periodic Cost Sub-Element
Long-Term Maintenance for Capping, ENR, and In Situ Treatment

COST WORKSHEET

Site: Portland Harbor Superfund Site
Location: Portland, Oregon
Phase: Feasibility Study
Base Year: 2016

Prepared By: JN **Date:** 3/4/2016
Checked By: AB **Date:** 3/7/2016

Work Statement:
This sub-element involves replacement of 5% of the technology assignment layers as part of long-term maintenance. It includes costs for on-site labor, equipment, and materials developed from previous work.
Quantities represent 5% of material placement quantities which were developed and presented in Appendix D.

Cost Analysis:
Cost for Long-Term Maintenance (Lump Sum)

COST DATABASE CODE	DESCRIPTION	QTY	UNIT(S)	HPF	LABOR	ADJ LABOR	EQUIP	ADJ EQUIP	MATL	OTHER	UNMOD UC	UNMOD LIC	PC OH	PC PF	BUR LIC	COST SOURCE CITATION	COMMENTS
	Mobilization / Demobilization																
O2	Mobilization/Demobilization for Long Term Maintenance	1	LS	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$262,132.23	$262,132.23	$262,132.23	0%	0%	$262,132	LD Lower Duwamish	Assumes 1.6% of total capital costs per Lower Duwamish Feasibility Study. See Calculations for derivation.
	Sand Placement for Technology Assignments																
P1	Sand	232,087	LCY	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$19.75	$19.75	$4,583,718.25	0%	0%	$4,583,718	P Anchor QEA	Assume 5% of placement of additional material
	Sand Placement (Riverbanks)																
A16	Material Placement (Confined)	6,586	CY	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$20.39	$20.39	$134,288.54	0%	0%	$134,289	MII MII	Assume 5% of placement of additional material
	Sand Placement (Confined)																
A16	Material Placement (Confined)	6,271	CY	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$20.39	$20.39	$127,865.69	0%	0%	$127,866	MII MII	Assume 5% of placement of additional material
	Sand Placement (Open Water)																
A15	Material Placement (Open)	219,230	CY	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$12.42	$12.42	$2,722,836.60	0%	0%	$2,722,837	MII MII	Assume 5% of placement of additional material
	Beach Mix Placement for Technology Assignments																
P3	ODOT 100 Beach Mix	8,128	LCY	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$57.69	$57.69	$468,904.32	0%	0%	$468,904	P Anchor QEA	Assume 5% of placement of additional material
	Beach Mix Placement (Riverbanks)																
A16	Material Placement (Confined)	1,241	CY	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$20.39	$20.39	$25,303.99	0%	0%	$25,304	MII MII	Assume 5% of placement of additional material
	Beach Mix Placement (Confined)																
A16	Material Placement (Confined)	431	CY	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$20.39	$20.39	$8,788.09	0%	0%	$8,788	MII MII	Assume 5% of placement of additional material
	Beach Mix Placement (Open Water)																
A15	Material Placement (Open)	6,456	CY	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$12.42	$12.42	$80,183.52	0%	0%	$80,184	MII MII	Assume 5% of placement of additional material
	Armor Placement for Technology Assignments																
P2	ODOT 200 Armor	38,020	LCY	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$57.69	$57.69	$2,193,373.80	0%	0%	$2,193,374	P Anchor QEA	Assume 5% of placement of additional material
	Armor Placement (Riverbanks)																
A16	Material Placement (Confined)	79	CY	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$20.39	$20.39	$1,610.81	0%	0%	$1,611	MII MII	Assume 5% of placement of additional material
	Armor Placement (Confined)																
A16	Material Placement (Confined)	2,893	CY	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$20.39	$20.39	$58,988.27	0%	0%	$58,988	MII MII	Assume 5% of placement of additional material
	Armor Placement (Open Water)																
A15	Material Placement (Open)	35,048	CY	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$12.42	$12.42	$435,296.16	0%	0%	$435,296	MII MII	Assume 5% of placement of additional material
	Reactive/GAC Placement for Technology Assignments																
	AquaGate Reactive Layer																
M4	Carbon (AquaGate + PAC 10%)	10,049	TON	1.00	$0.00	$0.00	$0.00	$0.00	$456.30	$0.00	$456.30	$4,585,358.70	5%	0%	$4,814,627	V Vendor Quote	Assume 5% of placement of additional material
P1	Sand	10,639	LCY	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$19.75	$19.75	$210,120.25	0%	0%	$210,120	P Anchor QEA	Assume 5% of placement of additional material
A3	Mixing Sand & Carbon for Reactive Layer	20,698	CY	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$4.76	$4.76	$98,522.48	0%	0%	$98,522	MII MII	Assume 5% of placement of additional material
A16	Material Placement (Confined)	1,841	CY	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$20.39	$20.39	$37,537.99	0%	0%	$37,538	MII MII	Assume 5% of placement of additional material
A15	Material Placement (Open)	18,858	CY	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$12.42	$12.42	$234,216.36	0%	0%	$234,216	MII MII	Assume 5% of placement of additional material

TABLE CW-H25

Alternative H **Cost Worksheet:** **CW-H25**
Periodic Cost Sub-Element
Long-Term Maintenance for Capping, ENR, and In Situ Treatment

COST WORKSHEET

Site: Portland Harbor Superfund Site
Location: Portland, Oregon
Phase: Feasibility Study
Base Year: 2016

Prepared By: JN **Date:** 3/4/2016
Checked By: AB **Date:** 3/7/2016

Work Statement:
This sub-element involves replacement of 5% of the technology assignment layers as part of long-term maintenance. It includes costs for on-site labor, equipment, and materials developed from previous work.
Quantities represent 5% of material placement quantities which were developed and presented in Appendix D.

Cost Analysis:
Cost for Long-Term Maintenance (Lump Sum)

COST DATABASE CODE	DESCRIPTION	QTY	UNIT(S)	HPF	LABOR	ADJ LABOR	EQUIP	ADJ EQUIP	MATL	OTHER	UNMOD UC	UNMOD LIC	PC OH	PC PF	BUR LIC	COST SOURCE CITATION	COMMENTS
	AquaBlock																
M3	Carbon (AquaBlok)	284	TON	1.00	$0.00	$0.00	$0.00	$0.00	$202.80	$0.00	$202.80	$57,595.20	5%	0%	$60,475	V Vendor Quote	Assume 5% of placement of additional material
A16	Material Placement (Confined)	248	CY	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$20.39	$20.39	$5,056.72	0%	0%	$5,057	MII MII	Assume 5% of placement of additional material
	Geofabric for Riverbanks																
O7	Geotextile Installation	1.6	AC	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$7,074.14	$7,074.14	$11,318.63	8%	9%	$13,324	V Vendor Quote	Assume 5% of placement of additional material
O6	Geotextile Material	1.6	AC	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$5,698.62	$5,698.62	$9,117.79	5%	0%	$9,574	V Vendor Quote	Assume 5% of placement of additional material
	Organoclay Mat Placement for Technology Assignments																
A17	Organoclay Mat Placement	8,715	SF	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$3.35	$3.35	$29,195.25	0%	0%	$29,195	MII MII	Assume 5% of placement of additional material
P4	Organoclay Mat Material	8,715	SF	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$3.38	$3.38	$29,456.70	0%	0%	$29,457	P Anchor QEA	Assume 5% of placement of additional material
												TOTAL COST:			$16,645,396		

	Representative Unit Quantity	Unit(s)	Total Cost	Unit Cost
COST WORKSHEET SUMMARY	1	LS	$16,645,396	$16,645,396

Notes:
Further information about the development of cost worksheets can be found in Attachment A - Methodology and Organization of Detailed Cost Estimates.
The quantity bolded in the QTY column is the quantity selected as the representative unit quantity for this cost worksheet. If multiple quantities are bolded, the representative unit quantity is the sum of those quantities. When the LS unit is utilized, the default representative unit quantity is 1.
HTRW productivity factor is from Exhibit B-3 or B-4 of "A Guide to Developing and Documenting Cost Estimates During the Feasibility Study", EPA 2000
EPA developed project-specific unit costs using the Micro Computer Aided Cost Engineering System (MCACES) Second Generation (MII) software version 4.2, build 3

Cost Database Code:
The Cost Database Code is a reference code for linking with line item cost information with the cost source database and is not otherwise used within these cost worksheets. The following cost source database prefixes apply:
L (EPA-Derived Labor Unit Costs), M (Project-Specific Vendor Unit Costs), P (Previously Developed Unit Costs by Anchor QEA for Portland Harbor), A (EPA-Derived MII Unit Costs), O (Unit Costs from Other Projects/Sources)

Source of Cost Data:
For citation references, the following sources apply:
ALL (Allowance), FLC (www.flcdatacenter.com), LD (Costs Derived from Lower Duwamish Waterway Final Feasibility Study), MII (MII), O (Other), P (Previously Developed by Anchor QEA for Portland Harbor), and V (Vendor Quote)

Abbreviations:

QTY	Quantity	AC	Acres
EQUIP	Equipment	CLF	100 Linear Foot
MATL	Material	CY	Cubic Yard
HPF	HTRW Productivity Factor	DY	Days
ADJ LABOR	Adjusted Labor for HFP	EA	Each
ADJ EQUIP	Adjusted Equipment for HFP	FTE	Full Time Equivalent
UNMOD UC	Unmodified Unit Cost	HR	Hours
UNMOD LIC	Unmodified Line Item Cost	LB	Pounds
UNBUR LIC	Unburdened Line Item Cost	LCY	Loose Cubic Yard
PC OH	Prime Contractor Overhead	LF	Linear Foot
PC PF	Prime Contractor Profit	LS	Lump Sum
BUR LIC	Burdened Line Item Cost	MO	Month
		SF	Square Foot
		SY	Square Yard
		TON	Tons
		YR	Years

Cost Adjustment Checklist: **NOTES:**

FACTOR:	Field work will be in Level "D" PPE.
H&S Productivity (labor and equipment only)	MII assembly costs include HPF adjustments.
Escalation to Base Year	2016 cost sources are not escalated (EF=1.00). All other costs are escalated based on the USACE CWCCIS, EM 1110-2-1304, Sept 2015.
Area Cost Factor	An AF of 1.05 is used for Oregon, except that an AF of 1.00 (national unmodified average) is used for MII assembly costs and local vendor quotes.
Subcontractor Overhead and Profit	It is assumed that home office OH is 8% and profit is 9% for the Prime Contractor. Professional labor overhead is 100%.
Prime Contractor Overhead and Profit	Allowances and items with mandated costs such as per diem do not have overhead and profit applied.
	Items previously developed by Anchor QEA already include contractor markups, therefore overhead and profit were not applied to those items.
	It is assumed that OH is 1% and profit is 0% for vendor quotes for treatment and disposal at offsite disposal facilities. It is assumed that OH is 5% and profit is 0% for quotes for all other material vendor quotes.
	Items developed using MII already include contractor markups such as overhead and profit, therefore additional overhead and profit were not applied in the PC OH and PC PF to those items.

TABLE CW-H26

Alternative H **Cost Worksheet:** **CW-H26**
Periodic Cost Sub-Element
5-Year Site Review

COST WORKSHEET

Site: Portland Harbor Superfund Site
Location: Portland, Oregon
Phase: Feasibility Study
Base Year: 2016

Prepared By: JN **Date:** 3/4/2016
Checked By: AB **Date:** 3/7/2016

Work Statement:
This sub-element involves the site visit and 5-year site review report. The following cost includes labor, material and shipping costs for site visits and 5-year site review reports.

Cost Analysis:
Cost for 5-Year Site Review (Lump Sum)

COST DATABASE CODE	DESCRIPTION	QTY	UNIT(S)	HPF	LABOR	ADJ LABOR	EQUIP	ADJ EQUIP	MATL	OTHER	UNMOD UC	UNMOD LIC	PC OH	PC PF	BUR LIC	COST SOURCE CITATION	COMMENTS
L11	Project Manager	300	HR	1.00	$82.17	$82.17	$0.00	$0.00	$0.00	$0.00	$82.17	$24,651.00	100%	9%	$53,739	FLC FLCDataCenter	Project-specific unit cost developed by EPA.
L4	Environmental Engineer	600	HR	1.00	$48.91	$48.91	$0.00	$0.00	$0.00	$0.00	$48.91	$29,346.00	100%	9%	$63,974	FLC FLCDataCenter	Project-specific unit cost developed by EPA.
L6	Environmental Scientist	900	HR	1.00	$37.70	$37.70	$0.00	$0.00	$0.00	$0.00	$37.70	$33,930.00	100%	9%	$73,967	FLC FLCDataCenter	Project-specific unit cost developed by EPA.
L12	Quality Control Engineer	120	HR	1.00	$64.99	$64.99	$0.00	$0.00	$0.00	$0.00	$64.99	$7,798.80	100%	9%	$17,001	FLC FLCDataCenter	Project-specific unit cost developed by EPA.
L1	CAD Drafter	300	HR	1.00	$31.31	$31.31	$0.00	$0.00	$0.00	$0.00	$31.31	$9,393.00	100%	9%	$20,477	FLC FLCDataCenter	Project-specific unit cost developed by EPA.
L3	Clerks, Typist, Bookkeeper & Receptionist	300	HR	1.00	$19.89	$19.89	$0.00	$0.00	$0.00	$0.00	$19.89	$5,967.00	100%	9%	$13,008	FLC FLCDataCenter	Project-specific unit cost developed by EPA.
O4	Copy and Shipping Allowance	1	LS	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$1,521.00	$1,521.00	$1,521.00	0%	0%	$1,521	ALL Allowance	
												TOTAL COST:			$243,687		

	Representative Unit Quantity	Unit(s)	Total Cost	Unit Cost
COST WORKSHEET SUMMARY	1	LS	$243,687	$243,687

Notes:
Further information about the development of cost worksheets can be found in Attachment A - Methodology and Organization of Detailed Cost Estimates.
The quantity bolded in the QTY column is the quantity selected as the representative unit quantity for this cost worksheet. If multiple quantities are bolded, the representative unit quantity is the sum of those quantities. When the LS unit is utilized, the default representative unit quantity is 1.
HTRW productivity factor is from Exhibit B-3 or B-4 of "A Guide to Developing and Documenting Cost Estimates During the Feasibility Study", EPA 2000
EPA developed project-specific unit costs using the Micro Computer Aided Cost Engineering System (MCACES) Second Generation (MII) software version 4.2, build 3

Cost Database Code:
The Cost Database Code is a reference code for linking with line item cost information with the cost source database and is not otherwise used within these cost worksheets. The following cost source database prefixes apply:
L (EPA-Derived Labor Unit Costs), M (Project-Specific Vendor Unit Costs), P (Previously Developed Unit Costs by Anchor QEA for Portland Harbor), A (EPA-Derived MII Unit Costs), O (Unit Costs from Other Projects/Sources)

Source of Cost Data:
For citation references, the following sources apply:
ALL (Allowance), FLC (www.flcdatacenter.com), LD (Costs Derived from Lower Duwamish Waterway Final Feasibility Study), MII (MII), O (Other), P (Previously Developed by Anchor QEA for Portland Harbor), and V (Vendor Quote)

Abbreviations:

QTY	Quantity	AC	Acres
EQUIP	Equipment	CLF	100 Linear Foot
MATL	Material	CY	Cubic Yard
HPF	HTRW Productivity Factor	DY	Days
ADJ LABOR	Adjusted Labor for HFP	EA	Each
ADJ EQUIP	Adjusted Equipment for HFP	FTE	Full Time Equivalent
UNMOD UC	Unmodified Unit Cost	HR	Hours
UNMOD LIC	Unmodified Line Item Cost	LB	Pounds
UNBUR LIC	Unburdened Line Item Cost	LCY	Loose Cubic Yard
PC OH	Prime Contractor Overhead	LF	Linear Foot
PC PF	Prime Contractor Profit	LS	Lump Sum
BUR LIC	Burdened Line Item Cost	MO	Month
		SF	Square Foot
		SY	Square Yard
		TON	Tons
		YR	Years

Cost Adjustment Checklist:	**NOTES:**
FACTOR:	Field work will be in Level "D" PPE.
H&S Productivity (labor and equipment only)	MII assembly costs include HPF adjustments.
Escalation to Base Year	2016 cost sources are not escalated (EF=1.00). All other costs are escalated based on the USACE CWCCIS, EM 1110-2-1304, Sept 2015.
Area Cost Factor	An AF of 1.05 is used for Oregon, except that an AF of 1.00 (national unmodified average) is used for MII assembly costs and local vendor quotes.
Subcontractor Overhead and Profit	It is assumed that home office OH is 8% and profit is 9% for the Prime Contractor. Professional labor overhead is 100%.
Prime Contractor Overhead and Profit	Allowances and items with mandated costs such as per diem do not have overhead and profit applied.
	Items previously developed by Anchor QEA already include contractor markups, therefore overhead and profit were not applied to those items.
	It is assumed that OH is 1% and profit is 0% for vendor quotes for treatment and disposal at offsite disposal facilities. It is assumed that OH is 5% and profit is 0% for quotes for all other material vendor quotes.
	Items developed using MII already include contractor markups such as overhead and profit, therefore additional overhead and profit were not applied in the PC OH and PC PF to those items.

Cost Worksheets
Alternative I

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TABLE CW-I1

Alternative I **Cost Worksheet:** **CW-I1**
Capital Cost Sub-Element
Mobilization / Demobilization

COST WORKSHEET

Site: Portland Harbor Superfund Site
Location: Portland, Oregon
Phase: Feasibility Study
Base Year: 2016

Prepared By: JN **Date:** 3/4/2016
Checked By: AB **Date:** 3/7/2016

Work Statement:
This sub-element involves mobilization and demobilization of all the required equipment to and from the site respectively.

Cost Analysis:
Cost for Mobilization/Demobilization (Lump Sum)

COST DATABASE CODE	DESCRIPTION	QTY	UNIT(S)	HPF	LABOR	ADJ LABOR	EQUIP	ADJ EQUIP	MATL	OTHER	UNMOD UC	UNMOD LIC	PC OH	PC PF	BUR LIC	COST SOURCE CITATION	COMMENTS
O1	Mobilization/Demobilization	1	LS	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$9,045,000.00	$9,045,000.00	$9,045,000.00	0%	0%	$9,045,000	LD Lower Duwamish	Assumes 1.6% of total capital costs per Lower Duwamish Feasibility Study. See Calculations for derivation.
														TOTAL COST:	$9,045,000		

	Representative Unit Quantity	Unit(s)	Total Cost	Unit Cost
COST WORKSHEET SUMMARY	1	LS	$9,045,000	$9,045,000

Notes:
Further information about the development of cost worksheets can be found in Attachment A - Methodology and Organization of Detailed Cost Estimates.
The quantity bolded in the QTY column is the quantity selected as the representative unit quantity for this cost worksheet. If multiple quantities are bolded, the representative unit quantity is the sum of those quantities. When the LS unit is utilized, the default representative unit quantity is 1.
HTRW productivity factor is from Exhibit B-3 or B-4 of "A Guide to Developing and Documenting Cost Estimates During the Feasibility Study", EPA 2000
EPA developed project-specific unit costs using the Micro Computer Aided Cost Engineering System (MCACES) Second Generation (MII) software version 4.2, build 3

Cost Database Code:
The Cost Database Code is a reference code for linking with line item cost information with the cost source database and is not otherwise used within these cost worksheets. The following cost source database prefixes apply:
L (EPA-Derived Labor Unit Costs), M (Project-Specific Vendor Unit Costs), P (Previously Developed Unit Costs by Anchor QEA for Portland Harbor), A (EPA-Derived MII Unit Costs), O (Unit Costs from Other Projects/Sources)

Source of Cost Data:
For citation references, the following sources apply:
ALL (Allowance), FLC (www.flcdatacenter.com), LD (Costs Derived from Lower Duwamish Waterway Final Feasibility Study), MII (MII), O (Other), P (Previously Developed by Anchor QEA for Portland Harbor), and V (Vendor Quote)

Abbreviations:

QTY	Quantity	AC	Acres
EQUIP	Equipment	CLF	100 Linear Foot
MATL	Material	CY	Cubic Yard
HPF	HTRW Productivity Factor	DY	Days
ADJ LABOR	Adjusted Labor for HFP	EA	Each
ADJ EQUIP	Adjusted Equipment for HFP	FTE	Full Time Equivalent
UNMOD UC	Unmodified Unit Cost	HR	Hours
UNMOD LIC	Unmodified Line Item Cost	LB	Pounds
UNBUR LIC	Unburdened Line Item Cost	LCY	Loose Cubic Yard
PC OH	Prime Contractor Overhead	LF	Linear Foot
PC PF	Prime Contractor Profit	LS	Lump Sum
BUR LIC	Burdened Line Item Cost	MO	Month
		SF	Square Foot
		SY	Square Yard
		TON	Tons
		YR	Years

Cost Adjustment Checklist:	**NOTES:**
FACTOR:	Field work will be in Level "D" PPE.
H&S Productivity (labor and equipment only)	MII assembly costs include HPF adjustments.
Escalation to Base Year	2016 cost sources are not escalated (EF=1.00). All other costs are escalated based on the USACE CWCCIS, EM 1110-2-1304, Sept 2015.
Area Cost Factor	An AF of 1.05 is used for Oregon, except that an AF of 1.00 (national unmodified average) is used for MII assembly costs and local vendor quotes.
Subcontractor Overhead and Profit	It is assumed that home office OH is 8% and profit is 9% for the Prime Contractor. Professional labor overhead is 100%.
Prime Contractor Overhead and Profit	Allowances and items with mandated costs such as per diem do not have overhead and profit applied.
	Items previously developed by Anchor QEA already include contractor markups, therefore overhead and profit were not applied to those items.
	It is assumed that OH is 1% and profit is 0% for vendor quotes for treatment and disposal at offsite disposal facilities. It is assumed that OH is 5% and profit is 0% for quotes for all other material vendor quotes.
	Items developed using MII already include contractor markups such as overhead and profit, therefore additional overhead and profit were not applied in the PC OH and PC PF to those items.

TABLE CW-I2

Alternative I **Cost Worksheet:** **CW-I2**

Capital Cost Sub-Element

Initial Establishment of Institutional Controls

COST WORKSHEET

Site: Portland Harbor Superfund Site
Location: Portland, Oregon
Phase: Feasibility Study
Base Year: 2016

Prepared By: JN **Date:** 3/4/2016
Checked By: AB **Date:** 3/7/2016

Work Statement:
This sub-element involves implementation of institutional controls for the site. The following cost includes labor and materials to develop legal documents for institutional controls and cost for document submission and recording.
Quantity development presented in Appendix D.

Cost Analysis:
Cost for Initial Establishment of Institutional Controls (Lump Sum)

COST DATABASE CODE	DESCRIPTION	QTY	UNIT(S)	HPF	LABOR	ADJ LABOR	EQUIP	ADJ EQUIP	MATL	OTHER	UNMOD UC	UNMOD LIC	PC OH	PC PF	BUR LIC	COST SOURCE CITATION	COMMENTS
	Informational Devices - Fish Consumption Advisory																
L11	Project Manager	2,080	HR	1.00	$82.17	$82.17	$0.00	$0.00	$0.00	$0.00	$82.17	$170,913.60	100%	9%	$372,592	FLC FLCDataCenter	Assumes 1 FTE for implementation of fish advisory
L4	Environmental Engineer	1,040	HR	1.00	$48.91	$48.91	$0.00	$0.00	$0.00	$0.00	$48.91	$50,866.40	100%	9%	$110,889	FLC FLCDataCenter	Assumes 0.5 FTE for implementation of fish advisory
L6	Environmental Scientist	1,040	HR	1.00	$37.70	$37.70	$0.00	$0.00	$0.00	$0.00	$37.70	$39,208.00	100%	9%	$85,473	FLC FLCDataCenter	Assumes 0.5 FTE for implementation of fish advisory
L3	Clerks, Typist, Bookkeeper & Receptionist	520	HR	1.00	$19.89	$19.89	$0.00	$0.00	$0.00	$0.00	$19.89	$10,342.80	100%	9%	$22,547	FLC FLCDataCenter	Assumes 0.25 FTE for implementation of fish advisory
L5	Environmental Lawyer	260	HR	1.00	$71.72	$71.72	$0.00	$0.00	$0.00	$0.00	$71.72	$18,647.20	100%	9%	$40,651	FLC FLCDataCenter	Assumes 0.125 FTE for implementation of fish advisory
L13	Paralegal	260	HR	1.00	$29.56	$29.56	$0.00	$0.00	$0.00	$0.00	$29.56	$7,685.60	100%	9%	$16,755	FLC FLCDataCenter	Assumes 0.125 FTE for implementation of fish advisory
M26	Signage	50	EA	1.00	$0.00	$0.00	$0.00	$0.00	$165.75	$0.00	$165.75	$8,287.50	5%	0%	$8,702	V Vendor Quote	Project-specific vendor quote - Allstate Sign & Plaque, 2016. 36" x 36" Signs
L8	Field Technician	50	HR	1.00	$31.42	$31.42	$0.00	$0.00	$0.00	$0.00	$31.42	$1,571.00	100%	9%	$3,425	FLC FLCDataCenter	Assumes 1 hr/sign for sign placement (2 technician crew)
O5	Allowance for Production & Copies for Advisories	1	LS	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$1,000.00	$1,000.00	$1,000.00	0%	0%	$1,000	ALL Allowance	
	Informational Devices - Regulated Navigation Area (RNA) Setup																
L11	Project Manager	200	HR	1.00	$82.17	$82.17	$0.00	$0.00	$0.00	$0.00	$82.17	$16,434.00	100%	9%	$35,826	FLC FLCDataCenter	Project-specific unit cost developed by EPA.
L4	Environmental Engineer	150	HR	1.00	$48.91	$48.91	$0.00	$0.00	$0.00	$0.00	$48.91	$7,336.50	100%	9%	$15,994	FLC FLCDataCenter	Project-specific unit cost developed by EPA.
L3	Clerks, Typist, Bookkeeper & Receptionist	40	HR	1.00	$19.89	$19.89	$0.00	$0.00	$0.00	$0.00	$19.89	$795.60	100%	9%	$1,734	FLC FLCDataCenter	Project-specific unit cost developed by EPA.
A1	18' Boat	296	HR	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$25.42	$25.42	$7,524.32	0%	0%	$7,524	MII MII	Assumes 2 hr/buoy for buoy setup
L17	Boat Operator	296	HR	1.00	$33.16	$33.16	$0.00	$0.00	$0.00	$0.00	$33.16	$9,815.36	100%	9%	$21,397	FLC FLCDataCenter	Assumes 2 hr/buoy for buoy setup
L8	Field Technician	592	HR	1.00	$31.42	$31.42	$0.00	$0.00	$0.00	$0.00	$31.42	$18,600.64	100%	9%	$40,549	FLC FLCDataCenter	Assumes 4 hrs/buoy for buoy setup (2 technician crew)
M21	Buoy	148	EA	1.00	$0.00	$0.00	$0.00	$0.00	$558.63	$0.00	$558.63	$82,677.24	5%	0%	$86,811	V Vendor Quote	Project-specific vendor quote - Go2Marine, 2016.
	Proprietary Controls																
L5	Environmental Lawyer	5,550	HR	1.00	$71.72	$71.72	$0.00	$0.00	$0.00	$0.00	$71.72	$398,046.00	100%	9%	$867,740	FLC FLCDataCenter	Assumes 150 hrs per dock/structure
L13	Paralegal	7,400	HR	1.00	$29.56	$29.56	$0.00	$0.00	$0.00	$0.00	$29.56	$218,744.00	100%	9%	$476,862	FLC FLCDataCenter	Assumes 200 hrs per dock/structure
L3	Clerks, Typist, Bookkeeper & Receptionist	3,700	HR	1.00	$19.89	$19.89	$0.00	$0.00	$0.00	$0.00	$19.89	$73,593.00	100%	9%	$160,433	FLC FLCDataCenter	Assumes 100 hrs per dock/structure
	Enforcement Tools																
L11	Project Manager	260	HR	1.00	$82.17	$82.17	$0.00	$0.00	$0.00	$0.00	$82.17	$21,364.20	100%	9%	$46,574	FLC FLCDataCenter	Assumes 0.125 FTE for implementation of enforcement tools
L5	Environmental Lawyer	2,080	HR	1.00	$71.72	$71.72	$0.00	$0.00	$0.00	$0.00	$71.72	$149,177.60	100%	9%	$325,207	FLC FLCDataCenter	Assumes 1 FTE for implementation of enforcement tools
L13	Paralegal	4,160	HR	1.00	$29.56	$29.56	$0.00	$0.00	$0.00	$0.00	$29.56	$122,969.60	100%	9%	$268,074	FLC FLCDataCenter	Assumes 2 FTE for implementation of enforcement tools
L3	Clerks, Typist, Bookkeeper & Receptionist	260	HR	1.00	$19.89	$19.89	$0.00	$0.00	$0.00	$0.00	$19.89	$5,171.40	100%	9%	$11,274	FLC FLCDataCenter	Assumes 0.125 FTE for implementation of enforcement tools
												TOTAL COST:			$3,028,033		

	Representative Unit Quantity	Unit(s)	Total Cost	Unit Cost
COST WORKSHEET SUMMARY	1	LS	$3,028,033	$3,028,033

TABLE CW-I2

Alternative I **Cost Worksheet:** **CW-I2**
Capital Cost Sub-Element
Initial Establishment of Institutional Controls

COST WORKSHEET

Site: Portland Harbor Superfund Site
Location: Portland, Oregon
Phase: Feasibility Study
Base Year: 2016

Prepared By: JN **Date:** 3/4/2016
Checked By: AB **Date:** 3/7/2016

Notes:

Further information about the development of cost worksheets can be found in Attachment A - Methodology and Organization of Detailed Cost Estimates.
The quantity bolded in the QTY column is the quantity selected as the representative unit quantity for this cost worksheet. If multiple quantities are bolded, the representative unit quantity is the sum of those quantities. When the LS unit is utilized, the default representative unit quantity is 1.
HTRW productivity factor is from Exhibit B-3 or B-4 of "A Guide to Developing and Documenting Cost Estimates During the Feasibility Study", EPA 2000
EPA developed project-specific unit costs using the Micro Computer Aided Cost Engineering System (MCACES) Second Generation (MII) software version 4.2, build 3

Cost Database Code:

The Cost Database Code is a reference code for linking with line item cost information with the cost source database and is not otherwise used within these cost worksheets. The following cost source database prefixes apply:

L (EPA-Derived Labor Unit Costs), M (Project-Specific Vendor Unit Costs), P (Previously Developed Unit Costs by Anchor QEA for Portland Harbor), A (EPA-Derived MII Unit Costs), O (Unit Costs from Other Projects/Sources)

Source of Cost Data:

For citation references, the following sources apply:

ALL (Allowance), FLC (www.flcdatacenter.com), LD (Costs Derived from Lower Duwamish Waterway Final Feasibility Study), MII (MII), O (Other), P (Previously Developed by Anchor QEA for Portland Harbor), and V (Vendor Quote)

Abbreviations:

QTY	Quantity	AC	Acres
EQUIP	Equipment	CLF	100 Linear Foot
MATL	Material	CY	Cubic Yard
HPF	HTRW Productivity Factor	DY	Days
ADJ LABOR	Adjusted Labor for HFP	EA	Each
ADJ EQUIP	Adjusted Equipment for HFP	FTE	Full Time Equivalent
UNMOD UC	Unmodified Unit Cost	HR	Hours
UNMOD LIC	Unmodified Line Item Cost	LB	Pounds
UNBUR LIC	Unburdened Line Item Cost	LCY	Loose Cubic Yard
PC OH	Prime Contractor Overhead	LF	Linear Foot
PC PF	Prime Contractor Profit	LS	Lump Sum
BUR LIC	Burdened Line Item Cost	MO	Month
		SF	Square Foot
		SY	Square Yard
		TON	Tons
		YR	Years

Cost Adjustment Checklist:	**NOTES:**
FACTOR:	Field work will be in Level "D" PPE.
H&S Productivity (labor and equipment only)	MII assembly costs include HPF adjustments.
Escalation to Base Year	2016 cost sources are not escalated (EF=1.00). All other costs are escalated based on the USACE CWCCIS, EM 1110-2-1304, Sept 2015.
Area Cost Factor	An AF of 1.05 is used for Oregon, except that an AF of 1.00 (national unmodified average) is used for MII assembly costs and local vendor quotes.
Subcontractor Overhead and Profit	It is assumed that home office OH is 8% and profit is 9% for the Prime Contractor. Professional labor overhead is 100%.
Prime Contractor Overhead and Profit	Allowances and items with mandated costs such as per diem do not have overhead and profit applied.
	Items previously developed by Anchor QEA already include contractor markups, therefore overhead and profit were not applied to those items.
	It is assumed that OH is 1% and profit is 0% for vendor quotes for treatment and disposal at offsite disposal facilities. It is assumed that OH is 5% and profit is 0% for quotes for all other material vendor quotes.
	Items developed using MII already include contractor markups such as overhead and profit, therefore additional overhead and profit were not applied in the PC OH and PC PF to those items.

TABLE CW-I3

Alternative I **Cost Worksheet:** **CW-I3**

Periodic Cost Sub-Element

Evaluating and Updating Institutional Controls

COST WORKSHEET

Site: Portland Harbor Superfund Site
Location: Portland, Oregon
Phase: Feasibility Study
Base Year: 2016

Prepared By: JN **Date:** 3/4/2016
Checked By: AB **Date:** 3/7/2016

Work Statement:
This sub-element involves evaluating and updating of institutional controls for the site. The following cost includes labor and materials to required for evaluating and updating institutional controls every 5 years.
Quantity development presented in Appendix D.

Cost Analysis:
Cost for Evaluating and Updating Institutional Controls (Lump Sum)

COST DATABASE CODE	DESCRIPTION	QTY	UNIT(S)	HPF	LABOR	ADJ LABOR	EQUIP	ADJ EQUIP	MATL	OTHER	UNMOD UC	UNMOD LIC	PC OH	PC PF	BUR LIC	COST SOURCE CITATION	COMMENTS
	Informational Devices - Fish Consumption Advisory																
L11	Project Manager	208	HR	1.00	$82.17	$82.17	$0.00	$0.00	$0.00	$0.00	$82.17	$17,091.36	100%	9%	$37,259	FLC FLCDataCenter	Assumes 10% of initial costs for updating periodically
L4	Environmental Engineer	104	HR	1.00	$48.91	$48.91	$0.00	$0.00	$0.00	$0.00	$48.91	$5,086.64	100%	9%	$11,089	FLC FLCDataCenter	Assumes 10% of initial costs for updating periodically
L6	Environmental Scientist	104	HR	1.00	$37.70	$37.70	$0.00	$0.00	$0.00	$0.00	$37.70	$3,920.80	100%	9%	$8,547	FLC FLCDataCenter	Assumes 10% of initial costs for updating periodically
L3	Clerks, Typist, Bookkeeper & Receptionist	52	HR	1.00	$19.89	$19.89	$0.00	$0.00	$0.00	$0.00	$19.89	$1,034.28	100%	9%	$2,255	FLC FLCDataCenter	Assumes 10% of initial costs for updating periodically
L5	Environmental Lawyer	26	HR	1.00	$71.72	$71.72	$0.00	$0.00	$0.00	$0.00	$71.72	$1,864.72	100%	9%	$4,065	FLC FLCDataCenter	Assumes 10% of initial costs for updating periodically
L13	Paralegal	26	HR	1.00	$29.56	$29.56	$0.00	$0.00	$0.00	$0.00	$29.56	$768.56	100%	9%	$1,675	FLC FLCDataCenter	Assumes 10% of initial costs for updating periodically
M26	Signage	50	EA	1.00	$0.00	$0.00	$0.00	$0.00	$165.75	$0.00	$165.75	$8,287.50	5%	0%	$8,702	V Vendor Quote	Assumes 100% replacement of signs every 5 years
L8	Field Technician	50	HR	1.00	$31.42	$31.42	$0.00	$0.00	$0.00	$0.00	$31.42	$1,571.00	100%	9%	$3,425	FLC FLCDataCenter	Assumes 1 hr/sign for sign placement (2 technician crew)
O5	Allowance for Production & Copies for Advisories	5	LS	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$1,000.00	$1,000.00	$5,000.00	0%	0%	$5,000	ALL Allowance	Assumes yearly allowance for production and copies during 5-yr periodic updates
	Informational Devices - Regulated Navigation Area (RNA) Setup																
L11	Project Manager	200	HR	1.00	$82.17	$82.17	$0.00	$0.00	$0.00	$0.00	$82.17	$16,434.00	100%	9%	$35,826	FLC FLCDataCenter	Project-specific unit cost developed by EPA.
L4	Environmental Engineer	150	HR	1.00	$48.91	$48.91	$0.00	$0.00	$0.00	$0.00	$48.91	$7,336.50	100%	9%	$15,994	FLC FLCDataCenter	Project-specific unit cost developed by EPA.
L3	Clerks, Typist, Bookkeeper & Receptionist	40	HR	1.00	$19.89	$19.89	$0.00	$0.00	$0.00	$0.00	$19.89	$795.60	100%	9%	$1,734	FLC FLCDataCenter	Project-specific unit cost developed by EPA.
A1	18' Boat	296	HR	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$25.42	$25.42	$7,524.32	0%	0%	$7,524	MII MII	Assumes 2 hr/buoy for buoy setup
L17	Boat Operator	296	HR	1.00	$33.16	$33.16	$0.00	$0.00	$0.00	$0.00	$33.16	$9,815.36	100%	9%	$21,397	FLC FLCDataCenter	Assumes 2 hr/buoy for buoy setup
L8	Field Technician	592	HR	1.00	$31.42	$31.42	$0.00	$0.00	$0.00	$0.00	$31.42	$18,600.64	100%	9%	$40,549	FLC FLCDataCenter	Assumes 4 hrs/buoy for buoy setup (2 technician crew)
M21	Buoy	148	EA	1.00	$0.00	$0.00	$0.00	$0.00	$558.63	$0.00	$558.63	$82,677.24	5%	0%	$86,811	V Vendor Quote	Assumes 100% replacement of buoys every 5 years. Quote - Go2Marine 2016.
	Proprietary Controls																
L5	Environmental Lawyer	555	HR	1.00	$71.72	$71.72	$0.00	$0.00	$0.00	$0.00	$71.72	$39,804.60	100%	9%	$86,774	FLC FLCDataCenter	Assumes 10% of initial costs for updating periodically
L13	Paralegal	740	HR	1.00	$29.56	$29.56	$0.00	$0.00	$0.00	$0.00	$29.56	$21,874.40	100%	9%	$47,686	FLC FLCDataCenter	Assumes 10% of initial costs for updating periodically
L3	Clerks, Typist, Bookkeeper & Receptionist	370	HR	1.00	$19.89	$19.89	$0.00	$0.00	$0.00	$0.00	$19.89	$7,359.30	100%	9%	$16,043	FLC FLCDataCenter	Assumes 10% of initial costs for updating periodically
	Enforcement Tools																
L11	Project Manager	26	HR	1.00	$82.17	$82.17	$0.00	$0.00	$0.00	$0.00	$82.17	$2,136.42	100%	9%	$4,657	FLC FLCDataCenter	Assumes 10% of initial costs for updating periodically
L5	Environmental Lawyer	208	HR	1.00	$71.72	$71.72	$0.00	$0.00	$0.00	$0.00	$71.72	$14,917.76	100%	9%	$32,521	FLC FLCDataCenter	Assumes 10% of initial costs for updating periodically
L13	Paralegal	416	HR	1.00	$29.56	$29.56	$0.00	$0.00	$0.00	$0.00	$29.56	$12,296.96	100%	9%	$26,807	FLC FLCDataCenter	Assumes 10% of initial costs for updating periodically
L3	Clerks, Typist, Bookkeeper & Receptionist	26	HR	1.00	$19.89	$19.89	$0.00	$0.00	$0.00	$0.00	$19.89	$517.14	100%	9%	$1,127	FLC FLCDataCenter	Assumes 10% of initial costs for updating periodically
												TOTAL COST:			$507,467		

	Representative Unit Quantity	Unit(s)	Total Cost	Unit Cost
COST WORKSHEET SUMMARY	1	LS	$507,467	$507,467

TABLE CW-I3

Alternative I **Cost Worksheet:** **CW-I3**

Periodic Cost Sub-Element

Evaluating and Updating Institutional Controls

COST WORKSHEET

Site: Portland Harbor Superfund Site
Location: Portland, Oregon
Phase: Feasibility Study
Base Year: 2016

Prepared By: JN **Date:** 3/4/2016

Checked By: AB **Date:** 3/7/2016

Notes:

Further information about the development of cost worksheets can be found in Attachment A - Methodology and Organization of Detailed Cost Estimates.
The quantity bolded in the QTY column is the quantity selected as the representative unit quantity for this cost worksheet. If multiple quantities are bolded, the representative unit quantity is the sum of those quantities. When the LS unit is utilized, the default representative unit quantity is 1.
HTRW productivity factor is from Exhibit B-3 or B-4 of "A Guide to Developing and Documenting Cost Estimates During the Feasibility Study", EPA 2000
EPA developed project-specific unit costs using the Micro Computer Aided Cost Engineering System (MCACES) Second Generation (MII) software version 4.2, build 3

Cost Database Code:

The Cost Database Code is a reference code for linking with line item cost information with the cost source database and is not otherwise used within these cost worksheets. The following cost source database prefixes apply:

L (EPA-Derived Labor Unit Costs), M (Project-Specific Vendor Unit Costs), P (Previously Developed Unit Costs by Anchor QEA for Portland Harbor), A (EPA-Derived MII Unit Costs), O (Unit Costs from Other Projects/Sources)

Source of Cost Data:

For citation references, the following sources apply:

ALL (Allowance), FLC (www.flcdatacenter.com), LD (Costs Derived from Lower Duwamish Waterway Final Feasibility Study), MII (MII), O (Other), P (Previously Developed by Anchor QEA for Portland Harbor), and V (Vendor Quote)

Abbreviations:

QTY	Quantity	AC	Acres
EQUIP	Equipment	CLF	100 Linear Foot
MATL	Material	CY	Cubic Yard
HPF	HTRW Productivity Factor	DY	Days
ADJ LABOR	Adjusted Labor for HFP	EA	Each
ADJ EQUIP	Adjusted Equipment for HFP	FTE	Full Time Equivalent
UNMOD UC	Unmodified Unit Cost	HR	Hours
UNMOD LIC	Unmodified Line Item Cost	LB	Pounds
UNBUR LIC	Unburdened Line Item Cost	LCY	Loose Cubic Yard
PC OH	Prime Contractor Overhead	LF	Linear Foot
PC PF	Prime Contractor Profit	LS	Lump Sum
BUR LIC	Burdened Line Item Cost	MO	Month
		SF	Square Foot
		SY	Square Yard
		TON	Tons
		YR	Years

Cost Adjustment Checklist:	**NOTES:**
FACTOR:	Field work will be in Level "D" PPE.
H&S Productivity (labor and equipment only)	MII assembly costs include HPF adjustments.
Escalation to Base Year	2016 cost sources are not escalated (EF=1.00). All other costs are escalated based on the USACE CWCCIS, EM 1110-2-1304, Sept 2015.
Area Cost Factor	An AF of 1.05 is used for Oregon, except that an AF of 1.00 (national unmodified average) is used for MII assembly costs and local vendor quotes.
Subcontractor Overhead and Profit	It is assumed that home office OH is 8% and profit is 9% for the Prime Contractor. Professional labor overhead is 100%.
Prime Contractor Overhead and Profit	Allowances and items with mandated costs such as per diem do not have overhead and profit applied.
	Items previously developed by Anchor QEA already include contractor markups, therefore overhead and profit were not applied to those items.
	It is assumed that OH is 1% and profit is 0% for vendor quotes for treatment and disposal at offsite disposal facilities. It is assumed that OH is 5% and profit is 0% for quotes for all other material vendor quotes.
	Items developed using MII already include contractor markups such as overhead and profit, therefore additional overhead and profit were not applied in the PC OH and PC PF to those items.

TABLE CW-I5

Alternative I **Cost Worksheet:** **CW-I5**
Capital Cost Sub-Element
Debris Removal and Disposal

COST WORKSHEET

Site: Portland Harbor Superfund Site
Location: Portland, Oregon
Phase: Feasibility Study
Base Year: 2016

Prepared By: JN **Date:** 3/4/2016
Checked By: AB **Date:** 3/7/2016

Work Statement:
This sub-element involves removal and disposal of debris for all areas prior to remedial activities. It includes costs for on-site labor, equipment, and materials developed from previous work.
Quantity development presented in Appendix D.

Cost Analysis:
Cost for Debris Removal and Disposal (Lump Sum)

COST DATABASE CODE	DESCRIPTION	QTY	UNIT(S)	HPF	LABOR	ADJ LABOR	EQUIP	ADJ EQUIP	MATL	OTHER	UNMOD UC	UNMOD LIC	PC OH	PC PF	BUR LIC	COST SOURCE CITATION	COMMENTS
P9	Debris Removal and Disposal	**292**	AC	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$13,107.01	$13,107.01	$3,827,246.92	0%	0%	$3,827,247	P Anchor QEA	Project-specific cost developed by Anchor QEA (2010) - see Backup Table 2.
												TOTAL COST:			$3,827,247		

	Representative Unit Quantity	Unit(s)	Total Cost	Unit Cost
COST WORKSHEET SUMMARY	292	AC	$3,827,247	$13,107

Notes:
Further information about the development of cost worksheets can be found in Attachment A - Methodology and Organization of Detailed Cost Estimates.
The quantity bolded in the QTY column is the quantity selected as the representative unit quantity for this cost worksheet. If multiple quantities are bolded, the representative unit quantity is the sum of those quantities. When the LS unit is utilized, the default representative unit quantity is 1.
HTRW productivity factor is from Exhibit B-3 or B-4 of "A Guide to Developing and Documenting Cost Estimates During the Feasibility Study", EPA 2000
EPA developed project-specific unit costs using the Micro Computer Aided Cost Engineering System (MCACES) Second Generation (MII) software version 4.2, build 3

Cost Database Code:
The Cost Database Code is a reference code for linking with line item cost information with the cost source database and is not otherwise used within these cost worksheets. The following cost source database prefixes apply:
L (EPA-Derived Labor Unit Costs), M (Project-Specific Vendor Unit Costs), P (Previously Developed Unit Costs by Anchor QEA for Portland Harbor), A (EPA-Derived MII Unit Costs), O (Unit Costs from Other Projects/Sources)

Source of Cost Data:
For citation references, the following sources apply:
ALL (Allowance), FLC (www.flcdatacenter.com), LD (Costs Derived from Lower Duwamish Waterway Final Feasibility Study), MII (MII), O (Other), P (Previously Developed by Anchor QEA for Portland Harbor), and V (Vendor Quote)

Abbreviations:

QTY	Quantity	AC	Acres
EQUIP	Equipment	CLF	100 Linear Foot
MATL	Material	CY	Cubic Yard
HPF	HTRW Productivity Factor	DY	Days
ADJ LABOR	Adjusted Labor for HFP	EA	Each
ADJ EQUIP	Adjusted Equipment for HFP	FTE	Full Time Equivalent
UNMOD UC	Unmodified Unit Cost	HR	Hours
UNMOD LIC	Unmodified Line Item Cost	LB	Pounds
UNBUR LIC	Unburdened Line Item Cost	LCY	Loose Cubic Yard
PC OH	Prime Contractor Overhead	LF	Linear Foot
PC PF	Prime Contractor Profit	LS	Lump Sum
BUR LIC	Burdened Line Item Cost	MO	Month
		SF	Square Foot
		SY	Square Yard
		TON	Tons
		YR	Years

Cost Adjustment Checklist:	**NOTES:**
FACTOR:	Field work will be in Level "D" PPE.
H&S Productivity (labor and equipment only)	MII assembly costs include HPF adjustments.
Escalation to Base Year	2016 cost sources are not escalated (EF=1.00). All other costs are escalated based on the USACE CWCCIS, EM 1110-2-1304, Sept 2015.
Area Cost Factor	An AF of 1.05 is used for Oregon, except that an AF of 1.00 (national unmodified average) is used for MII assembly costs and local vendor quotes.
Subcontractor Overhead and Profit	It is assumed that home office OH is 8% and profit is 9% for the Prime Contractor. Professional labor overhead is 100%.
Prime Contractor Overhead and Profit	Allowances and items with mandated costs such as per diem do not have overhead and profit applied.
	Items previously developed by Anchor QEA already include contractor markups, therefore overhead and profit were not applied to those items.
	It is assumed that OH is 1% and profit is 0% for vendor quotes for treatment and disposal at offsite disposal facilities. It is assumed that OH is 5% and profit is 0% for quotes for all other material vendor quotes.
	Items developed using MII already include contractor markups such as overhead and profit, therefore additional overhead and profit were not applied in the PC OH and PC PF to those items.

TABLE CW-I6

Alternative I **Cost Worksheet:** **CW-I6**
Capital Cost Sub-Element
Obstruction Removal and Relocation

COST WORKSHEET

Site: Portland Harbor Superfund Site
Location: Portland, Oregon
Phase: Feasibility Study
Base Year: 2016

Prepared By: JN **Date:** 3/4/2016
Checked By: AB **Date:** 3/7/2016

Work Statement:
This sub-element involves all work related to obstructions removal, relocation, and disposal. It includes all costs for labor, equipment and materials developed from previous work for pile removal and disposal, pile replacement, and temporary dock relocation.
Quantity development presented in Appendix D.

Cost Analysis:
Cost for Obstructions (Lump Sum)

COST DATABASE CODE	DESCRIPTION	QTY	UNIT(S)	HPF	LABOR	ADJ LABOR	EQUIP	ADJ EQUIP	MATL	OTHER	UNMOD UC	UNMOD LIC	PC OH	PC PF	BUR LIC	COST SOURCE CITATION	COMMENTS
P10	Pile Removal and Disposal	1,738	EA	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$715.65	$715.65	$1,243,791.01	0%	0%	$1,243,791	P Anchor QEA	Project-specific cost developed by Anchor QEA (2010) - see Backup Table 3.
P11	Pile Replacement	1,738	EA	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$7,478.77	$7,478.77	$12,998,105.74	0%	0%	$12,998,106	P Anchor QEA	Project-specific cost developed by Anchor QEA (2010) - see Backup Table 4.
P12	Temporary Dock Relocation	9	EA	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$100,497.97	$100,497.97	$904,481.74	0%	0%	$904,482	P Anchor QEA	Project-specific cost developed by Anchor QEA (2010) - see Backup Table 5.
												TOTAL COST:			$15,146,379		

	Representative Unit Quantity	Unit(s)	Total Cost	Unit Cost
COST WORKSHEET SUMMARY	1	LS	$15,146,379	$15,146,379

Notes:
Further information about the development of cost worksheets can be found in Attachment A - Methodology and Organization of Detailed Cost Estimates.
The quantity bolded in the QTY column is the quantity selected as the representative unit quantity for this cost worksheet. If multiple quantities are bolded, the representative unit quantity is the sum of those quantities. When the LS unit is utilized, the default representative unit quantity is 1.
HTRW productivity factor is from Exhibit B-3 or B-4 of "A Guide to Developing and Documenting Cost Estimates During the Feasibility Study", EPA 2000
EPA developed project-specific unit costs using the Micro Computer Aided Cost Engineering System (MCACES) Second Generation (MII) software version 4.2, build 3

Cost Database Code:
The Cost Database Code is a reference code for linking with line item cost information with the cost source database and is not otherwise used within these cost worksheets. The following cost source database prefixes apply:
L (EPA-Derived Labor Unit Costs), M (Project-Specific Vendor Unit Costs), P (Previously Developed Unit Costs by Anchor QEA for Portland Harbor), A (EPA-Derived MII Unit Costs), O (Unit Costs from Other Projects/Sources)

Source of Cost Data:
For citation references, the following sources apply:
ALL (Allowance), FLC (www.flcdatacenter.com), LD (Costs Derived from Lower Duwamish Waterway Final Feasibility Study), MII (MII), O (Other), P (Previously Developed by Anchor QEA for Portland Harbor), and V (Vendor Quote)

Abbreviations:

QTY	Quantity	AC	Acres
EQUIP	Equipment	CLF	100 Linear Foot
MATL	Material	CY	Cubic Yard
HPF	HTRW Productivity Factor	DY	Days
ADJ LABOR	Adjusted Labor for HFP	EA	Each
ADJ EQUIP	Adjusted Equipment for HFP	FTE	Full Time Equivalent
UNMOD UC	Unmodified Unit Cost	HR	Hours
UNMOD LIC	Unmodified Line Item Cost	LB	Pounds
UNBUR LIC	Unburdened Line Item Cost	LCY	Loose Cubic Yard
PC OH	Prime Contractor Overhead	LF	Linear Foot
PC PF	Prime Contractor Profit	LS	Lump Sum
BUR LIC	Burdened Line Item Cost	MO	Month
		SF	Square Foot
		SY	Square Yard
		TON	Tons
		YR	Years

Cost Adjustment Checklist:	**NOTES:**
FACTOR:	Field work will be in Level "D" PPE.
H&S Productivity (labor and equipment only)	MII assembly costs include HPF adjustments.
Escalation to Base Year	2016 cost sources are not escalated (EF=1.00). All other costs are escalated based on the USACE CWCCIS, EM 1110-2-1304, Sept 2015.
Area Cost Factor	An AF of 1.05 is used for Oregon, except that an AF of 1.00 (national unmodified average) is used for MII assembly costs and local vendor quotes.
Subcontractor Overhead and Profit	It is assumed that home office OH is 8% and profit is 9% for the Prime Contractor. Professional labor overhead is 100%.
Prime Contractor Overhead and Profit	Allowances and items with mandated costs such as per diem do not have overhead and profit applied.
	Items previously developed by Anchor QEA already include contractor markups, therefore overhead and profit were not applied to those items.
	It is assumed that OH is 1% and profit is 0% for vendor quotes for treatment and disposal at offsite disposal facilities. It is assumed that OH is 5% and profit is 0% for quotes for all other material vendor quotes.
	Items developed using MII already include contractor markups such as overhead and profit, therefore additional overhead and profit were not applied in the PC OH and PC PF to those items.

TABLE CW-I7

Alternative I **Cost Worksheet:** **CW-I7**
Capital Cost Sub-Element
Erosion/Residual Control Measures

COST WORKSHEET

Site: Portland Harbor Superfund Site
Location: Portland, Oregon
Phase: Feasibility Study
Base Year: 2016

Prepared By: JN **Date:** 3/4/2016
Checked By: AB **Date:** 3/7/2016

Work Statement:
This sub-element involves the installation, maintainance, and removal of silt curtains and sheet pile walls for erosion and residual control. It includes costs for on-site labor, equipment, and materials developed from previous work.
Quantity development presented in Appendix D.

Cost Analysis:
Cost for Erosion/Residual Control Measures (Lump Sum)

COST DATABASE CODE	DESCRIPTION	QTY	UNIT(S)	HPF	LABOR	ADJ LABOR	EQUIP	ADJ EQUIP	MATL	OTHER	UNMOD UC	UNMOD LIC	PC OH	PC PF	BUR LIC	COST SOURCE CITATION	COMMENTS
P13	Purchase, Install and Maintain Silt Curtains	47,500	LF	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$96.92	$96.92	$4,603,795.00	0%	0%	$4,603,795	P Anchor QEA	Project-specific cost developed by Anchor QEA (2010) - see Backup Table 7.
P14	Purchase, Install and Remove Sheet Pile Walls	7,500	LF	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$2,749.88	$2,749.88	$20,624,100.00	0%	0%	$20,624,100	P Anchor QEA	Project-specific cost developed by Anchor QEA (2010) - see Backup Table 6.
												TOTAL COST:			$25,227,895		

	Representative Unit Quantity	Unit(s)	Total Cost	Unit Cost
COST WORKSHEET SUMMARY	1	LS	$25,227,895	$25,227,895

Notes:
Further information about the development of cost worksheets can be found in Attachment A - Methodology and Organization of Detailed Cost Estimates.
The quantity bolded in the QTY column is the quantity selected as the representative unit quantity for this cost worksheet. If multiple quantities are bolded, the representative unit quantity is the sum of those quantities. When the LS unit is utilized, the default representative unit quantity is 1.
HTRW productivity factor is from Exhibit B-3 or B-4 of "A Guide to Developing and Documenting Cost Estimates During the Feasibility Study", EPA 2000
EPA developed project-specific unit costs using the Micro Computer Aided Cost Engineering System (MCACES) Second Generation (MII) software version 4.2, build 3

Cost Database Code:
The Cost Database Code is a reference code for linking with line item cost information with the cost source database and is not otherwise used within these cost worksheets. The following cost source database prefixes apply:
L (EPA-Derived Labor Unit Costs), M (Project-Specific Vendor Unit Costs), P (Previously Developed Unit Costs by Anchor QEA for Portland Harbor), A (EPA-Derived MII Unit Costs), O (Unit Costs from Other Projects/Sources)

Source of Cost Data:
For citation references, the following sources apply:
ALL (Allowance), FLC (www.flcdatacenter.com), LD (Costs Derived from Lower Duwamish Waterway Final Feasibility Study), MII (MII), O (Other), P (Previously Developed by Anchor QEA for Portland Harbor), and V (Vendor Quote)

Abbreviations:

QTY	Quantity	AC	Acres
EQUIP	Equipment	CLF	100 Linear Foot
MATL	Material	CY	Cubic Yard
HPF	HTRW Productivity Factor	DY	Days
ADJ LABOR	Adjusted Labor for HFP	EA	Each
ADJ EQUIP	Adjusted Equipment for HFP	FTE	Full Time Equivalent
UNMOD UC	Unmodified Unit Cost	HR	Hours
UNMOD LIC	Unmodified Line Item Cost	LB	Pounds
UNBUR LIC	Unburdened Line Item Cost	LCY	Loose Cubic Yard
PC OH	Prime Contractor Overhead	LF	Linear Foot
PC PF	Prime Contractor Profit	LS	Lump Sum
BUR LIC	Burdened Line Item Cost	MO	Month
		SF	Square Foot
		SY	Square Yard
		TON	Tons
		YR	Years

Cost Adjustment Checklist:	NOTES:
FACTOR:	Field work will be in Level "D" PPE.
H&S Productivity (labor and equipment only)	MII assembly costs include HPF adjustments.
Escalation to Base Year	2016 cost sources are not escalated (EF=1.00). All other costs are escalated based on the USACE CWCCIS, EM 1110-2-1304, Sept 2015.
Area Cost Factor	An AF of 1.05 is used for Oregon, except that an AF of 1.00 (national unmodified average) is used for MII assembly costs and local vendor quotes.
Subcontractor Overhead and Profit	It is assumed that home office OH is 8% and profit is 9% for the Prime Contractor. Professional labor overhead is 100%.
Prime Contractor Overhead and Profit	Allowances and items with mandated costs such as per diem do not have overhead and profit applied.
	Items previously developed by Anchor QEA already include contractor markups, therefore overhead and profit were not applied to those items.
	It is assumed that OH is 1% and profit is 0% for vendor quotes for treatment and disposal at offsite disposal facilities. It is assumed that OH is 5% and profit is 0% for quotes for all other material vendor quotes.
	Items developed using MII already include contractor markups such as overhead and profit, therefore additional overhead and profit were not applied in the PC OH and PC PF to those items.

TABLE CW-I8

Alternative I **Cost Worksheet:** **CW-I8**
Capital Cost Sub-Element
Dredging of Contaminated Sediments (Open Water)

COST WORKSHEET

Site: Portland Harbor Superfund Site
Location: Portland, Oregon
Phase: Feasibility Study
Base Year: 2016

Prepared By: JN **Date:** 3/4/2016
Checked By: AB **Date:** 3/7/2016

Work Statement:
This sub-element involves mechanical dredging of contaminated sediments in open water areas and transport to dewatering/stabilization area. It includes costs for on-site labor, equipment, and materials for open water dredging, assuming a 10 CY barge mounted crane and clamshell.
Quantity development presented in Appendix D.

Cost Analysis:
Cost for Open Water Dredging (Lump Sum)

COST DATABASE CODE	DESCRIPTION	QTY	UNIT(S)	HPF	LABOR	ADJ LABOR	EQUIP	ADJ EQUIP	MATL	OTHER	UNMOD UC	UNMOD LIC	PC OH	PC PF	BUR LIC	COST SOURCE CITATION	COMMENTS
A6	Open Water Dredging	**1,556,599**	CY	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$24.53	$24.53	$38,183,373.47	0%	0%	$38,183,373	MII MII	Project-specific unit cost developed in MII.
												TOTAL COST:			$38,183,373		

	Representative Unit Quantity	Unit(s)	Total Cost	Unit Cost
COST WORKSHEET SUMMARY	1,556,599	CY	$38,183,373	$24.53

Notes:
Further information about the development of cost worksheets can be found in Attachment A - Methodology and Organization of Detailed Cost Estimates.
The quantity bolded in the QTY column is the quantity selected as the representative unit quantity for this cost worksheet. If multiple quantities are bolded, the representative unit quantity is the sum of those quantities. When the LS unit is utilized, the default representative unit quantity is 1.
HTRW productivity factor is from Exhibit B-3 or B-4 of "A Guide to Developing and Documenting Cost Estimates During the Feasibility Study", EPA 2000
EPA developed project-specific unit costs using the Micro Computer Aided Cost Engineering System (MCACES) Second Generation (MII) software version 4.2, build 3

Cost Database Code:
The Cost Database Code is a reference code for linking with line item cost information with the cost source database and is not otherwise used within these cost worksheets. The following cost source database prefixes apply:
L (EPA-Derived Labor Unit Costs), M (Project-Specific Vendor Unit Costs), P (Previously Developed Unit Costs by Anchor QEA for Portland Harbor), A (EPA-Derived MII Unit Costs), O (Unit Costs from Other Projects/Sources)

Source of Cost Data:
For citation references, the following sources apply:
ALL (Allowance), FLC (www.flcdatacenter.com), LD (Costs Derived from Lower Duwamish Waterway Final Feasibility Study), MII (MII), O (Other), P (Previously Developed by Anchor QEA for Portland Harbor), and V (Vendor Quote)

Abbreviations:

QTY	Quantity	AC	Acres
EQUIP	Equipment	CLF	100 Linear Foot
MATL	Material	CY	Cubic Yard
HPF	HTRW Productivity Factor	DY	Days
ADJ LABOR	Adjusted Labor for HFP	EA	Each
ADJ EQUIP	Adjusted Equipment for HFP	FTE	Full Time Equivalent
UNMOD UC	Unmodified Unit Cost	HR	Hours
UNMOD LIC	Unmodified Line Item Cost	LB	Pounds
UNBUR LIC	Unburdened Line Item Cost	LCY	Loose Cubic Yard
PC OH	Prime Contractor Overhead	LF	Linear Foot
PC PF	Prime Contractor Profit	LS	Lump Sum
BUR LIC	Burdened Line Item Cost	MO	Month
		SF	Square Foot
		SY	Square Yard
		TON	Tons
		YR	Years

Cost Adjustment Checklist:	**NOTES:**
FACTOR:	Field work will be in Level "D" PPE.
H&S Productivity (labor and equipment only)	MII assembly costs include HPF adjustments.
Escalation to Base Year	2016 cost sources are not escalated (EF=1.00). All other costs are escalated based on the USACE CWCCIS, EM 1110-2-1304, Sept 2015.
Area Cost Factor	An AF of 1.05 is used for Oregon, except that an AF of 1.00 (national unmodified average) is used for MII assembly costs and local vendor quotes.
Subcontractor Overhead and Profit	It is assumed that home office OH is 8% and profit is 9% for the Prime Contractor. Professional labor overhead is 100%.
Prime Contractor Overhead and Profit	Allowances and items with mandated costs such as per diem do not have overhead and profit applied.
	Items previously developed by Anchor QEA already include contractor markups, therefore overhead and profit were not applied to those items.
	It is assumed that OH is 1% and profit is 0% for vendor quotes for treatment and disposal at offsite disposal facilities. It is assumed that OH is 5% and profit is 0% for quotes for all other material vendor quotes.
	Items developed using MII already include contractor markups such as overhead and profit, therefore additional overhead and profit were not applied in the PC OH and PC PF to those items.

TABLE CW-I9

Alternative I **Cost Worksheet:** **CW-I9**
Capital Cost Sub-Element
Dredging of Contaminated Sediments (Confined)

COST WORKSHEET

Site: Portland Harbor Superfund Site
Location: Portland, Oregon
Phase: Feasibility Study
Base Year: 2016

Prepared By: JN **Date:** 3/4/2016
Checked By: AB **Date:** 3/7/2016

Work Statement:
This sub-element involves mechanical dredging of contaminated sediments in confined areas and transport to dewatering/stabilization area. It includes costs for on-site labor, equipment, and materials for confined dredging, assuming a 4 CY barge mounted excavator.
Quantity development presented in Appendix D.

Cost Analysis:
Cost for Confined Dredging (Lump Sum)

COST DATABASE CODE	DESCRIPTION	QTY	UNIT(S)	HPF	LABOR	ADJ LABOR	EQUIP	ADJ EQUIP	MATL	OTHER	UNMOD UC	UNMOD LIC	PC OH	PC PF	BUR LIC	COST SOURCE CITATION	COMMENTS
A7	Confined Dredging	**93,151**	CY	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$31.10	$31.10	$2,896,996.10	0%	0%	$2,896,996	MII MII	Project-specific unit cost developed in MII.
												TOTAL COST:			$2,896,996		

	Representative Unit Quantity	Unit(s)	Total Cost	Unit Cost
COST WORKSHEET SUMMARY	93,151	CY	$2,896,996	$31.10

Notes:
Further information about the development of cost worksheets can be found in Attachment A - Methodology and Organization of Detailed Cost Estimates.
The quantity bolded in the QTY column is the quantity selected as the representative unit quantity for this cost worksheet. If multiple quantities are bolded, the representative unit quantity is the sum of those quantities. When the LS unit is utilized, the default representative unit quantity is 1.
HTRW productivity factor is from Exhibit B-3 or B-4 of "A Guide to Developing and Documenting Cost Estimates During the Feasibility Study", EPA 2000
EPA developed project-specific unit costs using the Micro Computer Aided Cost Engineering System (MCACES) Second Generation (MII) software version 4.2, build 3

Cost Database Code:
The Cost Database Code is a reference code for linking with line item cost information with the cost source database and is not otherwise used within these cost worksheets. The following cost source database prefixes apply:
L (EPA-Derived Labor Unit Costs), M (Project-Specific Vendor Unit Costs), P (Previously Developed Unit Costs by Anchor QEA for Portland Harbor), A (EPA-Derived MII Unit Costs), O (Unit Costs from Other Projects/Sources)

Source of Cost Data:
For citation references, the following sources apply:
ALL (Allowance), FLC (www.flcdatacenter.com), LD (Costs Derived from Lower Duwamish Waterway Final Feasibility Study), MII (MII), O (Other), P (Previously Developed by Anchor QEA for Portland Harbor), and V (Vendor Quote)

Abbreviations:

QTY	Quantity	AC	Acres
EQUIP	Equipment	CLF	100 Linear Foot
MATL	Material	CY	Cubic Yard
HPF	HTRW Productivity Factor	DY	Days
ADJ LABOR	Adjusted Labor for HFP	EA	Each
ADJ EQUIP	Adjusted Equipment for HFP	FTE	Full Time Equivalent
UNMOD UC	Unmodified Unit Cost	HR	Hours
UNMOD LIC	Unmodified Line Item Cost	LB	Pounds
UNBUR LIC	Unburdened Line Item Cost	LCY	Loose Cubic Yard
PC OH	Prime Contractor Overhead	LF	Linear Foot
PC PF	Prime Contractor Profit	LS	Lump Sum
BUR LIC	Burdened Line Item Cost	MO	Month
		SF	Square Foot
		SY	Square Yard
		TON	Tons
		YR	Years

Cost Adjustment Checklist:	**NOTES:**
FACTOR:	Field work will be in Level "D" PPE.
H&S Productivity (labor and equipment only)	MII assembly costs include HPF adjustments.
Escalation to Base Year	2016 cost sources are not escalated (EF=1.00). All other costs are escalated based on the USACE CWCCIS, EM 1110-2-1304, Sept 2015.
Area Cost Factor	An AF of 1.05 is used for Oregon, except that an AF of 1.00 (national unmodified average) is used for MII assembly costs and local vendor quotes.
Subcontractor Overhead and Profit	It is assumed that home office OH is 8% and profit is 9% for the Prime Contractor. Professional labor overhead is 100%.
Prime Contractor Overhead and Profit	Allowances and items with mandated costs such as per diem do not have overhead and profit applied.
	Items previously developed by Anchor QEA already include contractor markups, therefore overhead and profit were not applied to those items.
	It is assumed that OH is 1% and profit is 0% for vendor quotes for treatment and disposal at offsite disposal facilities. It is assumed that OH is 5% and profit is 0% for quotes for all other material vendor quotes.
	Items developed using MII already include contractor markups such as overhead and profit, therefore additional overhead and profit were not applied in the PC OH and PC PF to those items.

TABLE CW-I10

Alternative I **Cost Worksheet:** **CW-I10**
Capital Cost Sub-Element
Excavation of Riverbanks

COST WORKSHEET

Site: Portland Harbor Superfund Site
Location: Portland, Oregon
Phase: Feasibility Study
Base Year: 2016

Prepared By: JN **Date:** 3/4/2016
Checked By: AB **Date:** 3/7/2016

Work Statement:
This sub-element involves mechanical excavation of riverbank materials and transport to dewatering/stabilization area. It includes costs for on-site labor, equipment, and materials for riverbank excavation, assuming a 4 CY long-arm excavator.
Quantity development presented in Appendix D.

Cost Analysis:
Cost for Excavation from Shore for Riverbanks (Lump Sum)

COST DATABASE CODE	DESCRIPTION	QTY	UNIT(S)	HPF	LABOR	ADJ LABOR	EQUIP	ADJ EQUIP	MATL	OTHER	UNMOD UC	UNMOD LIC	PC OH	PC PF	BUR LIC	COST SOURCE CITATION	COMMENTS
A8	Riverbank Excavation	**102,624**	CY	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$5.19	$5.19	$532,617.96	0%	0%	$532,618	MII MII	Project-specific unit cost developed in MII.
												TOTAL COST:			$532,618		

	Representative Unit Quantity	Unit(s)	Total Cost	Unit Cost
COST WORKSHEET SUMMARY	102,624	CY	$532,618	$5.19

Notes:
Further information about the development of cost worksheets can be found in Attachment A - Methodology and Organization of Detailed Cost Estimates.
The quantity bolded in the QTY column is the quantity selected as the representative unit quantity for this cost worksheet. If multiple quantities are bolded, the representative unit quantity is the sum of those quantities. When the LS unit is utilized, the default representative unit quantity is 1.
HTRW productivity factor is from Exhibit B-3 or B-4 of "A Guide to Developing and Documenting Cost Estimates During the Feasibility Study", EPA 2000
EPA developed project-specific unit costs using the Micro Computer Aided Cost Engineering System (MCACES) Second Generation (MII) software version 4.2, build 3

Cost Database Code:
The Cost Database Code is a reference code for linking with line item cost information with the cost source database and is not otherwise used within these cost worksheets. The following cost source database prefixes apply:
L (EPA-Derived Labor Unit Costs), M (Project-Specific Vendor Unit Costs), P (Previously Developed Unit Costs by Anchor QEA for Portland Harbor), A (EPA-Derived MII Unit Costs), O (Unit Costs from Other Projects/Sources)

Source of Cost Data:
For citation references, the following sources apply:
ALL (Allowance), FLC (www.flcdatacenter.com), LD (Costs Derived from Lower Duwamish Waterway Final Feasibility Study), MII (MII), O (Other), P (Previously Developed by Anchor QEA for Portland Harbor), and V (Vendor Quote)

Abbreviations:

QTY	Quantity	AC	Acres
EQUIP	Equipment	CLF	100 Linear Foot
MATL	Material	CY	Cubic Yard
HPF	HTRW Productivity Factor	DY	Days
ADJ LABOR	Adjusted Labor for HFP	EA	Each
ADJ EQUIP	Adjusted Equipment for HFP	FTE	Full Time Equivalent
UNMOD UC	Unmodified Unit Cost	HR	Hours
UNMOD LIC	Unmodified Line Item Cost	LB	Pounds
UNBUR LIC	Unburdened Line Item Cost	LCY	Loose Cubic Yard
PC OH	Prime Contractor Overhead	LF	Linear Foot
PC PF	Prime Contractor Profit	LS	Lump Sum
BUR LIC	Burdened Line Item Cost	MO	Month
		SF	Square Foot
		SY	Square Yard
		TON	Tons
		YR	Years

Cost Adjustment Checklist:	**NOTES:**
FACTOR:	Field work will be in Level "D" PPE.
H&S Productivity (labor and equipment only)	MII assembly costs include HPF adjustments.
Escalation to Base Year	2016 cost sources are not escalated (EF=1.00). All other costs are escalated based on the USACE CWCCIS, EM 1110-2-1304, Sept 2015.
Area Cost Factor	An AF of 1.05 is used for Oregon, except that an AF of 1.00 (national unmodified average) is used for MII assembly costs and local vendor quotes.
Subcontractor Overhead and Profit	It is assumed that home office OH is 8% and profit is 9% for the Prime Contractor. Professional labor overhead is 100%.
Prime Contractor Overhead and Profit	Allowances and items with mandated costs such as per diem do not have overhead and profit applied.
	Items previously developed by Anchor QEA already include contractor markups, therefore overhead and profit were not applied to those items.
	It is assumed that OH is 1% and profit is 0% for vendor quotes for treatment and disposal at offsite disposal facilities. It is assumed that OH is 5% and profit is 0% for quotes for all other material vendor quotes.
	Items developed using MII already include contractor markups such as overhead and profit, therefore additional overhead and profit were not applied in the PC OH and PC PF to those items.

TABLE CW-I11

Alternative I **Cost Worksheet:** **CW-I11**
Capital Cost Sub-Element
Dewatering and Water Treatment for Dredging Operations

COST WORKSHEET

Site: Portland Harbor Superfund Site
Location: Portland, Oregon
Phase: Feasibility Study
Base Year: 2016

Prepared By: JN **Date:** 3/4/2016
Checked By: AB **Date:** 3/7/2016

Work Statement:
This sub-element involves the dewatering and water treatment for dredging operations. Assumes a temporary water treatment plant will be utilized for treatment of water generated from dewatering of sediments. It includes costs for labor, equipment, and materials for treatment of water generated from dredged sediments. Quantity development presented in Appendix D.

Cost Analysis:
Cost for Dewatering and Water Treatment for Dredging Operations (Lump Sum)

COST DATABASE CODE	DESCRIPTION	QTY	UNIT(S)	HPF	LABOR	ADJ LABOR	EQUIP	ADJ EQUIP	MATL	OTHER	UNMOD UC	UNMOD LIC	PC OH	PC PF	BUR LIC	COST SOURCE CITATION	COMMENTS
A9	Mobilization/Demobilization of Temporary Water Treatment System	7	EA	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$36,600.00	$36,600.00	$256,200.00	0%	0%	$256,200	MII MII	Project-specific unit cost developed in MII. Assumes mob/demob of treatment system will be required for each construction season
A10	Dewatering and Temporary Water Treatment System Operations	324	DY	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$21,654.00	$21,654.00	$7,005,069.00	0%	0%	$7,005,069	MII MII	Project-specific unit cost developed in MII.
												TOTAL COST:			$7,261,269		

	Representative Unit Quantity	Unit(s)	Total Cost	Unit Cost
COST WORKSHEET SUMMARY	1	LS	$7,261,269	$7,261,269

Notes:
Further information about the development of cost worksheets can be found in Attachment A - Methodology and Organization of Detailed Cost Estimates.
The quantity bolded in the QTY column is the quantity selected as the representative unit quantity for this cost worksheet. If multiple quantities are bolded, the representative unit quantity is the sum of those quantities. When the LS unit is utilized, the default representative unit quantity is 1.
HTRW productivity factor is from Exhibit B-3 or B-4 of "A Guide to Developing and Documenting Cost Estimates During the Feasibility Study", EPA 2000
EPA developed project-specific unit costs using the Micro Computer Aided Cost Engineering System (MCACES) Second Generation (MII) software version 4.2, build 3

Cost Database Code:
The Cost Database Code is a reference code for linking with line item cost information with the cost source database and is not otherwise used within these cost worksheets. The following cost source database prefixes apply:
L (EPA-Derived Labor Unit Costs), M (Project-Specific Vendor Unit Costs), P (Previously Developed Unit Costs by Anchor QEA for Portland Harbor), A (EPA-Derived MII Unit Costs), O (Unit Costs from Other Projects/Sources)

Source of Cost Data:
For citation references, the following sources apply:
ALL (Allowance), FLC (www.flcdatacenter.com), LD (Costs Derived from Lower Duwamish Waterway Final Feasibility Study), MII (MII), O (Other), P (Previously Developed by Anchor QEA for Portland Harbor), and V (Vendor Quote)

Abbreviations:

QTY	Quantity	AC	Acres
EQUIP	Equipment	CLF	100 Linear Foot
MATL	Material	CY	Cubic Yard
HPF	HTRW Productivity Factor	DY	Days
ADJ LABOR	Adjusted Labor for HFP	EA	Each
ADJ EQUIP	Adjusted Equipment for HFP	FTE	Full Time Equivalent
UNMOD UC	Unmodified Unit Cost	HR	Hours
UNMOD LIC	Unmodified Line Item Cost	LB	Pounds
UNBUR LIC	Unburdened Line Item Cost	LCY	Loose Cubic Yard
PC OH	Prime Contractor Overhead	LF	Linear Foot
PC PF	Prime Contractor Profit	LS	Lump Sum
BUR LIC	Burdened Line Item Cost	MO	Month
		SF	Square Foot
		SY	Square Yard
		TON	Tons
		YR	Years

Cost Adjustment Checklist:	**NOTES:**
FACTOR:	Field work will be in Level "D" PPE.
H&S Productivity (labor and equipment only)	MII assembly costs include HPF adjustments.
Escalation to Base Year	2016 cost sources are not escalated (EF=1.00). All other costs are escalated based on the USACE CWCCIS, EM 1110-2-1304, Sept 2015.
Area Cost Factor	An AF of 1.05 is used for Oregon, except that an AF of 1.00 (national unmodified average) is used for MII assembly costs and local vendor quotes.
Subcontractor Overhead and Profit	It is assumed that home office OH is 8% and profit is 9% for the Prime Contractor. Professional labor overhead is 100%.
Prime Contractor Overhead and Profit	Allowances and items with mandated costs such as per diem do not have overhead and profit applied.
	Items previously developed by Anchor QEA already include contractor markups, therefore overhead and profit were not applied to those items.
	It is assumed that OH is 1% and profit is 0% for vendor quotes for treatment and disposal at offsite disposal facilities. It is assumed that OH is 5% and profit is 0% for quotes for all other material vendor quotes.
	Items developed using MII already include contractor markups such as overhead and profit, therefore additional overhead and profit were not applied in the PC OH and PC PF to those items.

TABLE CW-I12

Alternative I **Cost Worksheet:** **CW-I12**

Capital Cost Sub-Element

Subtitle C/TSCA Disposal (Handling, Transportation, Treatment of Select PTW Materials, and Disposal)

COST WORKSHEET

Site: Portland Harbor Superfund Site
Location: Portland, Oregon
Phase: Feasibility Study
Base Year: 2016

Prepared By: JN **Date:** 5/20/2016
Checked By: AB **Date:** 5/23/2016

Work Statement:
This sub-element involves the disposal of contaminated sediments at a Subtitle C/TSCA landfill, including in-barge mixing of amendments, barge transportation of materials to a transload facility, materials handling from the barge to truck, transportation of the sediments to the Subtitle C/TSCA landfill, and disposal of contaminated sediments (including thermal treatment at the landfill facility for a portion of the volume). It includes costs for labor, equipment, and materials as well as recent vendor quotes. Costs for development of a transload facility are included in a separate cost worksheet.
Quantity development presented in Appendix D.

Cost Analysis:
Cost for Subtitle C/TSCA Disposal (Lump Sum)

COST DATABASE CODE	DESCRIPTION	QTY	UNIT(S)	HPF	LABOR	ADJ LABOR	EQUIP	ADJ EQUIP	MATL	OTHER	UNMOD UC	UNMOD LIC	PC OH	PC PF	BUR LIC	COST SOURCE CITATION	COMMENTS
Area 6W NRC/NAPL PTW																	
	Transportation																
A13	Barging to Transload Facility	218,332	CY	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$13.66	$13.66	$2,982,415.12	0%	0%	$2,982,415	MII MII	Project-specific unit cost developed in MII.
A5	Hauling Waste from Transload Facility to Landfill	218,332	CY	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$16.70	$16.70	$3,646,144.40	0%	0%	$3,646,144	MII MII	Project-specific unit cost developed in MII.
	Materials Handling at Transload Facility																
A14	Offloading of Sediments	218,332	CY	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$9.70	$9.70	$2,117,820.40	0%	0%	$2,117,820	MII MII	Project-specific unit cost developed in MII. Assumes mechanical offloading of sediments at the transload facility.
A4	Loading Trucks at Transload Facility	218,332	CY	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$2.68	$2.68	$585,129.76	0%	0%	$585,130	MII MII	Project-specific unit cost developed in MII.
	Treatment																
A11	In-Barge Stabilization / Mixing of Amendments	218,332	CY	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$24.50	$24.50	$5,349,134.00	0%	0%	$5,349,134	MII MII	Project-specific unit cost developed in MII.
P5	Diatomaceous Earth	12,655	TON	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$105.94	$105.94	$1,340,670.70	0%	0%	$1,340,671	P Anchor QEA	Project-specific cost developed by Anchor QEA (2010) - see Backup Table 24.
M25	Quicklime	17,463	TON	1.00	$0.00	$0.00	$0.00	$0.00	$239.00	$0.00	$239.00	$4,173,657.00	5%	0%	$4,382,340	V Vendor Quote	Project-specific vendor quote - Graymont, 2016.
A2	Hauling - Quicklime to Site	17,463	TON	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$5.71	$5.71	$99,713.73	0%	0%	$99,714	MII MII	Project-specific unit cost developed in MII. Assumes 10 mile one-way haul.
	Disposal at Subtitle C/TSCA Landfill																
M10	Tipping Fee at Subtitle C/TSCA Landfill	**283,209**	TON	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$86.19	$86.19	$24,409,783.71	1%	0%	$24,653,882	V Vendor Quote	Project-specific vendor quote - CWM of the Northwest, 2015.
Area 7W NRC/NAPL PTW																	
	Transportation																
A13	Barging to Transload Facility	66,633	CY	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$13.66	$13.66	$910,206.78	0%	0%	$910,207	MII MII	Project-specific unit cost developed in MII.
A5	Hauling Waste from Transload Facility to Landfill	66,633	CY	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$16.70	$16.70	$1,112,771.10	0%	0%	$1,112,771	MII MII	Project-specific unit cost developed in MII.
	Materials Handling at Transload Facility																
A14	Offloading of Sediments	66,633	CY	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$9.70	$9.70	$646,340.10	0%	0%	$646,340	MII MII	Project-specific unit cost developed in MII. Assumes mechanical offloading of sediments at the transload facility.
A4	Loading Trucks at Transload Facility	66,633	CY	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$2.68	$2.68	$178,576.44	0%	0%	$178,576	MII MII	Project-specific unit cost developed in MII.
	Treatment																
A11	In-Barge Stabilization / Mixing of Amendments	66,633	CY	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$24.50	$24.50	$1,632,508.50	0%	0%	$1,632,509	MII MII	Project-specific unit cost developed in MII.
P5	Diatomaceous Earth	5,700	TON	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$105.94	$105.94	$603,858.00	0%	0%	$603,858	P Anchor QEA	Project-specific cost developed by Anchor QEA (2010) - see Backup Table 24.
M25	Quicklime	1,573	TON	1.00	$0.00	$0.00	$0.00	$0.00	$239.00	$0.00	$239.00	$375,947.00	5%	0%	$394,744	V Vendor Quote	Project-specific vendor quote - Graymont, 2016.
A2	Hauling - Quicklime to Site	1,573	TON	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$5.71	$5.71	$8,981.83	0%	0%	$8,982	MII MII	Project-specific unit cost developed in MII. Assumes 10 mile one-way haul.
M20	Thermal Desorption Treatment at Subtitle C/TSCA Landfill (Low End of Treatment Cost Range)	12,541	TON	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$319.41	$319.41	$4,005,720.81	1%	0%	$4,045,778	V Vendor Quote	Project-specific vendor quote - CWM of the Northwest, 2015.
M9	Thermal Desorption Treatment at Subtitle C/TSCA Landfill (High End of Treatment Cost Range)	12,541	TON	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$572.91	$572.91	$7,184,864.31	1%	0%	$7,256,713	V Vendor Quote	Project-specific vendor quote - CWM of the Northwest, 2015.
	Disposal at Subtitle C/TSCA Landfill																
M10	Tipping Fee at Subtitle C/TSCA Landfill	**75,679**	TON	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$86.19	$86.19	$6,522,773.01	1%	0%	$6,588,001	V Vendor Quote	Project-specific vendor quote - CWM of the Northwest, 2015.
												TOTAL COST:			$68,535,729		

	Representative Unit Quantity	Unit(s)	Total Cost	Unit Cost
COST WORKSHEET SUMMARY	358,888	TON	$68,535,729	$191

TABLE CW-I12

Alternative I **Cost Worksheet:** **CW-I12**

Capital Cost Sub-Element

Subtitle C/TSCA Disposal (Handling, Transportation, Treatment of Select PTW Materials, and Disposal)

COST WORKSHEET

Site: Portland Harbor Superfund Site
Location: Portland, Oregon
Phase: Feasibility Study
Base Year: 2016

Prepared By: JN **Date:** 5/20/2016
Checked By: AB **Date:** 5/23/2016

Notes:

Further information about the development of cost worksheets can be found in Attachment A - Methodology and Organization of Detailed Cost Estimates.
The quantity bolded in the QTY column is the quantity selected as the representative unit quantity for this cost worksheet. If multiple quantities are bolded, the representative unit quantity is the sum of those quantities. When the LS unit is utilized, the default representative unit quantity is 1.
HTRW productivity factor is from Exhibit B-3 or B-4 of "A Guide to Developing and Documenting Cost Estimates During the Feasibility Study", EPA 2000
EPA developed project-specific unit costs using the Micro Computer Aided Cost Engineering System (MCACES) Second Generation (MII) software version 4.2, build 3

Cost Database Code:

The Cost Database Code is a reference code for linking with line item cost information with the cost source database and is not otherwise used within these cost worksheets. The following cost source database prefixes apply:

L (EPA-Derived Labor Unit Costs), M (Project-Specific Vendor Unit Costs), P (Previously Developed Unit Costs by Anchor QEA for Portland Harbor), A (EPA-Derived MII Unit Costs), O (Unit Costs from Other Projects/Sources)

Source of Cost Data:

For citation references, the following sources apply:

ALL (Allowance), FLC (www.flcdatacenter.com), LD (Costs Derived from Lower Duwamish Waterway Final Feasibility Study), MII (MII), O (Other), P (Previously Developed by Anchor QEA for Portland Harbor), and V (Vendor Quote)

Abbreviations:

QTY	Quantity	AC	Acres
EQUIP	Equipment	CLF	100 Linear Foot
MATL	Material	CY	Cubic Yard
HPF	HTRW Productivity Factor	DY	Days
ADJ LABOR	Adjusted Labor for HFP	EA	Each
ADJ EQUIP	Adjusted Equipment for HFP	FTE	Full Time Equivalent
UNMOD UC	Unmodified Unit Cost	HR	Hours
UNMOD LIC	Unmodified Line Item Cost	LB	Pounds
UNBUR LIC	Unburdened Line Item Cost	LCY	Loose Cubic Yard
PC OH	Prime Contractor Overhead	LF	Linear Foot
PC PF	Prime Contractor Profit	LS	Lump Sum
BUR LIC	Burdened Line Item Cost	MO	Month
		SF	Square Foot
		SY	Square Yard
		TON	Tons
		YR	Years

Cost Adjustment Checklist:	**NOTES:**
FACTOR:	Field work will be in Level "D" PPE.
H&S Productivity (labor and equipment only)	MII assembly costs include HPF adjustments.
Escalation to Base Year	2016 cost sources are not escalated (EF=1.00). All other costs are escalated based on the USACE CWCCIS, EM 1110-2-1304, Sept 2015.
Area Cost Factor	An AF of 1.05 is used for Oregon, except that an AF of 1.00 (national unmodified average) is used for MII assembly costs and local vendor quotes.
Subcontractor Overhead and Profit	It is assumed that home office OH is 8% and profit is 9% for the Prime Contractor. Professional labor overhead is 100%.
Prime Contractor Overhead and Profit	Allowances and items with mandated costs such as per diem do not have overhead and profit applied.
	Items previously developed by Anchor QEA already include contractor markups, therefore overhead and profit were not applied to those items.
	It is assumed that OH is 1% and profit is 0% for vendor quotes for treatment and disposal at offsite disposal facilities. It is assumed that OH is 5% and profit is 0% for quotes for all other material vendor quotes.
	Items developed using MII already include contractor markups such as overhead and profit, therefore additional overhead and profit were not applied in the PC OH and PC PF to those items.

TABLE CW-I13

Alternative I **Cost Worksheet:** **CW-I13**
Capital Cost Sub-Element
Subtitle D Disposal (Handling, Transportation, and Disposal)

COST WORKSHEET

Site: Portland Harbor Superfund Site
Location: Portland, Oregon
Phase: Feasibility Study
Base Year: 2016

Prepared By: JN **Date:** 3/4/2016
Checked By: AB **Date:** 3/7/2016

Work Statement:
This sub-element involves the disposal of contaminated sediments at a Subtitle D landfill, including barge transportation of materials to a transload facility, materials handling from the barge to truck, transportation of the sediments to the Subtitle C/TSCA landfill, and disposal of contaminated sediments (including thermal treatment at the landfill facility for a portion of the volume). It includes costs for labor, equipment, and materials as well as recent vendor quotes.
Quantity development presented in Appendix D.

Cost Analysis:
Cost for Subtitle D Disposal (Lump Sum)

COST DATABASE CODE	DESCRIPTION	QTY	UNIT(S)	HPF	LABOR	ADJ LABOR	EQUIP	ADJ EQUIP	MATL	OTHER	UNMOD UC	UNMOD LIC	PC OH	PC PF	BUR LIC	COST SOURCE CITATION	COMMENTS
	Diatomaceous Earth Amendment																
A11	In-Barge Stabilization / Mixing of Amendments	2,021,453	CY	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$24.50	$24.50	$49,525,598.50	0%	0%	$49,525,599	MII MII	Project-specific unit cost developed in MII.
P5	Diatomaceous Earth	120,688	TON	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$105.94	$105.94	$12,785,686.72	0%	0%	$12,785,687	P Anchor QEA	Project-specific cost developed by Anchor QEA (2010) - see Backup Table 24.
	Transportation to Transload Facility																
A13	Barging to Transload Facility	2,021,453	CY	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$13.66	$13.66	$27,613,047.98	0%	0%	$27,613,048	MII MII	Project-specific unit cost developed in MII.
	Transportation and Disposal at Subtitle D Landfill																
M11	Transportation and Disposal at Subtitle D Landfill	**2,534,454**	TON	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$74.53	$74.53	$188,892,856.62	1%	0%	$190,781,785	V Vendor Quote	Project-specific vendor quote - Republic Services (Roosevelt Landfill), 2015. Includes transloading of the sediments, truck transportation from the transload facility to the landfill, and disposal at the landfill.
												TOTAL COST:			$280,706,119		

	Representative Unit Quantity	Unit(s)	Total Cost	Unit Cost
COST WORKSHEET SUMMARY	2,534,454	TON	$280,706,119	$111

Notes:
Further information about the development of cost worksheets can be found in Attachment A - Methodology and Organization of Detailed Cost Estimates.
The quantity bolded in the QTY column is the quantity selected as the representative unit quantity for this cost worksheet. If multiple quantities are bolded, the representative unit quantity is the sum of those quantities. When the LS unit is utilized, the default representative unit quantity is 1.
HTRW productivity factor is from Exhibit B-3 or B-4 of "A Guide to Developing and Documenting Cost Estimates During the Feasibility Study", EPA 2000
EPA developed project-specific unit costs using the Micro Computer Aided Cost Engineering System (MCACES) Second Generation (MII) software version 4.2, build 3

Cost Database Code:
The Cost Database Code is a reference code for linking with line item cost information with the cost source database and is not otherwise used within these cost worksheets. The following cost source database prefixes apply:
L (EPA-Derived Labor Unit Costs), M (Project-Specific Vendor Unit Costs), P (Previously Developed Unit Costs by Anchor QEA for Portland Harbor), A (EPA-Derived MII Unit Costs), O (Unit Costs from Other Projects/Sources)

Source of Cost Data:
For citation references, the following sources apply:
ALL (Allowance), FLC (www.flcdatacenter.com), LD (Costs Derived from Lower Duwamish Waterway Final Feasibility Study), MII (MII), O (Other), P (Previously Developed by Anchor QEA for Portland Harbor), and V (Vendor Quote)

Abbreviations:

QTY	Quantity	AC	Acres
EQUIP	Equipment	CLF	100 Linear Foot
MATL	Material	CY	Cubic Yard
HPF	HTRW Productivity Factor	DY	Days
ADJ LABOR	Adjusted Labor for HFP	EA	Each
ADJ EQUIP	Adjusted Equipment for HFP	FTE	Full Time Equivalent
UNMOD UC	Unmodified Unit Cost	HR	Hours
UNMOD LIC	Unmodified Line Item Cost	LB	Pounds
UNBUR LIC	Unburdened Line Item Cost	LCY	Loose Cubic Yard
PC OH	Prime Contractor Overhead	LF	Linear Foot
PC PF	Prime Contractor Profit	LS	Lump Sum
BUR LIC	Burdened Line Item Cost	MO	Month
		SF	Square Foot
		SY	Square Yard
		TON	Tons
		YR	Years

Cost Adjustment Checklist:	**NOTES:**
FACTOR:	Field work will be in Level "D" PPE.
H&S Productivity (labor and equipment only)	MII assembly costs include HPF adjustments.
Escalation to Base Year	2016 cost sources are not escalated (EF=1.00). All other costs are escalated based on the USACE CWCCIS, EM 1110-2-1304, Sept 2015.
Area Cost Factor	An AF of 1.05 is used for Oregon, except that an AF of 1.00 (national unmodified average) is used for MII assembly costs and local vendor quotes.
Subcontractor Overhead and Profit	It is assumed that home office OH is 8% and profit is 9% for the Prime Contractor. Professional labor overhead is 100%.
Prime Contractor Overhead and Profit	Allowances and items with mandated costs such as per diem do not have overhead and profit applied.
	Items previously developed by Anchor QEA already include contractor markups, therefore overhead and profit were not applied to those items.
	It is assumed that OH is 1% and profit is 0% for vendor quotes for treatment and disposal at offsite disposal facilities. It is assumed that OH is 5% and profit is 0% for quotes for all other material vendor quotes.
	Items developed using MII already include contractor markups such as overhead and profit, therefore additional overhead and profit were not applied in the PC OH and PC PF to those items.

TABLE CW-I14

Alternative I
Capital Cost Sub-Element
Mitigation

Cost Worksheet: **CW-I14**

COST WORKSHEET

Site: Portland Harbor Superfund Site
Location: Portland, Oregon
Phase: Feasibility Study
Base Year: 2016

Prepared By: JN **Date:** 3/4/2016
Checked By: AB **Date:** 3/7/2016

Work Statement:
This sub-element involves mitigation of shallow water and riverbank areas. It includes costs for on-site labor, equipment, and materials developed from previous work.
Quantity development presented in Appendix D.

Cost Analysis:
Cost for Mitigation (Lump Sum)

COST DATABASE CODE	DESCRIPTION	QTY	UNIT(S)	HPF	LABOR	ADJ LABOR	EQUIP	ADJ EQUIP	MATL	OTHER	UNMOD UC	UNMOD LIC	PC OH	PC PF	BUR LIC	COST SOURCE CITATION	COMMENTS
O3	Mitigation	**34**	AC	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$1,070,827.00	$1,070,827.00	$36,408,118.00	0%	0%	$36,408,118	O Other	Average cost of projects presented in Tables 6.1-1 and 6.1-4 of the Appendix M, Attachment 1, Anchor QEA FS (2010) as well as select other projects. See Calculations for derivation.
												TOTAL COST:			$36,408,118		

	Representative Unit Quantity	Unit(s)	Total Cost	Unit Cost
COST WORKSHEET SUMMARY	34	AC	$36,408,118	$1,070,827

Notes:
Further information about the development of cost worksheets can be found in Attachment A - Methodology and Organization of Detailed Cost Estimates.
The quantity bolded in the QTY column is the quantity selected as the representative unit quantity for this cost worksheet. If multiple quantities are bolded, the representative unit quantity is the sum of those quantities. When the LS unit is utilized, the default representative unit quantity is 1.
HTRW productivity factor is from Exhibit B-3 or B-4 of "A Guide to Developing and Documenting Cost Estimates During the Feasibility Study", EPA 2000
EPA developed project-specific unit costs using the Micro Computer Aided Cost Engineering System (MCACES) Second Generation (MII) software version 4.2, build 3

Cost Database Code:
The Cost Database Code is a reference code for linking with line item cost information with the cost source database and is not otherwise used within these cost worksheets. The following cost source database prefixes apply:
L (EPA-Derived Labor Unit Costs), M (Project-Specific Vendor Unit Costs), P (Previously Developed Unit Costs by Anchor QEA for Portland Harbor), A (EPA-Derived MII Unit Costs), O (Unit Costs from Other Projects/Sources)

Source of Cost Data:
For citation references, the following sources apply:
ALL (Allowance), FLC (www.flcdatacenter.com), LD (Costs Derived from Lower Duwamish Waterway Final Feasibility Study), MII (MII), O (Other), P (Previously Developed by Anchor QEA for Portland Harbor), and V (Vendor Quote)

Abbreviations:

QTY	Quantity	AC	Acres
EQUIP	Equipment	CLF	100 Linear Foot
MATL	Material	CY	Cubic Yard
HPF	HTRW Productivity Factor	DY	Days
ADJ LABOR	Adjusted Labor for HFP	EA	Each
ADJ EQUIP	Adjusted Equipment for HFP	FTE	Full Time Equivalent
UNMOD UC	Unmodified Unit Cost	HR	Hours
UNMOD LIC	Unmodified Line Item Cost	LB	Pounds
UNBUR LIC	Unburdened Line Item Cost	LCY	Loose Cubic Yard
PC OH	Prime Contractor Overhead	LF	Linear Foot
PC PF	Prime Contractor Profit	LS	Lump Sum
BUR LIC	Burdened Line Item Cost	MO	Month
		SF	Square Foot
		SY	Square Yard
		TON	Tons
		YR	Years

Cost Adjustment Checklist:	**NOTES:**
FACTOR:	Field work will be in Level "D" PPE.
H&S Productivity (labor and equipment only)	MII assembly costs include HPF adjustments.
Escalation to Base Year	2016 cost sources are not escalated (EF=1.00). All other costs are escalated based on the USACE CWCCIS, EM 1110-2-1304, Sept 2015.
Area Cost Factor	An AF of 1.05 is used for Oregon, except that an AF of 1.00 (national unmodified average) is used for MII assembly costs and local vendor quotes.
Subcontractor Overhead and Profit	It is assumed that home office OH is 8% and profit is 9% for the Prime Contractor. Professional labor overhead is 100%.
Prime Contractor Overhead and Profit	Allowances and items with mandated costs such as per diem do not have overhead and profit applied.
	Items previously developed by Anchor QEA already include contractor markups, therefore overhead and profit were not applied to those items.
	It is assumed that OH is 1% and profit is 0% for vendor quotes for treatment and disposal at offsite disposal facilities. It is assumed that OH is 5% and profit is 0% for quotes for all other material vendor quotes.
	Items developed using MII already include contractor markups such as overhead and profit, therefore additional overhead and profit were not applied in the PC OH and PC PF to those items.

TABLE CW-I15

Alternative I **Cost Worksheet:** **CW-I15**
Capital Cost Sub-Element
Sand Placement for Technology Assignments

COST WORKSHEET

Site: Portland Harbor Superfund Site
Location: Portland, Oregon
Phase: Feasibility Study
Base Year: 2016

Prepared By: JN **Date:** 3/4/2016
Checked By: AB **Date:** 3/7/2016

Work Statement:
This sub-element involves the placement of sand for the construction of capping areas. It includes placement of sand within confined areas, open areas, and riverbanks. It includes costs for on-site labor, equipment, and materials as well as recent vendor quotes.
Quantity development presented in Appendix D.

Cost Analysis:
Cost for Sand Placement for Technology Assignments (Lump Sum)

COST DATABASE CODE	DESCRIPTION	QTY	UNIT(S)	HPF	LABOR	ADJ LABOR	EQUIP	ADJ EQUIP	MATL	OTHER	UNMOD UC	UNMOD LIC	PC OH	PC PF	BUR LIC	COST SOURCE CITATION	COMMENTS
P1	Sand	**598,578**	LCY	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$19.75	$19.75	$11,821,915.50	0%	0%	$11,821,916	P Anchor QEA	Project-specific cost developed by Anchor QEA (2010) - see Backup Table 29A. Includes conversion from TON to LCY.
	Sand Placement (Riverbanks)																
A16	Material Placement (Confined)	85,257	CY	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$20.39	$20.39	$1,738,390.23	0%	0%	$1,738,390	MII MII	Project-specific unit cost developed in MII.
	Sand Placement (Confined)																
A16	Material Placement (Confined)	52,384	CY	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$20.39	$20.39	$1,068,109.76	0%	0%	$1,068,110	MII MII	Project-specific unit cost developed in MII.
	Sand Placement (Open Water)																
A15	Material Placement (Open)	460,937	CY	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$12.42	$12.42	$5,724,837.54	0%	0%	$5,724,838	MII MII	Project-specific unit cost developed in MII.
												TOTAL COST:			$20,353,254		

	Representative Unit Quantity	Unit(s)	Total Cost	Unit Cost
COST WORKSHEET SUMMARY	598,578	CY	$20,353,254	$34.00

Notes:
Further information about the development of cost worksheets can be found in Attachment A - Methodology and Organization of Detailed Cost Estimates.
The quantity bolded in the QTY column is the quantity selected as the representative unit quantity for this cost worksheet. If multiple quantities are bolded, the representative unit quantity is the sum of those quantities. When the LS unit is utilized, the default representative unit quantity is 1.
HTRW productivity factor is from Exhibit B-3 or B-4 of "A Guide to Developing and Documenting Cost Estimates During the Feasibility Study", EPA 2000
EPA developed project-specific unit costs using the Micro Computer Aided Cost Engineering System (MCACES) Second Generation (MII) software version 4.2, build 3

Cost Database Code:
The Cost Database Code is a reference code for linking with line item cost information with the cost source database and is not otherwise used within these cost worksheets. The following cost source database prefixes apply:
L (EPA-Derived Labor Unit Costs), M (Project-Specific Vendor Unit Costs), P (Previously Developed Unit Costs by Anchor QEA for Portland Harbor), A (EPA-Derived MII Unit Costs), O (Unit Costs from Other Projects/Sources)

Source of Cost Data:
For citation references, the following sources apply:
ALL (Allowance), FLC (www.flcdatacenter.com), LD (Costs Derived from Lower Duwamish Waterway Final Feasibility Study), MII (MII), O (Other), P (Previously Developed by Anchor QEA for Portland Harbor), and V (Vendor Quote)

Abbreviations:

QTY	Quantity	AC	Acres
EQUIP	Equipment	CLF	100 Linear Foot
MATL	Material	CY	Cubic Yard
HPF	HTRW Productivity Factor	DY	Days
ADJ LABOR	Adjusted Labor for HFP	EA	Each
ADJ EQUIP	Adjusted Equipment for HFP	FTE	Full Time Equivalent
UNMOD UC	Unmodified Unit Cost	HR	Hours
UNMOD LIC	Unmodified Line Item Cost	LB	Pounds
UNBUR LIC	Unburdened Line Item Cost	LCY	Loose Cubic Yard
PC OH	Prime Contractor Overhead	LF	Linear Foot
PC PF	Prime Contractor Profit	LS	Lump Sum
BUR LIC	Burdened Line Item Cost	MO	Month
		SF	Square Foot
		SY	Square Yard
		TON	Tons
		YR	Years

Cost Adjustment Checklist:	**NOTES:**
FACTOR:	Field work will be in Level "D" PPE.
H&S Productivity (labor and equipment only)	MII assembly costs include HPF adjustments.
Escalation to Base Year	2016 cost sources are not escalated (EF=1.00). All other costs are escalated based on the USACE CWCCIS, EM 1110-2-1304, Sept 2015.
Area Cost Factor	An AF of 1.05 is used for Oregon, except that an AF of 1.00 (national unmodified average) is used for MII assembly costs and local vendor quotes.
Subcontractor Overhead and Profit	It is assumed that home office OH is 8% and profit is 9% for the Prime Contractor. Professional labor overhead is 100%.
Prime Contractor Overhead and Profit	Allowances and items with mandated costs such as per diem do not have overhead and profit applied.
	Items previously developed by Anchor QEA already include contractor markups, therefore overhead and profit were not applied to those items.
	It is assumed that OH is 1% and profit is 0% for vendor quotes for treatment and disposal at offsite disposal facilities. It is assumed that OH is 5% and profit is 0% for quotes for all other material vendor quotes.
	Items developed using MII already include contractor markups such as overhead and profit, therefore additional overhead and profit were not applied in the PC OH and PC PF to those items.

TABLE CW-I16

Alternative I **Cost Worksheet:** **CW-I16**
Capital Cost Sub-Element
Beach Mix Placement for Technology Assignments

COST WORKSHEET

Site: Portland Harbor Superfund Site
Location: Portland, Oregon
Phase: Feasibility Study
Base Year: 2016

Prepared By: JN **Date:** 3/4/2016
Checked By: AB **Date:** 3/7/2016

Work Statement:
This sub-element involves the placement of beach mix for the construction of capping areas. It includes placement of beach mix within confined areas, open areas, and riverbanks. It includes costs for on-site labor, equipment, and materials as well as recent vendor quotes.
Quantity development presented in Appendix D.

Cost Analysis:
Cost for Beach Mix Placement for Technology Assignments (Lump Sum)

COST DATABASE CODE	DESCRIPTION	QTY	UNIT(S)	HPF	LABOR	ADJ LABOR	EQUIP	ADJ EQUIP	MATL	OTHER	UNMOD UC	UNMOD LIC	PC OH	PC PF	BUR LIC	COST SOURCE CITATION	COMMENTS
P3	ODOT 100 Beach Mix	**49,511**	LCY	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$57.69	$57.69	$2,856,289.59	0%	0%	$2,856,290	P Anchor QEA	Project-specific cost developed by Anchor QEA (2010) - see Backup Table 29A. Includes conversion from TON to LCY.
	Beach Mix Placement (Riverbanks)																
A16	Material Placement (Confined)	15,528	CY	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$20.39	$20.39	$316,615.92	0%	0%	$316,616	MII MII	Project-specific unit cost developed in MII.
	Beach Mix Placement (Confined)																
A16	Material Placement (Confined)	5,075	CY	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$20.39	$20.39	$103,479.25	0%	0%	$103,479	MII MII	Project-specific unit cost developed in MII.
	Beach Mix Placement (Open Water)																
A15	Material Placement (Open)	28,908	CY	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$12.42	$12.42	$359,037.36	0%	0%	$359,037	MII MII	Project-specific unit cost developed in MII.
												TOTAL COST:			$3,635,422		

	Representative Unit Quantity	Unit(s)	Total Cost	Unit Cost
COST WORKSHEET SUMMARY	49,511	CY	$3,635,422	$73.43

Notes:
Further information about the development of cost worksheets can be found in Attachment A - Methodology and Organization of Detailed Cost Estimates.
The quantity bolded in the QTY column is the quantity selected as the representative unit quantity for this cost worksheet. If multiple quantities are bolded, the representative unit quantity is the sum of those quantities. When the LS unit is utilized, the default representative unit quantity is 1.
HTRW productivity factor is from Exhibit B-3 or B-4 of "A Guide to Developing and Documenting Cost Estimates During the Feasibility Study", EPA 2000
EPA developed project-specific unit costs using the Micro Computer Aided Cost Engineering System (MCACES) Second Generation (MII) software version 4.2, build 3

Cost Database Code:
The Cost Database Code is a reference code for linking with line item cost information with the cost source database and is not otherwise used within these cost worksheets. The following cost source database prefixes apply:
L (EPA-Derived Labor Unit Costs), M (Project-Specific Vendor Unit Costs), P (Previously Developed Unit Costs by Anchor QEA for Portland Harbor), A (EPA-Derived MII Unit Costs), O (Unit Costs from Other Projects/Sources)

Source of Cost Data:
For citation references, the following sources apply:
ALL (Allowance), FLC (www.flcdatacenter.com), LD (Costs Derived from Lower Duwamish Waterway Final Feasibility Study), MII (MII), O (Other), P (Previously Developed by Anchor QEA for Portland Harbor), and V (Vendor Quote)

Abbreviations:

QTY	Quantity	AC	Acres
EQUIP	Equipment	CLF	100 Linear Foot
MATL	Material	CY	Cubic Yard
HPF	HTRW Productivity Factor	DY	Days
ADJ LABOR	Adjusted Labor for HFP	EA	Each
ADJ EQUIP	Adjusted Equipment for HFP	FTE	Full Time Equivalent
UNMOD UC	Unmodified Unit Cost	HR	Hours
UNMOD LIC	Unmodified Line Item Cost	LB	Pounds
UNBUR LIC	Unburdened Line Item Cost	LCY	Loose Cubic Yard
PC OH	Prime Contractor Overhead	LF	Linear Foot
PC PF	Prime Contractor Profit	LS	Lump Sum
BUR LIC	Burdened Line Item Cost	MO	Month
		SF	Square Foot
		SY	Square Yard
		TON	Tons
		YR	Years

Cost Adjustment Checklist:	**NOTES:**
FACTOR:	Field work will be in Level "D" PPE.
H&S Productivity (labor and equipment only)	MII assembly costs include HPF adjustments.
Escalation to Base Year	2016 cost sources are not escalated (EF=1.00). All other costs are escalated based on the USACE CWCCIS, EM 1110-2-1304, Sept 2015.
Area Cost Factor	An AF of 1.05 is used for Oregon, except that an AF of 1.00 (national unmodified average) is used for MII assembly costs and local vendor quotes.
Subcontractor Overhead and Profit	It is assumed that home office OH is 8% and profit is 9% for the Prime Contractor. Professional labor overhead is 100%.
Prime Contractor Overhead and Profit	Allowances and items with mandated costs such as per diem do not have overhead and profit applied.
	Items previously developed by Anchor QEA already include contractor markups, therefore overhead and profit were not applied to those items.
	It is assumed that OH is 1% and profit is 0% for vendor quotes for treatment and disposal at offsite disposal facilities. It is assumed that OH is 5% and profit is 0% for quotes for all other material vendor quotes.
	Items developed using MII already include contractor markups such as overhead and profit, therefore additional overhead and profit were not applied in the PC OH and PC PF to those items.

TABLE CW-I17

Alternative I **Cost Worksheet:** **CW-I17**
Capital Cost Sub-Element
Armor Placement for Technology Assignments

COST WORKSHEET

Site: Portland Harbor Superfund Site
Location: Portland, Oregon
Phase: Feasibility Study
Base Year: 2016

Prepared By: JN **Date:** 3/4/2016
Checked By: AB **Date:** 3/7/2016

Work Statement:
This sub-element involves the placement of armor for the construction of capping areas. It includes placement of armor within confined areas, open areas, and riverbanks. It includes costs for on-site labor, equipment, and materials as well as recent vendor quotes.
Quantity development presented in Appendix D.

Cost Analysis:
Cost for Armor Placement for Technology Assignments (Lump Sum)

COST DATABASE CODE	DESCRIPTION	QTY	UNIT(S)	HPF	LABOR	ADJ LABOR	EQUIP	ADJ EQUIP	MATL	OTHER	UNMOD UC	UNMOD LIC	PC OH	PC PF	BUR LIC	COST SOURCE CITATION	COMMENTS
P2	ODOT 200 Armor	**80,297**	LCY	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$57.69	$57.69	$4,632,333.93	0%	0%	$4,632,334	P Anchor QEA	Project-specific cost developed by Anchor QEA (2010) - see Backup Table 29A. Includes conversion from TON to LCY.
	Armor Placement (Riverbanks)																
A16	Material Placement (Confined)	1,576	CY	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$20.39	$20.39	$32,134.64	0%	0%	$32,135	MII MII	Project-specific unit cost developed in MII.
	Armor Placement (Confined)																
A16	Material Placement (Confined)	20,167	CY	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$20.39	$20.39	$411,205.13	0%	0%	$411,205	MII MII	Project-specific unit cost developed in MII.
	Armor Placement (Open Water)																
A15	Material Placement (Open)	58,554	CY	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$12.42	$12.42	$727,240.68	0%	0%	$727,241	MII MII	Project-specific unit cost developed in MII.
												TOTAL COST:			$5,802,915		

	Representative Unit Quantity	Unit(s)	Total Cost	Unit Cost
COST WORKSHEET SUMMARY	80,297	CY	$5,802,915	$72.27

Notes:
Further information about the development of cost worksheets can be found in Attachment A - Methodology and Organization of Detailed Cost Estimates.
The quantity bolded in the QTY column is the quantity selected as the representative unit quantity for this cost worksheet. If multiple quantities are bolded, the representative unit quantity is the sum of those quantities. When the LS unit is utilized, the default representative unit quantity is 1.
HTRW productivity factor is from Exhibit B-3 or B-4 of "A Guide to Developing and Documenting Cost Estimates During the Feasibility Study", EPA 2000
EPA developed project-specific unit costs using the Micro Computer Aided Cost Engineering System (MCACES) Second Generation (MII) software version 4.2, build 3

Cost Database Code:
The Cost Database Code is a reference code for linking with line item cost information with the cost source database and is not otherwise used within these cost worksheets. The following cost source database prefixes apply:
L (EPA-Derived Labor Unit Costs), M (Project-Specific Vendor Unit Costs), P (Previously Developed Unit Costs by Anchor QEA for Portland Harbor), A (EPA-Derived MII Unit Costs), O (Unit Costs from Other Projects/Sources)

Source of Cost Data:
For citation references, the following sources apply:
ALL (Allowance), FLC (www.flcdatacenter.com), LD (Costs Derived from Lower Duwamish Waterway Final Feasibility Study), MII (MII), O (Other), P (Previously Developed by Anchor QEA for Portland Harbor), and V (Vendor Quote)

Abbreviations:

QTY	Quantity	AC	Acres
EQUIP	Equipment	CLF	100 Linear Foot
MATL	Material	CY	Cubic Yard
HPF	HTRW Productivity Factor	DY	Days
ADJ LABOR	Adjusted Labor for HFP	EA	Each
ADJ EQUIP	Adjusted Equipment for HFP	FTE	Full Time Equivalent
UNMOD UC	Unmodified Unit Cost	HR	Hours
UNMOD LIC	Unmodified Line Item Cost	LB	Pounds
UNBUR LIC	Unburdened Line Item Cost	LCY	Loose Cubic Yard
PC OH	Prime Contractor Overhead	LF	Linear Foot
PC PF	Prime Contractor Profit	LS	Lump Sum
BUR LIC	Burdened Line Item Cost	MO	Month
		SF	Square Foot
		SY	Square Yard
		TON	Tons
		YR	Years

Cost Adjustment Checklist:	**NOTES:**
FACTOR:	Field work will be in Level "D" PPE.
H&S Productivity (labor and equipment only)	MII assembly costs include HPF adjustments.
Escalation to Base Year	2016 cost sources are not escalated (EF=1.00). All other costs are escalated based on the USACE CWCCIS, EM 1110-2-1304, Sept 2015.
Area Cost Factor	An AF of 1.05 is used for Oregon, except that an AF of 1.00 (national unmodified average) is used for MII assembly costs and local vendor quotes.
Subcontractor Overhead and Profit	It is assumed that home office OH is 8% and profit is 9% for the Prime Contractor. Professional labor overhead is 100%.
Prime Contractor Overhead and Profit	Allowances and items with mandated costs such as per diem do not have overhead and profit applied.
	Items previously developed by Anchor QEA already include contractor markups, therefore overhead and profit were not applied to those items.
	It is assumed that OH is 1% and profit is 0% for vendor quotes for treatment and disposal at offsite disposal facilities. It is assumed that OH is 5% and profit is 0% for quotes for all other material vendor quotes.
	Items developed using MII already include contractor markups such as overhead and profit, therefore additional overhead and profit were not applied in the PC OH and PC PF to those items.

TABLE CW-I18

Alternative I **Cost Worksheet:** **CW-I18**
Capital Cost Sub-Element
Reactive/GAC Placement for Technology Assignments

COST WORKSHEET

Site: Portland Harbor Superfund Site
Location: Portland, Oregon
Phase: Feasibility Study
Base Year: 2016

Prepared By: JN **Date:** 3/4/2016
Checked By: AB **Date:** 3/7/2016

Work Statement:
This sub-element involves the placement of the reactive layers for the construction of capping areas. It includes placement of the reactive layer within confined areas, open areas, and riverbanks. It includes costs for on-site labor, equipment, and materials as well as recent vendor quotes.
Quantity development presented in Appendix D.

Cost Analysis:
Cost for Reactive/GAC Placement for Technology Assignments (Lump Sum)

COST DATABASE CODE	DESCRIPTION	QTY	UNIT(S)	HPF	LABOR	ADJ LABOR	EQUIP	ADJ EQUIP	MATL	OTHER	UNMOD UC	UNMOD LIC	PC OH	PC PF	BUR LIC	COST SOURCE CITATION	COMMENTS
	AquaGate Reactive Layer																
M4	Carbon (AquaGate + PAC 10%)	80,806	TON	1.00	$0.00	$0.00	$0.00	$0.00	$456.30	$0.00	$456.30	$36,871,777.80	5%	0%	$38,715,367	V Vendor Quote	Project-specific vendor quote - AquaBlok 2015. Material cost is $/TON.
P1	Sand	85,548	LCY	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$19.75	$19.75	$1,689,573.00	0%	0%	$1,689,573	P Anchor QEA	Project-specific cost developed by Anchor QEA (2010) - see Backup Table 29A. Includes conversion from TON to LCY.
A3	Mixing Sand & Carbon for Reactive Layer	166,437	CY	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$4.76	$4.76	$792,240.12	0%	0%	$792,240	MII MII	Project-specific unit cost developed in MII.
A16	Material Placement (Confined)	23,135	CY	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$20.39	$20.39	$471,722.65	0%	0%	$471,723	MII MII	Project-specific unit cost developed in MII.
A15	Material Placement (Open)	143,302	CY	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$12.42	$12.42	$1,779,810.84	0%	0%	$1,779,811	MII MII	Project-specific unit cost developed in MII.
	AquaBlock																
M3	Carbon (AquaBlok)	5,681	TON	1.00	$0.00	$0.00	$0.00	$0.00	$202.80	$0.00	$202.80	$1,152,106.80	5%	0%	$1,209,712	V Vendor Quote	Project-specific vendor quote - AquaBlok 2015. Material cost is $/TON.
A16	Material Placement (Confined)	4,951	CY	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$20.39	$20.39	$100,950.89	0%	0%	$100,951	MII MII	Project-specific unit cost developed in MII.
												TOTAL COST:			$44,759,377		

	Representative Unit Quantity	Unit(s)	Total Cost	Unit Cost
COST WORKSHEET SUMMARY	1	LS	$44,759,377	$44,759,377

Notes:
Further information about the development of cost worksheets can be found in Attachment A - Methodology and Organization of Detailed Cost Estimates.
The quantity bolded in the QTY column is the quantity selected as the representative unit quantity for this cost worksheet. If multiple quantities are bolded, the representative unit quantity is the sum of those quantities. When the LS unit is utilized, the default representative unit quantity is 1.
HTRW productivity factor is from Exhibit B-3 or B-4 of "A Guide to Developing and Documenting Cost Estimates During the Feasibility Study", EPA 2000
EPA developed project-specific unit costs using the Micro Computer Aided Cost Engineering System (MCACES) Second Generation (MII) software version 4.2, build 3

Cost Database Code:
The Cost Database Code is a reference code for linking with line item cost information with the cost source database and is not otherwise used within these cost worksheets. The following cost source database prefixes apply:
L (EPA-Derived Labor Unit Costs), M (Project-Specific Vendor Unit Costs), P (Previously Developed Unit Costs by Anchor QEA for Portland Harbor), A (EPA-Derived MII Unit Costs), O (Unit Costs from Other Projects/Sources)

Source of Cost Data:
For citation references, the following sources apply:
ALL (Allowance), FLC (www.flcdatacenter.com), LD (Costs Derived from Lower Duwamish Waterway Final Feasibility Study), MII (MII), O (Other), P (Previously Developed by Anchor QEA for Portland Harbor), and V (Vendor Quote)

Abbreviations:

QTY	Quantity	AC	Acres
EQUIP	Equipment	CLF	100 Linear Foot
MATL	Material	CY	Cubic Yard
HPF	HTRW Productivity Factor	DY	Days
ADJ LABOR	Adjusted Labor for HFP	EA	Each
ADJ EQUIP	Adjusted Equipment for HFP	FTE	Full Time Equivalent
UNMOD UC	Unmodified Unit Cost	HR	Hours
UNMOD LIC	Unmodified Line Item Cost	LB	Pounds
UNBUR LIC	Unburdened Line Item Cost	LCY	Loose Cubic Yard
PC OH	Prime Contractor Overhead	LF	Linear Foot
PC PF	Prime Contractor Profit	LS	Lump Sum
BUR LIC	Burdened Line Item Cost	MO	Month
		SF	Square Foot
		SY	Square Yard
		TON	Tons
		YR	Years

Cost Adjustment Checklist:	**NOTES:**
FACTOR:	Field work will be in Level "D" PPE.
H&S Productivity (labor and equipment only)	MII assembly costs include HPF adjustments.
Escalation to Base Year	2016 cost sources are not escalated (EF=1.00). All other costs are escalated based on the USACE CWCCIS, EM 1110-2-1304, Sept 2015.
Area Cost Factor	An AF of 1.05 is used for Oregon, except that an AF of 1.00 (national unmodified average) is used for MII assembly costs and local vendor quotes.
Subcontractor Overhead and Profit	It is assumed that home office OH is 8% and profit is 9% for the Prime Contractor. Professional labor overhead is 100%.
Prime Contractor Overhead and Profit	Allowances and items with mandated costs such as per diem do not have overhead and profit applied.
	Items previously developed by Anchor QEA already include contractor markups, therefore overhead and profit were not applied to those items.
	It is assumed that OH is 1% and profit is 0% for vendor quotes for treatment and disposal at offsite disposal facilities. It is assumed that OH is 5% and profit is 0% for quotes for all other material vendor quotes.
	Items developed using MII already include contractor markups such as overhead and profit, therefore additional overhead and profit were not applied in the PC OH and PC PF to those items.

TABLE CW-I19

Alternative I **Cost Worksheet:** **CW-I19**
Capital Cost Sub-Element
Geofabric for Riverbanks

COST WORKSHEET

Site: Portland Harbor Superfund Site
Location: Portland, Oregon
Phase: Feasibility Study
Base Year: 2016

Prepared By: JN **Date:** 3/4/2016
Checked By: AB **Date:** 3/7/2016

Work Statement:
This sub-element involves the installation of geofabric along the riverbanks. It includes costs for on-site labor, equipment, and materials from recent vendor quotes.
Quantity development presented in Appendix D.

Cost Analysis:
Cost for Geofabric for Riverbanks (Lump Sum)

COST DATABASE CODE	DESCRIPTION	QTY	UNIT(S)	HPF	LABOR	ADJ LABOR	EQUIP	ADJ EQUIP	MATL	OTHER	UNMOD UC	UNMOD LIC	PC OH	PC PF	BUR LIC	COST SOURCE CITATION	COMMENTS
O7	Geotextile Installation	**21.2**	AC	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$7,074.14	$7,074.14	$149,971.85	8%	9%	$176,547	V Vendor Quote	Vendor Quote - Geo-Synthetics (2014). Includes labor and equipment for installation
O6	Geotextile Material	21.2	AC	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$5,698.62	$5,698.62	$120,810.66	5%	0%	$126,851	V Vendor Quote	Vendor quote obtained for project of similar scope - Geo-Synthetics, 2014.
												TOTAL COST:			$303,398		

	Representative Unit Quantity	Unit(s)	Total Cost	Unit Cost
COST WORKSHEET SUMMARY	21.2	AC	$303,398	$14,311

Notes:
Further information about the development of cost worksheets can be found in Attachment A - Methodology and Organization of Detailed Cost Estimates.
The quantity bolded in the QTY column is the quantity selected as the representative unit quantity for this cost worksheet. If multiple quantities are bolded, the representative unit quantity is the sum of those quantities. When the LS unit is utilized, the default representative unit quantity is 1.
HTRW productivity factor is from Exhibit B-3 or B-4 of "A Guide to Developing and Documenting Cost Estimates During the Feasibility Study", EPA 2000
EPA developed project-specific unit costs using the Micro Computer Aided Cost Engineering System (MCACES) Second Generation (MII) software version 4.2, build 3

Cost Database Code:
The Cost Database Code is a reference code for linking with line item cost information with the cost source database and is not otherwise used within these cost worksheets. The following cost source database prefixes apply:
L (EPA-Derived Labor Unit Costs), M (Project-Specific Vendor Unit Costs), P (Previously Developed Unit Costs by Anchor QEA for Portland Harbor), A (EPA-Derived MII Unit Costs), O (Unit Costs from Other Projects/Sources)

Source of Cost Data:
For citation references, the following sources apply:
ALL (Allowance), FLC (www.flcdatacenter.com), LD (Costs Derived from Lower Duwamish Waterway Final Feasibility Study), MII (MII), O (Other), P (Previously Developed by Anchor QEA for Portland Harbor), and V (Vendor Quote)

Abbreviations:

QTY	Quantity	AC	Acres
EQUIP	Equipment	CLF	100 Linear Foot
MATL	Material	CY	Cubic Yard
HPF	HTRW Productivity Factor	DY	Days
ADJ LABOR	Adjusted Labor for HFP	EA	Each
ADJ EQUIP	Adjusted Equipment for HFP	FTE	Full Time Equivalent
UNMOD UC	Unmodified Unit Cost	HR	Hours
UNMOD LIC	Unmodified Line Item Cost	LB	Pounds
UNBUR LIC	Unburdened Line Item Cost	LCY	Loose Cubic Yard
PC OH	Prime Contractor Overhead	LF	Linear Foot
PC PF	Prime Contractor Profit	LS	Lump Sum
BUR LIC	Burdened Line Item Cost	MO	Month
		SF	Square Foot
		SY	Square Yard
		TON	Tons
		YR	Years

Cost Adjustment Checklist:	**NOTES:**
FACTOR:	Field work will be in Level "D" PPE.
H&S Productivity (labor and equipment only)	MII assembly costs include HPF adjustments.
Escalation to Base Year	2016 cost sources are not escalated (EF=1.00). All other costs are escalated based on the USACE CWCCIS, EM 1110-2-1304, Sept 2015.
Area Cost Factor	An AF of 1.05 is used for Oregon, except that an AF of 1.00 (national unmodified average) is used for MII assembly costs and local vendor quotes.
Subcontractor Overhead and Profit	It is assumed that home office OH is 8% and profit is 9% for the Prime Contractor. Professional labor overhead is 100%.
Prime Contractor Overhead and Profit	Allowances and items with mandated costs such as per diem do not have overhead and profit applied.
	Items previously developed by Anchor QEA already include contractor markups, therefore overhead and profit were not applied to those items.
	It is assumed that OH is 1% and profit is 0% for vendor quotes for treatment and disposal at offsite disposal facilities. It is assumed that OH is 5% and profit is 0% for quotes for all other material vendor quotes.
	Items developed using MII already include contractor markups such as overhead and profit, therefore additional overhead and profit were not applied in the PC OH and PC PF to those items.

TABLE CW-I20

Alternative I **Cost Worksheet:** **CW-I20**
Capital Cost Sub-Element
Organoclay Mat Placement for Technology Assignments

COST WORKSHEET

Site: Portland Harbor Superfund Site
Location: Portland, Oregon
Phase: Feasibility Study
Base Year: 2016

Prepared By: JN **Date:** 3/4/2016
Checked By: AB **Date:** 3/7/2016

Work Statement:
This sub-element involves the placement of the organoclay mat for the construction of capping areas. It includes placement of the organoclay mat within confined areas, open areas, and riverbanks. It includes costs for on-site labor, equipment, and materials as well as recent vendor quotes.
Quantity development presented in Appendix D.

Cost Analysis:
Cost for Organoclay Mat Placement for Technology Assignments (Lump Sum)

COST DATABASE CODE	DESCRIPTION	QTY	UNIT(S)	HPF	LABOR	ADJ LABOR	EQUIP	ADJ EQUIP	MATL	OTHER	UNMOD UC	UNMOD LIC	PC OH	PC PF	BUR LIC	COST SOURCE CITATION	COMMENTS
A17	Organoclay Mat Placement	**174,300**	SF	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$3.35	$3.35	$583,905.00	0%	0%	$583,905	MII MII	Project-specific unit cost developed in MII.
P4	Organoclay Mat Material	174,300	SF	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$3.38	$3.38	$589,134.00	0%	0%	$589,134	P Anchor QEA	Project-specific cost developed by Anchor QEA (2010) - see Backup Table 29A.
												TOTAL COST:			$1,173,039		

	Representative Unit Quantity	Unit(s)	Total Cost	Unit Cost
COST WORKSHEET SUMMARY	174,300	SF	$1,173,039	$6.73

Notes:
Further information about the development of cost worksheets can be found in Attachment A - Methodology and Organization of Detailed Cost Estimates.
The quantity bolded in the QTY column is the quantity selected as the representative unit quantity for this cost worksheet. If multiple quantities are bolded, the representative unit quantity is the sum of those quantities. When the LS unit is utilized, the default representative unit quantity is 1.
HTRW productivity factor is from Exhibit B-3 or B-4 of "A Guide to Developing and Documenting Cost Estimates During the Feasibility Study", EPA 2000
EPA developed project-specific unit costs using the Micro Computer Aided Cost Engineering System (MCACES) Second Generation (MII) software version 4.2, build 3

Cost Database Code:
The Cost Database Code is a reference code for linking with line item cost information with the cost source database and is not otherwise used within these cost worksheets. The following cost source database prefixes apply:
L (EPA-Derived Labor Unit Costs), M (Project-Specific Vendor Unit Costs), P (Previously Developed Unit Costs by Anchor QEA for Portland Harbor), A (EPA-Derived MII Unit Costs), O (Unit Costs from Other Projects/Sources)

Source of Cost Data:
For citation references, the following sources apply:
ALL (Allowance), FLC (www.flcdatacenter.com), LD (Costs Derived from Lower Duwamish Waterway Final Feasibility Study), MII (MII), O (Other), P (Previously Developed by Anchor QEA for Portland Harbor), and V (Vendor Quote)

Abbreviations:

QTY	Quantity	AC	Acres
EQUIP	Equipment	CLF	100 Linear Foot
MATL	Material	CY	Cubic Yard
HPF	HTRW Productivity Factor	DY	Days
ADJ LABOR	Adjusted Labor for HFP	EA	Each
ADJ EQUIP	Adjusted Equipment for HFP	FTE	Full Time Equivalent
UNMOD UC	Unmodified Unit Cost	HR	Hours
UNMOD LIC	Unmodified Line Item Cost	LB	Pounds
UNBUR LIC	Unburdened Line Item Cost	LCY	Loose Cubic Yard
PC OH	Prime Contractor Overhead	LF	Linear Foot
PC PF	Prime Contractor Profit	LS	Lump Sum
BUR LIC	Burdened Line Item Cost	MO	Month
		SF	Square Foot
		SY	Square Yard
		TON	Tons
		YR	Years

Cost Adjustment Checklist:	**NOTES:**
FACTOR:	Field work will be in Level "D" PPE.
H&S Productivity (labor and equipment only)	MII assembly costs include HPF adjustments.
Escalation to Base Year	2016 cost sources are not escalated (EF=1.00). All other costs are escalated based on the USACE CWCCIS, EM 1110-2-1304, Sept 2015.
Area Cost Factor	An AF of 1.05 is used for Oregon, except that an AF of 1.00 (national unmodified average) is used for MII assembly costs and local vendor quotes.
Subcontractor Overhead and Profit	It is assumed that home office OH is 8% and profit is 9% for the Prime Contractor. Professional labor overhead is 100%.
Prime Contractor Overhead and Profit	Allowances and items with mandated costs such as per diem do not have overhead and profit applied.
	Items previously developed by Anchor QEA already include contractor markups, therefore overhead and profit were not applied to those items.
	It is assumed that OH is 1% and profit is 0% for vendor quotes for treatment and disposal at offsite disposal facilities. It is assumed that OH is 5% and profit is 0% for quotes for all other material vendor quotes.
	Items developed using MII already include contractor markups such as overhead and profit, therefore additional overhead and profit were not applied in the PC OH and PC PF to those items.

TABLE CW-I21

Alternative I **Cost Worksheet:** **CW-I21**
Capital Cost Sub-Element
Transload Facility Development

COST WORKSHEET

Site: Portland Harbor Superfund Site
Location: Portland, Oregon
Phase: Feasibility Study
Base Year: 2016

Prepared By: JN **Date:** 3/4/2016
Checked By: AB **Date:** 3/7/2016

Work Statement:
This sub-element involves the development of a transload facility for facilitating offsite disposal of contaminated sediments. It includes costs for on-site labor, equipment, and materials developed from previous work. Transload facility is expected to be operated for 7 years, based on estimated construction duration. Property lease quantity (20 acres) adjusted for construction duration. Labor for the annual inspections is assumed to be 2.5 times full time equivalent. Environmental monitoring is assumed to be once per quarter year for construction duration.

Cost Analysis:
Cost for Transload Facility Development (Lump Sum)

COST DATABASE CODE	DESCRIPTION	QTY	UNIT(S)	HPF	LABOR	ADJ LABOR	EQUIP	ADJ EQUIP	MATL	OTHER	UNMOD UC	UNMOD LIC	PC OH	PC PF	BUR LIC	COST SOURCE CITATION	COMMENTS
	Transload Facility Development																
P31	Transload Facility Permitting	1	LS	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$45,080.00	$45,080.00	$45,080.00	0%	0%	$45,080	P Anchor QEA	Project-specific cost developed by Anchor QEA (2010) - see Backup Table 24.
P32	Transload Facility Development	1	LS	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$4,508,000.00	$4,508,000.00	$4,508,000.00	0%	0%	$4,508,000	P Anchor QEA	Project-specific cost developed by Anchor QEA (2010) - see Backup Table 24.
P33	Yearly Property Lease	140	AC	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$26,484.50	$26,484.50	$3,707,830.00	0%	0%	$3,707,830	P Anchor QEA	Developed by Anchor QEA (2010) - see Backup Table 24. Assumes leasing of 20 acres multiplied by estimated construction duration.
	Inspection and Monitoring of Transload Facility																
P34	Labor Inspections During Operations of Transload Facility	17.5	FTE	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$84,525.00	$84,525.00	$1,479,187.50	0%	0%	$1,479,188	P Anchor QEA	Developed by Anchor QEA (2010) - see Backup Table 24. Assumes 2.5 FTE/YR multiplied by estimated construction duration.
P35	Environmental Monitoring During Offloading at Transload Facility	28	MO	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$16,905.00	$16,905.00	$473,340.00	0%	0%	$473,340	P Anchor QEA	Developed by Anchor QEA (2010) - see Backup Table 24. Assumes 4 MO/YR multiplied by estimated construction duration.
P36	Inspection and Monitoring Reporting for Transload Facility	7	YR	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$45,080.00	$45,080.00	$315,560.00	0%	0%	$315,560	P Anchor QEA	Project-specific cost developed by Anchor QEA (2010) - see Backup Table 24.
												TOTAL COST:			$10,528,998		

	Representative Unit Quantity	Unit(s)	Total Cost	Unit Cost
COST WORKSHEET SUMMARY	1	LS	$10,528,998	$10,528,998

TABLE CW-I21

Alternative I **Cost Worksheet:** **CW-I21**
Capital Cost Sub-Element
Transload Facility Development

COST WORKSHEET

Site: Portland Harbor Superfund Site
Location: Portland, Oregon
Phase: Feasibility Study
Base Year: 2016

Prepared By: JN **Date:** 3/4/2016
Checked By: AB **Date:** 3/7/2016

Notes:

Further information about the development of cost worksheets can be found in Attachment A - Methodology and Organization of Detailed Cost Estimates.
The quantity bolded in the QTY column is the quantity selected as the representative unit quantity for this cost worksheet. If multiple quantities are bolded, the representative unit quantity is the sum of those quantities. When the LS unit is utilized, the default representative unit quantity is 1.
HTRW productivity factor is from Exhibit B-3 or B-4 of "A Guide to Developing and Documenting Cost Estimates During the Feasibility Study", EPA 2000
EPA developed project-specific unit costs using the Micro Computer Aided Cost Engineering System (MCACES) Second Generation (MII) software version 4.2, build 3

Cost Database Code:

The Cost Database Code is a reference code for linking with line item cost information with the cost source database and is not otherwise used within these cost worksheets. The following cost source database prefixes apply:

L (EPA-Derived Labor Unit Costs), M (Project-Specific Vendor Unit Costs), P (Previously Developed Unit Costs by Anchor QEA for Portland Harbor), A (EPA-Derived MII Unit Costs), O (Unit Costs from Other Projects/Sources)

Source of Cost Data:

For citation references, the following sources apply:

ALL (Allowance), FLC (www.flcdatacenter.com), LD (Costs Derived from Lower Duwamish Waterway Final Feasibility Study), MII (MII), O (Other), P (Previously Developed by Anchor QEA for Portland Harbor), and V (Vendor Quote)

Abbreviations:

QTY	Quantity	AC	Acres
EQUIP	Equipment	CLF	100 Linear Foot
MATL	Material	CY	Cubic Yard
HPF	HTRW Productivity Factor	DY	Days
ADJ LABOR	Adjusted Labor for HFP	EA	Each
ADJ EQUIP	Adjusted Equipment for HFP	FTE	Full Time Equivalent
UNMOD UC	Unmodified Unit Cost	HR	Hours
UNMOD LIC	Unmodified Line Item Cost	LB	Pounds
UNBUR LIC	Unburdened Line Item Cost	LCY	Loose Cubic Yard
PC OH	Prime Contractor Overhead	LF	Linear Foot
PC PF	Prime Contractor Profit	LS	Lump Sum
BUR LIC	Burdened Line Item Cost	MO	Month
		SF	Square Foot
		SY	Square Yard
		TON	Tons
		YR	Years

Cost Adjustment Checklist:	**NOTES:**
FACTOR:	Field work will be in Level "D" PPE.
H&S Productivity (labor and equipment only)	MII assembly costs include HPF adjustments.
Escalation to Base Year	2016 cost sources are not escalated (EF=1.00). All other costs are escalated based on the USACE CWCCIS, EM 1110-2-1304, Sept 2015.
Area Cost Factor	An AF of 1.05 is used for Oregon, except that an AF of 1.00 (national unmodified average) is used for MII assembly costs and local vendor quotes.
Subcontractor Overhead and Profit	It is assumed that home office OH is 8% and profit is 9% for the Prime Contractor. Professional labor overhead is 100%.
Prime Contractor Overhead and Profit	Allowances and items with mandated costs such as per diem do not have overhead and profit applied.
	Items previously developed by Anchor QEA already include contractor markups, therefore overhead and profit were not applied to those items.
	It is assumed that OH is 1% and profit is 0% for vendor quotes for treatment and disposal at offsite disposal facilities. It is assumed that OH is 5% and profit is 0% for quotes for all other material vendor quotes.
	Items developed using MII already include contractor markups such as overhead and profit, therefore additional overhead and profit were not applied in the PC OH and PC PF to those items.

TABLE CW-I22

Alternative I **Cost Worksheet:** **CW-I22**

Capital and Periodic Cost Sub-Element

Monitored Natural Recovery (MNR) for MNR/Enhanced Natural Recovery (ENR) and Broadcast GAC Areas

COST WORKSHEET

Site: Portland Harbor Superfund Site
Location: Portland, Oregon
Phase: Feasibility Study
Base Year: 2016

Prepared By: JN **Date:** 3/4/2016
Checked By: AB **Date:** 3/7/2016

Work Statement:
This sub-element involves sampling as part of monitored natural recovery for MNR, ENR, and Broadcast GAC areas. It includes costs for on-site labor, equipment, and materials developed from previous work.
Quantity development presented in Appendix D.

Cost Analysis:
Cost for Monitored Natural Recovery for MNR/ENR and Broadcast GAC Areas (Lump Sum)

COST DATABASE CODE	DESCRIPTION	QTY	UNIT(S)	HPF	LABOR	ADJ LABOR	EQUIP	ADJ EQUIP	MATL	OTHER	UNMOD UC	UNMOD LIC	PC OH	PC PF	BUR LIC	COST SOURCE CITATION	COMMENTS
P25	Monitored Natural Recovery	**1,937**	AC	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$3,686.33	$3,686.33	$7,140,415.09	0%	0%	$7,140,415	P Anchor QEA	Project-specific cost developed by Anchor QEA (2010) - based on Backup Table 2.
												TOTAL COST:			$7,140,415		

	Representative Unit Quantity	Unit(s)	Total Cost	Unit Cost
COST WORKSHEET SUMMARY	1,937	AC	$7,140,415	$3,686

Notes:
Further information about the development of cost worksheets can be found in Attachment A - Methodology and Organization of Detailed Cost Estimates.
The quantity bolded in the QTY column is the quantity selected as the representative unit quantity for this cost worksheet. If multiple quantities are bolded, the representative unit quantity is the sum of those quantities. When the LS unit is utilized, the default representative unit quantity is 1.
HTRW productivity factor is from Exhibit B-3 or B-4 of "A Guide to Developing and Documenting Cost Estimates During the Feasibility Study", EPA 2000
EPA developed project-specific unit costs using the Micro Computer Aided Cost Engineering System (MCACES) Second Generation (MII) software version 4.2, build 3

Cost Database Code:
The Cost Database Code is a reference code for linking with line item cost information with the cost source database and is not otherwise used within these cost worksheets. The following cost source database prefixes apply:
L (EPA-Derived Labor Unit Costs), M (Project-Specific Vendor Unit Costs), P (Previously Developed Unit Costs by Anchor QEA for Portland Harbor), A (EPA-Derived MII Unit Costs), O (Unit Costs from Other Projects/Sources)

Source of Cost Data:
For citation references, the following sources apply:
ALL (Allowance), FLC (www.flcdatacenter.com), LD (Costs Derived from Lower Duwamish Waterway Final Feasibility Study), MII (MII), O (Other), P (Previously Developed by Anchor QEA for Portland Harbor), and V (Vendor Quote)

Abbreviations:

QTY	Quantity	AC	Acres
EQUIP	Equipment	CLF	100 Linear Foot
MATL	Material	CY	Cubic Yard
HPF	HTRW Productivity Factor	DY	Days
ADJ LABOR	Adjusted Labor for HFP	EA	Each
ADJ EQUIP	Adjusted Equipment for HFP	FTE	Full Time Equivalent
UNMOD UC	Unmodified Unit Cost	HR	Hours
UNMOD LIC	Unmodified Line Item Cost	LB	Pounds
UNBUR LIC	Unburdened Line Item Cost	LCY	Loose Cubic Yard
PC OH	Prime Contractor Overhead	LF	Linear Foot
PC PF	Prime Contractor Profit	LS	Lump Sum
BUR LIC	Burdened Line Item Cost	MO	Month
		SF	Square Foot
		SY	Square Yard
		TON	Tons
		YR	Years

Cost Adjustment Checklist:	**NOTES:**
FACTOR:	Field work will be in Level "D" PPE.
H&S Productivity (labor and equipment only)	MII assembly costs include HPF adjustments.
Escalation to Base Year	2016 cost sources are not escalated (EF=1.00). All other costs are escalated based on the USACE CWCCIS, EM 1110-2-1304, Sept 2015.
Area Cost Factor	An AF of 1.05 is used for Oregon, except that an AF of 1.00 (national unmodified average) is used for MII assembly costs and local vendor quotes.
Subcontractor Overhead and Profit	It is assumed that home office OH is 8% and profit is 9% for the Prime Contractor. Professional labor overhead is 100%.
Prime Contractor Overhead and Profit	Allowances and items with mandated costs such as per diem do not have overhead and profit applied.
	Items previously developed by Anchor QEA already include contractor markups, therefore overhead and profit were not applied to those items.
	It is assumed that OH is 1% and profit is 0% for vendor quotes for treatment and disposal at offsite disposal facilities. It is assumed that OH is 5% and profit is 0% for quotes for all other material vendor quotes.
	Items developed using MII already include contractor markups such as overhead and profit, therefore additional overhead and profit were not applied in the PC OH and PC PF to those items.

TABLE CW-I23

Alternative I **Cost Worksheet:** **CW-I23**
Periodic Cost Sub-Element
Site-Wide Monitoring

COST WORKSHEET

Site: Portland Harbor Superfund Site
Location: Portland, Oregon
Phase: Feasibility Study
Base Year: 2016

Prepared By: JN **Date:** 3/4/2016
Checked By: AB **Date:** 3/7/2016

Work Statement:
This sub-element involves sampling, surveying, data management, and reporting as part of sitewide monitoring. It includes costs for on-site labor, equipment, and materials developed from previous work.

Cost Analysis:
Cost for Site-Wide Monitoring (Lump Sum)

COST DATABASE CODE	DESCRIPTION	QTY	UNIT(S)	HPF	LABOR	ADJ LABOR	EQUIP	ADJ EQUIP	MATL	OTHER	UNMOD UC	UNMOD LIC	PC OH	PC PF	BUR LIC	COST SOURCE CITATION	COMMENTS
	Site-Wide Monitoring																
P26	Sitewide Monitoring	1	LS	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$957,659.23	$957,659.23	$957,659.23	0%	0%	$957,659	P Anchor QEA	Project-specific cost developed by Anchor QEA (2010) - based on Backup Table 1.
												TOTAL COST:			$957,659		

	Representative Unit Quantity	Unit(s)	Total Cost	Unit Cost
COST WORKSHEET SUMMARY	1	LS	$957,659	$957,659

Notes:
Further information about the development of cost worksheets can be found in Attachment A - Methodology and Organization of Detailed Cost Estimates.
The quantity bolded in the QTY column is the quantity selected as the representative unit quantity for this cost worksheet. If multiple quantities are bolded, the representative unit quantity is the sum of those quantities. When the LS unit is utilized, the default representative unit quantity is 1.
HTRW productivity factor is from Exhibit B-3 or B-4 of "A Guide to Developing and Documenting Cost Estimates During the Feasibility Study", EPA 2000
EPA developed project-specific unit costs using the Micro Computer Aided Cost Engineering System (MCACES) Second Generation (MII) software version 4.2, build 3

Cost Database Code:
The Cost Database Code is a reference code for linking with line item cost information with the cost source database and is not otherwise used within these cost worksheets. The following cost source database prefixes apply:
L (EPA-Derived Labor Unit Costs), M (Project-Specific Vendor Unit Costs), P (Previously Developed Unit Costs by Anchor QEA for Portland Harbor), A (EPA-Derived MII Unit Costs), O (Unit Costs from Other Projects/Sources)

Source of Cost Data:
For citation references, the following sources apply:
ALL (Allowance), FLC (www.flcdatacenter.com), LD (Costs Derived from Lower Duwamish Waterway Final Feasibility Study), MII (MII), O (Other), P (Previously Developed by Anchor QEA for Portland Harbor), and V (Vendor Quote)

Abbreviations:

QTY	Quantity	AC	Acres
EQUIP	Equipment	CLF	100 Linear Foot
MATL	Material	CY	Cubic Yard
HPF	HTRW Productivity Factor	DY	Days
ADJ LABOR	Adjusted Labor for HFP	EA	Each
ADJ EQUIP	Adjusted Equipment for HFP	FTE	Full Time Equivalent
UNMOD UC	Unmodified Unit Cost	HR	Hours
UNMOD LIC	Unmodified Line Item Cost	LB	Pounds
UNBUR LIC	Unburdened Line Item Cost	LCY	Loose Cubic Yard
PC OH	Prime Contractor Overhead	LF	Linear Foot
PC PF	Prime Contractor Profit	LS	Lump Sum
BUR LIC	Burdened Line Item Cost	MO	Month
		SF	Square Foot
		SY	Square Yard
		TON	Tons
		YR	Years

Cost Adjustment Checklist:	**NOTES:**
FACTOR:	Field work will be in Level "D" PPE.
H&S Productivity (labor and equipment only)	MII assembly costs include HPF adjustments.
Escalation to Base Year	2016 cost sources are not escalated (EF=1.00). All other costs are escalated based on the USACE CWCCIS, EM 1110-2-1304, Sept 2015.
Area Cost Factor	An AF of 1.05 is used for Oregon, except that an AF of 1.00 (national unmodified average) is used for MII assembly costs and local vendor quotes.
Subcontractor Overhead and Profit	It is assumed that home office OH is 8% and profit is 9% for the Prime Contractor. Professional labor overhead is 100%.
Prime Contractor Overhead and Profit	Allowances and items with mandated costs such as per diem do not have overhead and profit applied.
	Items previously developed by Anchor QEA already include contractor markups, therefore overhead and profit were not applied to those items.
	It is assumed that OH is 1% and profit is 0% for vendor quotes for treatment and disposal at offsite disposal facilities. It is assumed that OH is 5% and profit is 0% for quotes for all other material vendor quotes.
	Items developed using MII already include contractor markups such as overhead and profit, therefore additional overhead and profit were not applied in the PC OH and PC PF to those items.

TABLE CW-I24

Alternative I **Cost Worksheet:** **CW-I24**

Periodic Cost Sub-Element

Cap Area Monitoring and Reactive Layer Monitoring

COST WORKSHEET

Site: Portland Harbor Superfund Site
Location: Portland, Oregon
Phase: Feasibility Study
Base Year: 2016

Prepared By: JN **Date:** 3/4/2016
Checked By: AB **Date:** 3/7/2016

Work Statement:
This sub-element involves sampling, surveying, data management, and reporting as part of cap and reactive layer monitoring. It includes costs for on-site labor, equipment, and materials developed from previous work.
Quantity development presented in Appendix D.

Cost Analysis:
Cost for Cap and Reactive Layer Monitoring (Lump Sum)

COST DATABASE CODE	DESCRIPTION	QTY	UNIT(S)	HPF	LABOR	ADJ LABOR	EQUIP	ADJ EQUIP	MATL	OTHER	UNMOD UC	UNMOD LIC	PC OH	PC PF	BUR LIC	COST SOURCE CITATION	COMMENTS
	Cap Area Monitoring																
P27	Cap Monitoring	148	AC	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$78,961.34	$78,961.34	$11,686,278.19	0%	0%	$11,686,278	P Anchor QEA	Project-specific cost developed by Anchor QEA (2010) - based on Backup Table 4.
	Reactive Layer Monitoring																
P28	Reactive Layer Monitoring	114	AC	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$88,968.76	$88,968.76	$10,142,438.75	0%	0%	$10,142,439	P Anchor QEA	Project-specific cost developed by Anchor QEA (2010) - based on Backup Table 3.
												TOTAL COST:			$21,828,717		

	Representative Unit Quantity	Unit(s)	Total Cost	Unit Cost
COST WORKSHEET SUMMARY	1	LS	$21,828,717	$21,828,717

Notes:
Further information about the development of cost worksheets can be found in Attachment A - Methodology and Organization of Detailed Cost Estimates.
The quantity bolded in the QTY column is the quantity selected as the representative unit quantity for this cost worksheet. If multiple quantities are bolded, the representative unit quantity is the sum of those quantities. When the LS unit is utilized, the default representative unit quantity is 1.
HTRW productivity factor is from Exhibit B-3 or B-4 of "A Guide to Developing and Documenting Cost Estimates During the Feasibility Study", EPA 2000
EPA developed project-specific unit costs using the Micro Computer Aided Cost Engineering System (MCACES) Second Generation (MII) software version 4.2, build 3

Cost Database Code:
The Cost Database Code is a reference code for linking with line item cost information with the cost source database and is not otherwise used within these cost worksheets. The following cost source database prefixes apply:
L (EPA-Derived Labor Unit Costs), M (Project-Specific Vendor Unit Costs), P (Previously Developed Unit Costs by Anchor QEA for Portland Harbor), A (EPA-Derived MII Unit Costs), O (Unit Costs from Other Projects/Sources)

Source of Cost Data:
For citation references, the following sources apply:
ALL (Allowance), FLC (www.flcdatacenter.com), LD (Costs Derived from Lower Duwamish Waterway Final Feasibility Study), MII (MII), O (Other), P (Previously Developed by Anchor QEA for Portland Harbor), and V (Vendor Quote)

Abbreviations:

QTY	Quantity	AC	Acres
EQUIP	Equipment	CLF	100 Linear Foot
MATL	Material	CY	Cubic Yard
HPF	HTRW Productivity Factor	DY	Days
ADJ LABOR	Adjusted Labor for HFP	EA	Each
ADJ EQUIP	Adjusted Equipment for HFP	FTE	Full Time Equivalent
UNMOD UC	Unmodified Unit Cost	HR	Hours
UNMOD LIC	Unmodified Line Item Cost	LB	Pounds
UNBUR LIC	Unburdened Line Item Cost	LCY	Loose Cubic Yard
PC OH	Prime Contractor Overhead	LF	Linear Foot
PC PF	Prime Contractor Profit	LS	Lump Sum
BUR LIC	Burdened Line Item Cost	MO	Month
		SF	Square Foot
		SY	Square Yard
		TON	Tons
		YR	Years

Cost Adjustment Checklist:	**NOTES:**
FACTOR:	Field work will be in Level "D" PPE.
H&S Productivity (labor and equipment only)	MII assembly costs include HPF adjustments.
Escalation to Base Year	2016 cost sources are not escalated (EF=1.00). All other costs are escalated based on the USACE CWCCIS, EM 1110-2-1304, Sept 2015.
Area Cost Factor	An AF of 1.05 is used for Oregon, except that an AF of 1.00 (national unmodified average) is used for MII assembly costs and local vendor quotes.
Subcontractor Overhead and Profit	It is assumed that home office OH is 8% and profit is 9% for the Prime Contractor. Professional labor overhead is 100%.
Prime Contractor Overhead and Profit	Allowances and items with mandated costs such as per diem do not have overhead and profit applied.
	Items previously developed by Anchor QEA already include contractor markups, therefore overhead and profit were not applied to those items.
	It is assumed that OH is 1% and profit is 0% for vendor quotes for treatment and disposal at offsite disposal facilities. It is assumed that OH is 5% and profit is 0% for quotes for all other material vendor quotes.
	Items developed using MII already include contractor markups such as overhead and profit, therefore additional overhead and profit were not applied in the PC OH and PC PF to those items.

TABLE CW-I25

Alternative I **Cost Worksheet:** **CW-I25**

Periodic Cost Sub-Element

Long-Term Maintenance for Capping, ENR, and In Situ Treatment

COST WORKSHEET

Site: Portland Harbor Superfund Site
Location: Portland, Oregon
Phase: Feasibility Study
Base Year: 2016

Prepared By: JN **Date:** 3/4/2016
Checked By: AB **Date:** 3/7/2016

Work Statement:
This sub-element involves replacement of 5% of the technology assignment layers as part of long-term maintenance. It includes costs for on-site labor, equipment, and materials developed from previous work.
Quantities represent 5% of material placement quantities which were developed and presented in Appendix D.

Cost Analysis:
Cost for Long-Term Maintenance (Lump Sum)

COST DATABASE CODE	DESCRIPTION	QTY	UNIT(S)	HPF	LABOR	ADJ LABOR	EQUIP	ADJ EQUIP	MATL	OTHER	UNMOD UC	UNMOD LIC	PC OH	PC PF	BUR LIC	COST SOURCE CITATION	COMMENTS
	Mobilization / Demobilization																
O2	Mobilization/Demobilization for Long Term Maintenance	1	LS	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$60,829.20	$60,829.20	$60,829.20	0%	0%	$60,829	LD Lower Duwamish	Assumes 1.6% of total capital costs per Lower Duwamish Feasibility Study. See Calculations for derivation.
	Sand Placement for Technology Assignments																
P1	Sand	29,929	LCY	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$19.75	$19.75	$591,097.75	0%	0%	$591,098	P Anchor QEA	Assume 5% of placement of additional material
	Sand Placement (Riverbanks)																
A16	Material Placement (Confined)	4,263	CY	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$20.39	$20.39	$86,922.57	0%	0%	$86,923	MII MII	Assume 5% of placement of additional material
	Sand Placement (Confined)																
A16	Material Placement (Confined)	2,619	CY	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$20.39	$20.39	$53,401.41	0%	0%	$53,401	MII MII	Assume 5% of placement of additional material
	Sand Placement (Open Water)																
A15	Material Placement (Open)	23,047	CY	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$12.42	$12.42	$286,243.74	0%	0%	$286,244	MII MII	Assume 5% of placement of additional material
	Beach Mix Placement for Technology Assignments																
P3	ODOT 100 Beach Mix	2,476	LCY	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$57.69	$57.69	$142,840.44	0%	0%	$142,840	P Anchor QEA	Assume 5% of placement of additional material
	Beach Mix Placement (Riverbanks)																
A16	Material Placement (Confined)	776	CY	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$20.39	$20.39	$15,822.64	0%	0%	$15,823	MII MII	Assume 5% of placement of additional material
	Beach Mix Placement (Confined)																
A16	Material Placement (Confined)	254	CY	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$20.39	$20.39	$5,179.06	0%	0%	$5,179	MII MII	Assume 5% of placement of additional material
	Beach Mix Placement (Open Water)																
A15	Material Placement (Open)	1,445	CY	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$12.42	$12.42	$17,946.90	0%	0%	$17,947	MII MII	Assume 5% of placement of additional material
	Armor Placement for Technology Assignments																
P2	ODOT 200 Armor	4,015	LCY	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$57.69	$57.69	$231,625.35	0%	0%	$231,625	P Anchor QEA	Assume 5% of placement of additional material
	Armor Placement (Riverbanks)																
A16	Material Placement (Confined)	79	CY	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$20.39	$20.39	$1,610.81	0%	0%	$1,611	MII MII	Assume 5% of placement of additional material
	Armor Placement (Confined)																
A16	Material Placement (Confined)	1,008	CY	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$20.39	$20.39	$20,553.12	0%	0%	$20,553	MII MII	Assume 5% of placement of additional material
	Armor Placement (Open Water)																
A15	Material Placement (Open)	2,928	CY	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$12.42	$12.42	$36,365.76	0%	0%	$36,366	MII MII	Assume 5% of placement of additional material
	Reactive/GAC Placement for Technology Assignments																
	AquaGate Reactive Layer																
M4	Carbon (AquaGate + PAC 10%)	4,040	TON	1.00	$0.00	$0.00	$0.00	$0.00	$456.30	$0.00	$456.30	$1,843,452.00	5%	0%	$1,935,625	V Vendor Quote	Assume 5% of placement of additional material
P1	Sand	4,277	LCY	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$19.75	$19.75	$84,470.75	0%	0%	$84,471	P Anchor QEA	Assume 5% of placement of additional material
A3	Mixing Sand & Carbon for Reactive Layer	8,322	CY	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$4.76	$4.76	$39,612.72	0%	0%	$39,613	MII MII	Assume 5% of placement of additional material
A16	Material Placement (Confined)	1,157	CY	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$20.39	$20.39	$23,591.23	0%	0%	$23,591	MII MII	Assume 5% of placement of additional material
A15	Material Placement (Open)	7,165	CY	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$12.42	$12.42	$88,989.30	0%	0%	$88,989	MII MII	Assume 5% of placement of additional material

TABLE CW-I25

Alternative I **Cost Worksheet:** **CW-I25**
Periodic Cost Sub-Element
Long-Term Maintenance for Capping, ENR, and In Situ Treatment

COST WORKSHEET

Site: Portland Harbor Superfund Site
Location: Portland, Oregon
Phase: Feasibility Study
Base Year: 2016

Prepared By: JN **Date:** 3/4/2016
Checked By: AB **Date:** 3/7/2016

Work Statement:
This sub-element involves replacement of 5% of the technology assignment layers as part of long-term maintenance. It includes costs for on-site labor, equipment, and materials developed from previous work.
Quantities represent 5% of material placement quantities which were developed and presented in Appendix D.

Cost Analysis:
Cost for Long-Term Maintenance (Lump Sum)

COST DATABASE CODE	DESCRIPTION	QTY	UNIT(S)	HPF	LABOR	ADJ LABOR	EQUIP	ADJ EQUIP	MATL	OTHER	UNMOD UC	UNMOD LIC	PC OH	PC PF	BUR LIC	COST SOURCE CITATION	COMMENTS
	AquaBlock																
M3	Carbon (AquaBlok)	284	TON	1.00	$0.00	$0.00	$0.00	$0.00	$202.80	$0.00	$202.80	$57,595.20	5%	0%	$60,475	V Vendor Quote	Assume 5% of placement of additional material
A16	Material Placement (Confined)	248	CY	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$20.39	$20.39	$5,056.72	0%	0%	$5,057	MII MII	Assume 5% of placement of additional material
	Geofabric for Riverbanks																
O7	Geotextile Installation	1.1	AC	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$7,074.14	$7,074.14	$7,781.56	8%	9%	$9,160	V Vendor Quote	Assume 5% of placement of additional material
O6	Geotextile Material	1.1	AC	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$5,698.62	$5,698.62	$6,268.48	5%	0%	$6,582	V Vendor Quote	Assume 5% of placement of additional material
	Organoclay Mat Placement for Technology Assignments																
A17	Organoclay Mat Placement	8,715	SF	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$3.35	$3.35	$29,195.25	0%	0%	$29,195	MII MII	Assume 5% of placement of additional material
P4	Organoclay Mat Material	8,715	SF	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$3.38	$3.38	$29,456.70	0%	0%	$29,457	P Anchor QEA	Assume 5% of placement of additional material
												TOTAL COST:			$3,862,654		

	Representative Unit Quantity	Unit(s)	Total Cost	Unit Cost
COST WORKSHEET SUMMARY	1	LS	$3,862,654	$3,862,654

Notes:
Further information about the development of cost worksheets can be found in Attachment A - Methodology and Organization of Detailed Cost Estimates.
The quantity bolded in the QTY column is the quantity selected as the representative unit quantity for this cost worksheet. If multiple quantities are bolded, the representative unit quantity is the sum of those quantities. When the LS unit is utilized, the default representative unit quantity is 1.
HTRW productivity factor is from Exhibit B-3 or B-4 of "A Guide to Developing and Documenting Cost Estimates During the Feasibility Study", EPA 2000
EPA developed project-specific unit costs using the Micro Computer Aided Cost Engineering System (MCACES) Second Generation (MII) software version 4.2, build 3

Cost Database Code:
The Cost Database Code is a reference code for linking with line item cost information with the cost source database and is not otherwise used within these cost worksheets. The following cost source database prefixes apply:
L (EPA-Derived Labor Unit Costs), M (Project-Specific Vendor Unit Costs), P (Previously Developed Unit Costs by Anchor QEA for Portland Harbor), A (EPA-Derived MII Unit Costs), O (Unit Costs from Other Projects/Sources)

Source of Cost Data:
For citation references, the following sources apply:
ALL (Allowance), FLC (www.flcdatacenter.com), LD (Costs Derived from Lower Duwamish Waterway Final Feasibility Study), MII (MII), O (Other), P (Previously Developed by Anchor QEA for Portland Harbor), and V (Vendor Quote)

Abbreviations:

QTY	Quantity	AC	Acres
EQUIP	Equipment	CLF	100 Linear Foot
MATL	Material	CY	Cubic Yard
HPF	HTRW Productivity Factor	DY	Days
ADJ LABOR	Adjusted Labor for HFP	EA	Each
ADJ EQUIP	Adjusted Equipment for HFP	FTE	Full Time Equivalent
UNMOD UC	Unmodified Unit Cost	HR	Hours
UNMOD LIC	Unmodified Line Item Cost	LB	Pounds
UNBUR LIC	Unburdened Line Item Cost	LCY	Loose Cubic Yard
PC OH	Prime Contractor Overhead	LF	Linear Foot
PC PF	Prime Contractor Profit	LS	Lump Sum
BUR LIC	Burdened Line Item Cost	MO	Month
		SF	Square Foot
		SY	Square Yard
		TON	Tons
		YR	Years

Cost Adjustment Checklist: **NOTES:**

FACTOR:	Field work will be in Level "D" PPE.
H&S Productivity (labor and equipment only)	MII assembly costs include HPF adjustments.
Escalation to Base Year	2016 cost sources are not escalated (EF=1.00). All other costs are escalated based on the USACE CWCCIS, EM 1110-2-1304, Sept 2015.
Area Cost Factor	An AF of 1.05 is used for Oregon, except that an AF of 1.00 (national unmodified average) is used for MII assembly costs and local vendor quotes.
Subcontractor Overhead and Profit	It is assumed that home office OH is 8% and profit is 9% for the Prime Contractor. Professional labor overhead is 100%.
Prime Contractor Overhead and Profit	Allowances and items with mandated costs such as per diem do not have overhead and profit applied.
	Items previously developed by Anchor QEA already include contractor markups, therefore overhead and profit were not applied to those items.
	It is assumed that OH is 1% and profit is 0% for vendor quotes for treatment and disposal at offsite disposal facilities. It is assumed that OH is 5% and profit is 0% for quotes for all other material vendor quotes.
	Items developed using MII already include contractor markups such as overhead and profit, therefore additional overhead and profit were not applied in the PC OH and PC PF to those items.

TABLE CW-I26

Alternative I
Periodic Cost Sub-Element
5-Year Site Review

Cost Worksheet: **CW-I26**

COST WORKSHEET

Site: Portland Harbor Superfund Site
Location: Portland, Oregon
Phase: Feasibility Study
Base Year: 2016

Prepared By: JN **Date:** 3/4/2016
Checked By: AB **Date:** 3/7/2016

Work Statement:
This sub-element involves the site visit and 5-year site review report. The following cost includes labor, material and shipping costs for site visits and 5-year site review reports.

Cost Analysis:
Cost for 5-Year Site Review (Lump Sum)

COST DATABASE CODE	DESCRIPTION	QTY	UNIT(S)	HPF	LABOR	ADJ LABOR	EQUIP	ADJ EQUIP	MATL	OTHER	UNMOD UC	UNMOD LIC	PC OH	PC PF	BUR LIC	COST SOURCE CITATION	COMMENTS
L11	Project Manager	300	HR	1.00	$82.17	$82.17	$0.00	$0.00	$0.00	$0.00	$82.17	$24,651.00	100%	9%	$53,739	FLC FLCDataCenter	Project-specific unit cost developed by EPA.
L4	Environmental Engineer	600	HR	1.00	$48.91	$48.91	$0.00	$0.00	$0.00	$0.00	$48.91	$29,346.00	100%	9%	$63,974	FLC FLCDataCenter	Project-specific unit cost developed by EPA.
L6	Environmental Scientist	900	HR	1.00	$37.70	$37.70	$0.00	$0.00	$0.00	$0.00	$37.70	$33,930.00	100%	9%	$73,967	FLC FLCDataCenter	Project-specific unit cost developed by EPA.
L12	Quality Control Engineer	120	HR	1.00	$64.99	$64.99	$0.00	$0.00	$0.00	$0.00	$64.99	$7,798.80	100%	9%	$17,001	FLC FLCDataCenter	Project-specific unit cost developed by EPA.
L1	CAD Drafter	300	HR	1.00	$31.31	$31.31	$0.00	$0.00	$0.00	$0.00	$31.31	$9,393.00	100%	9%	$20,477	FLC FLCDataCenter	Project-specific unit cost developed by EPA.
L3	Clerks, Typist, Bookkeeper & Receptionist	300	HR	1.00	$19.89	$19.89	$0.00	$0.00	$0.00	$0.00	$19.89	$5,967.00	100%	9%	$13,008	FLC FLCDataCenter	Project-specific unit cost developed by EPA.
O4	Copy and Shipping Allowance	1	LS	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$1,521.00	$1,521.00	$1,521.00	0%	0%	$1,521	ALL Allowance	
												TOTAL COST:			$243,687		

	Representative Unit Quantity	Unit(s)	Total Cost	Unit Cost
COST WORKSHEET SUMMARY	1	LS	$243,687	$243,687

Notes:
Further information about the development of cost worksheets can be found in Attachment A - Methodology and Organization of Detailed Cost Estimates.
The quantity bolded in the QTY column is the quantity selected as the representative unit quantity for this cost worksheet. If multiple quantities are bolded, the representative unit quantity is the sum of those quantities. When the LS unit is utilized, the default representative unit quantity is 1.
HTRW productivity factor is from Exhibit B-3 or B-4 of "A Guide to Developing and Documenting Cost Estimates During the Feasibility Study", EPA 2000
EPA developed project-specific unit costs using the Micro Computer Aided Cost Engineering System (MCACES) Second Generation (MII) software version 4.2, build 3

Cost Database Code:
The Cost Database Code is a reference code for linking with line item cost information with the cost source database and is not otherwise used within these cost worksheets. The following cost source database prefixes apply:
L (EPA-Derived Labor Unit Costs), M (Project-Specific Vendor Unit Costs), P (Previously Developed Unit Costs by Anchor QEA for Portland Harbor), A (EPA-Derived MII Unit Costs), O (Unit Costs from Other Projects/Sources)

Source of Cost Data:
For citation references, the following sources apply:
ALL (Allowance), FLC (www.flcdatacenter.com), LD (Costs Derived from Lower Duwamish Waterway Final Feasibility Study), MII (MII), O (Other), P (Previously Developed by Anchor QEA for Portland Harbor), and V (Vendor Quote)

Abbreviations:

QTY	Quantity	AC	Acres
EQUIP	Equipment	CLF	100 Linear Foot
MATL	Material	CY	Cubic Yard
HPF	HTRW Productivity Factor	DY	Days
ADJ LABOR	Adjusted Labor for HFP	EA	Each
ADJ EQUIP	Adjusted Equipment for HFP	FTE	Full Time Equivalent
UNMOD UC	Unmodified Unit Cost	HR	Hours
UNMOD LIC	Unmodified Line Item Cost	LB	Pounds
UNBUR LIC	Unburdened Line Item Cost	LCY	Loose Cubic Yard
PC OH	Prime Contractor Overhead	LF	Linear Foot
PC PF	Prime Contractor Profit	LS	Lump Sum
BUR LIC	Burdened Line Item Cost	MO	Month
		SF	Square Foot
		SY	Square Yard
		TON	Tons
		YR	Years

Cost Adjustment Checklist:	**NOTES:**
FACTOR:	Field work will be in Level "D" PPE.
H&S Productivity (labor and equipment only)	MII assembly costs include HPF adjustments.
Escalation to Base Year	2016 cost sources are not escalated (EF=1.00). All other costs are escalated based on the USACE CWCCIS, EM 1110-2-1304, Sept 2015.
Area Cost Factor	An AF of 1.05 is used for Oregon, except that an AF of 1.00 (national unmodified average) is used for MII assembly costs and local vendor quotes.
Subcontractor Overhead and Profit	It is assumed that home office OH is 8% and profit is 9% for the Prime Contractor. Professional labor overhead is 100%.
Prime Contractor Overhead and Profit	Allowances and items with mandated costs such as per diem do not have overhead and profit applied.
	Items previously developed by Anchor QEA already include contractor markups, therefore overhead and profit were not applied to those items.
	It is assumed that OH is 1% and profit is 0% for vendor quotes for treatment and disposal at offsite disposal facilities. It is assumed that OH is 5% and profit is 0% for quotes for all other material vendor quotes.
	Items developed using MII already include contractor markups such as overhead and profit, therefore additional overhead and profit were not applied in the PC OH and PC PF to those items.

Cost Estimate Backup

Note: Further information about the development of the cost estimate can be found in Attachment A - Methodology and Organization of Detailed Cost Estimates

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Cost Estimate Backup
Cost Source Database

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COST INDICES FOR ESCALATION

Base Year for Work: **2016**

Year	Cost Index[1]
2000	497.07
2001	503.52
2002	517.46
2003	529.95
2004	571.29
2005	608.36
2006	641.91
2007	673.52
2008	716.54
2009	703.00
2010	724.17
2011	756.48
2012	773.75
2013	787.64
2014	804.05
2015	804.78
2016	815.68
2017	830.36
2018	846.14
2019	863.06
2020	880.32
2021	897.93
2022	915.88
2023	934.20
2024	952.89
2025	971.94

[1] Yearly composite cost index (weighted average) from the U.S. Army Corps of Engineers Civil Works Construction Cost Index System (CWCCIS), EM 1110-2-1304, 31 March 2000. Revised as of 30 September 2015.

FLC Data Center Cost Sources

Base Year: 2016

COST CODES FOR EPA-DERIVED LABOR UNIT COSTS

Cost Code	Description	Units	Unit Labor Cost	Unit Equipment Cost	Unit Material Cost	Unit Other Cost	Year of Cost Source	Escalation Factor	Area Factor	Adjusted Labor Cost	Adjusted Equipment Cost	Adjusted Material Cost	Adjusted Other Cost	PC OH	PC PF	Cost Source		Comments
																Source	Source ID	
L1	CAD Drafter	HR	**$31.31**	$0.00	$0.00	$0.00	2016	1	1	$31.31	$0.00	$0.00	$0.00	100%	9%	FLC	FLCDataCenter	Project-specific unit cost developed by EPA.
L2	Civil Engineer	HR	**$46.64**	$0.00	$0.00	$0.00	2016	1	1	$46.64	$0.00	$0.00	$0.00	100%	9%	FLC	FLCDataCenter	Project-specific unit cost developed by EPA.
L3	Clerks, Typist, Bookkeeper & Receptionist	HR	**$19.89**	$0.00	$0.00	$0.00	2016	1	1	$19.89	$0.00	$0.00	$0.00	100%	9%	FLC	FLCDataCenter	Project-specific unit cost developed by EPA.
L4	Environmental Engineer	HR	**$48.91**	$0.00	$0.00	$0.00	2016	1	1	$48.91	$0.00	$0.00	$0.00	100%	9%	FLC	FLCDataCenter	Project-specific unit cost developed by EPA.
L5	Environmental Lawyer	HR	**$71.72**	$0.00	$0.00	$0.00	2016	1	1	$71.72	$0.00	$0.00	$0.00	100%	9%	FLC	FLCDataCenter	Project-specific unit cost developed by EPA.
L6	Environmental Scientist	HR	**$37.70**	$0.00	$0.00	$0.00	2016	1	1	$37.70	$0.00	$0.00	$0.00	100%	9%	FLC	FLCDataCenter	Project-specific unit cost developed by EPA.
L7	Field Engineer	HR	**$31.42**	$0.00	$0.00	$0.00	2016	1	1	$31.42	$0.00	$0.00	$0.00	100%	9%	FLC	FLCDataCenter	Project-specific unit cost developed by EPA.
L8	Field Technician	HR	**$31.42**	$0.00	$0.00	$0.00	2016	1	1	$31.42	$0.00	$0.00	$0.00	100%	9%	FLC	FLCDataCenter	Project-specific unit cost developed by EPA.
L9	Geologist	HR	**$45.04**	$0.00	$0.00	$0.00	2016	1	1	$45.04	$0.00	$0.00	$0.00	100%	9%	FLC	FLCDataCenter	Project-specific unit cost developed by EPA.
L10	General Superintendent (P.M.)	HR	**$64.70**	$0.00	$0.00	$0.00	2016	1	1	$64.70	$0.00	$0.00	$0.00	100%	9%	FLC	FLCDataCenter	Project-specific unit cost developed by EPA.
L11	Project Manager	HR	**$82.17**	$0.00	$0.00	$0.00	2016	1	1	$82.17	$0.00	$0.00	$0.00	100%	9%	FLC	FLCDataCenter	Project-specific unit cost developed by EPA.
L12	Quality Control Engineer	HR	**$64.99**	$0.00	$0.00	$0.00	2016	1	1	$64.99	$0.00	$0.00	$0.00	100%	9%	FLC	FLCDataCenter	Project-specific unit cost developed by EPA.
L13	Paralegal	HR	**$29.56**	$0.00	$0.00	$0.00	2016	1	1	$29.56	$0.00	$0.00	$0.00	100%	9%	FLC	FLCDataCenter	Project-specific unit cost developed by EPA.
L14	Surveyor	HR	**$41.56**	$0.00	$0.00	$0.00	2016	1	1	$41.56	$0.00	$0.00	$0.00	100%	9%	FLC	FLCDataCenter	Project-specific unit cost developed by EPA.
L15	Surveyor Assistant	HR	**$29.37**	$0.00	$0.00	$0.00	2016	1	1	$29.37	$0.00	$0.00	$0.00	100%	9%	FLC	FLCDataCenter	Project-specific unit cost developed by EPA.
L16	Safety Engineer	HR	**$53.79**	$0.00	$0.00	$0.00	2016	1	1	$53.79	$0.00	$0.00	$0.00	100%	9%	FLC	FLCDataCenter	Project-specific unit cost developed by EPA.
L17	Boat Operator	HR	**$33.16**	$0.00	$0.00	$0.00	2016	1	1	$33.16	$0.00	$0.00	$0.00	100%	9%	FLC	FLCDataCenter	Project-specific unit cost developed by EPA.

Note:
Wage rates based on flcdatacenter.com salary estimates for Portland-Vancouver-Beaverton, OR-WA MSA obtained February 2016.

Base Year: 2016

COST CODES FOR PROJECT-SPECIFIC VENDOR QUOTE UNIT COSTS

Cost Code	Description	Units	Unit Labor Cost	Unit Equipment Cost	Unit Material Cost	Unit Other Cost	Year of Cost Source	Escalation Factor	Area Factor	Adjusted Labor Cost	Adjusted Equipment Cost	Adjusted Material Cost	Adjusted Other Cost	PC OH	PC PF	Cost Source		Comments
																Source	Source ID	
M1	Cost Code Not Used																	
M2	Cost Code Not Used																	
M3	Carbon (AquaBlok)	TON	$0.00	$0.00	**$200.00**	$0.00	2015	1.014	1	$0.00	$0.00	$202.80	$0.00	5%	0%	V	Vendor Quote	Project-specific vendor quote - AquaBlok 2015. Material cost is $/TON.
M4	Carbon (AquaGate + PAC 10%)	TON	$0.00	$0.00	**$450.00**	$0.00	2015	1.014	1	$0.00	$0.00	$456.30	$0.00	5%	0%	V	Vendor Quote	Project-specific vendor quote - AquaBlok 2015. Material cost is $/TON.
M5	Cost Code Not Used																	
M6	Cost Code Not Used																	
M7	Cost Code Not Used																	
M8	Cost Code Not Used																	
M9	Thermal Desorption Treatment at Subtitle C/TSCA Landfill (High End of Treatment Cost Range)	TON	$0.00	$0.00	$0.00	**$565.00**	2015	1.014	1	$0.00	$0.00	$0.00	$572.91	1%	0%	V	Vendor Quote	Project-specific vendor quote - CWM of the Northwest, 2015.
M10	Tipping Fee at Subtitle C/TSCA Landfill	TON	$0.00	$0.00	$0.00	**$85.00**	2015	1.014	1	$0.00	$0.00	$0.00	$86.19	1%	0%	V	Vendor Quote	Project-specific vendor quote - CWM of the Northwest, 2015.
M11	Transportation and Disposal at Subtitle D Landfill	TON	$0.00	$0.00	$0.00	**$73.50**	2015	1.014	1	$0.00	$0.00	$0.00	$74.53	1%	0%	V	Vendor Quote	Project-specific vendor quote - Republic Services (Roosevelt Landfill), 2015. Includes transloading of the sediments, truck transportation from the transload facility to the landfill, and disposal at the landfill.
M12	Cost Code Not Used																	
M13	Cost Code Not Used																	
M14	Cost Code Not Used																	
M15	Cost Code Not Used																	
M16	Cost Code Not Used																	
M17	Cost Code Not Used																	
M18	Cost Code Not Used																	
M19	Cost Code Not Used																	
M20	Thermal Desorption Treatment at Subtitle C/TSCA Landfill (Low End of Treatment Cost Range)	TON	$0.00	$0.00	$0.00	**$315.00**	2015	1.014	1	$0.00	$0.00	$0.00	$319.41	1%	0%	V	Vendor Quote	Project-specific vendor quote - CWM of the Northwest, 2015.
M21	Buoy	EA	$0.00	$0.00	**$558.63**	$0.00	2016	1	1	$0.00	$0.00	$558.63	$0.00	5%	0%	V	Vendor Quote	Project-specific vendor quote - Go2Marine, 2016.
M22	Cost Code Not Used																	
M23	Portland Cement	TON	$0.00	$0.00	**$125.50**	$0.00	2016	1	1	$0.00	$0.00	$125.50	$0.00	5%	0%	V	Vendor Quote	Project-specific vendor quote - Cal Portland, 2016
M24	Concrete (3000 psi)	CY	$0.00	$0.00	**$124.50**	$0.00	2016	1	1	$0.00	$0.00	$124.50	$0.00	5%	0%	V	Vendor Quote	Project-specific vendor quote - Knife River, 2016. Includes delivery.
M25	Quicklime	TON	$0.00	$0.00	**$239.00**	$0.00	2016	1	1	$0.00	$0.00	$239.00	$0.00	5%	0%	V	Vendor Quote	Project-specific vendor quote - Graymont, 2016.
M26	Signage	EA	$0.00	$0.00	**$165.75**	$0.00	2016	1	1	$0.00	$0.00	$165.75	$0.00	5%	0%	V	Vendor Quote	Project-specific vendor quote - Allstate Sign & Plaque, 2016. 36" x 36" Signs

Base Year: 2016

COST CODES FOR PREVIOUSLY DEVELOPED UNIT COSTS BY ANCHOR QEA FOR PORTLAND HARBOR

Cost Code	Work or Material Description	Description for Cost Worksheets	Units	Previous Work Unit Cost	Year of Cost Source	Escalation Factor	Area Factor	Adjusted Unit Cost	PC OH	PC PF	Cost Source		Comments
											Source	Source ID	
P1	Sand	Sand	LCY	**$17.52**	2010	1.127	1	$19.75	0%	0%	P	Anchor QEA	Project-specific cost developed by Anchor QEA (2010) - see Backup Table 29A. Includes conversion from TON to LCY.
P2	ODOT 200 Armor	ODOT 200 Armor	LCY	**$51.19**	2010	1.127	1	$57.69	0%	0%	P	Anchor QEA	Project-specific cost developed by Anchor QEA (2010) - see Backup Table 29A. Includes conversion from TON to LCY.
P3	ODOT 100 Beach Mix	ODOT 100 Beach Mix	LCY	**$51.19**	2010	1.127	1	$57.69	0%	0%	P	Anchor QEA	Project-specific cost developed by Anchor QEA (2010) - see Backup Table 29A. Includes conversion from TON to LCY.
P4	Organoclay Mat Material	Organoclay Mat Material	SF	**$3.00**	2010	1.127	1	$3.38	0%	0%	P	Anchor QEA	Project-specific cost developed by Anchor QEA (2010) - see Backup Table 29A.
P5	Diatomaceous Earth	Diatomaceous Earth	TON	**$94.00**	2010	1.127	1	$105.94	0%	0%	P	Anchor QEA	Project-specific cost developed by Anchor QEA (2010) - see Backup Table 24.
P6	Cost Code Not Used	Cost Code Not Used											
P7	Cost Code Not Used	Cost Code Not Used											
P8	Cost Code Not Used	Cost Code Not Used											
P9	Debris Removal and Disposal	Debris Removal and Disposal	AC	**$11,630.00**	2010	1.127	1	$13,107.01	0%	0%	P	Anchor QEA	Project-specific cost developed by Anchor QEA (2010) - see Backup Table 2.
P10	Pile Removal and Disposal	Pile Removal and Disposal	EA	**$635.00**	2010	1.127	1	$715.65	0%	0%	P	Anchor QEA	Project-specific cost developed by Anchor QEA (2010) - see Backup Table 3.
P11	Pile Replacement	Pile Replacement	EA	**$6,636.00**	2010	1.127	1	$7,478.77	0%	0%	P	Anchor QEA	Project-specific cost developed by Anchor QEA (2010) - see Backup Table 4.
P12	Temporary Dock Relocation	Temporary Dock Relocation	EA	**$89,173.00**	2010	1.127	1	$100,497.97	0%	0%	P	Anchor QEA	Project-specific cost developed by Anchor QEA (2010) - see Backup Table 5.
P13	Purchase, Install, and Maintain Silt Curtains	Purchase, Install and Maintain Silt Curtains	LF	**$86.00**	2010	1.127	1	$96.92	0%	0%	P	Anchor QEA	Project-specific cost developed by Anchor QEA (2010) - see Backup Table 7.
P14	Purchase, Install, and Remove Sheet Pile Walls	Purchase, Install and Remove Sheet Pile Walls	LF	**$2,440.00**	2010	1.127	1	$2,749.88	0%	0%	P	Anchor QEA	Project-specific cost developed by Anchor QEA (2010) - see Backup Table 6.
P15	Cost Code Not Used	Cost Code Not Used											
P16	Cost Code Not Used	Cost Code Not Used											
P17	Cost Code Not Used	Cost Code Not Used											
P19	Cost Code Not Used	Cost Code Not Used											
P20	Cost Code Not Used	Cost Code Not Used											
P21	Cost Code Not Used	Cost Code Not Used											
P22	Cost Code Not Used	Cost Code Not Used											
P23	Cost Code Not Used	Cost Code Not Used											
P24	Cost Code Not Used	Cost Code Not Used											
P25	Monitored Natural Recovery	Monitored Natural Recovery	AC	**$3,270.92**	2010	1.127	1	$3,686.33	0%	0%	P	Anchor QEA	Project-specific cost developed by Anchor QEA (2010) - based on Backup Table 2.
P26	Sitewide Monitoring	Sitewide Monitoring	LS	**$849,742.00**	2010	1.127	1	$957,659.23	0%	0%	P	Anchor QEA	Project-specific cost developed by Anchor QEA (2010) - based on Backup Table 1.
P27	Cap Monitoring	Cap Monitoring	AC	**$70,063.30**	2010	1.127	1	$78,961.34	0%	0%	P	Anchor QEA	Project-specific cost developed by Anchor QEA (2010) - based on Backup Table 4.
P28	Reactive Layer Monitoring	Reactive Layer Monitoring	AC	**$78,943.00**	2010	1.127	1	$88,968.76	0%	0%	P	Anchor QEA	Project-specific cost developed by Anchor QEA (2010) - based on Backup Table 3.
P29	Cost Code Not Used	Cost Code Not Used											
P30	Cost Code Not Used	Cost Code Not Used											
P31	Transload Facility Permitting	Transload Facility Permitting	LS	**$40,000.00**	2010	1.127	1	$45,080.00	0%	0%	P	Anchor QEA	Project-specific cost developed by Anchor QEA (2010) - see Backup Table 24.
P32	Transload Facility Development	Transload Facility Development	LS	**$4,000,000.00**	2010	1.127	1	$4,508,000.00	0%	0%	P	Anchor QEA	Project-specific cost developed by Anchor QEA (2010) - see Backup Table 24.
P33	Yearly Property Lease	Yearly Property Lease	AC	**$23,500.00**	2010	1.127	1	$26,484.50	0%	0%	P	Anchor QEA	Developed by Anchor QEA (2010) - see Backup Table 24. Assumes leasing of 20 acres multiplied by estimated construction duration.
P34	Labor Inspections During Operations of Transload Facility	Labor Inspections During Operations of Transload Facility	FTE	**$75,000.00**	2010	1.127	1	$84,525.00	0%	0%	P	Anchor QEA	Developed by Anchor QEA (2010) - see Backup Table 24. Assumes 2.5 FTE/YR multiplied by estimated construction duration.
P35	Environmental Monitoring During Offloading at Transload Facility	Environmental Monitoring During Offloading at Transload Facility	MO	**$15,000.00**	2010	1.127	1	$16,905.00	0%	0%	P	Anchor QEA	Developed by Anchor QEA (2010) - see Backup Table 24. Assumes 4 MO/YR multiplied by estimated construction duration.
P36	Inspection and Monitoring Reporting for Transload Facility	Inspection and Monitoring Reporting for Transload Facility	YR	**$40,000.00**	2010	1.127	1	$45,080.00	0%	0%	P	Anchor QEA	Project-specific cost developed by Anchor QEA (2010) - see Backup Table 24.
P37	Cost Code Not Used	Cost Code Not Used											
P38	Cost Code Not Used	Cost Code Not Used											
P39	Cost Code Not Used	Cost Code Not Used											
P40	Cost Code Not Used	Cost Code Not Used											
P41	Cost Code Not Used	Cost Code Not Used											
P42	Cost Code Not Used	Cost Code Not Used											

Base Year: 2016

COST CODES FOR PREVIOUSLY DEVELOPED UNIT COSTS BY ANCHOR QEA FOR PORTLAND HARBOR

Cost Code	Work or Material Description	Description for Cost Worksheets	Units	Previous Work Unit Cost	Year of Cost Source	Escalation Factor	Area Factor	Adjusted Unit Cost	PC OH	PC PF	Cost Source		Comments
											Source	Source ID	
P43	Cost Code Not Used	Cost Code Not Used											
P44	Cost Code Not Used	Cost Code Not Used											
P45	Cost Code Not Used	Cost Code Not Used											
P46	Cost Code Not Used	Cost Code Not Used											
P47	Cost Code Not Used	Cost Code Not Used											
P48	Cost Code Not Used	Cost Code Not Used											
P49	CDF Construction	CDF Construction	LS	**$48,600,000.00**	2011	1.079	1	$52,439,400.00	0%	0%	P	Anchor QEA	Project-specific cost developed by Anchor QEA (2011)

Sources:
Draft Feasibility Study, Portland Harbor, Anchor QEA, March 2012 (costs cited in this document are 2010 costs)
Terminal 4 Confined Disposal Facility Design Analysis Report, Prefinal 60 Percent Design Deliverable, Port of Portland, Anchor QEA, August 2011

Base Year: 2016

COST CODES FOR EPA-DERIVED MII UNIT COSTS

Cost Code	Work or Material Description	Description for Cost Worksheets	Units	Unit Cost	Year of Cost Source	Escalation Factor	Area Factor	Adjusted MII Unit Cost	PC OH	PC PF	Cost Source		Comments
											Source	Source ID	
A1	18' Boat	18' Boat	HR	**$25.42**	2016	1.00	1	$25.42	0%	0%	MII	MII	Project-specific unit cost developed in MII. For buoy setup.
A2	Hauling - Quicklime to Site	Hauling - Quicklime to Site	TON	**$5.71**	2016	1.00	1	$5.71	0%	0%	MII	MII	Project-specific unit cost developed in MII. Assumes 10 mile one-way haul.
A3	Mixing Sand & Carbon for Reactive Layer	Mixing Sand & Carbon for Reactive Layer	CY	**$4.76**	2016	1.00	1	$4.76	0%	0%	MII	MII	Project-specific unit cost developed in MII.
A4	Loading Trucks at Transload Facility	Loading Trucks at Transload Facility	CY	**$2.68**	2016	1.00	1	$2.68	0%	0%	MII	MII	Project-specific unit cost developed in MII.
A5	Hauling Waste from Transload Facility to Landfill	Hauling Waste from Transload Facility to Landfill	CY	**$16.70**	2016	1.00	1	$16.70	0%	0%	MII	MII	Project-specific unit cost developed in MII.
A6	Open Water Dredging	Open Water Dredging	CY	**$24.53**	2016	1.00	1	$24.53	0%	0%	MII	MII	Project-specific unit cost developed in MII.
A7	Confined Dredging	Confined Dredging	CY	**$31.10**	2016	1.00	1	$31.10	0%	0%	MII	MII	Project-specific unit cost developed in MII.
A8	Riverbank Excavation	Riverbank Excavation	CY	**$5.19**	2016	1.00	1	$5.19	0%	0%	MII	MII	Project-specific unit cost developed in MII.
A9	Mobilization/Demobilization of Temporary Water Treatment System	Mobilization/Demobilization of Temporary Water Treatment System	EA	**$36,600**	2016	1.00	1	$36,600.00	0%	0%	MII	MII	Assumes mob/demob of treatment system will be required for each construction season
A10	Dewatering and Temporary Water Treatment System Operations	Dewatering and Temporary Water Treatment System Operations	DY	**$21,654**	2016	1.00	1	$21,654.00	0%	0%	MII	MII	Project-specific unit cost developed in MII.
A11	In-Barge Stabilization / Mixing of Amendments	In-Barge Stabilization / Mixing of Amendments	CY	**$24.50**	2016	1.00	1	$24.50	0%	0%	MII	MII	Project-specific unit cost developed in MII.
A12A	Handling of Sediment for Dewatering (Open)	Handling of Sediment for Dewatering (Open)	CY	**$12.57**	2016	1.00	1	$12.57	0%	0%	MII	MII	Project-specific unit cost developed in MII. Transfer of dredged sediments from sediment drying barge to barge for offsite transport.
A12B	Handling of Sediment for Dewatering (Open)	Handling of Sediment for Dewatering (Open)	CY	**$11.75**	2016	1.00	1	$11.75	0%	0%	MII	MII	Project-specific unit cost developed in MII. Transfer of dredged sediments from sediment drying barge to barge for offsite transport.
A13	Barging to Transload Facility	Barging to Transload Facility	CY	**$13.66**	2016	1.00	1	$13.66	0%	0%	MII	MII	Project-specific unit cost developed in MII.
A14	Offloading of Sediments	Offloading of Sediments	CY	**$9.70**	2016	1.00	1	$9.70	0%	0%	MII	MII	Assumes mechanical offloading of sediments at the transload facility.
A15	Material Placement (Open)	Material Placement (Open)	CY	**$12.42**	2016	1.00	1	$12.42	0%	0%	MII	MII	Project-specific unit cost developed in MII.
A16	Material Placement (Confined)	Material Placement (Confined)	CY	**$20.39**	2016	1.00	1	$20.39	0%	0%	MII	MII	Project-specific unit cost developed in MII.
A17	Organoclay Mat Placement	Organoclay Mat Placement	SF	**$3.35**	2016	1.00	1	$3.35	0%	0%	MII	MII	Project-specific unit cost developed in MII.

Note:
EPA developed project-specific unit costs using the Micro Computer Aided Cost Engineering System (MCACES) Second Generation (MII) software version 4.2, build 3

Base Year: 2016

COST CODES FOR UNIT COSTS FROM OTHER PROJECTS/SOURCES

Cost Code	Work or Material Description	Description for Cost Worksheets	Units	Unit Cost	Year of Cost Source	Escalation Factor	Area Factor	Adjusted Unit Cost	PC OH	PC PF	Cost Source		Comments
											Source	Source ID	
O1	Mobilization/Demobilization	Mobilization/Demobilization	LS	**1.6% of Total Cost**	2016	1.000	1	1.6%	0%	0%	LD	Lower Duwamish	Assumes 1.6% of total capital costs per Lower Duwamish Feasibility Study. See Calculations for derivation.
O2	Mobilization/Demobilization for Long Term Maintenance	Mobilization/Demobilization for Long Term Maintenance	LS	**1.6% of Total Cost**	2016	1.000	1	1.6%	0%	0%	LD	Lower Duwamish	Assumes 1.6% of total capital costs per Lower Duwamish Feasibility Study. See Calculations for derivation.
O3	Mitigation	Mitigation	AC	**$1,070,827.00**	2016	1.000	1	$1,070,827.00	0%	0%	O	Other	Tables 6.1-1 and 6.1-4 of the Appendix M, Attachment 1, Anchor QEA FS (2010) as well as select other projects. See Calculations for derivation.
O4	Copy and Shipping Allowance	Copy and Shipping Allowance	LS	**$1,500.00**	2015	1.014	1	$1,521.00	0%	0%	ALL	Allowance	
O5	Allowance for Production & Copies for Advisories	Allowance for Production & Copies for Advisories	LS	**$1,000.00**	2016	1.000	1	$1,000.00	0%	0%	ALL	Allowance	
O6	Geotextile Material	Geotextile Material	AC	**$5,614.40**	2014	1.015	1	$5,698.62	5%	0%	V	Vendor Quote	Vendor quote obtained for project of similar scope - Geo-Synthetics, 2014.
O7	Geotextile Installation	Geotextile Installation	AC	**$6,969.60**	2014	1.015	1	$7,074.14	8%	9%	V	Vendor Quote	Vendor Quote - Geo-Synthetics (2014). Includes labor and equipment for installation
O8	DSL Land Lease	DSL Land Lease	AC	**$116,487.17**	2016	1.000	1	$116,487.17	8%	9%	O	Other	0100 (4) (h) (A). Calculated based on average lease rate during the 100-year period of analysis
O9	DSL Land Lease	DSL Land Lease	AC	**$30,292.05**	2016	1.000	1	$30,292.05	8%	9%	O	Other	0100 (4) (h) (A). Calculated based on average lease rate during the 30-year period of analysis

Source:
Final Feasibility Study, Lower Duwamish Waterway, Seattle, WA, AECOM, October 2012

CDM Smith	PROJECT: Portland Harbor FS	COMPUTED BY : JN	CHECKED BY: AB
	JOB NO.: 79171.3383.345.FSZ	DATE : 3/4/2016	DATE CHECKED: 3/7/2016
	CLIENT: EPA		WRKSHT NO. : CALC-1

Description: Summary of cost buildup for unit costs for detailed costing of alternatives for Portland Harbor FS.

Estimate Base Year	**2016**	
Assumed Material Properties		
Density of Sand (wet), LB/LCY:	3,100	*Caterpillar Performance Handbook, edition 3.1*
Density of Sand (dry), LB/LCY:	2,400	*Caterpillar Performance Handbook, edition 3.1*
Density of Riprap, LB/LCY:	2,700	*Caterpillar Performance Handbook, edition 3.1*
Density of Gravel (pitrun), LB/LCY:	3,250	*Caterpillar Performance Handbook, edition 3.1*
Material and Placement Costs for Capping Materials		
Material Costs		
Sand Material Cost, $/TN:	$14.60	*cost developed by Anchor QEA, 2010 (See Backup Table 29A) based on material cost from Knife River quote #7838 (2010)*
Sand Material Cost, $/LB:	$0.01	
Unescalated Sand Material Cost, $/LCY:	**$17.52**	
Unescalated Backfill Material Cost, $/LCY:	**$17.52**	*Assumes backfill will be sand*
ODOT 200 Armor Material Cost, $/TN:	$31.50	*cost developed by Anchor QEA, 2010 (See Backup Table 29A) based on material cost from Knife River quote #7838 (2010)*
ODOT 200 Armor Material Cost, $/LB:	$0.02	
Unescalated ODOT 200 Armor Material Cost, $/LCY:	**$51.19**	*Assumed density of Gravel (pitrun)*
Beach Mix Material Cost, $/TN:	$31.50	*cost developed by Anchor QEA, 2010 (See Backup Table 29A) based on material cost from Knife River quote #7838 (2010)*
Beach Mix Material Cost, $/LB:	$0.02	
Unescalated Beach Mix Material Cost, $/LCY:	**$51.19**	*Assumed density of Gravel (pitrun)*
Diatomaceous Earth Material Cost, $/TN:	$94.00	*material cost from Waste Management (2010), see Anchor QEA, 2010 (See Backup Table 24)*
Unescalated Diatomaceous Earth Material Cost, $/TN:	**$94.00**	
Geotextile Material Cost, $/SY:	$1.16	*material cost from vendor quote (2014) for 8 oz/sy geotextile*
Unescalated Geotextile Material Cost, $/AC:	**$5,614.40**	
Organoclay Material Cost, $/SF:	$2.70	*cost developed by Anchor QEA, 2010 (See Backup Table 29A) based on material cost from Cetco quote (2010), excludes 15% cost increase for overlap*
Unescalated Organoclay Material Cost, $/SF:	**$2.70**	
Unit Costs for Obstruction and Debris Removal		
Pile Removal and Disposal, $/EA:	$635	*cost developed by Anchor QEA, 2010 (See Backup Table 3), includes removal and disposal*
Unescalated Pile Removal and Disposal, $/EA:	**$635.00**	
Pile Replacement, $/EA:	$6,636	*cost developed by Anchor QEA, 2010 (See Backup Table 4)*
Unescalated Pile Replacement, $/EA:	**$6,636.00**	
Temporary Dock Relocation, $/EA:	$89,173	*cost developed by Anchor QEA, 2010 (See Backup Table 5)*
Unescalated Temporary Dock Relocation, $/EA:	**$89,173.00**	
Debris Removal and Disposal, $/EA:	$11,630	*cost developed by Anchor QEA, 2010 (See Backup Table 2), includes removal and disposal*
Unescalated Debris Removal and Disposal, $/EA:	**$11,630.00**	
Unit Costs for Erosion/Residual Control Measures		
Temporary Sheetpile Walls, $/LF:	$2,440	*cost developed by Anchor QEA, 2010 (See Backup Table 6)*
Unescalated Temporary Sheetpile Walls, $/LF:	**$2,440.00**	
Silt Curtain Installation, $/LF:	$86	*cost developed by Anchor QEA, 2010 (See Backup Table 7)*
Unescalated Silt Curtain Installation, $/LF:	**$86.00**	
Unit Costs for Transload Facility Development		
Transload Facility Permitting, $/LS:	$40,000.00	*cost developed by Anchor QEA, 2010 (See Backup Table 24)*
Unescalated Transload Facility Permitting, $/LS:	**$40,000.00**	
Transload Facility Development, $/LS:	$4,000,000.00	*cost developed by Anchor QEA, 2010 (See Backup Table 24), includes full development cost (minus addition of new rail line)*
Unescalated Transload Facility Development, $/LS:	**$4,000,000.00**	
Yearly Property Lease, $/AC:	$23,500.00	*cost developed by Anchor QEA, 2010 (See Backup Table 24)*
Unescalated Yearly Property Lease, $/AC:	**$23,500.00**	
Labor Inspections During Operations of Transload Facility, $/FTE:	$75,000.00	*cost developed by Anchor QEA, 2010 (See Backup Table 24)*
Unescalated Labor Inspections During Operations of Transload Facility, $/FTE:	**$75,000.00**	
Unescalated Environmental Monitoring During Offloading at Transload Facility, $/MO:	$15,000.00	*cost developed by Anchor QEA, 2010 (See Backup Table 24)*
Unescalated Environmental Monitoring During Offloading at Transload Facility, $/MO:	**$15,000.00**	
Inspection and Monitoring Reporting for Transload Facility, $/YR:	$40,000.00	*cost developed by Anchor QEA, 2010 (See Backup Table 24)*
Unescalated Inspection and Monitoring Reporting for Transload Facility, $/YR:	**$40,000.00**	

PROJECT:	Portland Harbor FS	COMPUTED BY :	JN
JOB NO.:	79171.3383.345.FSZ	DATE :	3/4/2016
CLIENT:	EPA		

CHECKED BY:	AB
DATE CHECKED:	3/7/2016
WRKSHT NO. :	CALC-1

Description: Summary of cost buildup for unit costs for detailed costing of alternatives for Portland Harbor FS.

Unit Costs for Transportation and Disposal

Subtitle C Disposal

Thermal Desorption Treatment at Subtitle C Landfill (High End of Treatment Cost Range), $/TON:	$565.00	*Vendor quote - CWM of the Northwest, 2015*
Unescalated Thermal Desorption Treatment at Subtitle C Landfill (High End of Treatment Cost Range), $/TON:	**$565.00**	
Thermal Desorption Treatment at Subtitle C Landfill (Low End of Treatment Cost Range), $/TON:	$315.00	*Vendor quote - CWM of the Northwest, 2015*
Unescalated Thermal Desorption Treatment at Subtitle C Landfill (Low End of Treatment Cost Range), $/TON:	**$315.00**	
Tipping Fee at Subtitle C Landfill, $/TON:	$85.00	*Vendor quote - CWM of the Northwest, 2015*
Unescalated Tipping Fee at Subtitle C Landfill, $/TON:	**$85.00**	

Subtitle D Transportation and Disposal

Transportation to Subtitle D Landfill, $/TON:	$73.50	*Vendor quote - Republic Services, 2015. Includes transloading of waste, transportation of waste from transload facility to landfill, and disposal at landfill*
Unescalated Transportation to Subtitle D Landfill, $/TON:	**$73.50**	

Unit Costs for CDF Construction

CDF Construction, $/LS:	$48,600,000.00	*cost developed by Anchor QEA for T4 CDF 60% Design (2011) - excludes Indirect construction costs, Long-term monitoring and maintenance, and Contingency*
CDF Construction, $/LS:	**$48,600,000.00**	

Unit Costs for Mitigation

Mitigation, $/AC:	$1,070,827	*See CALC-MITIGATION worksheet for unit cost buildup, includes escalation*
Mitigation, $/AC:	**$1,070,827.00**	

Unit Costs for Monitoring

Monitored Natural Recovery for MNR/ENR and Broadcast GAC Areas

Monitored Natural Recovery, $/AC:	$3,271	*assumes 4 composite surface sediment samples per acre of MNR area. Developed by Anchor QEA, 2010 (See Backup Table 2)*
Unescalated Monitored Natural Recovery, $/AC:	**$3,270.92**	

Sitewide Monitoring

Site-wide Monitoring Costs, LS:	$849,742	*includes sampling for biota tissue chemistry and surface water chemistry, and mob/demob, data management and reporting for the two sampling events. Developed by Anchor QEA, 2010 (See Backup Table 1)*
Unescalated Site-wide Monitoring Costs, LS:	**$849,742.00**	

Technology Monitoring

Shallow Subsurface Monitoring, $/AC:	$70,063	*includes mob/demob, sampling for shallow subsurface sediment cores, hydrographic survey, data management and reporting. Developed by Anchor QEA, 2010 (See Backup Table 4). Excludes contingency.*
Unescalated Cap Monitoring Costs, LS:	**$70,063.30**	
Reactive Layer Monitoring, $/AC:	$78,943	*Porewater chemistry sampling. Developed by Anchor QEA, 2010 (See Backup Table 3). Excludes contingency.*
Unescalated Reactive Layer Monitoring Costs, LS:	**$78,943.00**	

Mobilization/Demobilization (Mob/Demob) Percentage of Capital Costs Derivation

	Lower Duwamish Waterway (LDW)	
	Alternative 2R	Alternative 6R
Volume of Dredging, CY:	584,326	3,943,174
Project Cost for Mob, LS:	$400,000	$400,000
Project Cost for Demob, LS:	$400,000	$400,000
Seasonal Mob/Demob (30% of Project Mob Cost or 15% of Project Mob/Demob Cost), $/Season:	$120,000	$120,000
Duration of Construction, Seasons:	6.8	46.6
Total Recurring/Seasonal Cost for Mob/Demob, LS:	$816,000	$5,592,000
Total Cost for Mobilization/Demobilization, LS:	$1,616,000	$6,392,000
Total Capital Cost of Alternative, LS:	$97,975,502	$417,698,523
Mobilization/Demobilization as Percentage of Capital Cost, %:	1.6%	1.5%
Average Percentage of Capital Costs for Mobilization/Demobilization, %:	**1.6%**	

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Cost Estimate Backup
EPA-Derived Labor Costs

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CDM Smith	PROJECT:	Portland Harbor FS	COMPUTED BY :	JN	CHECKED BY: AB
	JOB NO.:	79171.3383.345	DATE :	03/07/16	DATE CHECKED: 03/08/16
	CLIENT:	EPA Region 10			PAGE NO. : LB-01

Description: Determination of base wage rates for management and engineering personnel (i.e., project manager, civil engineer, etc.). Wage rates based on FLCdatacenter.com salary estimates for Multnomah County, OR for March 2016.

Escalation

Previous salary cost index (2Q16):	**813.65**	*EM 1110-2-1304, Rev. 30 September 2015*
Cost estimate prep cost index (2Q16):	**813.65**	*EM 1110-2-1304, Rev. 30 September 2015*

Hourly Wage Calculations

Number of work hours per year:	**2080**	*52 weeks x 40 hours per week*

Labor Category	Salary	Hourly	Benefits	Bonus	Year	Source
General Superintendent	$110,573	$53.16	15.20%	6.50%	2016	FLCdatacenter.com
Project Manager	$140,442	$67.52	15.20%	6.50%	2016	FLCdatacenter.com
Admin (Clerks, Typists)	$33,987	$16.34	15.20%	6.50%	2016	FLCdatacenter.com
Geologist	$76,981	$37.01	15.20%	6.50%	2016	FLCdatacenter.com
Civil Engineer	$79,706	$38.32	15.20%	6.50%	2016	FLCdatacenter.com
Environmental Engineer	$83,595	$40.19	15.20%	6.50%	2016	FLCdatacenter.com
Safety Engineer	$91,936	$44.20	15.20%	6.50%	2016	FLCdatacenter.com
Quality Control Engineer	$111,072	$53.40	15.20%	6.50%	2016	FLCdatacenter.com
Field Engineer	$53,706	$25.82	15.20%	6.50%	2016	FLCdatacenter.com
Operator / Technician	$53,706	$25.82	15.20%	6.50%	2016	FLCdatacenter.com
Draftsman	$53,518	$25.73	15.20%	6.50%	2016	FLCdatacenter.com
Surveyor, Chief	$71,032	$34.15	15.20%	6.50%	2016	FLCdatacenter.com
Surveyor	$50,190	$24.13	15.20%	6.50%	2016	FLCdatacenter.com
Environmental Scientist	$64,438	$30.98	15.20%	6.50%	2016	FLCdatacenter.com
Environmental Lawyer	$122,574	$58.93	15.20%	6.50%	2016	FLCdatacenter.com
Paralegal	$50,523	$24.29	15.20%	6.50%	2016	FLCdatacenter.com
Procurement Specialist	$37,981	$18.26	15.20%	6.50%	2016	FLCdatacenter.com
Boat Operator	$56,680	$27.25	15.20%	6.50%	2016	FLCdatacenter.com

Labor Category	Salary	Hourly	Taxable Fringe	Non-Tax Fringe[1]	Total
General Superintendent	$110,573	$53.16	$11.54	$0.00	$64.70
Project Manager	$140,442	$67.52	$14.65	$0.00	$82.17
Admin (Clerks, Typists)	$33,987	$16.34	$3.55	$0.00	$19.89
Geologist	$76,981	$37.01	$8.03	$0.00	$45.04
Civil Engineer	$79,706	$38.32	$8.32	$0.00	$46.64
Environmental Engineer	$83,595	$40.19	$8.72	$0.00	$48.91
Safety Engineer	$91,936	$44.20	$9.59	$0.00	$53.79
Quality Control Engineer	$111,072	$53.40	$11.59	$0.00	$64.99
Field Engineer	$53,706	$25.82	$5.60	$0.00	$31.42
Operator / Technician	$53,706	$25.82	$5.60	$0.00	$31.42
Draftsman	$53,518	$25.73	$5.58	$0.00	$31.31
Surveyor, Chief	$71,032	$34.15	$7.41	$0.00	$41.56
Surveyor	$50,190	$24.13	$5.24	$0.00	$29.37
Environmental Scientist	$64,438	$30.98	$6.72	$0.00	$37.70
Environmental Lawyer	$122,574	$58.93	$12.79	$0.00	$71.72
Paralegal	$50,523	$24.29	$5.27	$0.00	$29.56
Procurement Specialist	$37,981	$18.26	$3.96	$0.00	$22.22
Boat Operator	$56,680	$27.25	$5.91	$0.00	$33.16

Notes:

[1] - Non-taxable fringe is set at $0.00 in MII and is taken out of Taxable Fringe per the U.S. Army Corps of Engineers

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Cost Estimate Backup Project-
Specific Vendor Quotes

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Call Report

9200 Ward Parkway, Suite 500
Kansas City, MO – 64114
Tel: (816) 444-8270
Fax: (816) 523-2600

Project: Portland Harbor FS **Client:** EPA Region 10

Job No: 79171 **Date:** 7/17/2015

☐ **Phone in** ☒ **Phone out** ☒ **Current project** ☐ **Prospective project/Marketing** ☐ **Administrative**

☐ **Other**

Made by/Received by: Abby Broadstone

Talked with: Mark Krening at Chemical Waste Management of the Northwest (503-519-3959)

Subject: Subtitle C Transportation, Pretreatment and Disposal of Contaminated Sand/Sediment

Distribution: Scott Coffey, Gary Hazen, and Eleonora Borisova

Discussion:

Standard Tipping Fee: Standard tipping fee for Subtitle C is $85/TN. This is for waste that does not require pretreatment or does not exceed LDRs.

Treatment Costs: Stabilization is typically used for heavy metal contamination, and solidification is typically used for non-hazardous waste. Based on the fact that the waste contains TCE, PAH, Benzene (D018), and listed wastes (F002 and F027), we will need thermal desorption with organic recovery unit. The costs for thermal desorption treatment is in the range of $315/TN and $565/TN based on concentration and moisture content. This cost is based on the minimum volumes, those estimated for Alt B. There may be some cost savings based on volumes of waste.

Note: At the Arlington Facility they cannot accept Dioxin/Furan contamination with concentrations above treatment standards of 1 (typical of F027 wastes). This waste would have to go to Canada for incineration. This was not communicated with vendor, but note that the RPAC Outfall (F027) Waste concentrations of TCDDs do not exceed the 1 ug/kg treatment standard, total TCDFs were detected offshore of the RPAC outfall in two samples at 3.878 and 3.614 ug/kg.

Transportation Costs: Truck transport costs from Portland are approximately $45/TN with up to 34 TN/truckload. Rail transportation from Portland does not provide costs savings compared to truck transport. Barge costs may provide some cost savings based on bulk volume efficiencies; however, there is not a Port in Arlington. The barge will need to unload at the Port of Morral and trucked to Chemical Waste Management in Arlington. Barge costs are site-specific and dependent on location.

Action Required (what, who, when):

Nielsen, Justin C.

To: Whiteman, Leslie
Subject: RE: Pricing for Disposal of Sediments at Roosevelt Landfill

From: Whiteman, Leslie [mailto:LWhiteman@republicservices.com]
Sent: Tuesday, July 28, 2015 12:37 PM
To: Nielsen, Justin C. <nielsenjc@cdmsmith.com>
Cc: Whiteman, Leslie <LWhiteman@republicservices.com>
Subject: RE: Pricing for Disposal of Sediments at Roosevelt Landfill

Ok, if we assume you would be responsible for the transload of the dredge sediment and we would be responsible for transport and disposal from the Portland Area and we would use rail there- $55.00 per ton plus the Portland Metro Taxes (which is$ 3.50 per ton.

If we offload barges at SDS in Bingen- where we would be responsible for transload, transport and disposal-$70.00 per ton plus the Portland Metro Taxes.

When you have more information I can work on the numbers but the above is a good estimate.

Leslie

REPUBLIC SERVICES

We'll handle it from here.™

Leslie Whiteman Special Waste Sales

54 South Dawson Street
Seattle, WA 98134
e lwhiteman@republicservices.com
o 206.332.7711 c 206.391.1389
w republicservices.com

Nielsen, Justin C.

From: John Collins <jcollins@aquablok.com>
Sent: Tuesday, July 21, 2015 11:13 AM
To: Broadstone, Abby
Cc: Nielsen, Justin C.
Subject: RE: CDM Smith Aquagate Sand Mixture Quote

Abby,

Thanks for the call, glad to get into the discussion.

Per our call, we can offer two products that meet the 0.12lb/SF/cm objective. These are as follows:

AquaGate+PAC 5% - $385/CY (1,944lb of material at $400/ton) – This product would constitute 94.7% of a CY in volume, so only a small amount sand/aggregate would be required to fill out the CY volume.

AquaGate+PAC 10% - $220/CY (972lb of material at $450/ton) – This product would constitute 48.6% of a CY in volume, so the balance of the volume would need a sand/aggregate mixture.

In regard to the 0.48lb/CF/cm carbon loading (which equates to 1.22lb/SF/Inch), AquaBlok does not have a carbon amended product that can meet this loading. However, for comparison, our AquaGate+PAC 10% material will provide a loading of 0.616lb/SF/Inch in carbon loading – which is approximately one half of this requested target loading. The pricing for this material at maximum loading is based on our nominal bulk density of 74lb/CF – or approximately 2,000lb per CY - $450/CY (which is also almost exactly the price per ton).

As we discussed, I would question the 0.48lb/SF/cm loading, as this is very high compared to most activated carbon applications we have seen in the industry. It would be appreciated if we would have a further opportunity to discuss the need for this high loading level.

Please give me a call if you want to discuss or review the above.

Thanks, John

John A. Collins | COO
AquaBlok, Ltd. | www.aquablok.com
3401 Glendal Ave. Suite 300 | Toledo, OH 43614
Tel: 419.385.2980 | Cell 419.343.7803

From: Broadstone, Abby [mailto:BroadstoneAR@cdmsmith.com]
Sent: Tuesday, July 21, 2015 10:13 AM
To: John Collins
Cc: Nielsen, Justin C.
Subject: CDM Smith Aquagate Sand Mixture Quote

Hi John,

Thanks for your help. We need cost for Aquagate ($/CY) for activated carbon rates as follows:
0.12 lb/ft^2/cm
0.48 lb/ft^2/cm

Thanks,
~abby

Abby R. Broadstone, P.E., LEED AP
Environmental Engineer
CDM Smith
Phone: 314.704.5309
Fax: 816.412.3167
Email: broadstonear@cdmsmith.com
Please consider the environment before printing this email.

Nielsen, Justin C.

From: Broadstone, Abby
Sent: Wednesday, January 27, 2016 4:58 PM
To: Nielsen, Justin C.
Subject: FW: AquaBlok

Abby R. Broadstone, P.E., LEED AP
Environmental Engineer
CDM Smith
Phone: 314.704.5309
Fax: 816.412.3167
Email: broadstonear@cdmsmith.com
Please consider the environment before printing this email.

From: Blischke, Eric
Sent: Tuesday, January 26, 2016 4:52 PM
To: Broadstone, Abby <BroadstoneAR@cdmsmith.com>; Hazen, Gary <HazenGL@cdmsmith.com>
Subject: FW: AquaBlok

From: Blischke, Eric
Sent: Friday, December 18, 2015 9:55 AM
To: Coffey, Scott <CoffeySE@cdmsmith.com>
Subject: AquaBlok

Scott, attached is a summary of my conversation with John Collins yesterday.

Eric

On December 17, 2015, I spoke to John Collins of AquaBlock about application of AquaBlok to contaminated sediments beneath docks and similar structures.

AquaBlok is a low permeability material that is typically used in capping. Three questions must be answered when considering placement of AquaBlok – will it stay there when placed, will it mix with the sediments, will it move over time. Two physical conditions that can limit application of AquaBlok are placement on steep slopes and in high energy environments.

Typically, AquaBlok is placed with some sort of cover (sand, armor stone) to ensure that it remains in place.

The material can be placed under dock structures using telebelts or similar equipment. AquaBlok conducted a pilot study that involved placement of AquaGate material underneath dock structures at the Bremerton Naval Base in Washington.

Typically, a 6” hydrated layer of AquaBlok is required. This requires a dry placement thickness of 4” (hydrated thickness is typically 50% to 100% greater than dry thickness).

4.2” of thickness requires 30 lb per square foot at a density of 85 lb per cubic foot. The cost of AquaBlok is $200 per ton or $3.00 per square foot at 30 lb per square foot.

AquaBlok can be manufactured on site using the same manufacturing facility that would be used for manufacture of AquaGate. This reduces transportation costs. Approximately 2 acres of land with large buildings for weather protection is required.

Eric Blischke
CDM Smith
1220 SW Morrison, Suite 200
Portland, OR 97205
Office Phone: 503-205-7406
Cell Phone: 503-720-0754

Call Report

9200 Ward Parkway, Suite 500
Kansas City, MO – 64114
Tel: (816) 444-8270
Fax: (816) 523-2600

Project: Portland Harbor FS **Client:** EPA Region 10

Job No: 79171 **Date:** 2/12/2015

☐ **Phone in** ☒ **Phone out** ☒ **Current project** ☐ **Prospective project/Marketing** ☐ **Administrative**

☐ **Other**

Made by/Received by: Justin Nielsen

Talked with: Rob Freeman at Graymont (253-732-0605 [cell], 253-428-6550 [office])

Subject: Quicklime Cost

Distribution:

Discussion:

Graymont can supply quicklime from their Rivergate facility at 13939 North Rivergate Blvd, Portland, OR 97203. Material cost of quicklime from Rivergate facility is $239/TON FOB.

From the Safety Data Sheet on Graymont's website, density is 3.25-3.28 g/cm^3.

Action Required (what, who, when): No follow-up required.

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Menu

Shopping Cart

PROCEED TO CHECKOUT

Custom Aluminum Sign Builder was added to your shopping cart.

PRODUCT		PRICE	QTY	SUBTOTAL
	Custom Aluminum Sign Builder ***SKU:*** *G-CODE-3636R* ***Size / Reflectivity Options:*** 36" x 36" - Engineer Reflective ***Enter Wording and Instructions:*** Fish Advisory ***Background Color:*** White ***Wording and Border Color:*** Black ***Orientation (If applicable):*** Horizontal (Wide) ***Proofing Options:*** No, use best layout and ship	$165.75	1 Edit	$165.75

EMPTY CART UPDATE SHOPPING CART -OR- CONTINUE SHOPPING

Estimate Shipping and Tax

COUNTRY * United States

STATE/PROVINCE * Please select region, state or

ZIP *

ESTIMATE

SUBTOTAL $165.75

GRAND TOTAL $165.75

PROCEED TO CHECKOUT

- Orders shipped outside of NY state are tax exempt.
- If you are a tax exempt organization, contact us and we can set your account as tax exempt.
- Call **631-242-2828** if you have any questions or need help checking out.

Allstate Sign & Plaque
70 Burt Dr
Deer Park, NY 11729
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Installation Help
Petco Signage

Plaques
GSA Info
MUTCD Guidelines
Sign Shield
Privacy
Facebook

BBB ACCREDITED BUSINESS Click for Review

MONEY BACK 100% GUARANTEE

Items	Qty.	Price	Total
1/4" ISO Proof Coil Chain, General Purpose/Anchor Chain - G30 **Mfr.** Titan Marine Products **Part No.** 479550 | **Mfr No.** CHG30025ISO **Unit:** Foot Leaves Warehouse*: In-Stock (Ships In: 1 - 2 Days)	40 Remove	$1.69	**$67.60** **On Sale**
Large Regulatory Buoy, White w/ Label, 428R FREIGHT Note: Due to this item's shipping origin, weight or size; a shipping quote will be sent to you **after** you place your order. Contact us if you would like a shipping quote before placing your order. **Mfr.** Jim Buoy **Part No.** 218288 | **Mfr No.** 428R **Unit:** Each Leaves Warehouse*: 2 Weeks	1 Remove	$438.65	**$438.65**
River Anchor, Black Vinyl, #30 **Mfr.** SeaChoice **Part No.** 267581 | **Mfr No.** 41530 **Unit:** Each Leaves Warehouse*: In-Stock: 1 Day	1 Remove	$52.58	**$52.58** **On Sale**
			Update

Product Total: ** **$558.83**

Shipping & Handling:

United States | Postal/Zip Code | Go | --

See all available shipping options.

Continue Shopping | Checkout

Shipping Notes

***Leaves Warehouse:** Your order will ship from the warehouse in approximately the maximum "Leaves Warehouse" business days from the date the order is placed. Your actual delivery date will depend on your geographic location and chosen shipping method.

Please note that business days do not include weekends or holidays. If the delivery of your order is time sensitive, please contact our Customer Service Center to verify stock and suggest the most appropriate shipping method.

Customers Who Bought This Product Also Bought

$5.78

$42.33

$32.60 - $58.24

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Cost Estimate Backup
Previously Developed Costs by Anchor QEA

Note: Unit costs presented herein were developed by Anchor QEA in 2010. Only selected unit costs from this backup were utilized in the cost estimate. Green highlighting indicates unit costs that were used in the cost estimate.

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Table 2. Debris Removal and Disposal

ESTIMATE WORKSHEET 3.1

DEBRIS REMOVAL & DISPOSAL

BID DATE	PROJECT LOCATION	DESCRIPTION OF ITEM	ITEM NO.
			3.1

				PRODUCTION DATA				
				HOURS PER SHIFT	SHIFTS PER DAY	DAYS PER WEEK	DAILY UNIT PRODUCTION RATE	DAYS REQ. TO COMPLETE
TOTAL QUANTITY ON PROPOSAL	2 Acre							
QUANTITY				10	1	6	2	1

ESTIMATE WORKSHEET		TOTAL LABOR	TOTAL MATERIAL	TOTAL EQUIPMENT	TOTAL RENTED EQUIPMENT	TOTAL SUB-CONTRACTOR	TOTAL
WORKSHEET 3.1		$4,516.20	$3,614.00	$0.00	$5,076.00	$750.00	$13,956.20
							$0.00
GRAND TOTALS		$4,516.20	$3,614.00	$0.00	$5,076.00	$750.00	$13,956.20
UNIT PRICES		$3,010.80	$2,409.34	$0.00	$3,384.00	$500.00	

SUB-CONTRACTOR	WORK TO PERFORM	QUANTITY UNITS	UNIT COST		TOTAL COST
Disposal Assumption		15	$50.00		$750.00
					$0.00
					$0.00
					$0.00
					$0.00
					$0.00
BARE UNIT COST	$500.00	TOTAL COST			$750.00

UNIT PRICE	$9,304.14
UNIT OF MEASURE	Acre
OH&P 25%	$11,630

LABOR CLASSIFICATION	WORK TO PERFORM	TOTAL MEN	TOTAL HOURS	HRLY RATE	TOTAL COST
Crane Operator		1	10	$51.00	$510.00
Oiler		1	10	$50.00	$500.00
Captain	Tug	1	10	$54.00	$540.00
Laborer		3	10	$37.00	$1,110.00
Work Boat Labor		1	10	$37.00	$370.00
Teamster		1	10	$37.00	$370.00
Operator	Offload	1	10	$46.00	$460.00
17% OT			0		$656.20
BARE UNIT COST	$3,010.80	TOTAL LABOR COST			$4,516.20

OWN EQUIPMENT	WORK TO PERFORM	FUEL GALS.	TOTAL UNITS	TOTAL HOURS	HRLY RATE	TOTAL COST
BARE UNIT COS	$0.00	0		TOTAL SES COST		$0.00

MATERIAL / SERVICES		QUANTITY UNITS	UNIT COST		TOTAL COST
Fuel / Oil / Grease		405	$4.00		$1,620.00
PPE		9	$15.00		$135.00
Equipment Repair	7%	1	$216.30		$216.30
Oil Boom (FT)		250	$2.00		$500.00
Debris Curtain (FT)		250	$3.50		$875.00
					$0.00
					$0.00
					$0.00
					$0.00
					$0.00
					$0.00
					$0.00
					$0.00
TAX AT 8%					$267.70
BARE UNIT COST	$0.00	TOTAL MATERIAL COST			$3,614.00

RENTAL EQUIP	WORK TO PERFORM	FUEL GALS.	TOTAL UNITS	TOTAL HOURS	HRLY RATE	TOTAL COST
150 Ton Crane	Removal	120	1	10	$111.00	$1,110.00
Tug	Move	150	1	10	$60.00	$600.00
Work Boat		15	1	10	$56.00	$560.00
Scows	Debris	0	1	10	$68.00	$680.00
Barge		0	1	10	$54.00	$540.00
PC 300 long front	Unload	60	1	10	$50.00	$500.00
Dump Truck	Move	60	1	10	$32.00	$320.00
Clam Buck (10 cy)		0	1	10	$39.00	$390.00
		0		0	$0.00	$0.00
		0		0	$0.00	$0.00
		0		0	$0.00	$0.00
		0		0	$0.00	$0.00
		0		0	$0.00	$0.00
		0		0	$0.00	$0.00
		0		0	$0.00	$0.00
TAX 8%		0		0	$0.00	$376.00
BARE UNIT COS	$0.00	405		TOTAL RENTED EQUIP		$5,076.00

Table 3. Pile Removal

ESTIMATE WORKSHEET 3.2

PILE REMOVAL

BID DATE	PROJECT LOCATION	DESCRIPTION OF ITEM	ITEM NO.
			3.2

				HOURS PER SHIFT	SHIFTS PER DAY	DAYS PER WEEK	DAILY UNIT PRODUCTION RATE	DAYS REQ. TO COMPLETE
TOTAL QUANTITY ON PROPOSAL	25 EA							
QUANTITY				10	1	6	25	1

ESTIMATE WORKSHEET		TOTAL LABOR	TOTAL MATERIAL	TOTAL EQUIPMENT	TOTAL RENTED EQUIPMENT	TOTAL SUB-CONTRACTOR	TOTAL
		$3,510.00	$3,651.80		$4,287.60	$1,250.00	$12,699.40
GRAND TOTALS		$3,510.00	$3,651.80	$0.00	$4,287.60	$1,250.00	$12,699.40
UNIT PRICES		$140.40	$146.07	$0.00	$171.50	$50.00	

SUB-CONTRACTOR	WORK TO PERFORM	QUANTITY UNITS	UNIT COST		TOTAL COST
Pile Disposal		25	$50.00		$1,250.00
					$0.00
					$0.00
					$0.00
					$0.00
					$0.00
BARE UNIT COST	$50.00	TOTAL COST			$1,250.00

UNIT PRICE	$507.98
UNIT OF MEASURE	EA
OH&P 25%	$635

LABOR CLASSIFICATION	WORK TO PERFORM	TOTAL MEN	TOTAL HOURS	HRLY RATE	TOTAL COST
Crane Operator		1	10	$51.00	$510.00
Operator		2	10	$46.00	$920.00
Oiler		1	10	$46.00	$460.00
Laborer		3	10	$37.00	$1,110.00
17% OT					$510.00
BARE UNIT COST	$140.40	TOTAL LABOR COST			$3,510.00

OWN EQUIPMENT	WORK TO PERFORM	FUEL GALS.	TOTAL UNITS	TOTAL HOURS	HRLY RATE	TOTAL COST
		0		0	$0.00	$0.00
		0		0	$0.00	$0.00
		0		0	$0.00	$0.00
		0		0	$0.00	$0.00
		0		0	$0.00	$0.00
		0		0	$0.00	$0.00
		0		0	$0.00	$0.00
		0		0	$0.00	$0.00
		0		0	$0.00	$0.00
		0		0	$0.00	$0.00
		0		0	$0.00	$0.00
BARE UNIT COS	$0.00	0		TOTAL SES COST		$0.00

MATERIAL / SERVICES	QUANTITY UNITS	UNIT COST	UNIT OF MEAS.	TOTAL COST
Fuel / Oil / Grease	345	$ 4.00	GAL	$1,380.00
Equipment Repairs 7%				$135.10
PPE	7	$15.00		$116.20
Oil Boom (FT)	250	$2.00		$500.00
Debris Curtain (FT)	250	$5.00		$1,250.00
				$0.00
				$0.00
				$0.00
				$0.00
				$0.00
				$0.00
				$0.00
				$0.00
TAX AT 8%				$270.50
BARE UNIT COST	$146.07	TOTAL MATERIAL COST		$3,651.80

RENTAL EQUIP	WORK TO PERFORM	FUEL GALS.	TOTAL UNITS	TOTAL HOURS	HRLY RATE	TOTAL COST
150 Ton Crane		120	1	10	$111.00	$1,110.00
Barge 200x50		0	1	10	$107.00	$1,070.00
Tender 200 HP		20	1	10	$16.00	$160.00
Tug 800 HP		150	1	10	$60.00	$600.00
Debris Barge		0	1	10	$54.00	$540.00
ICE Vibratory		15	1	10	$22.00	$220.00
Air compressor		20	1	10	$5.00	$50.00
Welder/ Torch		20	1	10	$22.00	$220.00
		0		0	$0.00	$0.00
		0		0	$0.00	$0.00
		0		0	$0.00	$0.00
		0		0	$0.00	$0.00
		0		0	$0.00	$0.00
		0		0	$0.00	$0.00
		0		0	$0.00	$0.00
TAX AT 8%		0		0	$0.00	$317.60
BARE UNIT COS	$171.50	345		TOTAL RENTED EQUIP		$4,287.60

Table 4. Pile Replacement

ESTIMATE WORKSHEET 3.3

PILE REPLACEMENT

BID DATE	PROJECT LOCATION	DESCRIPTION OF ITEM	ITEM NO.
			3.3

				HOURS PER SHIFT	SHIFTS PER DAY	DAYS PER WEEK	DAILY UNIT PRODUCTION RATE	DAYS REQ. TO COMPLETE
TOTAL QUANTITY ON PROPOSAL	15 EA							
QUANTITY				10	1	6	15	1
ESTIMATE WORKSHEET		TOTAL LABOR	TOTAL MATERIAL	TOTAL EQUIPMENT	TOTAL RENTED EQUIPMENT		TOTAL SUB-CONTRACTOR	TOTAL
		$5,545.80	$68,863.18		$5,227.20		$0.00	$79,636.18
GRAND TOTALS		$5,545.80	$68,863.18	$0.00	$5,227.20		$0.00	$79,636.18
UNIT PRICES		$369.72	$4,590.88	$0.00	$348.48		$0.00	

SUB-CONTRACTOR	WORK TO PERFORM	QUANTITY UNITS	UNIT COST		TOTAL COST
					$0.00
					$0.00
					$0.00
					$0.00
					$0.00
					$0.00
BARE UNIT COST	$0.00	TOTAL COST			$0.00

UNIT PRICE	$5,309.08
UNIT OF MEASURE	EA
OH&P 25%	$6,636

LABOR CLASSIFICATION	WORK TO PERFORM	TOTAL MEN	TOTAL HOURS	HRLY RATE	TOTAL COST
Crane Operator		1	10	$51.00	$510.00
Operator		3	10	$46.00	$1,380.00
Oiler		2	10	$50.00	$1,000.00
Laborer		5	10	$37.00	$1,850.00
17% OT					$805.80
BARE UNIT COST	$369.72	TOTAL LABOR COST			$5,545.80

OWN EQUIPMENT	WORK TO PERFORM	FUEL GALS.	TOTAL UNITS	TOTAL HOURS	HRLY RATE	TOTAL COST
		0		0	$0.00	$0.00
		0		0	$0.00	$0.00
		0		0	$0.00	$0.00
		0		0	$0.00	$0.00
		0		0	$0.00	$0.00
		0		0	$0.00	$0.00
		0		0	$0.00	$0.00
		0		0	$0.00	$0.00
		0		0	$0.00	$0.00
		0		0	$0.00	$0.00
		0		0	$0.00	$0.00
BARE UNIT COS	$0.00	0		TOTAL SES COST		$0.00

MATERIAL / SERVICES	QUANTITY UNITS	UNIT COST	UNIT OF MEAS.	TOTAL COST
Fuel / Oil / Grease	425	$ 4.00	GAL	$1,700.00
Equipment Repairs 7%				$196.00
PPE	11	$15.00		$116.20
Oil Boom	250	$2.00		$500.00
Debris Curtain	250	$5.00		$1,250.00
12" Dia. Replacement Pile	15	$4,000.00		$60,000.00
				$0.00
				$0.00
				$0.00
				$0.00
				$0.00
				$0.00
				$0.00
TAX AT 8%				$5,100.98
BARE UNIT COST	$4,590.88	TOTAL MATERIAL COST		$68,863.18

RENTAL EQUIP	WORK TO PERFORM	FUEL GALS.	TOTAL UNITS	TOTAL HOURS	HRLY RATE	TOTAL COST
150 Ton Crane		120	1	10	$111.00	$1,110.00
Barge 200x50		0	1	10	$107.00	$1,070.00
Tender 200 HP		20	1	10	$16.00	$160.00
Tug 800 HP		150	1	10	$60.00	$600.00
Debris Barge		0	1	10	$54.00	$540.00
ICE Vibratory		15	1	10	$22.00	$220.00
Air compressor		20	1	10	$5.00	$50.00
Welder/ Torch		20	1	10	$22.00	$220.00
100 Ton Crane		80	1	10	$87.00	$870.00
		0		0	$0.00	$0.00
		0		0	$0.00	$0.00
		0		0	$0.00	$0.00
		0		0	$0.00	$0.00
		0		0	$0.00	$0.00
		0		0	$0.00	$0.00
TAX AT 8%		0		0	$0.00	$387.20
BARE UNIT COS	$348.48	425		TOTAL RENTED EQUIP		$5,227.20

Table 5. Temporary Dock Relocation

ESTIMATE WORKSHEET 3.4

TEMPORARY DOCK RELOCATION

BID DATE	PROJECT LOCATION	DESCRIPTION OF ITEM	ITEM NO.
			3.4

				HOURS PER SHIFT	SHIFTS PER DAY	DAYS PER WEEK	DAILY UNIT PRODUCTION RATE	DAYS REQ. TO COMPLETE
TOTAL QUANTITY ON PROPOSAL	1 Dock							
QUANTITY				10	1	6	1	1

ESTIMATE WORKSHEET		TOTAL LABOR	TOTAL MATERIAL	TOTAL EQUIPMENT	TOTAL RENTED EQUIPMENT	TOTAL SUB-CONTRACTOR	TOTAL
		$4,914.00	$3,793.50		$4,460.40	$58,170.55	$71,338.45
GRAND TOTALS		$4,914.00	$3,793.50	$0.00	$4,460.40	$58,170.55	$71,338.45
UNIT PRICES		$4,914.00	$3,793.50	$0.00	$4,460.40	$58,170.55	

SUB-CONTRACTOR	WORK TO PERFORM	QUANTITY UNITS	UNIT COST		TOTAL COST
10 Pile Replacement		10	$5,309.08		$53,090.78
10 Pile Removal		10	$507.98		$5,079.76
					$0.00
					$0.00
					$0.00
					$0.00
BARE UNIT COST	$58,170.55	TOTAL COST			$58,170.55

UNIT PRICE		$71,338.45
UNIT OF MEASURE		Dock
OH&P	25%	$89,173

LABOR CLASSIFICATION	WORK TO PERFORM	TOTAL MEN	TOTAL HOURS	HRLY RATE	TOTAL COST
Crane Operator		1	10	$51.00	$510.00
Operator		3	10	$46.00	$1,380.00
Oiler		1	10	$46.00	$460.00
Laborer		5	10	$37.00	$1,850.00
17% OT					$714.00
BARE UNIT COST	$4,914.00	TOTAL LABOR COST			$4,914.00

OWN EQUIPMENT	WORK TO PERFORM	FUEL GALS.	TOTAL UNITS	TOTAL HOURS	HRLY RATE	TOTAL COST
		0		0	$0.00	$0.00
		0		0	$0.00	$0.00
		0		0	$0.00	$0.00
		0		0	$0.00	$0.00
		0		0	$0.00	$0.00
		0		0	$0.00	$0.00
		0		0	$0.00	$0.00
		0		0	$0.00	$0.00
		0		0	$0.00	$0.00
		0		0	$0.00	$0.00
BARE UNIT COS	$0.00	0		TOTAL SES COST		$0.00

MATERIAL / SERVICES	QUANTITY UNITS	UNIT COST	UNIT OF MEAS.	TOTAL COST
Fuel / Oil / Grease	375	$ 4.00	GAL	$1,500.00
Equipment Repairs 7%				$146.30
PPE	10	$15.00		$116.20
Oil Boom	250	$2.00		$500.00
Debris Curtain	250	$5.00		$1,250.00
				$0.00
				$0.00
				$0.00
				$0.00
				$0.00
				$0.00
				$0.00
				$0.00
				$0.00
TAX AT 8%				$281.00
BARE UNIT COST	$3,793.50	TOTAL MATERIAL COST		$3,793.50

RENTAL EQUIP	WORK TO PERFORM	FUEL GALS.	TOTAL UNITS	TOTAL HOURS	HRLY RATE	TOTAL COST
150 Ton Crane		120	1	10	$111.00	$1,110.00
Barge 200x50		0	1	10	$107.00	$1,070.00
Tender 200 HP		20	1	10	$16.00	$160.00
Tug 800 HP		150	1	10	$60.00	$600.00
Pile Barge		0	1	10	$54.00	$540.00
ICE Vibratory		15	1	10	$22.00	$220.00
Air compressor		20	1	10	$5.00	$50.00
Welder/ Torch		20	1	10	$22.00	$220.00
Forklift		30	1	10	$16.00	$160.00
		0		0	$0.00	$0.00
		0		0	$0.00	$0.00
		0		0	$0.00	$0.00
		0		0	$0.00	$0.00
		0		0	$0.00	$0.00
		0		0	$0.00	$0.00
TAX AT 8%		0		0	$0.00	$330.40
BARE UNIT COS	$4,460.40	375		TOTAL RENTED EQUIP		$4,460.40

Table 6. Temporary Sheetpile Walls

ESTIMATE WORKSHEET 5.2

Temp. Sheet Pile Walls

BID DATE	PROJECT LOCATION			DESCRIPTION OF ITEM	ITEM NO.
					5.2

				PRODUCTION DATA				
				HOURS PER SHIFT	SHIFTS PER DAY	DAYS PER WEEK	DAILY UNIT PRODUCTION RATE	DAYS REQ. TO COMPLETE
TOTAL QUANTITY ON PROPOSAL	14 LF	3 pairs per day						
QUANTITY		Assume sheets 80'		10	1	6	14	1

ESTIMATE WORKSHEET		TOTAL LABOR	TOTAL MATERIAL	TOTAL EQUIPMENT	TOTAL RENTED EQUIPMENT	TOTAL SUB-CONTRACTOR	TOTAL
WORKSHEET 5.2		$4,800.00	$1,756.51		$5,130.00	$14,675.28	$26,362
							$0
							$0
							$0
GRAND TOTALS		$4,800.00	$1,756.51	$0.00	$5,130.00	$14,675.28	$26,362
UNIT PRICES		$355.56	$130.11	$0.00	$380.00	$1,087.06	

SUB-CONTRACTOR	WORK TO PERFORM	QUANTITY UNITS	UNIT COST		TOTAL COST			UNIT PRICE	$1,953
								UNIT OF MEASURE	LF
Purchase and deliver steel sheets		14	$1,082		$14,601			OH&P 25%	$2,440
Remove sheet pile wall		14	$433		$5,843				
Salvage Cost		14	-$427		-$5,769				
					$0				
					$0				
					$0				
BARE UNIT COST	$1,087.06	TOTAL COST			$14,675.28				

LABOR CLASSIFICATION	WORK TO PERFORM	TOTAL MEN	TOTAL HOURS	HRLY RATE	TOTAL COST	OWN EQUIPMENT	WORK TO PERFORM	FUEL GALS.	TOTAL UNITS	TOTAL HOURS	HRLY RATE	TOTAL COST
Laborer		8	10	$37.00	$2,960.00			0		0	$0.00	$0.00
Operator		4	10	$46.00	$1,840.00			0		0	$0.00	$0.00
			0	$0.00	$0.00			0		0	$0.00	$0.00
			0	$0.00	$0.00			0		0	$0.00	$0.00
			0	$0.00	$0.00			0		0	$0.00	$0.00
			0	$0.00	$0.00			0		0	$0.00	$0.00
			0	$0.00	$0.00			0		0	$0.00	$0.00
			0	$0.00	$0.00			0		0	$0.00	$0.00
			0	$0.00	$0.00			0		0	$0.00	$0.00
			0	$0.00	$0.00			0		0	$0.00	$0.00
			0	$0.00	$0.00			0		0	$0.00	$0.00
17% OT			0		$0.00			0		0	$0.00	$0.00
BARE UNIT COST	$0.00	TOTAL LABOR COST			$4,800.00	BARE UNIT COS	$0.00	0		TOTAL SES COST		$0.00

MATERIAL / SERVICES	QUANTITY UNITS	UNIT COST		TOTAL COST	RENTAL EQUIP	WORK TO PERFORM	FUEL GALS.	TOTAL UNITS	TOTAL HOURS	HRLY RATE	TOTAL COST
Fuel / Oil / Grease	345	$ 4.00	GAL	$1,380.00	150 Ton Crane		120	1	10	$111.00	$1,110.00
Equipment Repairs 7%				$152.60	Barge 200x50		0	1	10	$107.00	$1,070.00
PPE	12	$15.00		$93.80	Tender 200 HP		20	1	10	$16.00	$160.00
				$0.00	Tug 800 HP		150	1	10	$60.00	$600.00
				$0.00	ICE Vibratory		15	1	10	$22.00	$220.00
				$0.00	Air compressor		20	1	10	$47.00	$470.00
				$0.00	Welder/ Torch		20	1	10	$5.00	$50.00
				$0.00	Material Barge		0	1	10	$107.00	$1,070.00
				$0.00			0		0	$0.00	$0.00
				$0.00			0		0	$0.00	$0.00
				$0.00			0		0	$0.00	$0.00
				$0.00			0		0	$0.00	$0.00
				$0.00			0		0	$0.00	$0.00
				$0.00			0		0	$0.00	$0.00
				$0.00			0		0	$0.00	$0.00
TAX AT 8%				$130.11	TAX AT 8%		0		0	$0.00	$380.00
BARE UNIT COST	$130.11	TOTAL MATERIAL COST		$1,756.51	BARE UNIT COS	$380.00	345		TOTAL RENTED EQUIP		$5,130.00

Table 7. Silt Curtain Installation

ESTIMATE WORKSHEET 5.1

SILT CURTAIN INSTALLATION

BID DATE	PROJECT LOCATION	DESCRIPTION OF ITEM	ITEM NO.
			5.1

				PRODUCTION DATA				
				HOURS PER SHIFT	SHIFTS PER DAY	DAYS PER WEEK	DAILY UNIT PRODUCTION RATE	DAYS REQ. TO COMPLETE
TOTAL QUANTITY ON PROPOSAL	750 LF							
QUANTITY				10	1	6	750	1

ESTIMATE WORKSHEET		TOTAL LABOR	TOTAL MATERIAL	TOTAL EQUIPMENT	TOTAL RENTED EQUIPMENT	TOTAL SUB-CONTRACTOR	TOTAL
WORKSHEET 5.1		$2,808.00	$44,788.90		$1,252.80	$2,800.00	$51,649.70
							$0.00
							$0.00
							$0.00
GRAND TOTALS		$2,808.00	$44,788.90	$0.00	$1,252.80	$2,800.00	$51,649.70
UNIT PRICES		$3.74	$59.72	$0.00	$1.67	$3.73	

SUB-CONTRACTOR	WORK TO PERFORM	QUANTITY UNITS	UNIT COST		TOTAL COST
IWT Delivery		1	$2,800.00		$2,800.00
					$0.00
					$0.00
					$0.00
					$0.00
					$0.00
BARE UNIT COST	$0.00	TOTAL COST			$2,800.00

UNIT PRICE	$68.87
UNIT OF MEASURE	LF
OH&P 25%	$86

LABOR CLASSIFICATION	WORK TO PERFORM	TOTAL MEN	TOTAL HOURS	HRLY RATE	TOTAL COST
Laborer		4	10	$37.00	$1,480.00
Operator		2	10	$46.00	$920.00
			0	$0.00	$0.00
			0	$0.00	$0.00
			0	$0.00	$0.00
			0	$0.00	$0.00
			0	$0.00	$0.00
			0	$0.00	$0.00
			0	$0.00	$0.00
			0	$0.00	$0.00
			0	$0.00	$0.00
17% OT			0		$408.00
BARE UNIT COST	$0.00	TOTAL LABOR COST			$2,808.00

OWN EQUIPMENT	WORK TO PERFORM	FUEL GALS.	TOTAL UNITS	TOTAL HOURS	HRLY RATE	TOTAL COST
		0		0	$0.00	$0.00
		0		0	$0.00	$0.00
		0		0	$0.00	$0.00
		0		0	$0.00	$0.00
		0		0	$0.00	$0.00
		0		0	$0.00	$0.00
		0		0	$0.00	$0.00
		0		0	$0.00	$0.00
		0		0	$0.00	$0.00
		0		0	$0.00	$0.00
		0		0	$0.00	$0.00
BARE UNIT COS	$0.00	0		TOTAL SES COST		$0.00

MATERIAL / SERVICES		QUANTITY UNITS	UNIT COST		TOTAL COST
FOG	GAL	45	$4.00		$180.00
Equipment Repair	7%	1	$81.20		$81.20
PPE		6	$15.00		$90.00
Turbidity Curtains		800	$51.40		$41,120.00
					$0.00
					$0.00
					$0.00
					$0.00
					$0.00
					$0.00
					$0.00
					$0.00
					$0.00
					$0.00
TAX AT 8%					$3,317.70
BARE UNIT COST	$59.72	TOTAL MATERIAL COST			$44,788.90

RENTAL EQUIP	WORK TO PERFORM	FUEL GALS.	TOTAL UNITS	TOTAL HOURS	HRLY RATE	TOTAL COST
Work Boat		15	2	10	$56.00	$1,120.00
Forklift		30	1	2.5	$16.00	$40.00
		0		0	$0.00	$0.00
		0		0	$0.00	$0.00
		0		0	$0.00	$0.00
		0		0	$0.00	$0.00
		0		0	$0.00	$0.00
		0		0	$0.00	$0.00
		0		0	$0.00	$0.00
		0		0	$0.00	$0.00
		0		0	$0.00	$0.00
		0		0	$0.00	$0.00
TAX AT 8%		0		0	$0.00	$92.80
BARE UNIT COS	$1.67	45		TOTAL RENTED EQUIP		$1,252.80

Table 24. Upland Subtitle D Landfill Disposal Cost Buildup

Task	Unit	Quantity	Unit Cost	Total Cost	Basis/Notes
Transload Facility Development					
Transload facility permitting	LS	1	$40,000	$5,000	(1); Based on past experience normalized over total landfill disposal volume
Transload facility development	LS	1	$7,500,000	$863,000	(1,2); One time cost normalized over total estimated landfill disposal volume
Yearly property lease rate	ACRE	20	$23,500	$470,000	(3); Lease rate based on Port of Portland T6 public records.
Yearly gondola mobilization	Cars	500	$4,000	$2,000,000	(4); Car mobilization price from Waste Management
Materials Handling and Stabilization					
Materials handling from barge to upland stockpile	TON	345,000	$6	$2,070,000	(5); Offloading rate based on crane on dock and off-road trucks hauling to stockpile
Purchase Diatomaceous Earth (DE)	TON	17,250	$94	$1,622,000	Assumed 5% by weight mixing rate. DE price from Waste Management
Mix DE with dredged material to improve handling	TON	17,250	$2	$35,000	Cost based on end loader mixing DE and dredge material
Materials handling from stockpile to rail cars	TON	362,250	$5	$1,811,000	Cost assumes end loaders loading to rail cars on each side of stockpiles
Water treatment	1,000 gal	7,500	$10	$75,000	(6); Water treatment cost based on recent construction project.
Transportation and Disposal					
Rail transportation and tipping fee at Subtitle D landfill	TON	362,250	$50	$18,113,000	Price from Waste Management for unit train service.
Inspection and Monitoring of Transload Facility					
Labor inspections during operations	FTE	2.5	$75,000	$188,000	Assumes 7 people during 4 months of dredging and 1 during subsequent 2 months
Environmental monitoring direct costs during offloading	MONTH	4	$15,000	$60,000	Cost for boat, monitoring equipment and chemistry analysis
Reporting	Year	1	$40,000	$40,000	Based on past experience
Total Estimated Cost				**$27,352,000**	
Total Cubic Yards Handled Per Season				**230,000**	(7)
Total Tons Handled Per Season				**345,000**	Assumes 1.5 tons/cy unit weight
Estimated Cost Per Cubic Yard				**$119**	
Estimated Cost Per Ton				**$79**	

Notes:

(1) Assumed total dredge volume taken to upland landfill through life of facility: 2,000,000 cy
Alts B&C - ~200,000 to 1,260,000 cy (w/o in-water); 0 to 600,000 cy (w/ in-water)
Alts D&E - ~440,000 to 2,300,000 cy (w/o in-water); 0 to 600,000 cy (w/ in-water)
Alt F - ~2,200,000 to 6,698,000 cy (w/o in-water); 0 to 4,305,000 cy (w/ in-water)

(2) Assumption for site development:
- Pier/dock structure development/upgrade (~$1.5M)
- Addition of ~10,000 feet of new rail line & ~5 switches (~$3.5M)
- Creation of 12 to 15 acres of bermed stockpile areas holding up to 70,000 cy of sediment (~$1M)
- Mobilization of offloading equipment, off-road trucks, end loaders and other equipment (~$0.5M)
- Miscellaneous site improvements (utilities, water treatment, offices, etc.) (~$1M)

(3) Assumed another ~5 acres for support activities for total site need of 20 acres. Lease rate is yearly.

(4) Assuming 3,000 to 5,000 tons/day loaded out, 100 tons/gondola, and 10-day turnaround produces 300 to 500 rail cars needed each year.

(5) Assumes 230,000 cy/season and 1.5 tons/cy weight conversion.

(6) Assumes 15-acre stockpile receiving 37 inches/year of rain over the 6-month stockpile time.

(7) Assumes for transload volume per year:
- 85 to 105 days of dredging (5 to 6 days/week) in a 120-day construction window
- 700 cy/day/site and 2 to 3 cleanup sites being dredged at one time
- 10 to 15 acres of 5-foot stockpiles can hold between 70,000 and 120,000 cy for shipping to the landfill after the dredging season is complete.

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This document is currently under review by US EPA and its federal, state, and tribal partners, and is subject to change in whole or in part.

Table 29A. Material Costs

Material	Unit	FOB Plant Price	Barge Load Fee	Transport Fee[a]	Contractor Markup[b]	Total Unit Cost	Notes
Base Cap	Ton	$12	$0.5	$0.5	$1.63	$14.6	Knife River quote #7838 8/23/2010 from Gordy Jarman
Armor Material A	Ton	$15	$0.5	$0.5	$2.00	$18.0	Knife River quote #7838 8/23/2010 from Gordy Jarman
Armor Material B	Ton	$15	$0.5	$0.5	$2.00	$18.0	Knife River quote #7838 8/23/2010 from Gordy Jarman
Armor Material C	Ton	$15	$0.5	$0.5	$2.00	$18.0	Knife River quote #7838 8/23/2010 from Gordy Jarman
Armor Material D	Ton	$15	$0.5	$0.5	$2.00	$18.0	Knife River quote #7838 8/23/2010 from Gordy Jarman
ODOT 100	Ton	$27	$0.5	$0.5	$3.50	$31.5	Knife River quote #7838 8/23/2010 from Gordy Jarman
ODOT 200	Ton	$27	$0.5	$0.5	$3.50	$31.5	Knife River quote #7838 8/23/2010 from Gordy Jarman
Organoclay Mat	SF	$2.2	NA	$0.1	$0.29	$3.0	Increased the cost 15% to account for overlaps. Cetco quote 10/4/10 from James Wang

Notes:

[a] Assumes aggregate transported by barge and mat by truck to middle of harbor

[b] Contractor Markup: 12.5%

Table 29B. Vendor Quote

KNIFE RIVER
AN MDU RESOURCES COMPANY
OR CCB #2101 WA #M0RSEBI169BR

Quote #: 7838

Project Name:
WILLAMETTE RIVER PROJECT

Delivery Address:
T-4 WILLAMETTE RIVER

Customer: *ANCHOR QEA*
Attention: *Micheal Crystal*
P: 206-287-9130
mjcrystal@anchorqea.com

Source	Product Name	FOB Plant Price		Transfer Delivery		Solo Delivery	
Reichold	4"-3" SMALL COBBLES	$15.00	Ton	$22.00	Ton		
Reichold	2"-1" FINE GRAVEL	$15.00	Ton	$22.00	Ton		
Reichold	¾"-1/4" FINE GRAVEL	$15.00	Ton	$22.00	Ton		
Reichold	3 ½" -2 ½" COURSE GRAVEL	$15.00	Ton	$22.00	Ton		
Reichold	GRAVELLY SAND	$12.00	Ton	$19.00	Ton		
Angell Quarry	CLASS 100 RIP RAP	$20.00	Ton			$27.00	Ton
Angell Quarry	CLASS 200 RIP RAP	$20.00	Ton			$27.00	Ton
Angell Quarry	CLASS 700 RIP RAP	$25.00	Ton			$32.00	Ton
Angell Quarry	CLASS 2000 RIP RAP	$25.00	Ton			$32.00	Ton

The following terms will apply to material purchased at Knife River for this project:

1. Prices include standard ODOT quality control and process control tests at the plant during production of the above quoted product(s). Acceptance of materials supplied by Knife River is at the plant at the time of production.
2. All gradations per ODOT specifications unless otherwise stated. Materials contain natural moisture only.
3. Credit terms net 15th of month following invoice.
4. Prices are for all materials and dump sites quoted inclusive.
5. Per ton pricing is based upon full load deliveries. Short loads are priced at truck time plus materials.
6. Knife River will attempt to secure adequate trucking with a minimum of 48 hours notice.
7. If applicable, dump site agreement must be signed before any export will be accepted.
8. Conversion rates & proctors are for information only & shall not be used to determine pay quantities.
9. No retainage of any material purchased.

Remarks:

1. PRICING IS FOR BUDGET PURPOSES.
2. KNIFE RIVER HAS A BARGE LOAD OUT FACILITY IF BARGING MATERIAL IS AN OPTION.
3. THE PRICE TO RENT KNIFE RIVER'S 6000 TON BARGE, KR-1, IS $500 PER HOUR. THIS DOES NOT INCLUDE A TUGBOAT.
4. WE WILL LOAD THE ABOVE MATERIAL FROM THE REICHOLD SOURCE ONTO THE CUSTOMER'S BARGE FOR A FEE OF $0.50 PER TON.
5. THE RATE AT WHICH WE LOAD KR-1 IS 1500 TONS PER HOUR. IF NEEDED, KNIFE RIVER WILL BACK THAT SPEED DOWN TO 1000 TONS PER HOUR TO ACCOMMODATE THE CUSTOMER'S BARGES LOADING CAPABILITY.

Salesman: Gordy Jarman
Mobile: (503) 572-7236
Office: (503) 944-3500
gordy.jarman@kniferiver.com

Date of Origin: 8/23/2010
Quote Expires: 12/31/2010

Printed: 08/23/2010

Table 1. Harbor-wide, Long-term Monitoring and Maintenance Cost Backup

	Biota Tissue Monitoring	**Six Surface Water Transect Composites**	**50 Surface Sediment Samples**	**Mob and Demob**	**Data Report, Data Management, and Monitoring Report**
Labor					
Hours	768	1,020	364	160	1,360
Costs	$91,740	$121,560	$43,360	$18,960	$166,675
Sub-Contractors					
Laboratory analysis	$85,725	$33,264	$151,875		
Boat and core processing	$18,000	$53,180	$18,900		
Data Validation	$9,902	$3,961	$28,290		
Reimursables					
Vehicle rental	$2,000	$2,800	$1,100	$500	
Per diem	$17,500	$24,500	$8,250	$3,750	
Equipment	$4,860	$660	$600	$160	
Subtotal	$229,727	$239,925	$252,375	$23,370	$166,675

Harbor Wide Task[a]	**Cost**	**Cost with 40% Contingency**
Tissue monitoring	$420,000	$588,000
Surface water	$430,000	$602,000
Sediment	$442,000	$619,000

Note:

[a] Each task will be conducted separately; include mob and demob plus data management and reporting.

Table 2. MNR/EMNR Long-term Monitoring and Maintenance Cost Backup

	40 Power Grab Samples	**Mob and Demob**	**Data Report, Data Management, and Monitoring Report**	**Total**
Labor				
Hours	308	160	1,220	
Costs	$37,880	$18,960	$149,350	
Sub-Contractors				
Laboratory analysis	$78,840			
Boat and core processing	$18,620			
Data Vaolidation	$10,212			
Reimursables				
Vehicle rental	$900	$400		
Per diem	$8,250	$3,000		
Equipment	$520	$160		
Subtotal	$155,222	$22,520	$149,350	$327,000
Contingency (40%)				$131,000
Total				$458,000
Cost per Acre[a]				$4,600

Note:

[a] Cost normalized for a 10-acre area. As noted in the text, only 10 percent of that area would be monitored to serve as a surrogate for the remaining areas.

Table 3. In Situ Treatment Long-term Monitoring and Maintenance Cost Backup

	40 1-foot Cores and 40 Porewater Samples	**Mob and Demob**	**Data Report, Data Management, and Monitoring Report**	**Bathymetry**	**Total**
Labor					
Hours	946	460	1,304	0	
Costs	$112,660	$18,960	$159,045	$0	
Sub-Contractors					
Laboratory analysis	$363,600				
Boat and core processing	$24,290				
Data Vaolidation	$43,286				
Bathymetry				$40,000	
Reimursables					
Vehicle rental	$2,600	$400			
Per diem	$19,500	$3,000			
Equipment		$1,925	$160		
Subtotal	$565,936	$24,285	$159,205	$40,000	$789,000
Contingency (40%)					$316,000
Total					$1,105,000
Cost per Acre[a]					$111,000

Note:

[a] Costs normalized for a 10-acre area.

Table 4. Engineered Cap Long-term Monitoring and Maintenance Cost Backup

	40 4-foot Cores, 160 Samples	**Mob and Demob**	**Data Report, Data Management, and Monitoring Report**	**Bathymetry**	**Total**
Labor					
Hours	586	160	1,352	0	
Costs	$70,060	$18,960	$164,585	$0	
Sub-Contractors					
Laboratory analysis	$315,360				
Boat and core processing	$31,460				
Data Vaolidation	$40,848				
Bathymetry				$40,000	
Reimursables					
Vehicle rental	$1,800	$400			
Per diem	$13,500	$3,000			
Equipment	$660				
Subtotal	$473,688	$22,360	$164,585	$40,000	$701,000
Contingency (40%)					$280,000
Total					$981,000
Cost per Acre[a]					$98,000

Note:

[a] Costs normalized for a 10-acre area.

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Cost Estimate Backup
EPA-Derived MII Costs

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PROJECT:	Portland Harbor FS	COMPUTED BY :	MS	CHECKED BY:	JN
JOB NO.:	79171.3383.345	DATE :	3/1/2016	DATE CHECKED:	3/4/2016
CLIENT:	EPA Region 10			WRKSHT NO. :	PDSM-01

Description: Determination of number of shifts per day and number of crews needed and comparison to specific FS productivity assumptions.

General Assumptions

In-water work window, DY/YR:	122	
In-water work window, WK/YR:	17.4	
Number of dredging days per week, DY/WK:	6	
Actual dredging days per year, DY/YR:	104	
rall combined FS average daily dredging production, CY/DY:	5,100	*Per FS Engineers*
Overall combined FS average daily placement, CY/DY:	3,900	*Per FS Engineers*
FS average daily organoclay mat placement, SF/DY:	12,000	
Total Hours per Shift, HR:	12	
Crew shift time, breaks, etc., HR:	2	
Actual Work Hours per Shift, HR:	10	*Assumes crew shift time, breaks, etc. (approx. 2 hours)*

Dredging/Removal Activities	**Number of Shifts EA/DY**	**No. of Crews EA/DY**	**Total Hours HR/DY**	**Work Hours HR/DY**	**Unit Productivity CY/HR/SHIFT**	**Unit Productivity CY/DY/SHIFT**	**Overall Productivity CY/DY**
Open-Water Dredging	2	2	24	20	119.1	2,382	**4,764**
Confined Dredging	2	1	24	20	71.3	713	**1,426**
Riverbank Excavation	1	1	12	10	282.1	2,821	**2,821**

	Number of Shifts EA/DY	**No. of Crews EA/DY**	**Total Hours HR/DY**	**Work Hours HR/DY**	**Unit Productivity CY/HR/SHIFT**	**Unit Productivity CY/DY/SHIFT**	**Overall Productivity CY/DY**
Transfer to Barge (non-stabilized material)	2	2	24	20	133.7	1,337	**5,348**
In-Barge Stabilization	2	2	24	20	103	1,030	**4,120**

	Number of Shifts EA/DY	**No. of Crews EA/DY**	**Total Hours HR/DY**	**Work Hours HR/DY**
Dewatering and Water Treatment	2	1	24	20

	Number of Shifts EA/DY	**No. of Crews EA/DY**	**Total Hours HR/DY**	**Barge Time to Facility HR**	**Return Barge Time HR**
Transportation to Disposal Facility	1	1	12	24	18

	Number of Shifts EA/DY	**No. of Crews EA/DY**	**Total Hours HR/DY**	**Work Hours HR/DY**	**Unit Productivity CY/HR/SHIFT**	**Unit Productivity CY/DY/SHIFT**	**Overall Productivity CY/DY**
Offloading	2	2	24	20	171.6	1,716	**6,864**

Capping/Placement Activities	**Number of Shifts EA/DY**	**No. of Crews EA/DY**	**Total Hours HR/DY**	**Work Hours HR/DY**	**Unit Productivity CY/HR/SHIFT**	**Unit Productivity CY/DY/SHIFT**	**Overall Productivity CY/DY**
Armor Placement - Open Water	2	1	24	20	228.7	2,287	**4,574**
Beach Mix Placement - Open Water	2	1	24	20	228.7	2,287	**4,574**
Low Per Sand Placement - Open Water	2	1	24	20	228.7	2,287	**4,574**
Reactive Layer Placement - Open Water	2	1	24	20	228.7	2,287	**4,574**
Sand Placement - Open Water	2	1	24	20	228.7	2,287	**4,574**
Armor Placement - Confined	1	1	12	10	116.6	1,166	**1,166**
Beach Mix Placement - Confined	1	1	12	10	116.6	1,166	**1,166**
Low Per Sand Placement - Confined	1	1	12	10	116.6	1,166	**1,166**
Reactive Layer Placement - Confined	1	1	12	10	116.6	1,166	**1,166**
Sand Placement - Confined	1	1	12	10	116.6	1,166	**1,166**
Aquablok Placement - Confined	1	1	12	10	116.6	1,166	**1,166**
Sand for Backfill and Capping Riverbanks	1	1	12	10	116.6	1,166	**1,166**
Armor for Capping Riverbanks	1	1	12	10	116.6	1,166	**1,166**
Beachmix for Capping Riverbanks	1	1	12	10	116.6	1,166	**1,166**

CDM Smith

PROJECT:	Portland Harbor FS	COMPUTED BY :	MS	CHECKED BY:	JN
JOB NO.:	79171.3383.345	DATE :	3/1/2016	DATE CHECKED:	3/4/2016
CLIENT:	EPA Region 10			WRKSHT NO. :	PDSM-01

Description: Determination of number of shifts per day and number of crews needed and comparison to specific FS productivity assumptions.

	Number of Shifts EA/DY	No. of Crews EA/DY	Total Hours HR/DY	Work Hours HR/DY	Unit Productivity SF/HR/SHIFT	Unit Productivity SF/DY/SHIFT	Overall Productivity SF/DY
Organoclay Mat Placement - Open Water	1	1	12	10	1200	12,000	**12,000**
Organoclay Mat Placement - Confined	1	1	12	10	1200	12,000	**12,000**

PROJECT:	Portland Harbor FS	COMPUTED BY :	MS
JOB NO.:	79171.3383.345	DATE :	3/1/2016
CLIENT:	EPA Region 10		

CHECKED BY:	JN
DATE CHECKED:	3/4/2016
WRKSHT NO. :	CRW-01

Description: Assumptions for crew composition development. Adjusts crew composition based on productivity and duration determination. Adjusted crew man and equipment hours and adjusted productivity used to determine unit costs.

Overtime Assumptions

	# Days/Week	# Hrs/Shift	# Shifts/Day	# Work Hours/Shift 1st	2nd	3rd	Total Hrs/Day
Standard:	5	8	2	8	8	0	16
Actual:	6	8	2	12	12	0	24

Day	OT	Work
Monday	1	Y
Tuesday	1	Y
Wednesday	1	Y
Thursday	1.5	Y
Friday	1.5	Y
Saturday	1.5	Y
Sunday	1.5	N

MII Calculated Labor Overtime Percentage:	13.89%
MII Calculated Equipment Overtime Percentage:	-72.22%

Open Water Dredging with Clamshell

Number of Shifts, EA/DY:	2	*See Worksheet PDSM-01*
Number of Crews, EA/DY:	2	*See Worksheet PDSM-01*
Dredge time, HR/DY:	40	*See Worksheet PDSM-01*
Adjusted productivity, CY/DY:	**4,764**	*See Worksheet PDSM-01*
Total time, HR/DY:	24	
Adjusted productivity, CY/HR:	**198.5**	*Takes into account total shift time, not just work time.*

MII Assumptions

Labor Tag	Labor	Crew Labor Type	Crew Man Hours	Adj. Crew Man Hours
B-EQOPRCRB	Equip. Operators Crane with Boom Pay	Journeyman	1	**2**
X-EQOPROIL	Outside Equip. Oilers / Grade Checker	Journeyman	1	**2**
X-LABORER4	Outside Laborers, Group 4 Skilled	Foreman	1	**2**
X-LABORER4	Outside Laborers, Group 4 Skilled	Journeyman	4	**8**

Equip Tag	Equipment	Condition	Eq. Hours	Adj. Crew Eq. Hours
XX0XX410	BARGE MOUNTED CLAMSHELL, 10 CY CRANE	Average	1	**2**
XX0XX810	DUMP SCOW BARGE, 3,000 CY	Average	2	**4**
M10SM004	MARINE EQUIPMENT, BOATS & LAUNCHES, 23' LITTLE GIANT, W/CABIN TRI-HULL, CAP 3,400 LBS, OUTBOARD, 23.4' X 8.5' X 1.2'	Average	2	**4**
U-MISC-010	Miscellaneous Equipment (crane mats, etc.)	Average	1	**2**

PROJECT:	Portland Harbor FS	COMPUTED BY :	MS	CHECKED BY:	JN
JOB NO.:	79171.3383.345	DATE :	3/1/2016	DATE CHECKED:	3/4/2016
CLIENT:	EPA Region 10			WRKSHT NO. :	CRW-01

Description: Assumptions for crew composition development. Adjusts crew composition based on productivity and duration determination. Adjusted crew man and equipment hours and adjusted productivity used to determine unit costs.

Confined Dredging with Barge-Mounted Excavator

Number of Shifts, EA/DY:	2	*See Worksheet PDSM-01*
Number of Crews, EA/DY:	1	*See Worksheet PDSM-01*
Dredge time, HR/DY:	20	*See Worksheet PDSM-01*
Adjusted productivity, CY/DY:	**1,426**	*See Worksheet PDSM-01*
Total time, HR/DY:	24	
Adjusted productivity, CY/HR:	**59.4**	

MII Assumptions

Labor Tag	Labor	Crew Labor Type	Man Hours	Adj. Crew Man Hours
B-EQOPRCRB	Equip. Operators Crane with Boom Pay	Journeyman	1	**1**
X-LABORER4	Outside Laborers, Group 4 Skilled	Foreman	1	**1**
X-LABORER4	Outside Laborers, Group 4 Skilled	Journeyman	1	**1**
X-EQOPRMED	Outside Equip. Operators, Medium	Journeyman	1	**1**

Equip Tag	Equipment	Condition	Eq Hours	Adj. Crew Eq. Hours
H25Z3215	HYDRAULIC EXCAVATOR, CRAWLER, 140,000 LB (63,503 KG), 4.00 CY (3.1 M3) BUCKET, 31.4' (9.6 M) MAX DIGGING DEPTH	Average	1	**1**
M10XX022	MARINE EQUIPMENT, BOATS & LAUNCHES, 45' LENGTH, 16' BEAM, 5' 0" DRAFT, PUSH BOAT	Average	1	**1**
M10SM004	MARINE EQUIPMENT, BOATS & LAUNCHES, 23' LITTLE GIANT, W/CABIN TRI-HULL, CAP 3,400 LBS, OUTBOARD, 23.4' X 8.5' X 1.2'	Average	1	**1**
XX0XX740	WORK BARGE, FLAT DECK, 2000 TON WITH 4 SPUDS	Average	4	**4**
XX0XX800	DUMP SCOW BARGE, 1,500 CY	Average	4	**4**
U-MISC-010	Miscellaneous Equipment (crane mats, etc.)	Average	1	**1**

Riverbank Excavation with Barge-Mounted Excavator

Number of Shifts, EA/DY:	1	*See Worksheet PDSM-01*
Number of Crews, EA/DY:	1	*See Worksheet PDSM-01*
Dredge time, HR/DY:	10	*See Worksheet PDSM-01*
Adjusted productivity, CY/DY:	**2,821**	*See Worksheet PDSM-01*
Total time, HR/DY:	12	
Adjusted productivity, CY/HR:	**235.1**	

MII Assumptions

Labor Tag	Labor	Labor Type	Man Hours	Adj. Crew Man Hours
B-EQOPRCRN	Equip. Operators, Heavy	Journeyman	1	**1**
B-LABORER	Laborers, (Semi-Skilled)	Foreman	1	**1**
B-LABORER	Laborers, (Semi-Skilled)	Journeyman	2	**2**
X-EQOPRMED	Outside Equip. Operators, Medium	Journeyman	1	**1**

Equip Tag	Equipment	Condition	Eq Hours	Adj. Crew Eq. Hours
H25Z3215	HYDRAULIC EXCAVATOR, CRAWLER, 140,000 LB (63,503 KG), 4.00 CY (3.1 M3) BUCKET, 31.4' (9.6 M) MAX DIGGING DEPTH	Average	1	**1**
XX0XX800	DUMP SCOW BARGE, 1,500 CY	Average	2	**2**
S30KB033	SCREENING & CRUSHING PLANTS, CONVEYOR, ADJUSTABLE HEIGHT RADIAL STACKER, 36" WIDE X 150' LONG, PORTABLE, 2,000 TPH	Average	1	**1**
M10XX022	MARINE EQUIPMENT, BOATS & LAUNCHES, 45' LENGTH, 16' BEAM, 5' 0" DRAFT, PUSH BOAT	Average	1	**1**
XX0XX740	WORK BARGE, FLAT DECK, 2000 TON WITH 4 SPUDS	Average	1	**1**

PROJECT:	Portland Harbor FS	COMPUTED BY :	MS	CHECKED BY:	JN
JOB NO.:	79171.3383.345	DATE :	3/1/2016	DATE CHECKED:	3/4/2016
CLIENT:	EPA Region 10			WRKSHT NO. :	CRW-01

Description: Assumptions for crew composition development. Adjusts crew composition based on productivity and duration determination. Adjusted crew man and equipment hours and adjusted productivity used to determine unit costs.

Dewatering and Treatment

Number of Shifts, EA/DY:	**2**	*See Worksheet PDSM-01*
Number of Crews, EA/DY:	**1**	*See Worksheet PDSM-01*
Dewatering and Water Treatment time, HR/DY:	20	*See Worksheet PDSM-01*

MII Assumptions

Labor Tag	Labor	Labor Type	Man Hours	Adj. Crew Man Hours
X-LABORER4	Outside Laborers, Group 4 Skilled	Foreman	1	**1**
X-LABORER4	Outside Laborers, Group 4 Skilled	Journeyman	2	**2**

Equip Tag	Equipment	Condition	Eq Hours	Adj. Crew Eq. Hours
M10SM004	MARINE EQUIPMENT, BOATS & LAUNCHES, 23' LITTLE GIANT, W/CABIN TRI-HULL, CAP 3,400 LBS, OUTBOARD, 23.4' X 8.5' X 1.2'	Average	1	**1**
P50WC004	PUMP, WATER, CENTRIFUGAL, TRASH, ENGINE DRIVE, 6" DIA, 1,300 GPM @ 100' HEAD ,TRAILER MTD (ADD HOSES)	Average	1	**1**
P50Z5099	PUMP, WATER, CENTRIFUGAL, TRASH, HOSE, SUCTION/DISCH, 6" (150 MM) DIA X 50' (15 M) WITH COUPLING (PER SECTION)	Average	2	**2**
P50GR008	PUMP, WATER, CENTRIFUGAL, TRASH, HOSE, DISCH, 6" DIA X 50' WITH COUPLING (PER SECTION)	Average	6	**6**
XX0XX740	WORK BARGE, FLAT DECK, 2000 TON WITH 4 SPUDS	Average	1	**1**

Mobilization/Demobilization

U-B-MANAGE-150	Delivery/pick-up fees for frac tank rental	2	**2**	
U-B-MANAGE-170	Delivery/pick-up fees for temporary water treatment plant rental	1	**1**	

Rental Equipment

U-B-MANAGE-180	Temporary water treatment plant rental	1	**1**	
U-B-MANAGE-190	Carbon disposal	0	**0.167**	*Weekly carbon changeo*
U-B-MANAGE-160	Frac tank rental	2	**2**	

Transfer to Hauling Barge - Open Water Dredging (for non-stabilized material)

Number of Shifts, EA/DY:	2	*See Worksheet PDSM-01*
Number of Crews, EA/DY:	2	*See Worksheet PDSM-01*
Adjusted productivity, CY/DY:	**5,348**	*See Worksheet PDSM-01*
Work time, HR/DY:	24	*See Worksheet PDSM-01*
Adjusted productivity, CY/HR:	**222.8**	

MII Assumptions

Labor Tag	Labor	Labor Type	Man Hours	Adj. Crew Man Hours
X-EQOPRHVY	Outside Equip. Operators, Heavy	Journeyman	1	**2**
B-EQOPRCRN	Equip. Operators, Heavy	Journeyman	1	**2**
X-LABORER4	Outside Laborers, Group 4 Skilled	Journeyman	1	**2**
B-LABORER	Laborers, (Semi-Skilled)	Journeyman	1	**2**

Equip Tag	Equipment	Condition	Eq Hours	Adj. Crew Eq. Hours
H25Z3215	HYDRAULIC EXCAVATOR, CRAWLER, 140,000 LB (63,503 KG), 4.00 CY (3.1 M3) BUCKET, 31.4' (9.6 M) MAX DIGGING DEPTH	Average	1	**2**
XX0XX740	WORK BARGE, FLAT DECK, 2000 TON WITH 4 SPUDS	Average	1	**2**
XX0XX810	DUMP SCOW BARGE, 3,000 CY	Average	1	**2**
M10XX019	MARINE EQUIPMENT, ALL OTHER BARGES, HOPPER, 200' X 35' X 12', 1,600 TON (COVERED)	Average	1	**2**
M10XX033	MARINE EQUIPMENT, TUGS, 60 FT LENGTH, 21 FT BEAM, 5'0" DRAFT, 80 TON, TOW BOAT	Average	1	**2**
M10SM004	MARINE EQUIPMENT, BOATS & LAUNCHES, 23' LITTLE GIANT, W/CABIN TRI-HULL, CAP 3,400 LBS, OUTBOARD, 23.4' X 8.5' X 1.2'	Average	1	**2**
U-MISC-010	Miscellaneous Equipment (crane mats, etc.)	Average	1	**2**

PROJECT:	Portland Harbor FS	COMPUTED BY :	MS	CHECKED BY:	JN
JOB NO.:	79171.3383.345	DATE :	3/1/2016	DATE CHECKED:	3/4/2016
CLIENT:	EPA Region 10			WRKSHT NO. :	CRW-01

Description: Assumptions for crew composition development. Adjusts crew composition based on productivity and duration determination. Adjusted crew man and equipment hours and adjusted productivity used to determine unit costs.

Transfer to Hauling Barge - Confined Dredging (for non-stabilized material)

Number of Shifts, EA/DY:	2	*See Worksheet PDSM-01*
Number of Crews, EA/DY:	2	*See Worksheet PDSM-01*
Adjusted productivity, CY/DY:	**5,348**	*See Worksheet PDSM-01*
Work time, HR/DY:	24	*See Worksheet PDSM-01*
Adjusted productivity, CY/HR:	**222.8**	

MII Assumptions

Labor Tag	Labor	Labor Type	Man Hours	Adj. Crew Man Hours
X-EQOPRHVY	Outside Equip. Operators, Heavy	Journeyman	1	**2**
B-EQOPRCRN	Equip. Operators, Heavy	Journeyman	1	**2**
X-LABORER4	Outside Laborers, Group 4 Skilled	Journeyman	1	**2**
B-LABORER	Laborers, (Semi-Skilled)	Journeyman	1	**2**

Equip Tag	Equipment	Condition	Eq Hours	Adj. Crew Eq. Hours
H25Z3215	HYDRAULIC EXCAVATOR, CRAWLER, 140,000 LB (63,503 KG), 4.00 CY (3.1 M3) BUCKET, 31.4' (9.6 M) MAX DIGGING DEPTH	Average	1	**2**
XX0XX740	WORK BARGE, FLAT DECK, 2000 TON WITH 4 SPUDS	Average	1	**2**
XX0XX800	DUMP SCOW BARGE, 1,500 CY	Average	1	**2**
M10XX019	MARINE EQUIPMENT, ALL OTHER BARGES, HOPPER, 200' X 35' X 12', 1,600 TON (COVERED)	Average	1	**2**
M10XX033	MARINE EQUIPMENT, TUGS, 60 FT LENGTH, 21 FT BEAM, 5'0" DRAFT, 80 TON, TOW BOAT	Average	1	**2**
M10SM004	MARINE EQUIPMENT, BOATS & LAUNCHES, 23' LITTLE GIANT, W/CABIN TRI-HULL, CAP 3,400 LBS, OUTBOARD, 23.4' X 8.5' X 1.2'	Average	1	**2**
U-MISC-010	Miscellaneous Equipment (crane mats, etc.)	Average	1	**2**

In-Barge Stabilization

Number of Shifts, EA/DY:	2	*See Worksheet PDSM-01*
Number of Crews, EA/DY:	2	*See Worksheet PDSM-01*
Dredge time, HR/DY:	40	*See Worksheet PDSM-01*
Adjusted productivity, CY/DY:	**4,120**	*See Worksheet PDSM-01*
Work time, HR/DY:	24	
Adjusted productivity, CY/HR:	**171.7**	

MII Assumptions

Labor Tag	Labor	Labor Type	Man Hours	Adj. Crew Man Hours
X-EQOPRHVY	Outside Equip. Operators, Heavy	Journeyman	2	**4**
B-EQOPRCRN	Equip. Operators, Heavy	Journeyman	2	**4**
X-EQOPROIL	Outside Equip. Oilers / Grade Checker	Journeyman	1	**2**
X-LABORER4	Outside Laborers, Group 4 Skilled	Journeyman	2	**4**
B-LABORER	Laborers, (Semi-Skilled)	Journeyman	2	**4**

Equip Tag	Equipment	Condition	Eq Hours	Adj. Crew Eq. Hours
H25Z3215	HYDRAULIC EXCAVATOR, CRAWLER, 140,000 LB (63,503 KG), 4.00 CY (3.1 M3) BUCKET, 31.4' (9.6 M) MAX DIGGING DEPTH	Average	2	**4**
XX0XX740	WORK BARGE, FLAT DECK, 2000 TON WITH 4 SPUDS	Average	2	**4**
M10XX019	MARINE EQUIPMENT, ALL OTHER BARGES, HOPPER, 200' X 35' X 12', 1,600 TON (COVERED)	Average	5	**10**
M10XX033	MARINE EQUIPMENT, TUGS, 60 FT LENGTH, 21 FT BEAM, 5'0" DRAFT, 80 TON, TOW BOAT	Average	1	**2**
M10SM004	MARINE EQUIPMENT, BOATS & LAUNCHES, 23' LITTLE GIANT, W/CABIN TRI-HULL, CAP 3,400 LBS, OUTBOARD, 23.4' X 8.5' X 1.2'	Average	1	**2**

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CLIENT:	EPA Region 10			WRKSHT NO. :	CRW-01

Description: Assumptions for crew composition development. Adjusts crew composition based on productivity and duration determination. Adjusted crew man and equipment hours and adjusted productivity used to determine unit costs.

Barge Transportation to Disposal Facility

Number of Shifts, EA/DY:	1	*See Worksheet PDSM-01*
Number of Crews, EA/DY:	1	*See Worksheet PDSM-01*
Barge time to disposal facility, HR:	24	*See Worksheet PDSM-01*
Barge time return, HR:	18	*See Worksheet PDSM-01*
Total crew time, HR:	**42**	

MII Assumptions

Labor Tag	Labor	Labor Type	Man Hours	Adj. Crew Man Hours
X-EQOPRHVY	Outside Equip. Operators, Heavy	Journeyman	2	**2**
X-LABORER4	Outside Laborers, Group 4 Skilled	Foreman	1	**1**
X-LABORER4	Outside Laborers, Group 4 Skilled	Journeyman	1	**1**

Equip Tag	Equipment	Condition	Eq Hours	Adj. Crew Eq. Hours
M10XX036	MARINE EQUIPMENT, TUGS, 120 FT LENGTH, 34 FT BEAM, 8'0" DRAFT, 80 TON, TOW BOAT	Average	1	**1**
M10XX019	MARINE EQUIPMENT, ALL OTHER BARGES, HOPPER, 200' X 35' X 12', 1,600 TON (COVERED)	Average	1	**1**

Offloading

Number of Shifts, EA/DY:	2	*See Worksheet PDSM-01*
Number of Crews, EA/DY:	2	*See Worksheet PDSM-01*
Dredge time, HR/DY:	40	*See Worksheet PDSM-01*
Adjusted productivity, CY/DY:	**6,864**	*See Worksheet PDSM-01*
Work time, HR/DY:	24	
Adjusted productivity, CY/HR:	**286.0**	

MII Assumptions

Labor Tag	Labor	Labor Type	Man Hours	Adj. Crew Man Hours
B-EQOPRCRN	Equip. Operators, Heavy	Journeyman	1	**2**
X-LABORER4	Outside Laborers, Group 4 Skilled	Foreman	1	**2**
X-LABORER4	Outside Laborers, Group 4 Skilled	Journeyman	2	**4**
X-EQOPROIL	Outside Equip. Oilers / Grade Checker	Journeyman	1	**2**

Equip Tag	Equipment	Condition	Eq Hours	Adj. Crew Eq. Hours
XX0XX410	BARGE MOUNTED CLAMSHELL, 10 CY CRANE	Average	1	**2**
M10XX022	MARINE EQUIPMENT, BOATS & LAUNCHES, 45' LENGTH, 16' BEAM, 5' 0" DRAFT, PUSH BOAT	Average	1	**2**

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Description: Assumptions for crew composition development. Adjusts crew composition based on productivity and duration determination. Adjusted crew man and equipment hours and adjusted productivity used to determine unit costs.

Placement - Open Water

Number of Shifts, EA/DY:	2	*See Worksheet PDSM-01*
Number of Crews, EA/DY:	1	*See Worksheet PDSM-01*
Placement time, HR/DY:	20	*See Worksheet PDSM-01*
Adjusted productivity, CY/DY:	**4,574**	*See Worksheet PDSM-01*
Work time, HR/DY:	24	
Adjusted productivity, CY/HR:	**190.6**	

MII Assumptions

Labor Tag	Labor	Labor Type	Man Hours	Adj. Crew Man Hours
B-EQOPRCRB	Equip. Operators Crane with Boom Pay	Journeyman	1	**1**
X-LABORER4	Outside Laborers, Group 4 Skilled	Journeyman	1	**1**
X-LABORER4	Outside Laborers, Group 4 Skilled	Foreman	1	**1**
X-EQOPRHVY	Outside Equip. Operators, Heavy	Journeyman	2	**2**
X-EQOPROIL	Outside Equip. Oilers / Grade Checker	Journeyman	1	**1**

Equip Tag	Equipment	Condition	Eq Hours	Adj. Crew Eq. Hours
XX0XX410	BARGE MOUNTED CLAMSHELL, 10 CY CRANE	Average	1	**1**
XX0XX810	DUMP SCOW BARGE, 3,000 CY	Average	3	**3**
M10XX033	MARINE EQUIPMENT, TUGS, 60 FT LENGTH, 21 FT BEAM, 5'0" DRAFT, 80 TON, TOW BOAT	Average	1	**1**
M10SM004	MARINE EQUIPMENT, BOATS & LAUNCHES, 23' LITTLE GIANT, W/CABIN TRI-HULL, CAP 3,400 LBS, OUTBOARD, 23.4' X 8.5' X 1.2'	Average	2	**2**
U-MISC-010	Miscellaneous Equipment (crane mats, etc.)	Average	1	**1**

Placement - Confined

Number of Shifts, EA/DY:	1	*See Worksheet PDSM-01*
Number of Crews, EA/DY:	1	*See Worksheet PDSM-01*
Placement time, HR/DY:	10	*See Worksheet PDSM-01*
Adjusted productivity, CY/DY:	**1,166**	*See Worksheet PDSM-01*
Work time, HR/DY:	12	
Adjusted productivity, CY/HR:	**97.2**	

MII Assumptions

Labor Tag	Labor	Labor Type	Man Hours	Adj. Crew Man Hours
B-EQOPRCRN	Equip. Operators, Heavy	Journeyman	1	**1**
X-EQOPRHVY	Outside Equip. Operators, Heavy	Journeyman	1	**1**
X-LABORER4	Outside Laborers, Group 4 Skilled	Foreman	1	**1**
X-LABORER4	Outside Laborers, Group 4 Skilled	Journeyman	2	**2**
X-EQOPRMED	Outside Equip. Operators, Medium	Journeyman	1	**1**

Equip Tag	Equipment	Condition	Eq Hours	Adj. Crew Eq. Hours
H25Z3215	HYDRAULIC EXCAVATOR, CRAWLER, 140,000 LB (63,503 KG), 4.00 CY (3.1 M3) BUCKET, 31.4' (9.6 M) MAX DIGGING DEPTH	Average	1	**1**
M10XX033	MARINE EQUIPMENT, TUGS, 60 FT LENGTH, 21 FT BEAM, 5'0" DRAFT, 80 TON, TOW BOAT	Average	1	**1**
M10SM004	MARINE EQUIPMENT, BOATS & LAUNCHES, 23' LITTLE GIANT, W/CABIN TRI-HULL, CAP 3,400 LBS, OUTBOARD, 23.4' X 8.5' X 1.2'	Average	1	**1**
XX0XX740	WORK BARGE, FLAT DECK, 2000 TON WITH 4 SPUDS	Average	2	**2**
XX0XX800	DUMP SCOW BARGE, 1,500 CY	Average	2	**2**
M10XX022	MARINE EQUIPMENT, BOATS & LAUNCHES, 45' LENGTH, 16' BEAM, 5' 0" DRAFT, PUSH BOAT	Average	1	**1**
S30KB033	SCREENING & CRUSHING PLANTS, CONVEYOR, ADJUSTABLE HEIGHT RADIAL STACKER, 36" WIDE X 150' LONG, PORTABLE, 2,000 TPH	Average	1	**1**
U-MISC-010	Miscellaneous Equipment (crane mats, etc.)	Average	1	**1**

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Description: Assumptions for crew composition development. Adjusts crew composition based on productivity and duration determination. Adjusted crew man and equipment hours and adjusted productivity used to determine unit costs.

Placement - Organoclay Mat

Number of Shifts, EA/DY:	1	*See Worksheet PDSM-01*
Number of Crews, EA/DY:	1	*See Worksheet PDSM-01*
Placement time, HR/DY:	10	*See Worksheet PDSM-01*
Adjusted productivity, SF/DY:	**12,000**	*See Worksheet PDSM-01*
Work time, HR/DY:	12	
Adjusted productivity, SF/HR:	**1,000.0**	

MII Assumptions

Labor Tag	Labor	Labor Type	Man Hours	Adj. Crew Man Hours
X-EQOPRHVY	Outside Equip. Operators, Heavy	Journeyman	1	**1**
B-EQOPRCRN	Equip. Operators, Heavy	Journeyman	1	**1**
X-EQOPROIL	Outside Equip. Oilers / Grade Checker	Journeyman	1	**1**
X-EQOPRMED	Outside Equip. Operators, Medium	Journeyman	1	**1**
X-LABORER4	Outside Laborers, Group 4 Skilled	Foreman	1	**1**
X-LABORER4	Outside Laborers, Group 4 Skilled	Journeyman	3	**3**

Equip Tag	Equipment	Condition	Eq Hours	Adj. Crew Eq. Hours
M10XX033	MARINE EQUIPMENT, TUGS, 60 FT LENGTH, 21 FT BEAM, 5'0" DRAFT, 80 TON, TOW BOAT	Average	1	**1**
XX0XX520	BARGE MOUNTED CRANE, 150 TON, 150' BOOM, FOR LIFTING	Average	1	**1**
M10XX005	MARINE EQUIPMENT, FLAT-DECK CARGO BARGE, 120' X 30' X 7.25', 400 TON	Average	1	**1**
F10Z3040	FORK LIFT, ROUGH TERRAIN, 8,000 LB (3629 KG), 16.0' (4.9 M) HIGH, TELESCOPING MAST	Average	1	**1**
M10SM004	MARINE EQUIPMENT, BOATS & LAUNCHES, 23' LITTLE GIANT, W/CABIN TRI-HULL, CAP 3,400 LBS, OUTBOARD, 23.4' X 8.5' X 1.2'	Average	1	**1**

PROJECT:	Portland Harbor FS	COMPUTED BY :	MS	CHECKED BY:	JN
JOB NO.:	79171.3383.345	DATE :	3/1/2016	DATE CHECKED:	3/4/2016
CLIENT:	EPA Region 10			WRKSHT NO. :	PD-01

Description: Determine estimated productivities for typical crews including open water dredging, confined dredging, riverbank excavation, in-barge stabilization, off-loading, and placement of various cap materials.

Open Water Dredging - Clam Shell

Assumptions

Dredging

Total Hours per Shift, HR:	12
Crew shift time, breaks, etc., HR:	2
Actual Work Hours per Shift*, HR:	10

**Assumes crew shift time, breaks, etc. (approx. 2 hours)*

Assumed Bucket Capacity, CY:	10
Work Efficiency, %:	90%
Operator Ability Correction Factor:	0.9
Bucket Fill Factor, %:	60%
Load Time, MIN:	1
Swing Time Loaded, MIN:	0.25
Dump Time, MIN:	0.20
Swing Time Unloaded, MIN:	0.25
Maneuver Time, MIN:	0.75

Hauling for Disposal

Travel time to facility per barge, HR:	24
Return time per barge, HR:	24
Assumed barge capacity, CY:	3000
Assumed barge fill factor, %	95%

Productivity Calculations

Clamshell Volume	CY	10
Clamshell Fill Factor	%	60%
Clamshell Payload	CY	6
Cycle Time	MIN/cycle	2.45
	Cycle/HR	24
Ideal Clamshell Productivity	BCY/HR	147
Work Efficiency	%	90%
Operator Ability Correction Factor		0.9
Dredging Productivity	BCY/HR	119.1
	BCY/SHIFT	**1,191**
Barge volume	CY	3000
Barge Fill Factor	%	95%
Barge Payload	CY	2850
Cycle Time	HR/cycle	48
Barge Productivity	CY/HR	59.4
	CY/DY	2850
No. of Barges Anticipated	EA/DY	2
Adj. Barge Productivity	CY/DY	5700
No. of Shifts	**EA**	**2**
No. of Crews	**EA**	**2**
Adj. Dredging Productivity	**CY/DY**	**4,764**
Volume to Dredge	**CY**	**513,840**
Dredge Time	**DY**	**108**
No. of barges needed	**EA**	**181**

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Description: Determine estimated productivities for typical crews including open water dredging, confined dredging, riverbank excavation, in-barge stabilization, off-loading, and placement of various cap materials.

Confined Area Dredging - Barge Mounted Excavator

Assumptions

Assumes barge mounted excavator. Assumes excavator similar to CAT 365B or Komatsu PC 600.

Total Hours per Shift, HR:	12
Crew shift time, breaks, etc., HR:	2
Actual Work Hours per Shift*, HR:	10

**Assumes crew shift time, breaks, etc. (approx. 2 hours)*

Assumed Bucket Capacity, CY:	4
Work Efficiency, %:	90%
Operator Ability Correction Factor:	0.9
Bucket Fill Factor, %:	55%
Load Time, MIN:	0.34
Swing Time Loaded, MIN:	0.18
Dump Time, MIN:	0.04
Swing Time Unloaded, MIN:	0.14
Maneuver Time, MIN:	0.8

Productivity Calculations

Bucket Volume	CY	4
Bucket Fill Factor	%	55%
Bucket Payload	CY	2.2
Cycle Time	MIN/cycle	1.50
Ideal Loader Productivity	BCY/HR	88
Work Efficiency	%	90%
Operator Ability Correction Factor		0.9
Adjusted Loader Productivity	BCY/HR	71.3
	BCY/SHIFT	**595**

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Description: Determine estimated productivities for typical crews including open water dredging, confined dredging, riverbank excavation, in-barge stabilization, off-loading, and placement of various cap materials.

Riverbank Excavation - Barge Mounted Excavator

Assumptions

Assumes barge mounted excavator loading telebelt and material transfer barge. Assumes large excavator similar to CAT 375 or Komatsu PC 1100.

Total Hours per Shift, HR:	12
Crew shift time, breaks, etc., HR:	2
Actual Work Hours per Shift*, HR:	10
Assumed Bucket Capacity, CY:	6.5
Work Efficiency, %:	90%
Operator Ability Correction Factor:	0.9
Bucket Fill Factor, %:	75%
Load Time, MIN:	0.11
Swing Time Loaded, MIN:	0.1
Dump Time, MIN:	0.04
Swing Time Unloaded, MIN:	0.09
Maneuver Time, MIN:	0.5

**Assumes crew shift time, breaks, etc. (approx. 2 hours)*

Productivity Calculations

Bucket Volume	CY	6.5
Bucket Fill Factor	%	75%
Bucket Payload	CY	4.875
Cycle Time	MIN/cycle	0.84
Ideal Loader Productivity	BCY/HR	348.3
Work Efficiency	%	90%
Operator Ability Correction Factor		0.9
Adjusted Loader Productivity	BCY/HR	282.1
	BCY/SHIFT	**2,821**

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Description: Determine estimated productivities for typical crews including open water dredging, confined dredging, riverbank excavation, in-barge stabilization, off-loading, and placement of various cap materials.

Transfer to Hauling Barge - Barge Mounted Excavator

Assumptions

Assumes barge mounted excavator. Assumes excavator similar to CAT 365B or Komatsu PC 600.

Total Hours per Shift, HR:	12
Crew shift time, breaks, etc., HR:	2
Actual Work Hours per Shift*, HR:	10

**Assumes crew shift time, breaks, etc. (approx. 2 hours)*

Assumed Bucket Capacity, CY:	4
Work Efficiency, %:	90%
Operator Ability Correction Factor:	0.9
Bucket Fill Factor, %:	55%
Load Time, MIN:	0.1
Swing Time Loaded, MIN:	0.09
Dump Time, MIN:	0.04
Swing Time Unloaded, MIN:	0.07
Maneuver Time, MIN:	0.5

Productivity Calculations

Bucket Volume	CY	4
Bucket Fill Factor	%	55%
Bucket Payload	CY	2.2
Cycle Time	MIN/cycle	0.80
Ideal Loader Productivity	BCY/HR	165
Work Efficiency	%	90%
Operator Ability Correction Factor		0.9
Adjusted Loader Productivity	BCY/HR	133.7
	BCY/SHIFT	**1,115**

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Description: Determine estimated productivities for typical crews including open water dredging, confined dredging, riverbank excavation, in-barge stabilization, off-loading, and placement of various cap materials.

In-Barge Stabilization

Assumptions

Total Hours per Shift, HR:	12	
Crew shift time, breaks, etc., HR:	2	
Actual Work Hours per Shift*, HR:	10	*Assumes crew shift time, breaks, etc. (approx. 2 hours)*
Assumed Bucket Capacity, CY:	4	
Work Efficiency, %:	90%	
Operator Ability Correction Factor:	0.9	
Bucket Fill Factor, %:	90%	
Load Time from Dredge Barge, MIN:	0.1	
Swing Time Loaded to Mix Barge, MIN:	0.09	
Dump Time, MIN:	0.04	
Mix Time, MIN:	1	
Load Time from Mix Barge, MIN:	0.1	
Swing Time Loaded to Haul Barge, MIN:	0.09	
Dump Time, MIN:	0.04	
Swing Time Unloaded to Dredge Barge, MIN:	0.14	
Maneuver Time, MIN:	0.1	

Productivity Calculations

Bucket Volume	CY	4
Bucket Fill Factor	%	90%
Bucket Payload	CY	3.6
Cycle Time	MIN/cycle	1.7
Ideal Loader Productivity	BCY/HR	127.1
Work Efficiency	%	90%
Operator Ability Correction Factor		0.9
Adjusted Loader Productivity	BCY/HR	103
	BCY/SHIFT	**1,030**

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CLIENT:	EPA Region 10			WRKSHT NO. :	PD-01

Description: Determine estimated productivities for typical crews including open water dredging, confined dredging, riverbank excavation, in-barge stabilization, off-loading, and placement of various cap materials.

Offloading - Clam Shell

Assumptions

Total Hours per Shift, HR:	12	
Crew shift time, breaks, etc., HR:	2	
Actual Work Hours per Shift*, HR:	10	*Assumes crew shift time, breaks, etc. (approx. 2 hours)*
Assumed Bucket Capacity, CY:	10	
Work Efficiency, %:	90%	
Operator Ability Correction Factor:	0.9	
Bucket Fill Factor, %:	60%	
Load Time, MIN:	0.5	
Swing Time Loaded, MIN:	0.25	
Dump Time, MIN:	0.2	
Swing Time Unloaded, MIN:	0.25	
Maneuver Time, MIN:	0.5	

Productivity Calculations

Bucket Volume	CY	10
Bucket Fill Factor	%	60%
Bucket Payload	CY	6
Cycle Time	MIN/cycle	1.7
Ideal Loader Productivity	BCY/HR	211.8
Work Efficiency	%	90%
Operator Ability Correction Factor		0.9
Adjusted Loader Productivity	BCY/HR	171.6
	BCY/SHIFT	**1,716**

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CLIENT:	EPA Region 10			WRKSHT NO. :	PD-01

Description: Determine estimated productivities for typical crews including open water dredging, confined dredging, riverbank excavation, in-barge stabilization, off-loading, and placement of various cap materials.

Placement - Clam Shell

Assumptions

Total Hours per Shift, HR:	12	
Crew shift time, breaks, etc., HR:	2	
Actual Work Hours per Shift*, HR:	10	*Assumes crew shift time, breaks, etc. (approx. 2 hours)*
Assumed Bucket Capacity, CY:	10	
Work Efficiency, %:	90%	
Operator Ability Correction Factor:	0.9	
Bucket Fill Factor, %:	80%	
Load Time, MIN:	0.5	
Swing Time Loaded, MIN:	0.25	
Dump Time, MIN:	0.2	
Swing Time Unloaded, MIN:	0.25	
Maneuver Time, MIN:	0.5	

Productivity Calculations

Bucket Volume	CY	10
Bucket Fill Factor	%	80%
Bucket Payload	CY	8
Cycle Time	MIN/cycle	1.7
Ideal Loader Productivity	BCY/HR	282.4
Work Efficiency	%	90%
Operator Ability Correction Factor		0.9
Adjusted Loader Productivity	BCY/HR	228.7
	BCY/SHIFT	**2,287**

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CLIENT:	EPA Region 10			WRKSHT NO. :	PD-01

Description: Determine estimated productivities for typical crews including open water dredging, confined dredging, riverbank excavation, in-barge stabilization, off-loading, and placement of various cap materials.

Placement - Confined

Assumptions

Assumes barge mounted excavator loading telebelt. Assumes large excavator similar to CAT 375 or Komatsu PC 1100.

Total Hours per Shift, HR:	12
Crew shift time, breaks, etc., HR:	2
Actual Work Hours per Shift*, HR:	10

**Assumes crew shift time, breaks, etc. (approx. 2 hours)*

Assumed Bucket Capacity, CY:	4
Work Efficiency, %:	90%
Operator Ability Correction Factor:	0.9
Bucket Fill Factor, %:	90%
Load Time, MIN:	0.34
Swing Time Loaded, MIN:	0.18
Dump Time, MIN:	0.04
Swing Time Unloaded, MIN:	0.14
Maneuver Time, MIN:	0.8

Productivity Calculations

Bucket Volume	CY	4
Bucket Fill Factor	%	90%
Bucket Payload	CY	3.6
Cycle Time	MIN/cycle	1.5
Ideal Loader Productivity	BCY/HR	144
Work Efficiency	%	90%
Operator Ability Correction Factor		0.9
Adjusted Loader Productivity	BCY/HR	116.6
	BCY/SHIFT	**1,166**

CDM Smith	PROJECT:	Portland Harbor FS	COMPUTED BY :	JN	CHECKED BY: GH
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Description: Determine the productivity of loading/transporting quicklime to the site.

Hauling Productivity Determination

Assumed Payload Capacity, TON:	**25**
Work Efficiency, %:	**90%**
Average Distance for Haul, MI:	**10**
Average Speed, MPH:	**30**
Unloaded Haul Time, MIN:	**20**
Loaded Haul Time (20% additional time), MIN:	**24**

Payload Capacity	TON/truck	25
Hours per Shift	HR/DY	7
Work Efficiency	%	90%
Load Time per Truck	MIN	**10.0**
Dump and Maneuver Time	MIN	**10.0**
On Road Haul Time	MIN	24
On Road Return Time	MIN	20
Cycle Time per Truck	MIN/cycle	64.0
Cycle Time per Truck	HR/cycle	1.07
Ideal Cycles Per Day	Cyc/Truck/DY	7
Ideal Productivity per Truck	TON/HR	25
Adjusted Productivity per Truck	**TON/HR**	**22.5**

CDM Smith

PROJECT:	Portland Harbor FS	COMPUTED BY :	JN	CHECKED BY:	MS
JOB NO.:	79171.3383.345.FSZ	DATE :	2/29/2016	DATE CHECKED:	3/1/2016
CLIENT:	EPA			WRKSHT NO. :	PD-03

Description: General assumptions for loading sediments onto trucks at the offsite transload facility and hauling of the sediments to a Subtitle C for disposal.

Productivity Determinations - Load and Haul - Subtitle C Waste

Loader and Hauling

Excavator Productivity Determination

Assumed Bucket Capacity, CY:	**4**
Hours per Shift, HR:	**7**
Work Efficiency, %:	**70%**
Operator Ability Correction Factor:	**0.9**

Bucket Size	CY	4
		Moist loam
Bucket Fill Factor [1]	%	100%
Bucket Payload	CY	4.0
Work Efficiency	%	70%
Operator Ability Correction Factor	Factor	0.9
Total Cycle Time [2]	Min/Cycle	0.55
Ideal Loader Productivity	LCY/HR	436.4
Adjusted Loader Productivity	LCY/HR	274.9
Total Loader Productivity	**LCY/HR**	**274.9**

Number of Excavators Anticipated		**1**
Total Excavator Productivity	LCY/HR	274.9
	LCY/DY	1924.3
Volume to Load	LCY	125,036
Loading Time	HR	455
Haul Time	HR	1083
Est total time to completion	HR	1083
Imp. loader productivity	**LCY/HR**	**115.5**

Hauling Productivity Determination

Hours per Shift, HR:	7
Assumed Payload Capacity, LCY:	**22**
Work Efficiency, %:	**90%**
Estimated haul distance, MI:	**45**
Assumed Average Haul Speed, MPH:	**50**
Assumed Average Return Speed, MPH:	**55**
Payload Fill Factor:	**90%**

Assumed Payload Capacity	LCY/truck	20
Hours per Shift	HR/DY	7
Work Efficiency	%	90%
Adjusted Loading Productivity	LCY/HR	274.9
Load Time per Truck	MIN	4.8
Dump and Maneuver Time	MIN	**20**
Loaded Haul Time	MIN	54.0
Unloaded Return Time	MIN	49.1
Cycle Time per Truck	MIN/cycle	127.9
Cycle Time per Truck	HR/cycle	2.14
Ideal Cycles Per Day	Cyc/Truck/DY	3
Ideal Productivity per Truck	LCY/HR	8.6
Adjusted Productivity per Truck	LCY/HR	7.7

Number of Haul Trucks Anticipated		**15**
Total Hauling Productivity	LCY/HR	115.5
	LCY/DY	808.5
Volume to Haul	LCY	125,036
Haul Time	HR	1083
Excavation Time	HR	455
Est total time to completion	HR	1083
Imp. hauling productivity	**LCY/HR**	**115.5**

Summary	Number	Prod	Units
Loader	1.0	115.5	LCY/HR
Laborer (Loading)	1.0	HR/Loader HR	
Haul Trucks	15.0	115.5	LCY/HR

[1] (Ref: CAT Performance Handbook-40, Page 12-108)
[2] (Ref: CAT Performance Handbook-40, Page 12-107)

PROJECT:	Portland Harbor FS	COMPUTED BY :	MS	CHECKED BY:	JN
JOB NO.:	79171.3383.345	DATE :	3/1/2016	DATE CHECKED:	3/4/2016
CLIENT:	EPA Region 10			WRKSHT NO. :	LB-01

Description: Determination of base wage rates for general construction personnel (i.e., labor, equipment operators, etc.). Wage rates based on Foreign Labor Certification (FLC) Data Center Online Wage Library (flcdatacenter.com) or base wage rates from Davis-Bacon determinations for Multnomah County, Oregon obtained February 2016. Fringe rates were assumed where Davis-Bacon determination did not set fringe rates. Payroll taxes and insurance are included in the MII estimate calculations.

Library Detail

Title: MC_OR_2016 MCOR_022016

Note:

Labor costs updated with local labor costs (Davis-Bacon or FLCdatacenter.com), February 2016.

Professional Labor Work Hours Per Year

Number of weeks per year:	52	
Number of hours per week:	40	
Number of work hours per year:	2,080	*Based on 52 weeks x 40 hours per week*

Escalation

Previous salary cost index (2Q16):	813.65	Escalation indices (composite index) obtained from the U.S. Army Corps of Engineers Civil Works Construction Cost Index System (CWCCIS), EM 1110-2-1304, March 2012, revised as of 30 September 2015 for feature code Composite Index (Weighted Average)
Cost estimate prep cost index (2Q16):	813.65	

CDM Smith

PROJECT:	Portland Harbor FS	COMPUTED BY :	MS	CHECKED BY:	JN
JOB NO.:	79171.3383.345	DATE :	3/1/2016	DATE CHECKED:	3/4/2016
CLIENT:	EPA Region 10			WRKSHT NO. :	LB-02

Description: Determination of base wage rates for general construction personnel (i.e., labor, equipment operators, etc.). Wage rates based on Foreign Labor Certification (FLC) Data Center Online Wage Library (flcdatacenter.com) or base wage rates from Davis-Bacon determinations for Multnomah County, Oregon obtained February 2016. Fringe rates were assumed where Davis-Bacon determination did not set fringe rates. Payroll taxes and insurance are included in the MII estimate calculations.

Craft Labor Rates

Source Tag	Labor Category	Designated Labor Category	Hourly	Fringe	Year	Source
B-SKILLWKR	Skilled Workers		-	-	-	Average of all labor rates
B-LABORER	Laborers, (Semi-Skilled)	Laborer - Shore	$27.44	$13.10	2016	LABO0003-023 - Group 2
B-LABORERG	Laborers, General (Lowest paid)		$26.43	$13.10	2016	LABO0003-023 - Group 1
X-LABORER	Outside Laborers, (Semi-Skilled)	Diver	$29.16	$6.33	2016	FLC 49-9092.00 Level 4
B-EQOPRCRB	Equip. Operators Crane with Boom Pay	Crane Operator, Dredge Operator	$45.96	$14.35	2016	ENGI0701-004 - Leverman, Dipper
B-EQOPRCRN	Equip. Operators, Heavy	Operator - Shore Dredging Excavator	$37.58	$14.10	2016	ENGI0701-034 - Group 2
B-EQOPRMED	Equip. Operators, Medium		$36.44	$14.10	2016	ENGI0701-034 - Group 3
B-EQOPRLT	Equip. Operators, Light		$35.36	$14.10	2016	ENGI0701-034 - Group 4
X-EQOPRHVY	Outside Equip. Operators, Heavy	Captain, Tug Captain, Derrick Captain	$43.15	$9.36	2016	FLC 17-3011.00 Level 3
X-EQOPRMED	Outside Equip. Operators, Medium	Boat Operator, Operator	$42.80	$14.35	2016	ENGI0701-004 - Asst. Engineer
X-EQOPROIL	Outside Equip. Oilers / Grade Checker	Oiler	$41.31	$14.35	2016	ENGI0701-004 - Tenderman
B-TRKDVRHV	Truck Drivers, Heavy	Teamster - Truck Driver	$27.41	$14.37	2016	TEAM0037-010 - Group 4
B-TRKDVRLT	Truck Drivers, Light		$26.90	$14.37	2016	TEAM0037-010 - Group 1
X-LABORER4	Outside Laborers, Group 4 Skilled	Laborer, Work Boat Laborer, Deck Hand, Teamster	$37.44	$14.35	2016	ENGI0701-004 - Asst. Mate

	Labor Category		Hourly	Taxable Fringe	Non-Tax Fringe[1]	Total
B-SKILLWKR	Skilled Workers	-	$36.56	$12.72	$0.00	$49.29
B-LABORER	Laborers, (Semi-Skilled)	Laborer - Shore	$27.44	$13.10	$0.00	$40.54
B-LABORERG	Laborers, General (Lowest paid)	-	$26.43	$13.10	$0.00	$39.53
B-EQOPRCRB	Equip. Operators Crane with Boom Pay	Crane Operator, Dredge Operator	$45.96	$14.35	$0.00	$60.31
B-EQOPRCRN	Equip. Operators, Heavy	Operator - Shore Dredging Excavator	$37.58	$14.10	$0.00	$51.68
B-EQOPRMED	Equip. Operators, Medium	-	$36.44	$14.10	$0.00	$50.54
B-EQOPRLT	Equip. Operators, Light	-	$35.36	$14.10	$0.00	$49.46
X-EQOPRHVY	Outside Equip. Operators, Heavy	Captain, Tug Captain, Derrick Captain	$43.15	$9.36	$0.00	$52.51
X-EQOPRMED	Outside Equip. Operators, Medium	Boat Operator, Operator	$42.80	$14.35	$0.00	$57.15
X-EQOPROIL	Outside Equip. Oilers / Grade Checker	Oiler	$41.31	$14.35	$0.00	$55.66
B-TRKDVRHV	Truck Drivers, Heavy	Teamster - Truck Driver	$27.41	$14.37	$0.00	$41.78
B-TRKDVRLT	Truck Drivers, Light	-	$26.90	$14.37	$0.00	$41.27
X-LABORER4	Outside Laborers, Group 4 Skilled	Laborer, Work Boat Laborer, Deck Hand, Teamster	$37.44	$14.35	$0.00	$51.79

Notes

1 - Non-taxable fringe is taken out of Taxable Fringe but is set at $0.00 in MII per the U.S. Army Corps of Engineers.

CDM Smith

PROJECT:	Portland Harbor FS	COMPUTED BY :	MS	CHECKED BY:	JN
JOB NO.:	79171.3383.345	DATE :	3/1/2016	DATE CHECKED:	3/4/2016
CLIENT:	EPA Region 10			WRKSHT NO. :	EQ-01

Description: Determination of backup for equipment rate updates. Information presented should represent the information that is used to update the project's MII equipment library. Region specific factors and shipping rates can be found in the region specific *Construction Equipment Ownership and Operating Expense Schedule* (EP 1110-1-8 - http://www.nww.usace.army.mil/Missions/CostEngineering.aspx).

Library Detail

Area Location: 08 NORTHWEST
Title: EP14R08
Note: 2014 Region 8 equipment library updated with February 2016 COM and area specific sales tax, electricity, gas, and diesel fuel costs for Multnomah County, Oregon.

Factors

Sales Tax, %:	**0.00**	*State and local sales tax rate - search internet*
Working Hours/Year (WHPY), HR/YR:	**1,540**	*See region specific Construction Equipment Ownership and Operating Expense Schedule (EP 1110-1-8)*
Labor Adjustment Factor:	**1.06**	*See region specific Construction Equipment Ownership and Operating Expense Schedule (EP 1110-1-8)*
COM, %:	**2.5**	*https://www.fiscal.treasury.gov/fsservices/gov/pmt/promptPayment/promptPayment_home.htm*
COM Disc., %:	**25**	*See region specific Construction Equipment Ownership and Operating Expense Schedule (EP 1110-1-8)*

Fuels

Electricity, $/KWH:	**$0.0884**	*http://www.eia.gov/electricity/monthly/* *See Table 5.6.A - End-Use Sector, by State - commercial rate*
Gas, $/GAL:	**$1.923**	*http://fuelgaugereport.aaa.com/todays-gas-prices/*
Federal Diesel Tax, $/GAL:	$0.244	
State Diesel Tax, $/GAL:	$0.3035	*http://www.api.org/Oil-and-Natural-Gas-Overview/Industry-Economics/Fuel-Taxes*
Diesel (Off-Road), $/GAL:	**$1.471**	*On-Road diesel minus fuel taxes*
Diesel (On-Road), $/GAL:	**$2.018**	*http://fuelgaugereport.aaa.com/todays-gas-prices/*

Estimated by	CDM Smith
Designed by	CDM Smith
Prepared by	Marc Schlebusch
Preparation Date	3/28/2016
Effective Date of Pricing	3/28/2016
Estimated Construction Time	Days

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20 Confined Dredging with Excavator 1
30 Riverbank Excavation 1
40 Dewatering and Water Treatment 1
10 Mobilization/Demobilization 1
20 Dewatering and Treatment 1
50 Transfer 1
10 Open Water Dredging 2
20 Confined Dredging 2
60 In-Barge Stabilization 2
70 Barge Transportation to Disposal Offload Facility 2
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Designed by
CDM Smith
Estimated by
CDM Smith
Prepared by
Marc Schlebusch

Design Document	
Document Date	3/28/2016
District	
Contact	Marc Schlebusch
Budget Year	2016
UOM System	Original

Direct Costs
LaborCost
EQCost
MatlCost
SubBidCost

Timeline/Currency

Preparation Date	3/28/2016
Escalation Date	3/28/2016
Eff. Pricing Date	3/28/2016
Estimated Duration	0 Day(s)
Currency	US dollars
Exchange Rate	1.000000

Costbook CB10EB: MII English Cost Book 2010

Labor MC_OR_2016: MCOR_022016
Note: Labor costs updated with local labor costs (Davis-Bacon or FLCdatacenter.com), February 2016.

Labor Rates
LaborCost1
LaborCost2
LaborCost3
LaborCost4

Equipment EP14R08: MII Equipment 2014 Region 08
Note: 2014 Region 8 equipment library updated with February 2016 COM and area specific sales tax, electricity, gas, and diesel fuel costs for Multnomah County, Oregon.

08 NORTHWEST

Sales Tax	0.00
Working Hours per Year	1,540
Labor Adjustment Factor	1.06
Cost of Money	2.50
Cost of Money Discount	25.00
Tire Recap Cost Factor	1.50
Tire Recap Wear Factor	1.80
Tire Repair Factor	0.15
Equipment Cost Factor	1.00
Standby Depreciation Factor	0.50

Fuel

Electricity	0.088
Gas	1.923
Diesel Off-Road	1.471
Diesel On-Road	2.018

Shipping Rates

Over 0 CWT	30.86
Over 240 CWT	29.05
Over 300 CWT	26.59
Over 400 CWT	24.30
Over 500 CWT	11.26
Over 700 CWT	9.51
Over 800 CWT	6.48

Markup Properties

Direct Cost Markups

	Category	Method
Productivity	Productivity	Productivity
Overtime	Overtime	Overtime

	Days/Week	*Hours/Shift*	*Shifts/Day*	*1st Shift*	*2nd Shift*	*3rd Shift*
Standard	*5.00*	*8.00*	*2.00*	*8.00*	*8.00*	*0.00*
Actual	*6.00*	*8.00*	*2.00*	*12.00*	*12.00*	*0.00*

Day	*OT Factor*	*Working*	*OT Percent*	*FCCM Percent*
Monday	*1.00*	*Yes*	*13.89*	*(72.22)*
Tuesday	*1.00*	*Yes*		
Wednesday	*1.00*	*Yes*		
Thursday	*1.50*	*Yes*		
Friday	*1.50*	*Yes*		
Saturday	*1.50*	*Yes*		
Sunday	*1.50*	*No*		

Sales Tax	TaxAdj	Running % on Selected Costs
MatlCost		

Contractor Markups

	Category	Method
JOOH	JOOH	Running %
HOOH	HOOH	Running %
Profit	Profit	Running %
Bond	Bond	Bond Table

HTRW (Other), Banded, 24 months, 1.00% Surcharge

Contract Price	*Bond Rate*
0	*4.40*
3,000,000	*3.85*
5,000,000	*3.30*
7,500,000	*2.75*

Excise Tax	Excise	Running %

Owner Markups

	Category	Method
Escalation	Escalation	Escalation

StartDate	*StartIndex*	*EndDate*	*EndIndex*	*Escalation*

Contingency	Contingency	Running %
SIOH	SIOH	Running %

Description	Quantity	UOM	BareCost	DirectCost	CostToPrime	ContractCost
Project Cost Summary Report			**352,320**	**396,333**	**515,399**	**693,512**
			12.08	*13.60*	*18.23*	*24.53*
10 Open Water Dredging with Clamshell	**4,764.00**	**CY**	**57,549**	**64,776**	**86,846**	**116,858**
			10.94	*12.18*	*16.39*	*22.05*
USR U-B-DREDGE-100 Open Water Dredging with Clamshell	4,764.00	CY	52,135	58,016	78,066	105,044
			336.75	*401.98*	*540.89*	*727.82*
USR U-B-MANAGE-400 Local Scow Transport - Open Water Dredging	3.00	EA	1,010	1,206	1,623	2,183
			4,403.26	*5,553.39*	*7,157.61*	*9,631.15*
USR U-B-SURVEY-100 Surveying Crew/Boat - 2 shifts	1.00	DAY	4,403	5,553	7,158	9,631
			15.32	*17.34*	*23.11*	*31.10*
20 Confined Dredging with Excavator	**1,426.00**	**CY**	**21,845**	**24,728**	**32,959**	**44,348**
			11.76	*12.88*	*17.33*	*23.33*
USR U-B-DREDGE-200 Confined Dredging with Excavator	1,426.00	CY	16,769	18,371	24,719	33,262
			336.75	*401.98*	*540.89*	*727.82*
USR U-B-DREDGE-410 Local Scow Transport -Scow Transport - Confined Dredging or Riverbank Excavation	2.00	EA	673	804	1,082	1,456
			4,403.26	*5,553.39*	*7,157.61*	*9,631.15*
USR U-B-SURVEY-100 Surveying Crew/Boat - 2 shifts	1.00	DAY	4,403	5,553	7,158	9,631
			2.52	*2.87*	*3.86*	*5.19*
30 Riverbank Excavation	**2,821.00**	**CY**	**7,111**	**8,083**	**10,876**	**14,634**
			2.28	*2.58*	*3.47*	*4.67*
USR U-B-DREDGE-300 Riverbank Excavation	2,821.00	CY	6,438	7,279	9,794	13,179
			336.75	*401.98*	*540.89*	*727.82*
USR U-B-DREDGE-410 Local Scow Transport - Scow Transport - Confined Dredging or Riverbank Excavation	2.00	EA	673	804	1,082	1,456
40 Dewatering and Water Treatment	**1.00**	**LS**	**41,149**	**43,293**	**43,293**	**58,254**
			27,200.00	*27,200.00*	*27,200.00*	*36,599.84*
10 Mobilization/Demobilization	**1.00**	**EA**	**27,200**	**27,200**	**27,200**	**36,600**
			300.00	*300.00*	*300.00*	*403.67*
USR U-B-MANAGE-150 Delivery/pick-up fees for frac tank rental	4.00	EA	1,200	1,200	1,200	1,615
USR U-B-MANAGE-170 Delivery/pick-up fees for temporary water treatment plant rental	1.00	LS	26,000	26,000	26,000	34,985
			13,949.34	*16,092.89*	*16,092.89*	*21,654.30*
20 Dewatering and Treatment	**1.00**	**DAY**	**13,949**	**16,093**	**16,093**	**21,654**
			11,497.13	*13,640.67*	*13,640.67*	*18,354.65*
USR U-B-MANAGE-100 Dewatering and Water Treatment	1.00	DAY	11,497	13,641	13,641	18,355
			692.31	*692.31*	*692.31*	*931.56*
USR U-B-MANAGE-180 Temporary water treatment plant rental	1.00	DAY	692	692	692	932
			10,000.00	*10,000.00*	*10,000.00*	*13,455.82*
USR U-B-MANAGE-190 Carbon disposal	0.17	EA	1,670	1,670	1,670	2,247
			44.95	*44.95*	*44.95*	*60.49*
USR U-B-MANAGE-160 Frac tank rental	2.00	DAY	90	90	90	121
50 Transfer	**1.00**	**LS**	**62,773**	**71,854**	**96,686**	**130,099**

Description	Quantity	UOM	BareCost	DirectCost	CostToPrime	ContractCost
			6.09	*6.94*	*9.34*	*12.57*
10 Open Water Dredging	**5,348.00**	**CY**	**32,596**	**37,136**	**49,970**	**67,239**
			6.09	*6.94*	*9.34*	*12.57*
USR U-B-MANAGE-200 Transfer Non-Stabilized Material - Open Water Dredging	5,348.00	CY	32,596	37,136	49,970	67,239
			5.64	*6.49*	*8.74*	*11.75*
20 Confined Dredging	**5,348.00**	**CY**	**30,177**	**34,718**	**46,716**	**62,860**
			5.64	*6.49*	*8.74*	*11.75*
USR U-B-MANAGE-210 Transfer Non-Stabilized Material - Confined Dreding	5,348.00	EA	30,177	34,718	46,716	62,860
			11.75	*13.53*	*18.21*	*24.50*
60 In-Barge Stabilization	**4,120.00**	**CY**	**48,430**	**55,759**	**75,028**	**100,957**
			11.75	*13.53*	*18.21*	*24.50*
USR U-B-MANAGE-200 In-Barge Stabilization	4,120.00	CY	48,430	55,759	75,028	100,957
			21,585.56	*23,629.42*	*30,455.29*	*40,980.10*
70 Barge Transportation to Disposal Offload Facility	**1.00**	**EA**	**21,586**	**23,629**	**30,455**	**40,980**
			513.94	*562.61*	*725.13*	*975.72*
USR U-B-MANAGE-400 Barging to Disposal Offload Facility	42.00	HR	21,586	23,629	30,455	40,980
			4.77	*5.36*	*7.21*	*9.70*
80 Offloading	**6,864.00**	**CY**	**32,740**	**36,779**	**49,489**	**66,592**
			4.77	*5.36*	*7.21*	*9.70*
USR U-B-MANAGE-500 Offloading	6,864.00	CY	32,740	36,779	49,489	66,592
			59,098.91	*67,392.82*	*89,726.39*	*120,734.25*
90 Placement	**1.00**	**EA**	**59,099**	**67,393**	**89,726**	**120,734**
			6.29	*6.91*	*9.23*	*12.42*
10 Open Water Placement	**4,574.00**	**CY**	**28,789**	**31,611**	**42,221**	**56,811**
			5.33	*5.70*	*7.67*	*10.31*
USR U-B-PLACE-110 Placement - Open Water	4,574.00	CY	24,386	26,058	35,063	47,180
			4,403.26	*5,553.39*	*7,157.61*	*9,631.15*
USR U-B-SURVEY-100 Surveying Crew/Boat - 2 Shifts	1.00	DAY	4,403	5,553	7,158	9,631
			9.90	*11.36*	*15.16*	*20.39*
20 Confined Placement	**1,166.00**	**CY**	**11,548**	**13,251**	**17,673**	**23,780**
			8.02	*8.98*	*12.09*	*16.26*
USR U-B-PLACE-210 Placement - Confined Area	1,166.00	CY	9,347	10,474	14,094	18,965
			2,201.64	*2,776.71*	*3,578.82*	*4,815.60*
USR U-B-SURVEY-110 Surveying Crew/Boat - 1 Shift	1.00	DAY	2,202	2,777	3,579	4,816
			1.56	*1.88*	*2.49*	*3.35*
40 Organoclay Mat Placement	**12,000.00**	**SF**	**18,762**	**22,530**	**29,833**	**40,142**
			0.93	*1.07*	*1.43*	*1.93*
USR U-B-PLACE-300 Placement - Organoclay Mat	12,000.00	SF	11,157	12,794	17,215	23,164
			2,201.64	*2,776.71*	*3,578.82*	*4,815.60*

Description	Quantity	UOM	BareCost	DirectCost	CostToPrime	ContractCost
USR U-B-SURVEY-110 Surveying Crew/Boat - 1 Shift	1.00	DAY	2,202	2,777	3,579	4,816
			366.03	*479.52*	*618.04*	*831.62*
USR U-B-PLACE-400 Divers	12.00	HR	4,392	5,754	7,416	9,979
			336.75	*401.98*	*540.89*	*727.82*
USR U-B-MANAGE-420 Local Barge Movement	3.00	EA	1,010	1,206	1,623	2,183
			2.29	*2.63*	*3.53*	*4.76*
100 Mixing Sand & Carbon for Reactive Layer	**1.00**	**CY**	**2**	**3**	**4**	**5**
			2.29	*2.63*	*3.53*	*4.76*
USR MIX-SAND-CARB Mixing Sand & Carbon for Reactive Layer	1.00	CY	2	3	4	5
			1.31	*1.48*	*2.00*	*2.68*
110 Loading Trucks at Transload Facility	**1.00**	**CY**	**1**	**1**	**2**	**3**
			1.31	*1.48*	*2.00*	*2.68*
USR LOAD-TRANS Loading Trucks at Transload Facility	1.00	CY	1	1	2	3
			11.48	*12.41*	*12.41*	*16.70*
120 Trucking Waste from Transload Facility to Landfill	**1.00**	**CY**	**11**	**12**	**12**	**17**
			11.48	*12.41*	*12.41*	*16.70*
USR HAUL-WASTE Trucking Waste from Transload Facility to Landfill	1.00	CY	11	12	12	17
			18.89	*18.89*	*18.89*	*25.42*
130 18' Boat	**1.00**	**HR**	**19**	**19**	**19**	**25**
			18.89	*18.89*	*18.89*	*25.42*
MAP M10SM005 MARINE EQUIPMENT, BOATS & LAUNCHES, 18' RIVER RUNNER, VEE HULL, NO CABIN, CAP 1,350 LBS, OUTBOARD, 18' X 7.9' X 0.5'	1.00	HR	19	19	19	25
			3.93	*4.25*	*4.25*	*5.71*
140 Hauling Quicklime to Site	**1.00**	**TON**	**4**	**4**	**4**	**6**
			3.93	*4.25*	*4.25*	*5.71*
USR HAUL-LIME Hauling Quicklime to Site	1.00	TON	4	4	4	6

Description	CrewHours	MemberType	MemberRate	ManHours	LaborCost	EQHours	EQCost	CrewCost
Crews (Bare Costs) by Contractor, Report	**388.19**			**2,788.21**	**143,596.37**	**3,218.39**	**179,052.73**	**322,649.10**
General Contractor	**388.19**		**0.00**	**2,788.21**	**143,596.37**	**3,218.39**	**179,052.73**	**322,649.10**
				1.00	*41.78*	*2.00*	*46.58*	*88.36*
USR HAUL-LIME Hauling Quicklime to Site	0.04			0.04	1.86	0.09	2.07	3.93
MIL B-TRKDVRHV Truck Drivers, Heavy		Journeyman	41.78	1.00	41.78			
GEN T45Z7205 TRUCK TRAILER, END DUMP, 28 CY (21 M3), 36 TON (32.7 MT) (ADD 50,000 LB (22,680 KG) GVW TRUCK)		EP / Average	7.42			1.00	7.42	
GEN T50Z7630 TRUCK, HIGHWAY, 65,000 LB (29,484 KG) GVW, 6X6, 3 AXLE (ADD ACCESSORIES)		EP / Average	39.16			1.00	39.16	
				1.00	*41.78*	*2.00*	*46.58*	*88.36*
USR HAUL-WASTE Hauling Waste to Landfill	0.13			0.13	5.43	0.26	6.05	11.48
MIL B-TRKDVRHV Truck Drivers, Heavy		Journeyman	41.78	1.00	41.78			
GEN T45Z7205 TRUCK TRAILER, END DUMP, 28 CY (21 M3), 36 TON (32.7 MT) (ADD 50,000 LB (22,680 KG) GVW TRUCK)		EP / Average	7.42			1.00	7.42	
GEN T50Z7630 TRUCK, HIGHWAY, 65,000 LB (29,484 KG) GVW, 6X6, 3 AXLE (ADD ACCESSORIES)		EP / Average	39.16			1.00	39.16	
				6.00	*312.74*	*22.00*	*166.31*	*479.05*
USR U-B-MANAGE-100 Dewatering	24.00			144.00	7,505.75	528.00	3,991.37	11,497.13
RSM X-LABORER4 Outside Laborers, Group 4 Skilled		Journeyman	51.79	4.00	207.16			
RSM X-LABORER4 Outside Laborers, Group 4 Skilled		Foreman	52.79	2.00	105.58			
EP M10SM004 MARINE EQUIPMENT, BOATS & LAUNCHES, 23' LITTLE GIANT, W/CABIN TRI-HULL, CAP 3,400 LBS, OUTBOARD, 23.4' X 8.5' X 1.2'		EP / Average	43.20			2.00	86.40	
MAP P50GR008 PUMP, WATER, CENTRIFUGAL, TRASH, HOSE, DISCH, 6" DIA X 50' WITH COUPLING (PER SECTION)		EP / Average	0.36			12.00	4.28	
MAP P50WC004 PUMP, WATER, CENTRIFUGAL, TRASH, ENGINE DRIVE, 6" DIA, 1,300 GPM @ 100' HEAD ,TRAILER MTD (ADD HOSES)		EP / Average	5.75			4.00	23.00	
GEN P50Z5099 PUMP, WATER, CENTRIFUGAL, TRASH, HOSE, SUCTION/DISCH, 6" (150 MM) DIA X 50' (15 M) WITH COUPLING (PER SECTION)		EP / Average	0.36			2.00	0.71	
NON XX0XX740 WORK BARGE, FLAT DECK, 2000 TON WITH 4 SPUDS		Non-EP / Average	25.96			2.00	51.92	
Surveying Subcontractor	**96.00**		**0.00**	**288.00**	**13,465.93**	**96.00**	**4,147.11**	**17,613.05**
				3.00	*140.27*	*1.00*	*43.20*	*183.47*
USR U-B-SURVEY-100 Survey Crew/Boat	96.00			288.00	13,465.93	96.00	4,147.11	17,613.05
FOP FC-SURYR Surveyors		Journeyman	35.46	1.00	35.46			
MIL X-EQOPRMED Outside Equip. Operators, Medium		Journeyman	57.15	1.00	57.15			
FOP FC-SURYC Surveyors, Chief		Journeyman	47.66	1.00	47.66			
EP M10SM004 MARINE EQUIPMENT, BOATS & LAUNCHES, 23' LITTLE GIANT, W/CABIN TRI-HULL, CAP 3,400 LBS,		EP / Average	43.20			1.00	43.20	

Description	CrewHours	MemberType	MemberRate	ManHours	LaborCost	EQHours	EQCost	CrewCost
OUTBOARD, 23.4' X 8.5' X 1.2'								
Barging Subcontractor	**42.00**		**0.00**	**168.00**	**8,803.20**	**126.00**	**12,782.36**	**21,585.56**
				4.00	*209.60*	*3.00*	*304.34*	*513.94*
USR U-B-DREDGE-500 Barge Transport to Disposal Facility	42.00			168.00	8,803.20	126.00	12,782.36	21,585.56
RSM X-LABORER4 Outside Laborers, Group 4 Skilled		Journeyman	51.79	1.00	51.79			
MIL X-EQOPRHVY Outside Equip. Operators, Heavy		Journeyman	52.51	2.00	105.02			
RSM X-LABORER4 Outside Laborers, Group 4 Skilled		Foreman	52.79	1.00	52.79			
EP M10XX019 MARINE EQUIPMENT, ALL OTHER BARGES, HOPPER, 200' X 35' X 12', 1,600 TON (COVERED)		EP / Average	23.05			2.00	46.10	
EP M10XX036 MARINE EQUIPMENT, TUGS, 120 FT LENGTH, 34 FT BEAM, 8'0" DRAFT, 80 TON, TOW BOAT		EP / Average	258.25			1.00	258.25	
Dredging Subcontractor	**214.02**		**0.00**	**2,092.03**	**109,875.32**	**2,444.04**	**157,670.33**	**267,545.65**
				2.00	*91.71*	*1.00*	*59.67*	*151.38*
USR LOAD-TRANS Loading Trucks at Transload Facility	0.01			0.02	0.79	0.01	0.52	1.31
MIL B-LABORER Laborers, (Semi-Skilled)		Journeyman	40.03	1.00	40.03			
MIL B-EQOPRCRN Equip. Operators, Heavy		Journeyman	51.68	1.00	51.68			
MAP L40CA025 LOADER, FRONT END, WHEEL, 4.00 CY BUCKET, ARTICULATED, 4X4		EP / Average	59.67			1.00	59.67	
				4.00	*183.71*	*3.00*	*82.73*	*266.44*
USR MIX-SAND-CARB Mixing Sand & Carbon for Reactive Layer	0.01			0.03	1.58	0.03	0.71	2.29
MIL B-EQOPRMED Equip. Operators, Medium		Journeyman	50.54	1.00	50.54			
MIL B-LABORER Laborers, (Semi-Skilled)		Journeyman	40.03	2.00	80.06			
MIL B-SKILLWKR Skilled Workers		Foreman	53.11	1.00	53.11			
MAP L40CA025 LOADER, FRONT END, WHEEL, 4.00 CY BUCKET, ARTICULATED, 4X4		EP / Average	59.67			1.00	59.67	
EP S30KB034 SCREENING & CRUSHING PLANTS, FEEDER CONVEYOR, 30" WIDE X 50' LONG, 7 CY HOPPER & 6' FEED, PORTABLE, 500 TPH		EP / Average	11.53			2.00	23.05	
				4.00	*221.27*	*8.00*	*794.89*	*1,016.16*
USR U-B-CAP-010 Open Water Layer Placement	24.00			95.99	5,310.02	191.98	19,075.81	24,385.83
MIL B-EQOPRCRB Equip. Operators Crane with Boom Pay		Journeyman	60.31	1.00	60.31			
MIL X-EQOPROIL Outside Equip. Oilers / Grade Checker		Journeyman	55.66	1.00	55.66			
RSM X-LABORER4 Outside Laborers, Group 4 Skilled		Foreman	52.79	1.00	52.79			
MIL X-EQOPRHVY Outside Equip. Operators, Heavy		Journeyman	52.51	1.00	52.51			
USR U-MISC-010 Miscellaneous Equipment (crane mats, etc.)		Non-EP Rental / Average	1.00			1.00	1.00	
EP M10SM004 MARINE EQUIPMENT, BOATS & LAUNCHES, 23' LITTLE GIANT, W/CABIN TRI-HULL, CAP 3,400 LBS, OUTBOARD, 23.4' X 8.5' X 1.2'		EP / Average	43.20			2.00	86.40	
EP M10XX033 MARINE EQUIPMENT, TUGS, 60 FT LENGTH,		EP / Average	84.67			1.00	84.67	

Description	CrewHours	MemberType	MemberRate	ManHours	LaborCost	EQHours	EQCost	CrewCost
21 FT BEAM, 5'0" DRAFT, 80 TON, TOW BOAT								
NON XX0XX410 BARGE MOUNTED CLAMSHELL, 10 CY CRANE		Non-EP / Average	350.22			1.00	350.22	
NON XX0XX810 DUMP SCOW BARGE, 3,000 CY		Non-EP / Average	90.87			3.00	272.61	
				6.00	*317.71*	*10.00*	*461.44*	*779.15*
USR U-B-CAP-020 Confined Area Layer Placement	12.00			71.98	3,811.21	119.96	5,535.42	9,346.64
RSM X-LABORER4 Outside Laborers, Group 4 Skilled		Foreman	52.79	1.00	52.79			
MIL X-EQOPRHVY Outside Equip. Operators, Heavy		Journeyman	52.51	1.00	52.51			
MIL X-EQOPRMED Outside Equip. Operators, Medium		Journeyman	57.15	1.00	57.15			
RSM X-LABORER4 Outside Laborers, Group 4 Skilled		Journeyman	51.79	2.00	103.58			
MIL B-EQOPRCRN Equip. Operators, Heavy		Journeyman	51.68	1.00	51.68			
USR U-MISC-010 Miscellaneous Equipment (crane mats, etc.)		Non-EP Rental / Average	1.00			1.00	1.00	
GEN H25Z3215 HYDRAULIC EXCAVATOR, CRAWLER, 140,000 LB (63,503 KG), 4.00 CY (3.1 M3) BUCKET, 31.4' (9.6 M) MAX DIGGING DEPTH		EP / Average	98.25			1.00	98.25	
EP M10SM004 MARINE EQUIPMENT, BOATS & LAUNCHES, 23' LITTLE GIANT, W/CABIN TRI-HULL, CAP 3,400 LBS, OUTBOARD, 23.4' X 8.5' X 1.2'		EP / Average	43.20			1.00	43.20	
EP M10XX022 MARINE EQUIPMENT, BOATS & LAUNCHES, 45' LENGTH, 16' BEAM, 5' 0" DRAFT, PUSH BOAT		EP / Average	68.16			1.00	68.16	
EP M10XX033 MARINE EQUIPMENT, TUGS, 60 FT LENGTH, 21 FT BEAM, 5'0" DRAFT, 80 TON, TOW BOAT		EP / Average	84.67			1.00	84.67	
EP S30KB033 SCREENING & CRUSHING PLANTS, CONVEYOR, ADJUSTABLE HEIGHT RADIAL STACKER, 36" WIDE X 150' LONG, PORTABLE, 2,000 TPH		EP / Average	33.24			1.00	33.24	
NON XX0XX740 WORK BARGE, FLAT DECK, 2000 TON WITH 4 SPUDS		Non-EP / Average	25.96			2.00	51.92	
NON XX0XX800 DUMP SCOW BARGE, 1,500 CY		Non-EP / Average	40.50			2.00	81.00	
				8.00	*426.99*	*6.00*	*502.79*	*929.78*
USR U-B-CAP-100 Organoclay Mat Placement	12.00			96.00	5,123.88	72.00	6,033.48	11,157.36
MIL X-EQOPRHVY Outside Equip. Operators, Heavy		Foreman	53.51	1.00	53.51			
MIL X-EQOPRMED Outside Equip. Operators, Medium		Journeyman	57.15	1.00	57.15			
MIL X-EQOPROIL Outside Equip. Oilers / Grade Checker		Journeyman	55.66	1.00	55.66			
MIL X-EQOPRHVY Outside Equip. Operators, Heavy		Journeyman	52.51	1.00	52.51			
RSM X-LABORER4 Outside Laborers, Group 4 Skilled		Journeyman	51.79	3.00	155.37			
RSM X-LABORER4 Outside Laborers, Group 4 Skilled		Foreman	52.79	1.00	52.79			
GEN F10Z3040 FORK LIFT, ROUGH TERRAIN, 8,000 LB (3629 KG), 16.0' (4.9 M) HIGH, TELESCOPING MAST		EP / Average	18.89			1.00	18.89	
EP M10SM004 MARINE EQUIPMENT, BOATS & LAUNCHES, 23' LITTLE GIANT, W/CABIN TRI-HULL, CAP 3,400 LBS, OUTBOARD, 23.4' X 8.5' X 1.2'		EP / Average	43.20			1.00	43.20	

Description	CrewHours	MemberType	MemberRate	ManHours	LaborCost	EQHours	EQCost	CrewCost
EP M10XX005 MARINE EQUIPMENT, FLAT-DECK CARGO BARGE, 120' X 30' X 7.25', 400 TON		EP / Average	4.41			2.00	8.81	
EP M10XX033 MARINE EQUIPMENT, TUGS, 60 FT LENGTH, 21 FT BEAM, 5'0" DRAFT, 80 TON, TOW BOAT		EP / Average	84.67			1.00	84.67	
MAP XX0XX520 BARGE MOUNTED CRANE, 150 TON, 150' BOOM, FOR LIFTING		Non-EP / Average	347.22			1.00	347.22	
				14.00	*751.84*	*14.00*	*1,420.46*	*2,172.30*
USR U-B-DREDGE-100 Open Water Dredging with Barge Mounted Clamshell	24.00			336.00	18,044.16	336.00	34,090.95	52,135.11
MIL X-EQOPROIL Outside Equip. Oilers / Grade Checker		Journeyman	55.66	2.00	111.32			
RSM X-LABORER4 Outside Laborers, Group 4 Skilled		Journeyman	51.79	8.00	414.32			
MIL B-EQOPRCRB Equip. Operators Crane with Boom Pay		Journeyman	60.31	2.00	120.62			
RSM X-LABORER4 Outside Laborers, Group 4 Skilled		Foreman	52.79	2.00	105.58			
USR U-MISC-010 Miscellaneous Equipment (crane mats, etc.)		Non-EP Rental / Average	1.00			2.00	2.00	
EP M10SM004 MARINE EQUIPMENT, BOATS & LAUNCHES, 23' LITTLE GIANT, W/CABIN TRI-HULL, CAP 3,400 LBS, OUTBOARD, 23.4' X 8.5' X 1.2'		EP / Average	43.20			4.00	172.80	
NON XX0XX410 BARGE MOUNTED CLAMSHELL, 10 CY CRANE		Non-EP / Average	350.22			2.00	700.44	
NON XX0XX810 DUMP SCOW BARGE, 3,000 CY		Non-EP / Average	90.87			6.00	545.22	
				4.00	*222.04*	*12.00*	*476.45*	*698.49*
USR U-B-DREDGE-200 Confined Dredging with Barge Mounted Excavator	24.01			96.03	5,330.46	288.08	11,438.08	16,768.53
RSM X-LABORER4 Outside Laborers, Group 4 Skilled		Foreman	52.79	1.00	52.79			
MIL X-EQOPRMED Outside Equip. Operators, Medium		Journeyman	57.15	1.00	57.15			
RSM X-LABORER4 Outside Laborers, Group 4 Skilled		Journeyman	51.79	1.00	51.79			
MIL B-EQOPRCRB Equip. Operators Crane with Boom Pay		Journeyman	60.31	1.00	60.31			
USR U-MISC-010 Miscellaneous Equipment (crane mats, etc.)		Non-EP Rental / Average	1.00			1.00	1.00	
GEN H25Z3215 HYDRAULIC EXCAVATOR, CRAWLER, 140,000 LB (63,503 KG), 4.00 CY (3.1 M3) BUCKET, 31.4' (9.6 M) MAX DIGGING DEPTH		EP / Average	98.25			1.00	98.25	
EP M10SM004 MARINE EQUIPMENT, BOATS & LAUNCHES, 23' LITTLE GIANT, W/CABIN TRI-HULL, CAP 3,400 LBS, OUTBOARD, 23.4' X 8.5' X 1.2'		EP / Average	43.20			1.00	43.20	
EP M10XX022 MARINE EQUIPMENT, BOATS & LAUNCHES, 45' LENGTH, 16' BEAM, 5' 0" DRAFT, PUSH BOAT		EP / Average	68.16			1.00	68.16	
NON XX0XX740 WORK BARGE, FLAT DECK, 2000 TON WITH 4 SPUDS		Non-EP / Average	25.96			4.00	103.84	
NON XX0XX800 DUMP SCOW BARGE, 1,500 CY		Non-EP / Average	40.50			4.00	162.00	
				5.00	*229.92*	*6.00*	*306.62*	*536.54*
USR U-B-DREDGE-300 Riverbank Excavation with Barge Mounted Excavator	12.00			60.00	2,758.84	71.99	3,679.15	6,438.00

Description	CrewHours	MemberType	MemberRate	ManHours	LaborCost	EQHours	EQCost	CrewCost
MIL X-EQOPRMED Outside Equip. Operators, Medium		Journeyman	57.15	1.00	57.15			
MIL B-LABORER Laborers, (Semi-Skilled)		Foreman	41.03	1.00	41.03			
MIL B-LABORER Laborers, (Semi-Skilled)		Journeyman	40.03	2.00	80.06			
MIL B-EQOPRCRN Equip. Operators, Heavy		Journeyman	51.68	1.00	51.68			
USR U-MISC-010 Miscellaneous Equipment (crane mats, etc.)		Non-EP Rental / Standby	0.00			0.00	0.00	
GEN H25Z3215 HYDRAULIC EXCAVATOR, CRAWLER, 140,000 LB (63,503 KG), 4.00 CY (3.1 M3) BUCKET, 31.4' (9.6 M) MAX DIGGING DEPTH		EP / Average	98.25			1.00	98.25	
EP M10XX022 MARINE EQUIPMENT, BOATS & LAUNCHES, 45' LENGTH, 16' BEAM, 5' 0" DRAFT, PUSH BOAT		EP / Average	68.16			1.00	68.16	
EP S30KB033 SCREENING & CRUSHING PLANTS, CONVEYOR, ADJUSTABLE HEIGHT RADIAL STACKER, 36" WIDE X 150' LONG, PORTABLE, 2,000 TPH		EP / Average	33.24			1.00	33.24	
NON XX0XX740 WORK BARGE, FLAT DECK, 2000 TON WITH 4 SPUDS		Non-EP / Average	25.96			1.00	25.96	
NON XX0XX800 DUMP SCOW BARGE, 1,500 CY		Non-EP / Average	40.50			2.00	81.00	
				4.00	*208.88*	*2.00*	*127.87*	*336.75*
USR U-B-DREDGE-400 Scow Transport - Open Water Dredging	3.00			12.00	626.64	6.00	383.60	1,010.24
MIL X-EQOPRHVY Outside Equip. Operators, Heavy		Journeyman	52.51	1.00	52.51			
RSM X-LABORER4 Outside Laborers, Group 4 Skilled		Foreman	52.79	1.00	52.79			
RSM X-LABORER4 Outside Laborers, Group 4 Skilled		Journeyman	51.79	2.00	103.58			
EP M10SM004 MARINE EQUIPMENT, BOATS & LAUNCHES, 23' LITTLE GIANT, W/CABIN TRI-HULL, CAP 3,400 LBS, OUTBOARD, 23.4' X 8.5' X 1.2'		EP / Average	43.20			1.00	43.20	
EP M10XX033 MARINE EQUIPMENT, TUGS, 60 FT LENGTH, 21 FT BEAM, 5'0" DRAFT, 80 TON, TOW BOAT		EP / Average	84.67			1.00	84.67	
				4.00	*208.88*	*2.00*	*127.87*	*336.75*
USR U-B-DREDGE-410 Scow Transport - Confined Dredging or Riverbank Excavation	4.00			16.00	835.52	8.00	511.46	1,346.98
RSM X-LABORER4 Outside Laborers, Group 4 Skilled		Foreman	52.79	1.00	52.79			
RSM X-LABORER4 Outside Laborers, Group 4 Skilled		Journeyman	51.79	2.00	103.58			
MIL X-EQOPRHVY Outside Equip. Operators, Heavy		Journeyman	52.51	1.00	52.51			
EP M10SM004 MARINE EQUIPMENT, BOATS & LAUNCHES, 23' LITTLE GIANT, W/CABIN TRI-HULL, CAP 3,400 LBS, OUTBOARD, 23.4' X 8.5' X 1.2'		EP / Average	43.20			1.00	43.20	
EP M10XX033 MARINE EQUIPMENT, TUGS, 60 FT LENGTH, 21 FT BEAM, 5'0" DRAFT, 80 TON, TOW BOAT		EP / Average	84.67			1.00	84.67	
				4.00	*208.88*	*2.00*	*127.87*	*336.75*
USR U-B-DREDGE-420 Barge Movement	3.00			12.00	626.64	6.00	383.60	1,010.24
RSM X-LABORER4 Outside Laborers, Group 4 Skilled		Foreman	52.79	1.00	52.79			

Description	CrewHours	MemberType	MemberRate	ManHours	LaborCost	EQHours	EQCost	CrewCost
MIL X-EQOPRHVY Outside Equip. Operators, Heavy		Journeyman	52.51	1.00	52.51			
RSM X-LABORER4 Outside Laborers, Group 4 Skilled		Journeyman	51.79	2.00	103.58			
EP M10SM004 MARINE EQUIPMENT, BOATS & LAUNCHES, 23' LITTLE GIANT, W/CABIN TRI-HULL, CAP 3,400 LBS, OUTBOARD, 23.4' X 8.5' X 1.2'		EP / Average	43.20			1.00	43.20	
EP M10XX033 MARINE EQUIPMENT, TUGS, 60 FT LENGTH, 21 FT BEAM, 5'0" DRAFT, 80 TON, TOW BOAT		EP / Average	84.67			1.00	84.67	
				12.00	*623.96*	*14.00*	*733.99*	*1,357.95*
USR U-B-MANAGE-200 Transfer Non-Stabilized Material - Open Water Dredging	24.00			288.04	14,977.28	336.05	17,618.33	32,595.61
MIL B-EQOPRCRB Equip. Operators Crane with Boom Pay		Journeyman	60.31	2.00	120.62			
MIL B-EQOPRCRN Equip. Operators, Heavy		Journeyman	51.68	2.00	103.36			
MIL B-LABORER Laborers, (Semi-Skilled)		Journeyman	40.03	2.00	80.06			
MIL X-EQOPROIL Outside Equip. Oilers / Grade Checker		Journeyman	55.66	2.00	111.32			
MIL X-EQOPRHVY Outside Equip. Operators, Heavy		Journeyman	52.51	2.00	105.02			
RSM X-LABORER4 Outside Laborers, Group 4 Skilled		Journeyman	51.79	2.00	103.58			
USR U-MISC-010 Miscellaneous Equipment (crane mats, etc.)		Non-EP Rental / Average	1.00			2.00	2.00	
GEN H25Z3215 HYDRAULIC EXCAVATOR, CRAWLER, 140,000 LB (63,503 KG), 4.00 CY (3.1 M3) BUCKET, 31.4' (9.6 M) MAX DIGGING DEPTH		EP / Average	98.25			2.00	196.50	
EP M10SM004 MARINE EQUIPMENT, BOATS & LAUNCHES, 23' LITTLE GIANT, W/CABIN TRI-HULL, CAP 3,400 LBS, OUTBOARD, 23.4' X 8.5' X 1.2'		EP / Average	43.20			2.00	86.40	
EP M10XX019 MARINE EQUIPMENT, ALL OTHER BARGES, HOPPER, 200' X 35' X 12', 1,600 TON (COVERED)		EP / Average	23.05			2.00	46.10	
EP M10XX033 MARINE EQUIPMENT, TUGS, 60 FT LENGTH, 21 FT BEAM, 5'0" DRAFT, 80 TON, TOW BOAT		EP / Average	84.67			2.00	169.33	
NON XX0XX740 WORK BARGE, FLAT DECK, 2000 TON WITH 4 SPUDS		Non-EP / Average	25.96			2.00	51.92	
NON XX0XX810 DUMP SCOW BARGE, 3,000 CY		Non-EP / Average	90.87			2.00	181.74	
				12.00	*623.96*	*14.00*	*633.25*	*1,257.21*
USR U-B-MANAGE-210 Transfer Non-Stabilized Material - Confined Dredging	24.00			288.04	14,977.28	336.05	15,200.21	30,177.49
MIL B-EQOPRCRN Equip. Operators, Heavy		Journeyman	51.68	2.00	103.36			
RSM X-LABORER4 Outside Laborers, Group 4 Skilled		Journeyman	51.79	2.00	103.58			
MIL B-LABORER Laborers, (Semi-Skilled)		Journeyman	40.03	2.00	80.06			
MIL B-EQOPRCRB Equip. Operators Crane with Boom Pay		Journeyman	60.31	2.00	120.62			
MIL X-EQOPRHVY Outside Equip. Operators, Heavy		Journeyman	52.51	2.00	105.02			
MIL X-EQOPROIL Outside Equip. Oilers / Grade Checker		Journeyman	55.66	2.00	111.32			
USR U-MISC-010 Miscellaneous Equipment (crane mats, etc.)		Non-EP Rental / Average	1.00			2.00	2.00	

Description	CrewHours	MemberType	MemberRate	ManHours	LaborCost	EQHours	EQCost	CrewCost
GEN H25Z3215 HYDRAULIC EXCAVATOR, CRAWLER, 140,000 LB (63,503 KG), 4.00 CY (3.1 M3) BUCKET, 31.4' (9.6 M) MAX DIGGING DEPTH		EP / Average	98.25			2.00	196.50	
EP M10SM004 MARINE EQUIPMENT, BOATS & LAUNCHES, 23' LITTLE GIANT, W/CABIN TRI-HULL, CAP 3,400 LBS, OUTBOARD, 23.4' X 8.5' X 1.2'		EP / Average	43.20			2.00	86.40	
EP M10XX019 MARINE EQUIPMENT, ALL OTHER BARGES, HOPPER, 200' X 35' X 12', 1,600 TON (COVERED)		EP / Average	23.05			2.00	46.10	
EP M10XX033 MARINE EQUIPMENT, TUGS, 60 FT LENGTH, 21 FT BEAM, 5'0" DRAFT, 80 TON, TOW BOAT		EP / Average	84.67			2.00	169.33	
NON XX0XX740 WORK BARGE, FLAT DECK, 2000 TON WITH 4 SPUDS		Non-EP / Average	25.96			2.00	51.92	
NON XX0XX800 DUMP SCOW BARGE, 1,500 CY		Non-EP / Average	40.50			2.00	81.00	
				20.00	*1,033.24*	*24.00*	*985.05*	*2,018.29*
USR U-B-MANAGE-300 In-Barge Stabilization	24.00			479.91	24,792.95	575.89	23,636.59	48,429.53
MIL B-EQOPRCRB Equip. Operators Crane with Boom Pay		Journeyman	60.31	4.00	241.24			
MIL B-LABORER Laborers, (Semi-Skilled)		Journeyman	40.03	4.00	160.12			
MIL B-EQOPRCRN Equip. Operators, Heavy		Journeyman	51.68	2.00	103.36			
RSM X-LABORER4 Outside Laborers, Group 4 Skilled		Journeyman	51.79	4.00	207.16			
MIL X-EQOPRHVY Outside Equip. Operators, Heavy		Journeyman	52.51	4.00	210.04			
MIL X-EQOPROIL Outside Equip. Oilers / Grade Checker		Journeyman	55.66	2.00	111.32			
USR U-MISC-010 Miscellaneous Equipment (crane mats, etc.)		Non-EP Rental / Average	1.00			2.00	2.00	
GEN H25Z3215 HYDRAULIC EXCAVATOR, CRAWLER, 140,000 LB (63,503 KG), 4.00 CY (3.1 M3) BUCKET, 31.4' (9.6 M) MAX DIGGING DEPTH		EP / Average	98.25			4.00	393.00	
EP M10SM004 MARINE EQUIPMENT, BOATS & LAUNCHES, 23' LITTLE GIANT, W/CABIN TRI-HULL, CAP 3,400 LBS, OUTBOARD, 23.4' X 8.5' X 1.2'		EP / Average	43.20			2.00	86.40	
EP M10XX019 MARINE EQUIPMENT, ALL OTHER BARGES, HOPPER, 200' X 35' X 12', 1,600 TON (COVERED)		EP / Average	23.05			10.00	230.48	
EP M10XX033 MARINE EQUIPMENT, TUGS, 60 FT LENGTH, 21 FT BEAM, 5'0" DRAFT, 80 TON, TOW BOAT		EP / Average	84.67			2.00	169.33	
NON XX0XX740 WORK BARGE, FLAT DECK, 2000 TON WITH 4 SPUDS		Non-EP / Average	25.96			4.00	103.84	
				10.00	*527.42*	*4.00*	*836.77*	*1,364.19*
USR U-B-MANAGE-600 Offloading Material	24.00			240.00	12,658.08	96.00	20,082.42	32,740.50
RSM X-LABORER4 Outside Laborers, Group 4 Skilled		Foreman	52.79	2.00	105.58			
MIL X-EQOPROIL Outside Equip. Oilers / Grade Checker		Journeyman	55.66	2.00	111.32			
RSM X-LABORER4 Outside Laborers, Group 4 Skilled		Journeyman	51.79	4.00	207.16			
MIL B-EQOPRCRN Equip. Operators, Heavy		Journeyman	51.68	2.00	103.36			
EP M10XX022 MARINE EQUIPMENT, BOATS & LAUNCHES,		EP / Average	68.16			2.00	136.33	

Description	CrewHours	MemberType	MemberRate	ManHours	LaborCost	EQHours	EQCost	CrewCost
45' LENGTH, 16' BEAM, 5' 0" DRAFT, PUSH BOAT NON XX0XX410 BARGE MOUNTED CLAMSHELL, 10 CY CRANE		Non-EP / Average	350.22			2.00	700.44	
Diver Subcontractor	**12.00**		**0.00**	**96.00**	**3,938.88**	**24.00**	**453.43**	**4,392.31**
				8.00	*328.24*	*2.00*	*37.79*	*366.03*
USR U-B-CAP-200 Divers	12.00			96.00	3,938.88	24.00	453.43	4,392.31
MIL X-EQOPRMED Outside Equip. Operators, Medium		Journeyman	57.15	2.00	114.30			
MIL X-LABORER Outside Laborers, (Semi-Skilled)		Journeyman	35.49	5.00	177.45			
MIL X-LABORER Outside Laborers, (Semi-Skilled)		Foreman	36.49	1.00	36.49			
GEN M10Z4230 MARINE EQUIPMENT, BOATS & LAUNCHES, 18' (5.5 M) LONG, R-RUNNER V-HULL, 1,350 LBS (612 KG), NO CABIN, OUTBOARD ENGINE		EP / Average	18.89			2.00	37.79	

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Cost Estimate Backup
Costs from Other Projects/Sources

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CDM Smith

PROJECT:	Portland Harbor FS	CHECKED BY:	GH
JOB NO.:	79171.3383.345.FSZ	DATE CHECKED:	2/9/2016
CLIENT:	EPA	WRKSHT NO. :	CALC-MITIGATION

Description: Summary of cost buildup for mitigation unit cost.

Project	Project Cost ($)	Acreage (AC)	Unit Cost ($/DSAY)	DSAY to Acre Conversion (DSAY/AC)	Unit Cost ($/AC)	Year Constructed	2016 Escalated Cost ($)	2016 Escalated Unit Cost ($/AC)	Source
North Winds Weir Project (Lower Duwamish Waterway Natural Resources Damage Project), King County, WA	$3,700,000	2.55	-	-	$1,450,980.39	2010	$4,167,552	$1,634,334	Table 6.1-1 of the Appendix M, Attachment 1, Anchor QEA FS (2010)
South Park (Lower Duwamish Waterway Project), King County, WA	$691,809	0.35	-	-	$1,976,597.14	2010 [1]	$779,230	$2,226,371	Table 6.1-1 of the Appendix M, Attachment 1, Anchor QEA FS (2010)
Strawberry Plant (Bainbridge Island), Kitsap County, WA	$1,168,212	1.58	-	-	$739,374.68	2010 [1]	$1,315,834	$832,806	Table 6.1-4 of the Appendix M, Attachment 1, Anchor QEA FS (2010)
Pritchard Park East (Bainbridge Island), Kitsap County, WA	$734,853	1.35	-	-	$544,335.56	2010 [1]	$827,713	$613,121	Table 6.1-4 of the Appendix M, Attachment 1, Anchor QEA FS (2010)
Port of Bremerton Sinclair Inlet Estuary Restoration Phase 2 (*A Primer on Habitat Project Costs* ; Evergreen Funding Consultants 2003), Kitsap County, WA	$885,581 [2]	1.7	-	-	$520,930.00	2003 [1]	$1,363,054	$801,796	Table 6.1-4 of the Appendix M, Attachment 1, Anchor QEA FS (2010)
A Primer on Habitat Project Costs - Estuary Restoration Matrix Cost Range [3] (Evergreen Funding Consultants 2003)	$450,000	1	-	-	$450,000.00	2003	$692,624	$692,624	Table 6.1-4 of the Appendix M, Attachment 1, Anchor QEA FS (2010). Used the high end of cost range for "*Somewhat* Developed" Land Use and "Moderate/Average" Extent of Earthmoving.
West Fork Hylebos Habitat Restoration Project (Tacoma), Pierce County, WA	$408,025	0.5	-	-	$816,050.00	2010 [1]	$459,585	$919,170	Table 6.1-4 of the Appendix M, Attachment 1, Anchor QEA FS (2010)
Cle Elum River Instream Habitat (Salmon Recovery Funding Board [SRFB]), Kittitas County, WA	$498,720	2	-	-	$249,360.00	2010 [1]	$561,741	$280,871	Table 6.1-4 of the Appendix M, Attachment 1, Anchor QEA FS (2010)
Wildlands Inc - Alder Creek Restoration Project, Multnomah County, OR [4,5]	-	-	$75,000	14.34	$1,075,500.00	2014	-	$1,091,056	Agreement for Purchase and Sale of Discounted Acre-Year Credits and Escrow Instructions (Alder Creek-City of Portland). City of Portland Ordinance No. 186911
A Primer on Habitat Project Costs - Estuary Restoration Matrix Cost Range [6] (Evergreen Funding Consultants 2003)	$1,050,000	1	-	-	$1,050,000.00	2003	$1,616,122	$1,616,122	A Primer on Habitat Project Costs (Evergreen Funding Consultants 2003). Used the middle of cost range for "*Highly* Developed" Land Use and "Moderate/Average" Extent of Earthmoving.
						Revised Average Unit Cost (2016):		***$1,070,827***	

Notes:

Mitigation costs were escalated from the year of construction to 2016. The weighted average composite indices from USACE Civil Works Construction Cost Index System (CWCCIS), EM 1110-2-1304, revised 31 March 2012 and amended 30 September 2015 was used to determine the escalation rate to the base year of the current estimate (2016).

Mitigation costs for the McCormick & Baxter Superfund Site were excluded from the analysis as of 2/9/16 because costs for mitigation were not quantified per discussion with DEQ.

[1] - For projects where the construction year was not specified, costs were assumed to be current as of the year the source document was produced.

[2] - The cost presented in Table 6.1-4 of the Appendix M, Attachment 1, Anchor QEA FS (2010) for this item is $885,581, as shown in the table above. However, the actual costs present in *A Primer on Habitat Project Cost* is $885,817.

[3] - The cost presented in Table 6.1-4 of the Appendix M, Attachment 1, Anchor QEA FS (2010) for this item used the high end of cost range for "Somewhat Developed" Land Use and "Moderate/Average" Extent of Earthmoving. This cost is likely underestimating the cost of mitigation, as the Portland Harbor Site should be classified as "Highly Developed". See footnote 6.

[4] - Costs for the Alder Creek Restoration project are based on DSAY (discounted service-acre year) credits as opposed to acreage because it was for NRDA mitigation. Because the acreage and total project cost does not reflect in the calculation, it is not presented for purposes of this table.

[5] - Based on the Habitat Equivalency Analysis method used to evaulate the Alder Creek Restoration project, it is expected that 14.34 DSAY credits will be generated per acre. Therefore, a conversion factor of 14.34 DSAYs/AC was used to convert the unit cost of $/DSAY to $/AC.

[6] - Due to Table 6.1-4 of the Appendix M, Attachment 1, Anchor QEA FS (2010) likely underestimating the cost of mitigation, as discussed in footnote 3, a separate cost was included from the *A Primer on Habitat Project Costs* - Estuary Restoration Matrix Cost Range. This cost used the middle of cost range for "Highly Developed" Land Use and "Moderate/Average" Extent of Earthmoving.

Telephone Call Report

9200 Ward Parkway, Suite 500
Kansas City, MO – 64114
Tel: (816) 444-8270
Fax: (816) 523-2600

Project:	Gilt Edge Mine Site, OU1	**Client:**	USEPA
Job No.		**Date:**	Sep 10, 2014 3:50 pm

☐ **Phone in** ☐ **Phone out** ☐ **Current Project** ☐ **Prospective Project/Marketing** ☐ **Administrative** ☑ **Other**

Made by/Received by: Abhay Sonawane

Talked with: Mark Downs, Geo-Synthetics, Inc.

Subject: Price Quote for Geomembrane, Geocomposite, and Geotextile Installation

Distribution:

- **Discussion:**

Company:
Geo-Synthetics, Inc.
Mark H. Downs
Geo-Synthetics, Inc.
Ph: (605)428-4353
Fax: (605)428-4393
Cell: (262)366-5570
markd@geo-synthetics.com

Installation costs only, no material

Geomembrane Installation (60 mil): $0.29 / SF

Geotextile Installation (8 oz): $0.16 / SF

Geocomposite Installation (8-300-8): $0.288 / SF

- **Action Required (what, who, when):**

Telephone Call Report

9200 Ward Parkway, Suite 500
Kansas City, MO - 64114
Tel: (816) 444-8270
Fax: (816) 523-2600

Project:	Gilt Edge Mine Site, OU1	**Client:**	USEPA
Job No.		**Date:**	Sep 2014

☐ **Phone in** ☑ **Phone out** ☐ **Current Project** ☐ **Prospective Project/Marketing** ☐ **Administrative** ☐ **Other**

Made by/Received by: Abhay Sonawane

Talked with: Greg/Scott, Bierschbach Equipment & Supply

Subject: Price Quote for Nonwoven Geotextile (Mirafi® 180N)

Distribution:

- **Discussion:**

Company:
Bierschbach Equipment & Supply
3030 N Plaza Dr
Rapid City, SD 57702

Tel: (605) 348-6440, (800) 658-5437

Geotextile:
(*Nonwoven, Needlepunched, Polypropylene, 8 oz/yd^2, 15' x 300' (500 yd^2)***)**

- Price per Roll (material only) - **$0.12/SF, $1.08/SY**
- Delivery Cost - **$550/load (approx. 15 rolls per load)**

- **Action Required (what, who, when):**

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Attachment A

Methodology and Organization of Detailed Analysis Cost Estimates

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Memorandum

To: *Kristine Koch, Project Manager – U.S. Environmental Protection Agency (EPA) Region 10*

From: *Scott Coffey and Gary Hazen, CDM Federal Programs Corporation*

Date: *May 31, 2016*

Subject: *Methodology and Organization of Detailed Analysis Cost Estimates, Feasibility Study, Portland Harbor Superfund Site*

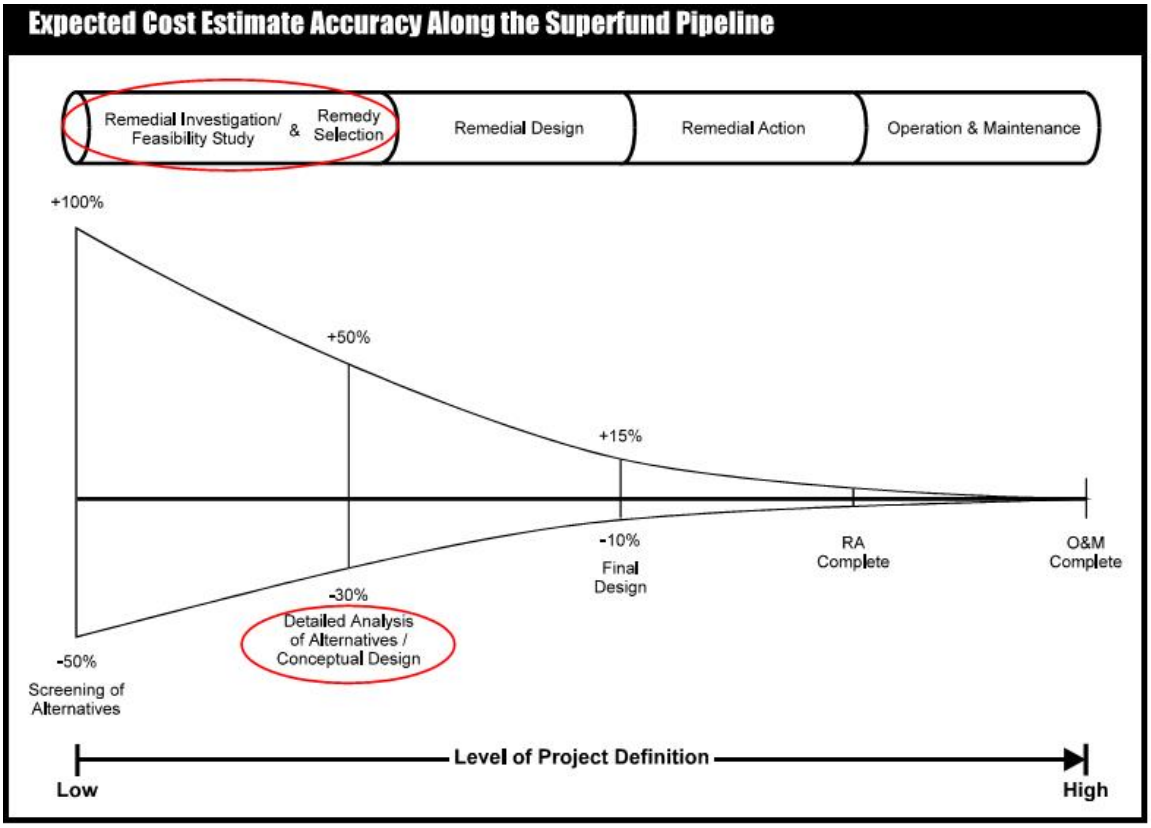
Introduction

CDM Federal Programs Corporation (CDM Smith) has been tasked to develop detailed analysis cost estimates for eight alternatives (Alternatives B, C, D, E, F, G, H, and I) as part of the Feasibility Study (FS) for the Portland Harbor Superfund Site (herein referred to as "FS cost estimates"). The FS cost estimates are based on the scope of the alternatives as presented in the FS.

Purpose and Accuracy of FS Detailed Analysis Cost Estimates

The FS cost estimates are developed during the detailed analysis phase to compare alternatives and support remedy selection, not for establishing project budgets or negotiating Superfund enforcement settlements. At the FS stage of the project, the "design" for the remedial action as represented by the remedial alternatives is still conceptual, not detailed, and the cost estimates are considered to be "order-of-magnitude". The information provided in the cost estimate is based on the best available information regarding the anticipated scope of the remedial alternatives. As described in *A Guide to Developing and Documenting Cost Estimates During the Feasibility Study* (EPA 2000), the detailed analysis cost estimate is expected to have an accuracy between -30% to +50% of actual cost, based on the scope presented in the FS. **Exhibit 1** illustrates the relationship between level of alternative scope definition and related accuracy as a typical project progresses through the CERCLA process.

Exhibit 1. Expected Cost Estimate Accuracy Along the Superfund Pipeline (EPA 2000)



Generalized Scope of Remedial Alternatives

The FS includes nine alternatives, including the "No Further Action" alternative (Alternative A). Per EPA direction, Alternative A does not include activities that require cost estimating and thus is presented as a "zero" cost without any additional backup information.

All alternatives developed for the FS (other than Alternative A) include the following scope elements to address contaminated sediment and riverbank soils; the alternatives primarily differ with respect to quantities and related durations of work. The primary scope elements are presented in Section 3 of the FS text and summarized as follows:

- Technology assignments
  - capping (several types depending on location and conditions)
  - dredging/excavation and related transportation/disposal
  - enhanced natural recovery (ENR)

- Monitored natural recovery (MNR)
- Institutional controls
- Monitoring and maintenance of remedy components (technology assignments as well as ICs) and five year site reviews

Other secondary elements of this scope include but are not limited to erosion/sedimentation best management practices and mitigation.

Transportation and disposal of dredged/excavated materials is a significant consideration that affects the overall costs of each alternative. The FS presents two disposed material management (DMM) scenarios that may be implemented depending on the alternative. They include DMM Scenario 1 (confined disposal facility (CDF) and off-site disposal) and DMM Scenario 2 (off-site disposal). For purposes of presenting the alternatives for detailed analysis in the FS, DMM Scenario 2 was selected by EPA. Cost differences that could result in potential savings by implementing DMM Scenario 1 are discussed later in this memorandum.

The primary variable scope item between alternatives for off-site disposal is the type of facility used for off-site disposal of dredged/excavated contaminated sediments and riverbank soils and whether ex situ treatment is required prior to disposal. There are a number of complicating factors that can affect this decision such as presence of listed or characteristic RCRA hazardous waste, state hazardous waste (such as DDx), and designation of ex situ treatment principal threat waste (PTW) (i.e. not reliably contained [NRC]/non-aqueous phase liquid [NAPL] PTW). Assumptions for material management and disposal of dredged/excavated materials are consistent with Section 3 of the FS text. In addition, the off-site facilities have the right to accept or reject the wastes proposed for disposal based on acceptance criteria.

The following assumptions were made for purposes of the detailed analysis cost estimates with respect to management, disposal, and ex situ treatment (if needed) at off-site facilities:

- Contaminated materials designated for the Subtitle C/TSCA facility need to be sufficiently managed through pre-treatment (dewatering and/or amendment with diatomaceous earth) to pass the paint filter test.
- Contaminated materials designated for the Subtitle D facility need to be sufficiently managed through pre-treatment (dewatering assumed with diatomaceous earth) to minimize free liquids.
- All NRC/NAPL PTW will be disposed of at the representative Subtitle C/TSCA facility. Treatment assumptions prior to disposal at Subtitle C/TSCA facility were broken down by which of the two areas the NRC/NAPL PTW originated from (Area 6W or Area 7W).
- All NRC/NAPL PTW originating from Area 6W is assumed to undergo ex-situ solidification treatment (using quicklime) prior to disposal at the Subtitle C/TSCA facility.
- For NRC/NAPL PTW originating from Area 7W, one-third will undergo ex-situ solidification treatment (using quicklime) prior to disposal, one-third is assumed to undergo ex-situ low temperature thermal desorption treatment prior to disposal, and the remaining one-third is assumed to not require treatment prior to disposal at the Subtitle C/TSCA facility.

- Ex-situ stabilization/solidification will consist of quicklime amendment on the barge prior to transportation offsite for disposal.
- Ex-situ low temperature thermal desorption will be performed offsite at the Subtitle C/TSCA facility prior to disposal.
- All other contaminated sediment and riverbank soils designated for off-site disposal is assumed to be disposed of at the representative Subtitle D facility.
- No treatment will be performed for contaminated sediment and riverbank soils designated for the Subtitle D facility as they are assumed to have waste classifications and contaminant concentrations when generated that are acceptable to the facility.

Several modes of transport (truck, rail, and barge) are available for disposal of contaminated sediments and riverbank soils. After discussions with the representative Subtitle C/TSCA disposal facility (Chemical Waste Management of the Northwest) and the representative Subtitle D facility (Roosevelt Regional), the following assumptions were made for purposes of the detailed analysis cost estimates with respect to transport methods for disposal at off-site facilities:

- Transport of contaminated sediment/riverbank soils to the Subtitle C/TSCA facility is assumed to be by barge for all alternatives. The representative facility's opinion is that barge transportation will have a cost similar to rail or trucking. For costing purposes, transloading was assumed to occur at the Port of Morrow, near Boardman, Oregon, followed by truck transportation from the Port of Morrow to the Subtitle C/TSCA facility.
- Transport of contaminated sediment/riverbank soils for off-site disposal at the Subtitle D facility is assumed to be by barge for all alternatives. The representative facility's opinion is that for their facility barge transport will have a cost representaive of other transportation methods, and they provided unit costs for transloading at an off-site facility and truck transportation from the transload facility to the Subtitle D facility.

With the exception of Alternative A, the remaining alternatives include the work activities listed as follows.

Major Work Activities Costed for Alternatives B, C, D, E, F, G, H, and I:

1. Implementation of institutional controls
2. Mobilization/demobilization
3. Debris removal and disposal from dredge/excavation areas
4. Obstruction (i.e. structure and utility) removal and relocation from dredge/excavation areas
5. Dredging of contaminated sediments (both open water and confined dredging)
6. Excavation of riverbank materials (assumed for cost estimating purposes to be from barges)
7. Development of an offsite transload facility for facilitating off-site disposal of contaminated sediments and riverbank soils
8. Offloading of sediments to the transload facility

9. Management of dredged/excavated sediments and riverbank soils prior to off-site transportation to the transload facility, including ex-situ solidification for select NRC/NAPL PTW materials and dewatering for all materials.
10. Transportation (assumed to be by barge) to the off-site transload facility.
11. Transportation and disposal of contaminated sediments/riverbank soils at off-site facilities, including ex-situ thermal desorption treatment of select NRC/NAPL PTW materials at the off-site Subtitle C/TSCA facility
12. Placement of sand, beach mix, armor, carbon amendments (AquaGate and AquaBlok), organoclay mats, and geofabric for technology assignments including capping, reactive residual layers, ENR, and in situ treatment (such as broadcast GAC)
13. Mitigation of nearshore areas impacted by activities such as capping, dredging, in situ treatment and ENR that extend to a depth of -13 feet NAVD88
14. MNR
15. Site-wide monitoring, cap area monitoring, and reactive layer monitoring
16. Long-term maintenance for capping, ENR, and in-situ treatment
17. Five-year site reviews

General Methodology and Relevant Cost Guidance

Cost estimates are developed according to *A Guide to Developing and Documenting Cost Estimates during the Feasibility Study* (EPA 2000). Flexibility is incorporated into each alternative for the location of remedial facilities, the selection of cleanup levels, and the period in which remedial action will be completed. Assumptions of the project scope and duration are defined for each alternative to provide cost estimates for the various remedial alternatives.

Types of costs that are assessed for each alternative include the following:

- Capital costs
- Annual operation and maintenance (O&M) costs
- Periodic costs
- Present value of capital, annual O&M, and periodic costs

The levels of detail employed in making these estimates are conceptual but are considered appropriate for making choices between alternatives. The information provided in the cost estimate is based on the best available information regarding the anticipated scope of the remedial alternatives.

The costs are evaluated with respect to the following categories:

- Capital costs are expenditures that are required to construct a remedial action. They are exclusive of costs required to operate or maintain the action throughout its lifetime. Capital costs consist primarily of expenditures initially incurred to build or install the remedial action. Capital costs include all labor, equipment, and material costs (including contractor markups, such as overhead and profit) associated with activities, such as mobilization/demobilization,

site work, dredging of sediments, installation of caps, and disposal facilities. Capital costs also include expenditures for professional/technical services that are necessary to support construction of the remedial action. The construction activities occurring as capital costs include major work activities 1 through 13.

- Annual O&M costs are post-construction costs necessary to ensure or verify the continued effectiveness of a remedial action. These costs are typically estimated on an annual basis. Annual O&M costs include all labor, equipment, and material costs (including contractor markups, such as overhead and profit) associated with O&M activities. Annual O&M costs also include expenditures for professional/technical services necessary to support O&M activities. Although work activities are contemplated for long-term maintenance and monitoring (work activities 14 through 16), the O&M of these work activities would occur periodically rather than annually. Subsequently, no work activities are included in these estimates that would be classified as annual O&M costs.
- Periodic costs are costs that occur only once every few years (e.g., 5-year reviews, monitoring, and maintenance) or expenditures that occur only once during the entire O&M period or remedial time frame (e.g., site closeout and remedy failure/replacement). These costs may be either capital or O&M costs, but because of their periodic nature, it is more practical to consider them separately from other capital or O&M costs in the estimating process. The post-construction activity occurring on a periodic basis that is typical of capital costs is the pre-construction baseline MNR event for major work activity 13. The post-construction activities occurring on a periodic basis that are typical of O&M costs include major work activities 14 through 17.
- The present value of each alternative provides the basis for the cost comparison. The present value cost represents the amount of money that, if invested in the initial year of the remedial action at a given rate, would provide the funds required to make future payments to cover all costs associated with the remedial action over its planned life. Future O&M and periodic costs are included and reduced by the appropriate present value real discount rate (7%) as outlined in *A Guide to Developing and Documenting Cost Estimates during the Feasibility Study* (EPA 540-R-00-002, July 2000). Inflation and depreciation were not considered in preparing the present value costs.

Development Approach for Information Provided in Cost Worksheets

Unit quantities (lengths, areas and volumes) used to cost activities such as capping, dredging, in-situ treatment, ENR, MNR, transport, and disposal were developed for each alternative primarily using the results of the technology assignment modeling performed using the software called “R”. Additional calculations were developed by CDM Smith to supplement the quantities provided by the model. Output quantities from the technology assignment model and supplemental calculations are provided in Appendix D. In addition to the model quantities and supplemental calculations, additional quantities such as obstruction removal and relocation, riverbanks, mitigation, and installation of silt curtains and sheet piles were estimated from the FS technology assignment figures for each alternative. Information provided by Anchor QEA, vendors, literature from sites of similar scope, as well as engineering judgment was used to develop quantity assumptions and other design components not estimated from the technology assignment model or FS figures.

Unit costs were derived from three main sources:

- EPA-Derived Unit Costs – EPA-derived unit costs were prepared using USACE's Micro Computer Aided Cost Engineering System (MCACES) Second Generation (MII) software version 4.2, Build 3. This is the software platform generally used by Federal agencies, including the EPA, to develop construction cost estimates for CERCLA remedial actions. The MII unit costs account for local market conditions to the degree practicable (e.g. the estimate uses local Davis Bacon wage rate determinations for labor costs and local fuel and energy rates for equipment costs). Crews and productivities were developed based on assumptions with the FS. Assumptions for the MII crews and productivities are presented in the MII backup calculations (PDSM-01, CRW-01, and PD-01).

- Unit Costs Previously Developed by Anchor QEA – These unit costs were derived from costs developed by Anchor QEA in 2010. Crew productivities assumed in development of the unit costs by Anchor QEA were not modified by EPA. These unit costs were originally obtained in 2010 and were escalated to the base year of these estimates (2016) using the Civil Works Construction Cost Index System (CWCCIS), Engineer Manual (EM) 1110-2-1304, Amendment #7 revised as of 30 September 2015. In addition, some of these units costs were converted to another unit of measure using assumed densities as presented in the cost buildup calculations (CALC-1).
- Project-Specific Vendor Quotes – EPA obtained project-specific vendor quote for numerous items including, but not limited to, transportation and disposal of waste at off-site disposal facilities, carbon amendments (AquaBlok and AquaGate), and quicklime.

In those instances where these three cost sources were not sufficient for costing all major work activities, supplemental unit costs were obtained. Costs that were derived from other sources include the following:

- Vendor quotes from a project of similar scope were utilized for geotextile material and placement costs.

- Unit costs for professional labor rates included in the labor rate backup were determined using FLCdatacenter.com tailored to the Portland, Oregon area. These labor rates were used in developing costs for implementation of institutional controls, evaluating and updating institutional controls, and five-year site reviews.

- The mitigation unit cost was calculated from the average cost of projects presented in Tables 6.1-1 and 6.1-4 of the Appendix M, Attachment 1, Anchor QEA FS (2010) as well as select other projects. The calculation of the mitigation cost is presented in the summary of cost buildup (CALC-MITIGATION).

- Mobilization/demobilization costs are applied as a percentage of the capital cost for each alternative. This percentage was based on an evaluation of the mobilization/demobilization costs presented in the detailed cost estimates of the Lower Duwamish Waterway Final Feasibility Study (EPA 2012). Lower Duwamish mobilization/demobilization costs accounted for approximately 1.5%-1.6% of total capital costs for each alternative based on the scope of the work. The scope and duration of the remedial activities assumed for each of the Lower

Duwamish Waterway FS alternatives was taken into consideration when determining the cost assumption for mobilization/demobilization presented in the FS. The derivation of the mobilization/demobilization assumption is presented in the summary of cost buildup (CALC-01).

Specific modifications from the general approach and shown in the cost worksheets include the following:

- Unit costs developed by EPA using MII include contractor markups such as overhead and profit; therefore, additional no additional overhead and profit was added to these items in the cost worksheets.
- Unit cost buildups provided by Anchor QEA (including quotes) indicate they include prime contractor overhead and profit; thus, no additional overhead and profit was added to these items.
- Disposal and treatment costs obtained by EPA from the disposal facilities presumably include the facility's overhead and profit. However the prime contractor implementing the work would likely need to have some type of overhead costs for administering and tracking disposal off-site. Thus a handling fee of 1 percent was included in the prime contractor overhead but no additional profit was added on that activity.
- In addition to disposal and treatment costs, EPA obtained vendor quotes for materials such as carbon amendments (AquaBlok and AquaGate) and quicklime. For these items, a handling fee of 5 percent was included in the prime contractor overhead but no additional profit was added.

Development Approach for Information Provided in Cost Summary Tables

The cost summary tables are organized by the three major cost categories: capital costs, annual O&M costs, and periodic costs. Costs are totaled for each major work activity. Contingency and professional/technical services are applied within the cost summary tables after subtotaling the costs for major work activities. Percentages used for contingency and professional/technical services costs are based on the recommended ranges presented in Section 5.0 of *A Guide to Developing and Documenting Cost Estimates During the Feasibility Study* (EPA 2000), unless otherwise noted within the cost summary tables.

Specific modifications from the general approach and shown in the cost summary tables include the following:

- As described in Section 5.4 of *A Guide to Developing and Documenting Cost Estimates During the Feasibility Study*, engineering judgment may be used to adjust rule-of-thumb percentages presented in Exhibit 5-6 for scope contingency with a lower contingency indicating that project scope will undergo minimal change during design. Due to the high overall costs for major work activities and a detailed level of conceptual design performed as part of the technology assignment modeling, the scope contingency percentages were modified to the low end of the recommended range presented in the guidance, to better reflect the detailed evaluation and concepts developed for these items.

- As described in Section 5.5 of *A Guide to Developing and Documenting Cost Estimates During the Feasibility Study*, engineering judgment may be used to adjust rule-of-thumb percentages presented in Exhibit 5-8 for project management, remedial design, and construction management as well as the recommended range presented for technical support. Due to the high overall costs for major work activities, the professional/technical percentages were modified to lower than the recommended range presented in the guidance, to better reflect realistic costs for professional/technical services costs for these items.
- As described in Section 5.6 of *A Guide to Developing and Documenting Cost Estimates During the Feasibility Study*, contingency is generally not applied to institutional control cost elements. However, due to the complexity of the site and the numerous property owners involved at the site, a 15% contingency (10% Scope, 5% Bid) was applied to account for uncertainties relating to implementation of institutional controls and a 10% contingency (10% Scope, 0% Bid) was applied to account for uncertainties relating to evaluating and updating institutional controls.
- As described in Section 5.5 of *A Guide to Developing and Documenting Cost Estimates During the Feasibility Study*, bid contingency is typically applied to remedial action construction or O&M activities. Since costs for 5-Year Site Reviews fall outside that definition, bid contingency was not applied for 5-Year Site Review Periodic Costs and only 10% scope contingency was applied.

Development Approach for Information Provided in Present Value Tables

The present value of each alternative provides the basis for the cost comparison. The present value cost represents the amount of money that, if invested in the initial year of the remedial action at a given rate, would provide the funds required to make future payments to cover all costs associated with the remedial action over its planned life. Future O&M periodic costs are included and reduced by the appropriate present value discount rate as outlined in *A Guide to Developing and Documenting Cost Estimates during the Feasibility Study* (EPA 2000a). Per the guidance, the present value analysis was performed on remedial alternatives using a 7 percent discount (interest) rate over the period of evaluation for each alternative. Per guidance, inflation and depreciation were not considered in preparing the present value costs.

Specific modifications from the general approach and shown in the present value tables include the following:

- As discussed in A Guide to Developing and Documenting Cost Estimates during the Feasibility Study (EPA 2000), the real discount (interest) rate used for present value analysis in the FS depends on whether the Site is classified as a federal facility site. Federal facility sites are former or current installations operated or controlled by a federal government agency and identified by EPA's Federal Facilities Restoration and Reuse Office (FFRRO). Based on a cursory review, the areas within the Site are not a federal facility identified within FFRRO's site inventory. In addition, the guidance specifically mentions that although a federal-lead site cleaned up by EPA using the Superfund trust fund (i.e., fund-lead sites) may be an analogous situation to a federal facility site being cleaned up using Superfund authority, there is always a chance that a potentially responsible party (PRP) could remediate the Site. Thus, per guidance a real discount rate of 7 percent should be used in calculating present value costs for all non-federal facility sites. A 7 percent real discount rate was used to develop present value costs for

each retained alternative over the period of evaluation for each alternative since there is PRP involvement and the site or areas within the site are not identified as federal facilities in the FFRRO site inventory.

- The project duration for each alternative is longer than the period of evaluation for present value analysis (Years 0 through 30 as selected by EPA). The guidance indicates in those situations that site-specific justification for the selected period of evaluation should be provided. It is likely that all remedial alternatives would require an indefinite duration of O&M (evaluated as periodic costs within these estimates). However, evaluation of long durations of O&M is cumbersome and is generally not necessary for comparative evaluation between alternatives because of the effects of cost discounting in later years under present value analysis. The period of analysis for the FS is assumed to be 30 years, because the increase of present value cost due to small periodic expenditures for maintenance and monitoring after 30 years is minimal relative to the accuracy range of the estimates. In addition, Anchor QEA also used a period of 30 years in their analysis. However for purposes of illustrating cost impacts beyond 30 years, EPA has elected to include costs to 100 years as part of sensitivity analyses.
- As described in Section 4.2 of *A Guide to Developing and Documenting Cost Estimates During the Feasibility Study* (EPA 2000), most FS cost analyses assume that initial construction and startup will occur in year zero, but this assumption can be modified if it is known that capital costs will be expended beyond one year. Capital costs for each alternative were split out evenly over assumed construction durations. Due to the vast size of the cleanup and factors external to the project, construction durations were assumed to be longer than the minimum calculated which were based solely on productivities and work windows. The assumed construction durations for the alternatives (starting at Year 0) are: 4 Years (Alternative B), 5 Years (Alternative C), 6 Years (Alternative D), 7 Years (Alternative E), 13 Years (Alternative F), 19 Years (Alternative G), 62 Years (Alternative H), and 7 Years (Alternative I). Due to Alternative H having an estimated construction duration (62 Years) which is longer than the assumed period of analysis for all the alternatives (30 Years), all of the capital costs for Alternative H were applied in year zero as allowed in the guidance as a simplifying assumption when the exact duration of construction is unknown. This allows for all alternatives to be compared on a common 30 year period of analysis. This assumption is justified as it is highly unlikely that if the alternative were to be implemented that the work would be performed over that time period; it is more likely that additional crews would be dispatched to perform the work which would have the potential to increase costs as is represented by using the year zero simplifying assumption.
- In addition, a "no-discounting" scenario is included for the present value analysis of each alternative as recommended by the guidance for long-term projects (e.g., project duration exceeding 30 years). A non-discounted constant dollar cash flow over time demonstrates the impact of a discount rate on the total present value cost and the relative amounts of future annual expenditures. Non-discounted constant dollar costs are presented for comparison purposes only and should not be used in place of present value costs in the Superfund remedy selection process.

Development Approach for Sensitivity Analyses

During development of the FS costs, EPA provided questions and comments regarding the remedial alternative cost estimates. EPA requested a sensitivity analysis be performed to obtain a better understanding of the various cost drivers and the impact of these cost drivers on the total costs (both constant dollar (non-discounted) costs and present value dollar (discounted) costs).

Based on the comments/questions posed by EPA, CDM Smith performed the cost sensitivity analyses.

Development Approach for DMM Scenario 1 (Confined Disposal Facility [CDF] and Off-Site Disposal) and DMM Scenario 2 (Off-Site Disposal) Comparison

As previously indicated, as part of the general scope of FS cost estimates, DMM Scenario 2 (off-site disposal) was assumed for Alternatives B, C, D, E, F G, H, and I. However, DMM Scenario 1 (CDF and off-site disposal) may be viable and represent a potential cost savings for each eligible alternative (Alternatives E, F, G, H, and I) if it were to be implemented.

Costs were developed for each eligible alternative to reflect the assumptions of the DMM Scenario 1 which includes construction of a CDF and placement of a portion of the volume of dredged sediments into the CDF and off-site disposal of the remaining volume of dredged or excavated sediment and riverbank soils. Comparisons of costs for each alternative between DMM Scenario 1 and Scenario 2 provide an indication of the differences that represent potential cost savings by implementing DMM Scenario 1, assuming the wastes could meet the CDF acceptance criteria.

Attachment B of this FS cost estimate includes a comparison of total costs (both constant dollar [non-discounted] costs and present value dollar [discounted] costs) of DMM Scenario 1 (CDF and off-site disposal) and DMM Scenario 2 (off-site disposal).

FS Detailed Analysis Cost Estimate Organization

The detailed analysis cost estimates are organized into the following sections:

- Detailed Analysis Cost Estimates
- Attachment A – Methodology and Organization of Detailed Analysis Cost Estimates, Feasibility Study, Portland Harbor Superfund Site

  This is the memorandum you are currently reading that summarizes the approach to developing the detailed analysis cost estimates within the FS for the Portland Harbor Superfund Site.

- Attachment B - Comparison of Costs for DMM Scenario 1 (CDF and Off-Site Disposal) and DMM Scenario 2 (Off-site Disposal)

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Attachment B

Disposed Material Management (DMM) Scenario Comparison

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Disposed Material Management (DMM) Scenario Comparison
Feasibility Study
Portland Harbor Superfund Site

Introduction

CDM Federal Programs Corporation (CDM Smith) has been tasked to complete detailed analysis cost estimates for the Portland Harbor Superfund Site Feasibility Study (FS), herein referred to as the FS cost estimates. During development of the FS cost estimates, EPA requested a comparison be performed to obtain a better understanding of the differences on the total costs (both constant dollar (non-discounted) costs and present value dollar (discounted) costs) for two disposed material management (DMM) scenarios.

General Methodology

Dredged material removed from the Site would be managed in accordance with one of the two DMM scenarios:

- DMM Scenario 1: Confined Disposal Facility (CDF), and Off-site Disposal
- DMM Scenario 2: Off-Site Disposal

DMM Scenario 2 was used as the basis for the FS cost estimates provided for each alternative as discussed in Sections 3 and 4. The cost estimate assumptions for DMM Scenario 2 are listed in Attachment A (Methodology and Organization of Detailed Analysis Cost Estimates). The following assumptions were made for purposes of the detailed analysis cost estimates with respect to management, disposal, and ex situ treatment (if needed) at off-site facilities:

- All NRC/NAPL PTW will be disposed of at the representative Subtitle C/TSCA facility. Treatment assumptions prior to disposal at Subtitle C/TSCA facility were broken down by which of the two areas the NRC/NAPL PTW originated from (Area 6W or Area 7W).
- All NRC/NAPL PTW originating from Area 6W is assumed to undergo ex-situ solidification treatment (using quicklime) prior to disposal at the Subtitle C/TSCA facility.
- For NRC/NAPL PTW originating from Area 7W, one-third will undergo ex-situ solidification treatment (using quicklime) prior to disposal, one-third is assumed to undergo ex-situ low temperature thermal desorption treatment prior to disposal, and the remaining one-third is assumed to not require treatment prior to disposal at the Subtitle C/TSCA facility.
- Ex-situ stabilization/solidification will consist of quicklime amendment on the barge prior to transportation offsite for disposal.
- Ex-situ low temperature thermal desorption will be performed offsite at the Subtitle C/TSCA facility prior to disposal.
- Contaminated materials designated for the Subtitle C/TSCA facility need to be sufficiently managed through pre-treatment (dewatering and/or amendment with diatomaceous earth) to pass the paint filter test.
- All other contaminated sediment and riverbank soils designated for off-site disposal is assumed to be disposed of at the representative Subtitle D facility.

- No treatment will be performed for contaminated sediment and riverbank soils designated for the Subtitle D facility as they are assumed to have waste classifications and contaminant concentrations when generated that are acceptable to the facility.
- Contaminated materials designated for the Subtitle D facility need to be sufficiently managed through pre-treatment (dewatering assumed with diatomaceous earth) to minimize free liquids.

DMM Scenario 1 provides an option for onsite disposal of dredged sediment or excavated riverbank soils within a CDF to lessen offsite impacts and potentially reduce overall alternative costs. The following assumptions were made for purposes of the DMM Scenario 2 with respect to management, disposal, and ex situ treatment (if needed):

- Similar to DMM Scenario 2, all NRC/NAPL PTW will be disposed of at the representative Subtitle C/TSCA facility, and the assumptions for ex situ treatment, materials handling and management of NRC/NAPL PTW will be similar to DMM Scenario 2.
- Construction and disposal of contaminated materials within a CDF for DMM Scenario 1 is assumed to be located at the Port of Portland Terminal 4. Based on the current design, the capacity of the Terminal 4 CDF is 670,000 cubic yards of dredged contaminated sediments.
- A minimum threshold volume of material dredged/excavated to justify the CDF's construction is assumed to be 1,005,000 cubic yards. Based on that threshold relative to the estimated volume of dredged sediment and soil that is potentially acceptable for placement in a CDF, this CDF option was evaluated for Alternatives E, F G, H, and I.
- No treatment will be performed for contaminated sediment and riverbank soils designated for either the CDF or the Subtitle D facility as they are assumed to have waste classifications and contaminant concentrations when generated that are acceptable to either the CDF or the Subtitle D facility, as appropriate.
- Contaminated materials designated for the Subtitle D facility need to be sufficiently managed through pre-treatment (dewatering assumed with diatomaceous earth) to minimize free liquids.

Conclusions

Alternatives B, C, and D were not evaluated for DMM Scenario 1 and thus did not realize a cost difference (savings). Alternatives E, F, G, H, and I were evaluated for DMM Scenario 1 as well as Scenario 2 and thus cost differences (potential savings) could be estimated and are presented in **Exhibit 1**.

The constant dollar (non-discounted) cost difference between DMM Scenarios 2 and 1 for Alternatives E, F, G, H, and I are the same (approximately $79,400,000). The present value dollar (discounted) cost difference between DMM Scenarios 2 and 1 for Alternatives E, F, G, H, and I are approximately $65,410,000, $54,610,000, $46,210,000, $79,400,000, and $65,400,000 respectively. The constant dollar cost differences between DMM Scenarios 2 and 1 for Alternatives E, F, G, H, and I were the same because the CDF disposal volume (670,000 cubic yards) diverted from Subtitle D offsite disposal is the same for Alternatives E, F G, H, and I regardless of total volume dredged for each alternative. The present value costs cost differences between DMM Scenarios 2 and 1 for Alternatives E, F, G, H, and I vary because the capital costs for each alternative are discounted over differing construction durations for present value analysis.

Exhibit 1
Comparison of Constant Dollar Costs and Present Value Costs
Alternatives B, C, D, E, F, G, H, and I as Presented in the FS
Comparison of DMM Scenario 1 (CDF and Off-Site Option) and DMM Scenario 2 (Off-Site Disposal)

Scenario	Alternative B Total Expenditures		Alternative C Total Expenditures		Alternative D Total Expenditures		Alternative E Total Expenditures		Alternative F Total Expenditures		Alternative G Total Expenditures		Alternative H Total Expenditures		Alternative I Total Expenditures	
	Constant Dollar Cost	Present Value Cost	Constant Dollar Cost	Present Value Cost	Constant Dollar Cost	Present Value Cost	Constant Dollar Cost	Present Value Cost	Constant Dollar Cost	Present Value Cost	Constant Dollar Cost	Present Value Cost	Constant Dollar Cost	Present Value Cost	Constant Dollar Cost	Present Value Cost
DMM Scenario 2 (Off-Site Disposal)	$642,421,000	$451,460,000	$718,397,000	$496,760,000	$953,032,000	$653,700,000	$1,239,797,000	$869,530,000	$2,178,919,000	$1,371,170,000	$3,208,659,000	$1,777,320,000	$10,232,747,000	$9,524,940,000	$1,173,299,000	$811,290,000
DMM Scenario 1 (CDF and Off-Site Disposal)	N/A	N/A	N/A	N/A	N/A	N/A	$1,160,403,000	$804,120,000	$2,099,526,000	$1,316,560,000	$3,129,266,000	$1,731,110,000	$10,153,354,000	$9,445,540,000	$1,093,906,000	$745,890,000
Cost Difference (Savings)	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**$79,400,000**	**$65,410,000**	**$79,400,000**	**$54,610,000**	**$79,400,000**	**$46,210,000**	**$79,400,000**	**$79,400,000**	**$79,400,000**	**$65,400,000**

Note: Cost Difference (Savings) is rounded to the nearest $10,000

N/A: Not applicable (Alternatives B, C, and D were not evaluated for DMM Scenario 1)

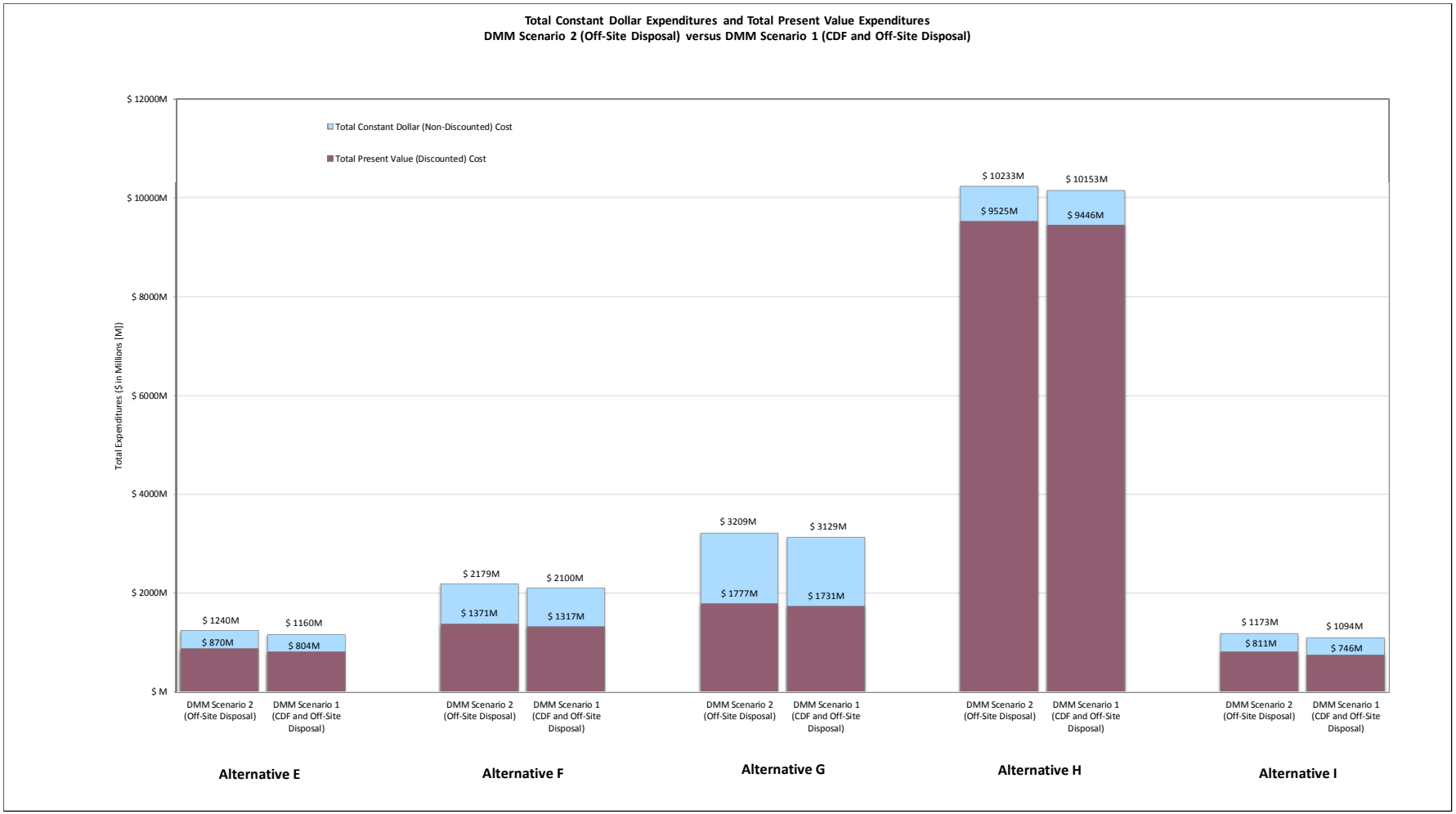

TABLE CS-ALT-CDF

ALTERNATIVE COST SUMMARY

Site: Portland Harbor Superfund Site
Location: Portland, Oregon
Phase: Feasibility Study (-30% to +50%)
Base Year: 2016

	Total Capital Cost	Total Periodic Cost	Total Non-Discounted Cost	Present Value Cost	Minus 30% Plus 50% Range
Alternative B					
DMM Scenario 2 (Off-Site Disposal)	$352,097,000	$290,324,000	$642,421,000	$451,460,000	$316,022,000 to $677,190,000
Alternative C					
DMM Scenario 2 (Off-Site Disposal)	$400,933,000	$317,464,000	$718,397,000	$496,760,000	$347,732,000 to $745,140,000
Alternative D					
DMM Scenario 2 (Off-Site Disposal)	$556,004,000	$397,028,000	$953,032,000	$653,700,000	$457,590,000 to $980,550,000
Alternative E					
DMM Scenario 1 (CDF and Off-Site Disposal)	$748,071,000	$412,332,000	$1,160,403,000	$804,120,000	$562,884,000 to $1,206,180,000
DMM Scenario 2 (Off-Site Disposal)	$827,465,000	$412,332,000	$1,239,797,000	$869,530,000	$608,671,000 to $1,304,295,000
Alternative F					
DMM Scenario 1 (CDF and Off-Site Disposal)	$1,550,014,000	$549,512,000	$2,099,526,000	$1,316,560,000	$938,147,000 to $2,010,315,000
DMM Scenario 2 (Off-Site Disposal)	$1,629,407,000	$549,512,000	$2,178,919,000	$1,371,170,000	$959,819,000 to $2,056,755,000
Alternative G					
DMM Scenario 1 (CDF and Off-Site Disposal)	$2,421,152,000	$708,114,000	$3,129,266,000	$1,731,110,000	$1,211,777,000 to $2,596,665,000
DMM Scenario 2 (Off-Site Disposal)	$2,500,545,000	$708,114,000	$3,208,659,000	$1,777,320,000	$1,244,124,000 to $2,665,980,000
Alternative H					
DMM Scenario 1 (CDF and Off-Site Disposal)	$8,869,180,000	$1,284,174,000	$10,153,354,000	$9,445,540,000	$6,611,878,000 to $14,168,310,000
DMM Scenario 2 (Off-Site Disposal)	$8,948,573,000	$1,284,174,000	$10,232,747,000	$9,524,940,000	$6,667,458,000 to $14,287,410,000
Alternative I					
DMM Scenario 1 (CDF and Off-Site Disposal)	$671,966,000	$421,940,000	$1,093,906,000	$745,890,000	$522,123,000 to $1,118,835,000
DMM Scenario 2 (Off-Site Disposal)	$751,359,000	$421,940,000	$1,173,299,000	$811,290,000	$567,903,000 to $1,216,935,000

Notes:
1 - Capital costs, annual costs, and periodic costs are presented on Tables CS-B through CS-I.
2 - Estimated remedial timeframes and associated present value analysis for each remedial alternative are provided on Tables PV-B through PV-I.
3 - The total present value cost demonstrates the impact of a discount rate on the total non-discounted cost and the relative amount of future annual expenditures. Non-discounted costs are presented for comparison purposes only and should not be used in place of present value costs in the CERCLA remedy selection process.
4 - Costs presented for this alternative are expected to have an accuracy between -30% to +50% of actual costs, based on the scope presented. They are prepared solely to facilitate relative comparisons between alternatives for feasibility study level evaluation purposes.

DMM Scenario 1
Alternative E

Note: Cost Worksheets presented herein are specific to DMM Scenario 1. All other Cost Worksheets are the same for both DMM Scenario 1 and DMM Scenario 2, and can be found in the base estimate

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TABLE PV-E

PRESENT VALUE ANALYSIS

Alternative **E DMM Scenario 1 (CDF and Off-Site Option)**

Site: Portland Harbor Superfund Site
Location: Portland, Oregon
Phase: Feasibility Study (-30% to +50%)
Base Year: 2016

Year[1]	Capital Costs (Institutional Controls)[2]	Capital Costs (Monitored Natural Recovery)[2]	Capital Costs (Technology Assignments)[2]	Annual O&M Costs	Periodic Costs (Long Term Monitoring and Monitored Natural Recovery)	Periodic Costs (Long Term Operations and Maintenance and Institutional Controls)	Periodic Costs (Five-Year Site Reviews)	Total Annual Expenditure[3]	Discount Factor (7.0%)	Present Value[4]
0	$524,714	$9,991,000	$104,915,286	$0	$0	$0	$0	$115,431,000	1.0000	$115,431,000
1	$524,714	$0	$104,915,286	$0	$0	$0	$0	$105,440,000	0.9346	$98,544,224
2	$524,714	$0	$104,915,286	$0	$37,467,000	$0	$0	$142,907,000	0.8734	$124,814,974
3	$524,714	$0	$104,915,286	$0	$0	$0	$0	$105,440,000	0.8163	$86,070,672
4	$524,714	$0	$104,915,286	$0	$37,467,000	$0	$0	$142,907,000	0.7629	$109,023,750
5	$524,714	$0	$104,915,286	$0	$0	$5,969,000	$308,000	$111,717,000	0.7130	$79,654,221
6	$524,714	$0	$104,915,286	$0	$37,467,000	$0	$0	$142,907,000	0.6663	$95,218,934
7	$0	$0	$0	$0	$0	$0	$0	$0	0.6227	$0
8	$0	$0	$0	$0	$37,467,000	$0	$0	$37,467,000	0.5820	$21,805,794
9	$0	$0	$0	$0	$0	$0	$0	$0	0.5439	$0
10	$0	$0	$0	$0	$37,467,000	$5,969,000	$308,000	$43,744,000	0.5083	$22,235,075
11	$0	$0	$0	$0	$0	$0	$0	$0	0.4751	$0
12	$0	$0	$0	$0	$0	$0	$0	$0	0.4440	$0
13	$0	$0	$0	$0	$0	$0	$0	$0	0.4150	$0
14	$0	$0	$0	$0	$37,467,000	$0	$0	$37,467,000	0.3878	$14,529,703
15	$0	$0	$0	$0	$0	$5,969,000	$308,000	$6,277,000	0.3624	$2,274,785
16	$0	$0	$0	$0	$0	$0	$0	$0	0.3387	$0
17	$0	$0	$0	$0	$0	$0	$0	$0	0.3166	$0
18	$0	$0	$0	$0	$37,467,000	$0	$0	$37,467,000	0.2959	$11,086,485
19	$0	$0	$0	$0	$0	$0	$0	$0	0.2765	$0
20	$0	$0	$0	$0	$0	$5,969,000	$308,000	$6,277,000	0.2584	$1,621,977
21	$0	$0	$0	$0	$0	$0	$0	$0	0.2415	$0
22	$0	$0	$0	$0	$37,467,000	$0	$0	$37,467,000	0.2257	$8,456,302
23	$0	$0	$0	$0	$0	$0	$0	$0	0.2109	$0
24	$0	$0	$0	$0	$0	$0	$0	$0	0.1971	$0
25	$0	$0	$0	$0	$0	$5,969,000	$308,000	$6,277,000	0.1842	$1,156,223
26	$0	$0	$0	$0	$37,467,000	$0	$0	$37,467,000	0.1722	$6,451,817
27	$0	$0	$0	$0	$0	$0	$0	$0	0.1609	$0
28	$0	$0	$0	$0	$0	$0	$0	$0	0.1504	$0
29	$0	$0	$0	$0	$0	$0	$0	$0	0.1406	$0
30	$0	$0	$0	$0	$37,467,000	$5,969,000	$308,000	$43,744,000	0.1314	$5,747,962
TOTALS:	$3,673,000	$9,991,000	$734,407,000	$0	$374,670,000	$35,814,000	$1,848,000	$1,160,403,000		$804,123,898
TOTAL PRESENT VALUE OF ALTERNATIVE E [5]										**$804,120,000**

Notes:

[1] The alternative is expected to require cost expenditures for perpetuity since some contamination within the sediment bed and associated riverbank soils would remain in-place that do not allow for unrestricted use or unlimited exposure to human or ecological receptors. However the period of analysis was assumed to be 30 yrs beyond the construction in Year 0.

[2] Capital costs, for purposes of this analysis, are assumed to be distributed as indicated on Table CS-E.

[3] Total annual expenditure is the total cost per year with no discounting.

[4] Present value is the total cost per year including a 7.0% discount factor for that year. See Table PV-ADRFT for details.

[5] Total present value is rounded to the nearest $10,000. Inflation and depreciation are excluded from the present value cost.

Costs presented for this alternative are expected to have an accuracy between -30% to +50% of actual costs, based on the scope presented.

They are prepared solely to facilitate relative comparisons between alternatives for FS evaluation purposes.

TABLE CS-E

Alternative **E DMM Scenario 1 (CDF and Off-Site Option)**

DETAILED COST ESTIMATE SUMMARY

Site: Portland Harbor Superfund Site
Location: Portland, Oregon
Phase: Feasibility Study (-30% to +50%)
Base Year: 2016
Date: 5/24/2016

Description: This alternative evaluates a remedy that would involve dredging of contaminated sediments, disposal of contaminated sediment at offsite facilities (Subtitle D and Subtitle C/TSCA), capping, enhanced natural recovery (ENR), in-situ treatment, and monitored natural recovery (MNR). Capital costs are based on Disposed Material Management (DMM) Scenario 1.

INSTITUTIONAL CONTROLS CAPITAL COSTS: (Assumed to be Incurred During Years 0 through 6)

DESCRIPTION	WORKSHEET	QTY	UNIT(S)	UNIT COST	TOTAL	NOTES
Initial Establishment of Institutional Controls	CW-E2	1	LS	$2,985,246	$2,985,246	
SUBTOTAL					$2,985,246	
Contingency (Scope and Bid)		15%			$447,787	10% Scope, 5% Bid as documented in Attachment A.
SUBTOTAL					$3,433,033	
Project Management		2%			$68,661	Percentage modified as documented in Attachment A.
Remedial Design		2%			$68,661	Percentage modified as documented in Attachment A.
Construction Management		3%			$102,991	Percentage modified as documented in Attachment A.
TOTAL					$3,673,346	
TOTAL CAPITAL COST					**$3,673,000**	Total capital cost is rounded to the nearest $1,000.

MONITORED NATURAL RECOVERY CAPITAL COSTS: (Assumed to be Incurred During Year 0)

DESCRIPTION	WORKSHEET	QTY	UNIT(S)	UNIT COST	TOTAL	NOTES
Monitored Natural Recovery (MNR) for MNR/Enhanced Natural Recovery (ENR) and Broadcast GAC Areas	CW-E22	1,898	AC	$3,686	$6,996,648	Quantity represents dredge, MNR/ENR and in situ treatment areas.
SUBTOTAL					$6,996,648	
Contingency (Scope and Bid)		20%			$1,399,330	10% Scope, 10% Bid (Low end of the recommended range in EPA 540-R-00-002).
SUBTOTAL					$8,395,978	
Project Management		5%			$419,799	Percentage from Exhibit 5-8 in EPA 540-R-00-002 was used.
Remedial Design		8%			$671,678	Percentage from Exhibit 5-8 in EPA 540-R-00-002 was used.
Construction Management		6%			$503,759	Percentage from Exhibit 5-8 in EPA 540-R-00-002 was used.
TOTAL					$9,991,214	
TOTAL CAPITAL COST					**$9,991,000**	Total capital cost is rounded to the nearest $1,000.

TABLE CS-E

Alternative **E DMM Scenario 1 (CDF and Off-Site Option)**

DETAILED COST ESTIMATE SUMMARY

Site: Portland Harbor Superfund Site
Location: Portland, Oregon
Phase: Feasibility Study (-30% to +50%)
Base Year: 2016
Date: 5/24/2016

Description: This alternative evaluates a remedy that would involve dredging of contaminated sediments, disposal of contaminated sediment at offsite facilities (Subtitle D and Subtitle C/TSCA), capping, enhanced natural recovery (ENR), in-situ treatment, and monitored natural recovery (MNR). Capital costs are based on Disposed Material Management (DMM) Scenario 1.

TECHNOLOGY ASSIGNMENTS MEASURES CAPITAL CONSTRUCTION COSTS: (Assumed to be Incurred During Years 0 through 6)

DESCRIPTION	WORKSHEET	QTY	UNIT(S)	UNIT COST	TOTAL	NOTES
Mobilization / Demobilization	CW-E1	1	LS	$9,982,000	$9,982,000	
Transload Facility Development	CW-E21	1	LS	$10,528,998	$10,528,998	
Debris Removal and Disposal	CW-E5	330	AC	$13,107	$4,325,313	
Obstruction Removal and Relocation	CW-E6	1	LS	$15,701,434	$15,701,434	
Erosion/Residual Control Measures	CW-E7	1	LS	$24,743,285	$24,743,285	
Dredging of Contaminated Sediments (Open Water)	CW-E8	1,835,521	CY	$24.53	$45,025,330	
Dredging of Contaminated Sediments (Confined)	CW-E9	92,616	CY	$31.10	$2,880,358	
Excavation of Riverbanks	CW-E10	96,086	CY	$5.19	$498,687	
Dewatering and Water Treatment for Dredging Operations	CW-E11	1	LS	$8,443,577	$8,443,577	Includes collection and treatment of water from sediment dewatering during dredging operations
Offloading of the Contaminated Sediments at the CDF - DMM Scenario 1 (CDF and Off-Site Option)	CW-E11A	670,000	CY	$9.70	$6,499,000	
Subtitle C/TSCA Disposal (Handling, Transportation, Treatment of Select PTW Materials, and Disposal)	CW-E12	358,888	TON	$191	$68,535,729	Includes waste going to offsite Subtitle C/TSCA facility for disposal, including the volume of NRC/NAPL PTW that would require treatment
Subtitle D Disposal (Handling, Transportation, and Disposal) - DMM Scenario 1 (CDF and Off-Site Option)	CW-E13C	1,885,188	TON	$111	$208,796,076	Includes waste going to offsite Subtitle D facility for disposal without treatment, including the volume of non-PTW contaminated sediments/riverbank soils as well as the volume of highly toxic PTW
CDF Construction - DMM Scenario 1 (CDF and Off-Site Option)	CW-E13D	1	LS	$52,439,400	$52,439,400	
Mitigation	CW-E14	35	AC	$1,070,827	$37,478,945	
Sand Placement for Technology Assignments	CW-E15	665,248	CY	$33.73	$22,437,471	
Beach Mix Placement for Technology Assignments	CW-E16	48,189	CY	$73.34	$3,534,049	
Armor Placement for Technology Assignments	CW-E17	79,256	CY	$72.14	$5,717,178	
Reactive/GAC Placement for Technology Assignments	CW-E18	1	LS	$42,943,721	$42,943,721	
Geofabric for Riverbanks	CW-E19	19.9	AC	$14,311	$284,794	
Organoclay Mat Placement for Technology Assignments	CW-E20	174,300	SF	$6.73	$1,173,039	
SUBTOTAL					$571,968,384	
Contingency (Scope and Bid)		20%			$114,393,677	10% Scope, 10% Bid (Low end of the recommended range in EPA 540-R-00-002).
SUBTOTAL					$686,362,061	
Project Management		2%			$13,727,241	Percentage modified as documented in Attachment A.
Remedial Design		2%			$13,727,241	Percentage modified as documented in Attachment A.
Construction Management		3%			$20,590,862	Percentage modified as documented in Attachment A.
TOTAL					$734,407,405	
TOTAL CAPITAL COST					**$734,407,000**	Total capital cost is rounded to the nearest $1,000.

TABLE CS-E

Alternative **E DMM Scenario 1 (CDF and Off-Site Option)**

DETAILED COST ESTIMATE SUMMARY

Site: Portland Harbor Superfund Site
Location: Portland, Oregon
Phase: Feasibility Study (-30% to +50%)
Base Year: 2016
Date: 5/24/2016

Description: This alternative evaluates a remedy that would involve dredging of contaminated sediments, disposal of contaminated sediment at offsite facilities (Subtitle D and Subtitle C/TSCA), capping, enhanced natural recovery (ENR), in-situ treatment, and monitored natural recovery (MNR). Capital costs are based on Disposed Material Management (DMM) Scenario 1.

SITE-WIDE MONITORING AND MONITORED NATURAL RECOVERY PERIODIC COSTS: (Assumed to be Incurred at Years 2, 4, 6, 8, 10 and Every 4 Years through Period of Analysis)

DESCRIPTION	WORKSHEET	QTY	UNIT(S)	UNIT COST	TOTAL	NOTES
Monitored Natural Recovery (MNR) for MNR/Enhanced Natural Recovery (ENR) and Broadcast GAC Areas	CW-E22	1,898	AC	$3,686	$6,996,648	
Site-Wide Monitoring	CW-E23	1	LS	$957,659	$957,659	
Cap Area Monitoring and Reactive Layer Monitoring	CW-E24	1	LS	$21,225,951	$21,225,951	
SUBTOTAL					$29,180,258	
Contingency (Scope and Bid)		20%			$5,836,052	10% Scope, 10% Bid (Low end of the recommended range in EPA 540-R-00-002).
SUBTOTAL					$35,016,310	
Project Management		2%			$700,326	Percentage modified as documented in Attachment A.
Technical Support		5%			$1,750,816	Percentage modified as documented in Attachment A.
TOTAL					$37,467,452	
TOTAL PERIODIC COST					**$37,467,000**	Total periodic cost is rounded to the nearest $1,000.

LONG TERM OPERATIONS AND MAINTENANCE PERIODIC COSTS: (Assumed to be Incurred at Year 5 and Every 5 Years through Period of Analysis)

DESCRIPTION	WORKSHEET	QTY	UNIT(S)	UNIT COST	TOTAL	NOTES
Long-Term Maintenance for Capping, ENR, and In Situ Treatment	CW-E25	1	LS	$3,865,618	$3,865,618	Assume 5% of placement of additional material for capping, ENR and In Situ Treatment. Includes mobilization and demobilization costs.
SUBTOTAL					$3,865,618	
Contingency (Scope and Bid)		20%			$773,124	10% Scope, 10% Bid (Low end of the recommended range in EPA 540-R-00-002).
SUBTOTAL					$4,638,742	
Project Management		5%			$231,937	Low end of the recommended range in EPA 540-R-00-002 was used.
Technical Support		10%			$463,874	Low end of the recommended range in EPA 540-R-00-002 was used.
TOTAL					$5,334,553	
TOTAL PERIODIC COST					**$5,335,000**	Total periodic cost is rounded to the nearest $1,000.

TABLE CS-E

Alternative **E DMM Scenario 1 (CDF and Off-Site Option)**

DETAILED COST ESTIMATE SUMMARY

Site: Portland Harbor Superfund Site
Location: Portland, Oregon
Phase: Feasibility Study (-30% to +50%)
Base Year: 2016
Date: 5/24/2016

Description: This alternative evaluates a remedy that would involve dredging of contaminated sediments, disposal of contaminated sediment at offsite facilities (Subtitle D and Subtitle C/TSCA), capping, enhanced natural recovery (ENR), in-situ treatment, and monitored natural recovery (MNR). Capital costs are based on Disposed Material Management (DMM) Scenario 1.

INSTITUTIONAL CONTROLS PERIODIC COSTS: (Assumed to be Incurred at Year 5 and Every 5 Years through Period of Analysis)

DESCRIPTION	WORKSHEET	QTY	UNIT(S)	UNIT COST	TOTAL	NOTES
Evaluating and Updating Institutional Controls	CW-E3	1	LS	$501,289	$501,289	
SUBTOTAL					$501,289	
Contingency (Scope and Bid)		10%			$50,129	10% Scope, 0% Bid as documented in Attachment A.
SUBTOTAL					$551,418	
Project Management		5%			$27,571	Low end of the recommended range in EPA 540-R-00-002 was used.
Technical Support		10%			$55,142	Low end of the recommended range in EPA 540-R-00-002 was used.
TOTAL					$634,131	
TOTAL PERIODIC COST					**$634,000**	Total periodic cost is rounded to the nearest $1,000.

5-YEAR SITE REVIEW PERIODIC COSTS: (Assumed to be Incurred at Year 5 and Every 5 Years through Period of Analysis)

DESCRIPTION	WORKSHEET	QTY	UNIT(S)	UNIT COST	TOTAL	NOTES
5-Year Site Review	CW-E26	1	LS	$243,687	$243,687	
SUBTOTAL					$243,687	
Contingency (Scope and Bid)		10%			$24,369	10% Scope, 0% Bid as documented in Attachment A.
SUBTOTAL					$268,056	
Project Management		5%			$13,403	Low end of the recommended range in EPA 540-R-00-002 was used.
Technical Support		10%			$26,806	Low end of the recommended range in EPA 540-R-00-002 was used.
TOTAL					$308,265	
TOTAL PERIODIC COST					**$308,000**	Total periodic cost is rounded to the nearest $1,000.

Notes:
Percentages used for contingency and professional/technical services costs are based on guidance from Section 5.0 of "A Guide to Developing and Documenting Cost Estimates During the Feasibility Study", EPA 2000. Modifications to the percentages applied for contingency and professional/technical services are documented in Attachment A.
Costs presented for this alternative are expected to have an accuracy between -30% to +50% of actual costs, based on the scope presented. They are prepared solely to facilitate relative comparisons between alternatives for FS evaluation purposes.

Red text indicates Cost Worksheets that are specific to DMM Scenario 1. All other Cost Worksheets are the same for both DMM Scenario 1 and DMM Scenario 2

Abbreviations:

AC	Acre
CY	Cubic Yard
LS	Lump Sum
QTY	Quantity
SF	Square Foot
TON	Ton

TABLE CW-E11A

Alternative E **Cost Worksheet: CW-E11A**
Capital Cost Sub-Element
Offloading of the Contaminated Sediments at the CDF - DMM Scenario 1 (CDF and Off-Site Option)

COST WORKSHEET

Site: Portland Harbor Superfund Site
Location: Portland, Oregon
Phase: Feasibility Study
Base Year: 2016

Prepared By: JN **Date:** 3/4/2016
Checked By: AB **Date:** 3/7/2016

Work Statement:
This sub-element involves the offloading of contaminated sediments at the CDF. It includes costs for on-site labor, equipment, and materials developed from previous work.

Cost Analysis:
Cost for Offloading at the CDF (Lump Sum)

COST DATABASE CODE	DESCRIPTION	QTY	UNIT(S)	HPF	LABOR	ADJ LABOR	EQUIP	ADJ EQUIP	MATL	OTHER	UNMOD UC	UNMOD LIC	PC OH	PC PF	BUR LIC	COST SOURCE CITATION	COMMENTS
	Offloading for CDF Disposal																
A14	Offloading of Sediments	**670,000**	CY	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$9.70	$9.70	$6,499,000.00	0%	0%	$6,499,000	MII MII	Project-specific unit cost developed in MII. Assumes mechanical offloading of sediments at the transload facility.
												TOTAL COST:			$6,499,000		

	Representative Unit Quantity	Unit(s)	Total Cost	Unit Cost
COST WORKSHEET SUMMARY	670,000	CY	$6,499,000	$9.70

Notes:
Further information about the development of cost worksheets can be found in Attachment A - Methodology and Organization of Detailed Cost Estimates.
The quantity bolded in the QTY column is the quantity selected as the representative unit quantity for this cost worksheet. If multiple quantities are bolded, the representative unit quantity is the sum of those quantities. When the LS unit is utilized, the default representative unit quantity is 1.
HTRW productivity factor is from Exhibit B-3 or B-4 of "A Guide to Developing and Documenting Cost Estimates During the Feasibility Study", EPA 2000
EPA developed project-specific unit costs using the Micro Computer Aided Cost Engineering System (MCACES) Second Generation (MII) software version 4.2, build 3

Cost Database Code:
The Cost Database Code is a reference code for linking with line item cost information with the cost source database and is not otherwise used within these cost worksheets. The following cost source database prefixes apply:
L (EPA-Derived Labor Unit Costs), M (Project-Specific Vendor Unit Costs), P (Previously Developed Unit Costs by Anchor QEA for Portland Harbor), A (EPA-Derived MII Unit Costs), O (Unit Costs from Other Projects/Sources)

Source of Cost Data:
For citation references, the following sources apply:
ALL (Allowance), FLC (www.flcdatacenter.com), LD (Costs Derived from Lower Duwamish Waterway Final Feasibility Study), MII (MII), O (Other), P (Previously Developed by Anchor QEA for Portland Harbor), and V (Vendor Quote)

Abbreviations:

QTY	Quantity	AC	Acres
EQUIP	Equipment	CLF	100 Linear Foot
MATL	Material	CY	Cubic Yard
HPF	HTRW Productivity Factor	DY	Days
ADJ LABOR	Adjusted Labor for HFP	EA	Each
ADJ EQUIP	Adjusted Equipment for HFP	FTE	Full Time Equivalent
UNMOD UC	Unmodified Unit Cost	HR	Hours
UNMOD LIC	Unmodified Line Item Cost	LB	Pounds
UNBUR LIC	Unburdened Line Item Cost	LCY	Loose Cubic Yard
PC OH	Prime Contractor Overhead	LF	Linear Foot
PC PF	Prime Contractor Profit	LS	Lump Sum
BUR LIC	Burdened Line Item Cost	MO	Month
		SF	Square Foot
		SY	Square Yard
		TON	Tons
		YR	Years

Cost Adjustment Checklist:	**NOTES:**
FACTOR:	Field work will be in Level "D" PPE.
H&S Productivity (labor and equipment only)	MII assembly costs include HPF adjustments.
Escalation to Base Year	2016 cost sources are not escalated (EF=1.00). All other costs are escalated based on the USACE CWCCIS, EM 1110-2-1304, Sept 2015.
Area Cost Factor	An AF of 1.05 is used for Oregon, except that an AF of 1.00 (national unmodified average) is used for MII assembly costs and local vendor quotes.
Subcontractor Overhead and Profit	It is assumed that home office OH is 8% and profit is 9% for the Prime Contractor. Professional labor overhead is 100%.
Prime Contractor Overhead and Profit	Allowances and items with mandated costs such as per diem do not have overhead and profit applied.
	Items previously developed by Anchor QEA already include contractor markups, therefore overhead and profit were not applied to those items.
	It is assumed that OH is 1% and profit is 0% for vendor quotes for treatment and disposal at offsite disposal facilities. It is assumed that OH is 5% and profit is 0% for quotes for all other material vendor quotes.
	Items developed using MII already include contractor markups such as overhead and profit, therefore additional overhead and profit were not applied in the PC OH and PC PF to those items.

TABLE CW-E13C

Alternative E **Cost Worksheet: CW-E13C**
Capital Cost Sub-Element
Subtitle D Disposal (Handling, Transportation, and Disposal) - DMM Scenario 1 (CDF and Off-Site Option)

COST WORKSHEET

Site: Portland Harbor Superfund Site
Location: Portland, Oregon
Phase: Feasibility Study
Base Year: 2016

Prepared By: JN **Date:** 3/4/2016
Checked By: AB **Date:** 3/7/2016

Work Statement:
This sub-element involves the disposal of contaminated sediments at a Subtitle D landfill, including barge transportation of materials to a transload facility, materials handling from the barge to truck, transportation of the sediments to the Subtitle C/TSCA landfill, and disposal of contaminated sediments (including thermal treatment at the landfill facility for a portion of the volume). It includes costs for labor, equipment, and materials as well as recent vendor quotes.

Cost Analysis:
Cost for Subtitle D Disposal (Lump Sum)

COST DATABASE CODE	DESCRIPTION	QTY	UNIT(S)	HPF	LABOR	ADJ LABOR	EQUIP	ADJ EQUIP	MATL	OTHER	UNMOD UC	UNMOD LIC	PC OH	PC PF	BUR LIC	COST SOURCE CITATION	COMMENTS
	Diatomaceous Earth Amendment																
A11	In-Barge Stabilization / Mixing of Amendments	1,503,607	CY	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$24.50	$24.50	$36,838,371.50	0%	0%	$36,838,372	MII MII	Project-specific unit cost developed in MII.
P5	Diatomaceous Earth	89,771	TON	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$105.94	$105.94	$9,510,339.74	0%	0%	$9,510,340	P Anchor QEA	Project-specific cost developed by Anchor QEA (2010) - see Backup Table 24.
	Transportation to Transload Facility																
A13	Barging to Transload Facility	1,503,607	CY	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$13.66	$13.66	$20,539,271.62	0%	0%	$20,539,272	MII MII	Project-specific unit cost developed in MII.
	Transportation and Disposal at Subtitle D Landfill																
M11	Transportation and Disposal at Subtitle D Landfill	**1,885,188**	TON	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$74.53	$74.53	$140,503,061.64	1%	0%	$141,908,092	V Vendor Quote	Project-specific vendor quote - Republic Services (Roosevelt Landfill), 2015. Includes transloading of the sediments, truck transportation from the transload facility to the landfill, and disposal at the landfill.
												TOTAL COST:			$208,796,076		

	Representative Unit Quantity	Unit(s)	Total Cost	Unit Cost
COST WORKSHEET SUMMARY	1,885,188	TON	$208,796,076	$111

Notes:
Further information about the development of cost worksheets can be found in Attachment A - Methodology and Organization of Detailed Cost Estimates.
The quantity bolded in the QTY column is the quantity selected as the representative unit quantity for this cost worksheet. If multiple quantities are bolded, the representative unit quantity is the sum of those quantities. When the LS unit is utilized, the default representative unit quantity is 1.
HTRW productivity factor is from Exhibit B-3 or B-4 of "A Guide to Developing and Documenting Cost Estimates During the Feasibility Study", EPA 2000
EPA developed project-specific unit costs using the Micro Computer Aided Cost Engineering System (MCACES) Second Generation (MII) software version 4.2, build 3

Cost Database Code:
The Cost Database Code is a reference code for linking with line item cost information with the cost source database and is not otherwise used within these cost worksheets. The following cost source database prefixes apply:
L (EPA-Derived Labor Unit Costs), M (Project-Specific Vendor Unit Costs), P (Previously Developed Unit Costs by Anchor QEA for Portland Harbor), A (EPA-Derived MII Unit Costs), O (Unit Costs from Other Projects/Sources)

Source of Cost Data:
For citation references, the following sources apply:
ALL (Allowance), FLC (www.flcdatacenter.com), LD (Costs Derived from Lower Duwamish Waterway Final Feasibility Study), MII (MII), O (Other), P (Previously Developed by Anchor QEA for Portland Harbor), and V (Vendor Quote)

Abbreviations:

QTY	Quantity	AC	Acres
EQUIP	Equipment	CLF	100 Linear Foot
MATL	Material	CY	Cubic Yard
HPF	HTRW Productivity Factor	DY	Days
ADJ LABOR	Adjusted Labor for HFP	EA	Each
ADJ EQUIP	Adjusted Equipment for HFP	FTE	Full Time Equivalent
UNMOD UC	Unmodified Unit Cost	HR	Hours
UNMOD LIC	Unmodified Line Item Cost	LB	Pounds
UNBUR LIC	Unburdened Line Item Cost	LCY	Loose Cubic Yard
PC OH	Prime Contractor Overhead	LF	Linear Foot
PC PF	Prime Contractor Profit	LS	Lump Sum
BUR LIC	Burdened Line Item Cost	MO	Month
		SF	Square Foot
		SY	Square Yard
		TON	Tons
		YR	Years

Cost Adjustment Checklist:	**NOTES:**
FACTOR:	Field work will be in Level "D" PPE.
H&S Productivity (labor and equipment only)	MII assembly costs include HPF adjustments.
Escalation to Base Year	2016 cost sources are not escalated (EF=1.00). All other costs are escalated based on the USACE CWCCIS, EM 1110-2-1304, Sept 2015.
Area Cost Factor	An AF of 1.05 is used for Oregon, except that an AF of 1.00 (national unmodified average) is used for MII assembly costs and local vendor quotes.
Subcontractor Overhead and Profit	It is assumed that home office OH is 8% and profit is 9% for the Prime Contractor. Professional labor overhead is 100%.
Prime Contractor Overhead and Profit	Allowances and items with mandated costs such as per diem do not have overhead and profit applied.
	Items previously developed by Anchor QEA already include contractor markups, therefore overhead and profit were not applied to those items.
	It is assumed that OH is 1% and profit is 0% for vendor quotes for treatment and disposal at offsite disposal facilities. It is assumed that OH is 5% and profit is 0% for quotes for all other material vendor quotes.
	Items developed using MII already include contractor markups such as overhead and profit, therefore additional overhead and profit were not applied in the PC OH and PC PF to those items.

TABLE CW-E13D

Alternative E **Cost Worksheet:** **CW-E13D**
Capital Cost Sub-Element
CDF Construction - DMM Scenario 1 (CDF and Off-Site Option)

COST WORKSHEET

Site: Portland Harbor Superfund Site
Location: Portland, Oregon
Phase: Feasibility Study
Base Year: 2016

Prepared By: JN **Date:** 3/4/2016
Checked By: AB **Date:** 3/7/2016

Work Statement:
This sub-element involves the construction of the CDF for disposal of contaminated sediments. It includes costs for on-site labor, equipment, and materials developed from previous work. Costs for the placement of the contaminated sediments within the CDF are included in Cost Worksheet CW-E11A

Cost Analysis:
Cost for CDF Disposal (Lump Sum)

COST DATABASE CODE	DESCRIPTION	QTY	UNIT(S)	HPF	LABOR	ADJ LABOR	EQUIP	ADJ EQUIP	MATL	OTHER	UNMOD UC	UNMOD LIC	PC OH	PC PF	BUR LIC	COST SOURCE CITATION	COMMENTS
P49	CDF Construction	1	LS	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$52,439,400.00	$52,439,400.00	$52,439,400.00	0%	0%	$52,439,400	P Anchor QEA	Project-specific cost developed by Anchor QEA (2011)
												TOTAL COST:			$52,439,400		

	Representative Unit Quantity	Unit(s)	Total Cost	Unit Cost
COST WORKSHEET SUMMARY	1	LS	$52,439,400	$52,439,400

Notes:
Further information about the development of cost worksheets can be found in Attachment A - Methodology and Organization of Detailed Cost Estimates.
The quantity bolded in the QTY column is the quantity selected as the representative unit quantity for this cost worksheet. If multiple quantities are bolded, the representative unit quantity is the sum of those quantities. When the LS unit is utilized, the default representative unit quantity is 1.
HTRW productivity factor is from Exhibit B-3 or B-4 of "A Guide to Developing and Documenting Cost Estimates During the Feasibility Study", EPA 2000
EPA developed project-specific unit costs using the Micro Computer Aided Cost Engineering System (MCACES) Second Generation (MII) software version 4.2, build 3

Cost Database Code:
The Cost Database Code is a reference code for linking with line item cost information with the cost source database and is not otherwise used within these cost worksheets. The following cost source database prefixes apply:
L (EPA-Derived Labor Unit Costs), M (Project-Specific Vendor Unit Costs), P (Previously Developed Unit Costs by Anchor QEA for Portland Harbor), A (EPA-Derived MII Unit Costs), O (Unit Costs from Other Projects/Sources)

Source of Cost Data:
For citation references, the following sources apply:
ALL (Allowance), FLC (www.flcdatacenter.com), LD (Costs Derived from Lower Duwamish Waterway Final Feasibility Study), MII (MII), O (Other), P (Previously Developed by Anchor QEA for Portland Harbor), and V (Vendor Quote)

Abbreviations:

QTY	Quantity	AC	Acres
EQUIP	Equipment	CLF	100 Linear Foot
MATL	Material	CY	Cubic Yard
HPF	HTRW Productivity Factor	DY	Days
ADJ LABOR	Adjusted Labor for HFP	EA	Each
ADJ EQUIP	Adjusted Equipment for HFP	FTE	Full Time Equivalent
UNMOD UC	Unmodified Unit Cost	HR	Hours
UNMOD LIC	Unmodified Line Item Cost	LB	Pounds
UNBUR LIC	Unburdened Line Item Cost	LCY	Loose Cubic Yard
PC OH	Prime Contractor Overhead	LF	Linear Foot
PC PF	Prime Contractor Profit	LS	Lump Sum
BUR LIC	Burdened Line Item Cost	MO	Month
		SF	Square Foot
		SY	Square Yard
		TON	Tons
		YR	Years

Cost Adjustment Checklist:	NOTES:
FACTOR:	Field work will be in Level "D" PPE.
H&S Productivity (labor and equipment only)	MII assembly costs include HPF adjustments.
Escalation to Base Year	2016 cost sources are not escalated (EF=1.00). All other costs are escalated based on the USACE CWCCIS, EM 1110-2-1304, Sept 2015.
Area Cost Factor	An AF of 1.05 is used for Oregon, except that an AF of 1.00 (national unmodified average) is used for MII assembly costs and local vendor quotes.
Subcontractor Overhead and Profit	It is assumed that home office OH is 8% and profit is 9% for the Prime Contractor. Professional labor overhead is 100%.
Prime Contractor Overhead and Profit	Allowances and items with mandated costs such as per diem do not have overhead and profit applied.
	Items previously developed by Anchor QEA already include contractor markups, therefore overhead and profit were not applied to those items.
	It is assumed that OH is 1% and profit is 0% for vendor quotes for treatment and disposal at offsite disposal facilities. It is assumed that OH is 5% and profit is 0% for quotes for all other material vendor quotes.
	Items developed using MII already include contractor markups such as overhead and profit, therefore additional overhead and profit were not applied in the PC OH and PC PF to those items.

DMM Scenario 1
Alternative F

Note: Cost Worksheets presented herein are specific to DMM Scenario 1. All other Cost Worksheets are the same for both DMM Scenario 1 and DMM Scenario 2, and can be found in the base estimate

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TABLE PV-F

PRESENT VALUE ANALYSIS

Alternative **F DMM Scenario 1 (CDF and Off-Site Option)**

Site: Portland Harbor Superfund Site
Location: Portland, Oregon
Phase: Feasibility Study (-30% to +50%)
Base Year: 2016

Year[1]	Capital Costs (Institutional Controls)[2]	Capital Costs (Monitored Natural Recovery)[2]	Capital Costs (Technology Assignments)[2]	Annual O&M Costs	Periodic Costs (Long Term Monitoring and Monitored Natural Recovery)	Periodic Costs (Long Term Operations and Maintenance and Institutional Controls)	Periodic Costs (Five-Year Site Reviews)	Total Annual Expenditure[3]	Discount Factor (7.0%)	Present Value[4]
0	$353,000	$8,749,000	$118,205,846	$0	$0	$0	$0	$127,307,846	1.0000	$127,307,846
1	$353,000	$0	$118,205,846	$0	$0	$0	$0	$118,558,846	0.9346	$110,805,097
2	$353,000	$0	$118,205,846	$0	$49,499,000	$0	$0	$168,057,846	0.8734	$146,781,723
3	$353,000	$0	$118,205,846	$0	$0	$0	$0	$118,558,846	0.8163	$96,779,586
4	$353,000	$0	$118,205,846	$0	$49,499,000	$0	$0	$168,057,846	0.7629	$128,211,331
5	$353,000	$0	$118,205,846	$0	$0	$8,779,000	$308,000	$127,645,846	0.7130	$91,011,488
6	$353,000	$0	$118,205,846	$0	$49,499,000	$0	$0	$168,057,846	0.6663	$111,976,943
7	$353,000	$0	$118,205,846	$0	$0	$0	$0	$118,558,846	0.6227	$73,826,593
8	$353,000	$0	$118,205,846	$0	$49,499,000	$0	$0	$168,057,846	0.5820	$97,809,666
9	$353,000	$0	$118,205,846	$0	$0	$0	$0	$118,558,846	0.5439	$64,484,156
10	$353,000	$0	$118,205,846	$0	$49,499,000	$8,779,000	$308,000	$177,144,846	0.5083	$90,042,725
11	$353,000	$0	$118,205,846	$0	$0	$0	$0	$118,558,846	0.4751	$56,327,308
12	$353,000	$0	$118,205,846	$0	$0	$0	$0	$118,558,846	0.4440	$52,640,128
13	$0	$0	$0	$0	$0	$0	$0	$0	0.4150	$0
14	$0	$0	$0	$0	$49,499,000	$0	$0	$49,499,000	0.3878	$19,195,712
15	$0	$0	$0	$0	$0	$8,779,000	$308,000	$9,087,000	0.3624	$3,293,129
16	$0	$0	$0	$0	$0	$0	$0	$0	0.3387	$0
17	$0	$0	$0	$0	$0	$0	$0	$0	0.3166	$0
18	$0	$0	$0	$0	$49,499,000	$0	$0	$49,499,000	0.2959	$14,646,754
19	$0	$0	$0	$0	$0	$0	$0	$0	0.2765	$0
20	$0	$0	$0	$0	$0	$8,779,000	$308,000	$9,087,000	0.2584	$2,348,081
21	$0	$0	$0	$0	$0	$0	$0	$0	0.2415	$0
22	$0	$0	$0	$0	$49,499,000	$0	$0	$49,499,000	0.2257	$11,171,924
23	$0	$0	$0	$0	$0	$0	$0	$0	0.2109	$0
24	$0	$0	$0	$0	$0	$0	$0	$0	0.1971	$0
25	$0	$0	$0	$0	$0	$8,779,000	$308,000	$9,087,000	0.1842	$1,673,825
26	$0	$0	$0	$0	$49,499,000	$0	$0	$49,499,000	0.1722	$8,523,728
27	$0	$0	$0	$0	$0	$0	$0	$0	0.1609	$0
28	$0	$0	$0	$0	$0	$0	$0	$0	0.1504	$0
29	$0	$0	$0	$0	$0	$0	$0	$0	0.1406	$0
30	$0	$0	$0	$0	$49,499,000	$8,779,000	$308,000	$58,586,000	0.1314	$7,698,200
TOTALS:	$4,589,000	$8,749,000	$1,536,676,000	$0	$494,990,000	$52,674,000	$1,848,000	$2,099,526,000		$1,316,555,943
TOTAL PRESENT VALUE OF ALTERNATIVE F [5]										**$1,316,560,000**

Notes:

[1] The alternative is expected to require cost expenditures for perpetuity since some contamination within the sediment bed and associated riverbank soils would remain in-place that do not allow for unrestricted use or unlimited exposure to human or ecological receptors. However the period of analysis was assumed to be 30 yrs beyond the construction in Year 0.

[2] Capital costs, for purposes of this analysis, are assumed to be distributed as indicated on Table CS-F.

[3] Total annual expenditure is the total cost per year with no discounting.

[4] Present value is the total cost per year including a 7.0% discount factor for that year. See Table PV-ADRFT for details.

[5] Total present value is rounded to the nearest $10,000. Inflation and depreciation are excluded from the present value cost.

Costs presented for this alternative are expected to have an accuracy between -30% to +50% of actual costs, based on the scope presented.

They are prepared solely to facilitate relative comparisons between alternatives for FS evaluation purposes.

TABLE CS-F

Alternative **F DMM Scenario 1 (CDF and Off-Site Option)**

DETAILED COST ESTIMATE SUMMARY

Site: Portland Harbor Superfund Site
Location: Portland, Oregon
Phase: Feasibility Study (-30% to +50%)
Base Year: 2016
Date: 5/24/2016

Description: This alternative evaluates a remedy that would involve dredging of contaminated sediments, disposal of the remaining contaminated sediment at offsite facilities (Subtitle D and Subtitle C/TSCA), capping, enhanced natural recovery (ENR), in-situ treatment, and monitored natural recovery (MNR). Capital costs are based on Disposed Material Management (DMM) Scenario 1.

INSTITUTIONAL CONTROLS CAPITAL COSTS: (Assumed to be Incurred During Years 0 through 12)

DESCRIPTION	WORKSHEET	QTY	UNIT(S)	UNIT COST	TOTAL	NOTES
Institutional Controls	CW-F2	1	LS	$3,728,996	$3,728,996	
SUBTOTAL					$3,728,996	
Contingency (Scope and Bid)		15%			$559,349	10% Scope, 5% Bid as documented in Attachment A.
SUBTOTAL					$4,288,345	
Project Management		2%			$85,767	Percentage modified as documented in Attachment A.
Remedial Design		2%			$85,767	Percentage modified as documented in Attachment A.
Construction Management		3%			$128,650	Percentage modified as documented in Attachment A.
TOTAL					$4,588,529	
TOTAL CAPITAL COST					**$4,589,000**	Total capital cost is rounded to the nearest $1,000.

MONITORED NATURAL RECOVERY CAPITAL COSTS: (Assumed to be Incurred During Year 0)

DESCRIPTION	WORKSHEET	QTY	UNIT(S)	UNIT COST	TOTAL	NOTES
Monitored Natural Recovery (MNR) for MNR/Enhanced Natural Recovery (ENR) and Broadcast GAC Areas	CW-F22	1,662	AC	$3,686	$6,126,675	Quantity represents dredge, MNR/ENR and in situ treatment areas.
SUBTOTAL					$6,126,675	
Contingency (Scope and Bid)		20%			$1,225,335	10% Scope, 10% Bid (Low end of the recommended range in EPA 540-R-00-002).
SUBTOTAL					$7,352,010	
Project Management		5%			$367,601	Percentage from Exhibit 5-8 in EPA 540-R-00-002 was used.
Remedial Design		8%			$588,161	Percentage from Exhibit 5-8 in EPA 540-R-00-002 was used.
Construction Management		6%			$441,121	Percentage from Exhibit 5-8 in EPA 540-R-00-002 was used.
TOTAL					$8,748,893	
TOTAL CAPITAL COST					**$8,749,000**	Total capital cost is rounded to the nearest $1,000.

TABLE CS-F

Alternative **F DMM Scenario 1 (CDF and Off-Site Option)**

DETAILED COST ESTIMATE SUMMARY

Site: Portland Harbor Superfund Site
Location: Portland, Oregon
Phase: Feasibility Study (-30% to +50%)
Base Year: 2016
Date: 5/24/2016

Description: This alternative evaluates a remedy that would involve dredging of contaminated sediments, disposal of the remaining contaminated sediment at offsite facilities (Subtitle D and Subtitle C/TSCA), capping, enhanced natural recovery (ENR), in-situ treatment, and monitored natural recovery (MNR). Capital costs are based on Disposed Material Management (DMM) Scenario 1.

TECHNOLOGY ASSIGNMENTS MEASURES CAPITAL CONSTRUCTION COSTS: (Assumed to be Incurred During Years 0 through 12)

DESCRIPTION	WORKSHEET	QTY	UNIT(S)	UNIT COST	TOTAL	NOTES
Mobilization / Demobilization	CW-F1	1	LS	$19,821,000	$19,821,000	
Transload Facility Development	CW-F21	1	LS	$15,651,213	$15,651,213	
Debris Removal and Disposal	CW-F5	534	AC	$13,107	$6,999,143	
Obstruction Removal and Relocation	CW-F6	1	LS	$20,718,583	$20,718,583	
Erosion/Residual Control Measures	CW-F7	1	LS	$27,166,335	$27,166,335	
Dredging of Contaminated Sediments (Open Water)	CW-F8	4,339,288	CY	$24.53	$106,442,735	
Dredging of Contaminated Sediments (Confined)	CW-F9	123,286	CY	$31.10	$3,834,195	
Excavation of Riverbanks	CW-F10	122,827	CY	$5.19	$637,472	
Dewatering and Water Treatment for Dredging Operations	CW-F11	1	LS	$19,423,050	$19,423,050	Includes collection and treatment of water from sediment dewatering during dredging operations
Offloading of the Contaminated Sediments at the CDF - DMM Scenario 1 (CDF and Off-Site Option)	CW-F11A	670,000	CY	$9.70	$6,499,000	
Subtitle C/TSCA Disposal (Handling, Transportation, Treatment of Select PTW Materials, and Disposal)	CW-F12	358,888	TON	$191	$68,535,729	Includes waste going to offsite Subtitle C/TSCA facility for disposal, including the volume of NRC/NAPL PTW that would require treatment
Subtitle D Disposal (Handling, Transportation, and Disposal) - DMM Scenario 1 (CDF and Off-Site Option)	CW-F13C	6,058,727	TON	$111	$671,040,892	Includes waste going to offsite Subtitle D facility for disposal without treatment, including the volume of non-PTW contaminated sediments/riverbank soils as well as the volume of highly toxic PTW
CDF Construction - DMM Scenario 1 (CDF and Off-Site Option)	CW-F13D	1	LS	$52,439,400	$52,439,400	
Mitigation	CW-F14	60	AC	$1,070,827	$64,249,620	
Sand Placement for Technology Assignments	CW-F15	1,119,996	CY	$33.48	$37,494,727	
Beach Mix Placement for Technology Assignments	CW-F16	69,510	CY	$72.97	$5,071,863	
Armor Placement for Technology Assignments	CW-F17	151,909	CY	$71.97	$10,932,677	
Reactive/GAC Placement for Technology Assignments	CW-F18	1	LS	$58,294,110	$58,294,110	
Geofabric for Riverbanks	CW-F19	25.4	AC	$14,311	$363,505	
Organoclay Mat Placement for Technology Assignments	CW-F20	174,300	SF	$6.73	$1,173,039	
SUBTOTAL					$1,196,788,288	
Contingency (Scope and Bid)		20%			$239,357,658	10% Scope, 10% Bid (Low end of the recommended range in EPA 540-R-00-002).
SUBTOTAL					$1,436,145,946	
Project Management		2%			$28,722,919	Percentage modified as documented in Attachment A.
Remedial Design		2%			$28,722,919	Percentage modified as documented in Attachment A.
Construction Management		3%			$43,084,378	Percentage modified as documented in Attachment A.
TOTAL					$1,536,676,162	
TOTAL CAPITAL COST					**$1,536,676,000**	Total capital cost is rounded to the nearest $1,000.

TABLE CS-F

Alternative **F DMM Scenario 1 (CDF and Off-Site Option)**

DETAILED COST ESTIMATE SUMMARY

Site: Portland Harbor Superfund Site
Location: Portland, Oregon
Phase: Feasibility Study (-30% to +50%)
Base Year: 2016
Date: 5/24/2016

Description: This alternative evaluates a remedy that would involve dredging of contaminated sediments, disposal of the remaining contaminated sediment at offsite facilities (Subtitle D and Subtitle C/TSCA), capping, enhanced natural recovery (ENR), in-situ treatment, and monitored natural recovery (MNR). Capital costs are based on Disposed Material Management (DMM) Scenario 1.

SITE-WIDE MONITORING AND MONITORED NATURAL RECOVERY PERIODIC COSTS: (Assumed to be Incurred at Years 2, 4, 6, 8, 10 and Every 4 Years through Period of Analysis)

DESCRIPTION	WORKSHEET	QTY	UNIT(S)	UNIT COST	TOTAL	NOTES
Monitored Natural Recovery (MNR) for MNR/Enhanced Natural Recovery (ENR) and Broadcast GAC Areas	CW-F22	1,662	AC	$3,686	$6,126,675	
Site-Wide Monitoring	CW-F23	1	LS	$957,659	$957,659	
Cap Area Monitoring and Reactive Layer Monitoring	CW-F24	1	LS	$31,466,392	$31,466,392	
SUBTOTAL					$38,550,726	
Contingency (Scope and Bid)		20%			$7,710,145	10% Scope, 10% Bid (Low end of the recommended range in EPA 540-R-00-002).
SUBTOTAL					$46,260,871	
Project Management		2%			$925,217	Percentage modified as documented in Attachment A.
Technical Support		5%			$2,313,044	Percentage modified as documented in Attachment A.
TOTAL					$49,499,132	
TOTAL PERIODIC COST					**$49,499,000**	Total periodic cost is rounded to the nearest $1,000.

LONG TERM OPERATIONS AND MAINTENANCE PERIODIC COSTS: (Assumed to be Incurred at Year 5 and Every 5 Years through Period of Analysis)

DESCRIPTION	WORKSHEET	QTY	UNIT(S)	UNIT COST	TOTAL	NOTES
Long-Term Maintenance for Capping, ENR, and In Situ Treatment	CW-F25	1	LS	$5,757,416	$5,757,416	Assume 5% of placement of additional material for capping, ENR and In Situ Treatment. Includes mobilization and demobilization costs
SUBTOTAL					$5,757,416	
Contingency (Scope and Bid)		20%			$1,151,483	10% Scope, 10% Bid (Low end of the recommended range in EPA 540-R-00-002).
SUBTOTAL					$6,908,899	
Project Management		5%			$345,445	Low end of the recommended range in EPA 540-R-00-002 was used.
Technical Support		10%			$690,890	Low end of the recommended range in EPA 540-R-00-002 was used.
TOTAL					$7,945,234	
TOTAL PERIODIC COST					**$7,945,000**	Total periodic cost is rounded to the nearest $1,000.

TABLE CS-F

Alternative **F DMM Scenario 1 (CDF and Off-Site Option)**

DETAILED COST ESTIMATE SUMMARY

Site: Portland Harbor Superfund Site
Location: Portland, Oregon
Phase: Feasibility Study (-30% to +50%)
Base Year: 2016
Date: 5/24/2016

Description: This alternative evaluates a remedy that would involve dredging of contaminated sediments, disposal of the remaining contaminated sediment at offsite facilities (Subtitle D and Subtitle C/TSCA), capping, enhanced natural recovery (ENR), in-situ treatment, and monitored natural recovery (MNR). Capital costs are based on Disposed Material Management (DMM) Scenario 1.

INSTITUTIONAL CONTROLS PERIODIC COSTS: (Assumed to be Incurred at Year 5 and Every 5 Years through Period of Analysis)

DESCRIPTION	WORKSHEET	QTY	UNIT(S)	UNIT COST	TOTAL	NOTES
Evaluating and Updating Institutional Controls	CW-F3	1	LS	$659,296	$659,296	
SUBTOTAL					$659,296	
Contingency (Scope and Bid)		10%			$65,930	10% Scope, 0% Bid as documented in Attachment A.
SUBTOTAL					$725,226	
Project Management		5%			$36,261	Low end of the recommended range in EPA 540-R-00-002 was used.
Technical Support		10%			$72,523	Low end of the recommended range in EPA 540-R-00-002 was used.
TOTAL					$834,010	
TOTAL PERIODIC COST					**$834,000**	Total periodic cost is rounded to the nearest $1,000.

5-YEAR SITE REVIEW PERIODIC COSTS: (Assumed to be Incurred at Year 5 and Every 5 Years through Period of Analysis)

DESCRIPTION	WORKSHEET	QTY	UNIT(S)	UNIT COST	TOTAL	NOTES
5-Year Site Review	CW-F26	1	LS	$243,687	$243,687	
SUBTOTAL					$243,687	
Contingency (Scope and Bid)		10%			$24,369	10% Scope, 0% Bid as documented in Attachment A.
SUBTOTAL					$268,056	
Project Management		5%			$13,403	Low end of the recommended range in EPA 540-R-00-002 was used.
Technical Support		10%			$26,806	Low end of the recommended range in EPA 540-R-00-002 was used.
TOTAL					$308,265	
TOTAL PERIODIC COST					**$308,000**	Total periodic cost is rounded to the nearest $1,000.

Notes:
Percentages used for contingency and professional/technical services costs are based on guidance from Section 5.0 of "A Guide to Developing and Documenting Cost Estimates During the Feasibility Study", EPA 2000. Modifications to the percentages applied for contingency and professional/technical services are documented in Attachment A.
Costs presented for this alternative are expected to have an accuracy between -30% to +50% of actual costs, based on the scope presented. They are prepared solely to facilitate relative comparisons between alternatives for FS evaluation purposes.
Red text indicates Cost Worksheets that are specific to DMM Scenario 1. All other Cost Worksheets are the same for both DMM Scenario 1 and DMM Scenario 2

Abbreviations:

AC	Acre
CY	Cubic Yard
LS	Lump Sum
QTY	Quantity
SF	Square Foot
TON	Ton

TABLE CW-F11A

Alternative F **Cost Worksheet: CW-F11A**
Capital Cost Sub-Element
Offloading of the Contaminated Sediments at the CDF - DMM Scenario 1 (CDF and Off-Site Option)

COST WORKSHEET

Site: Portland Harbor Superfund Site
Location: Portland, Oregon
Phase: Feasibility Study
Base Year: 2016

Prepared By: JN **Date:** 3/4/2016
Checked By: AB **Date:** 3/7/2016

Work Statement:
This sub-element involves the offloading of contaminated sediments at the CDF. It includes costs for on-site labor, equipment, and materials developed from previous work.

Cost Analysis:
Cost for Offloading at the CDF (Lump Sum)

COST DATABASE CODE	DESCRIPTION	QTY	UNIT(S)	HPF	LABOR	ADJ LABOR	EQUIP	ADJ EQUIP	MATL	OTHER	UNMOD UC	UNMOD LIC	PC OH	PC PF	BUR LIC	COST SOURCE CITATION	COMMENTS
	Offloading for CDF Disposal																
A14	Offloading of Sediments	**670,000**	CY	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$9.70	$9.70	$6,499,000.00	0%	0%	$6,499,000	MII MII	Project-specific unit cost developed in MII. Assumes mechanical offloading of sediments at the transload facility.
												TOTAL COST:			$6,499,000		

	Representative Unit Quantity	Unit(s)	Total Cost	Unit Cost
COST WORKSHEET SUMMARY	670,000	CY	$6,499,000	$9.70

Notes:
Further information about the development of cost worksheets can be found in Attachment A - Methodology and Organization of Detailed Cost Estimates.
The quantity bolded in the QTY column is the quantity selected as the representative unit quantity for this cost worksheet. If multiple quantities are bolded, the representative unit quantity is the sum of those quantities. When the LS unit is utilized, the default representative unit quantity is 1.
HTRW productivity factor is from Exhibit B-3 or B-4 of "A Guide to Developing and Documenting Cost Estimates During the Feasibility Study", EPA 2000
EPA developed project-specific unit costs using the Micro Computer Aided Cost Engineering System (MCACES) Second Generation (MII) software version 4.2, build 3

Cost Database Code:
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Source of Cost Data:
For citation references, the following sources apply:
ALL (Allowance), FLC (www.flcdatacenter.com), LD (Costs Derived from Lower Duwamish Waterway Final Feasibility Study), MII (MII), O (Other), P (Previously Developed by Anchor QEA for Portland Harbor), and V (Vendor Quote)

Abbreviations:

QTY	Quantity	AC	Acres
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UNMOD LIC	Unmodified Line Item Cost	LB	Pounds
UNBUR LIC	Unburdened Line Item Cost	LCY	Loose Cubic Yard
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PC PF	Prime Contractor Profit	LS	Lump Sum
BUR LIC	Burdened Line Item Cost	MO	Month
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		SY	Square Yard
		TON	Tons
		YR	Years

Cost Adjustment Checklist:	**NOTES:**
FACTOR:	Field work will be in Level "D" PPE.
H&S Productivity (labor and equipment only)	MII assembly costs include HPF adjustments.
Escalation to Base Year	2016 cost sources are not escalated (EF=1.00). All other costs are escalated based on the USACE CWCCIS, EM 1110-2-1304, Sept 2015.
Area Cost Factor	An AF of 1.05 is used for Oregon, except that an AF of 1.00 (national unmodified average) is used for MII assembly costs and local vendor quotes.
Subcontractor Overhead and Profit	It is assumed that home office OH is 8% and profit is 9% for the Prime Contractor. Professional labor overhead is 100%.
Prime Contractor Overhead and Profit	Allowances and items with mandated costs such as per diem do not have overhead and profit applied.
	Items previously developed by Anchor QEA already include contractor markups, therefore overhead and profit were not applied to those items.
	It is assumed that OH is 1% and profit is 0% for vendor quotes for treatment and disposal at offsite disposal facilities. It is assumed that OH is 5% and profit is 0% for quotes for all other material vendor quotes.
	Items developed using MII already include contractor markups such as overhead and profit, therefore additional overhead and profit were not applied in the PC OH and PC PF to those items.

TABLE CW-F13C

Alternative F **Cost Worksheet: CW-F13C**
Capital Cost Sub-Element
Subtitle D Disposal (Handling, Transportation, and Disposal) - DMM Scenario 1 (CDF and Off-Site Option)

COST WORKSHEET

Site: Portland Harbor Superfund Site
Location: Portland, Oregon
Phase: Feasibility Study
Base Year: 2016

Prepared By: JN **Date:** 3/4/2016
Checked By: AB **Date:** 3/7/2016

Work Statement:
This sub-element involves the disposal of contaminated sediments at a Subtitle D landfill, including barge transportation of materials to a transload facility, materials handling from the barge to truck, transportation of the sediments to the Subtitle C/TSCA landfill, and disposal of contaminated sediments (including thermal treatment at the landfill facility for a portion of the volume). It includes costs for labor, equipment, and materials as well as recent vendor quotes.

Cost Analysis:
Cost for Subtitle D Disposal (Lump Sum)

COST DATABASE CODE	DESCRIPTION	QTY	UNIT(S)	HPF	LABOR	ADJ LABOR	EQUIP	ADJ EQUIP	MATL	OTHER	UNMOD UC	UNMOD LIC	PC OH	PC PF	BUR LIC	COST SOURCE CITATION	COMMENTS
	Diatomaceous Earth Amendment																
A11	In-Barge Stabilization / Mixing of Amendments	4,832,378	CY	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$24.50	$24.50	$118,393,261.00	0%	0%	$118,393,261	MII MII	Project-specific unit cost developed in MII.
P5	Diatomaceous Earth	288,511	TON	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$105.94	$105.94	$30,564,855.34	0%	0%	$30,564,855	P Anchor QEA	Project-specific cost developed by Anchor QEA (2010) - see Backup Table 24.
	Transportation to Transload Facility																
A13	Barging to Transload Facility	4,832,378	CY	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$13.66	$13.66	$66,010,283.48	0%	0%	$66,010,283	MII MII	Project-specific unit cost developed in MII.
	Transportation and Disposal at Subtitle D Landfill																
M11	Transportation and Disposal at Subtitle D Landfill	**6,058,727**	TON	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$74.53	$74.53	$451,556,923.31	1%	0%	$456,072,493	V Vendor Quote	Project-specific vendor quote - Republic Services (Roosevelt Landfill), 2015. Includes transloading of the sediments, truck transportation from the transload facility to the landfill, and disposal at the landfill.
												TOTAL COST:			$671,040,892		

	Representative Unit Quantity	Unit(s)	Total Cost	Unit Cost
COST WORKSHEET SUMMARY	6,058,727	TON	$671,040,892	$111

Notes:
Further information about the development of cost worksheets can be found in Attachment A - Methodology and Organization of Detailed Cost Estimates.
The quantity bolded in the QTY column is the quantity selected as the representative unit quantity for this cost worksheet. If multiple quantities are bolded, the representative unit quantity is the sum of those quantities. When the LS unit is utilized, the default representative unit quantity is 1.
HTRW productivity factor is from Exhibit B-3 or B-4 of "A Guide to Developing and Documenting Cost Estimates During the Feasibility Study", EPA 2000
EPA developed project-specific unit costs using the Micro Computer Aided Cost Engineering System (MCACES) Second Generation (MII) software version 4.2, build 3

Cost Database Code:
The Cost Database Code is a reference code for linking with line item cost information with the cost source database and is not otherwise used within these cost worksheets. The following cost source database prefixes apply:
L (EPA-Derived Labor Unit Costs), M (Project-Specific Vendor Unit Costs), P (Previously Developed Unit Costs by Anchor QEA for Portland Harbor), A (EPA-Derived MII Unit Costs), O (Unit Costs from Other Projects/Sources)

Source of Cost Data:
For citation references, the following sources apply:
ALL (Allowance), FLC (www.flcdatacenter.com), LD (Costs Derived from Lower Duwamish Waterway Final Feasibility Study), MII (MII), O (Other), P (Previously Developed by Anchor QEA for Portland Harbor), and V (Vendor Quote)

Abbreviations:

QTY	Quantity	AC	Acres
EQUIP	Equipment	CLF	100 Linear Foot
MATL	Material	CY	Cubic Yard
HPF	HTRW Productivity Factor	DY	Days
ADJ LABOR	Adjusted Labor for HFP	EA	Each
ADJ EQUIP	Adjusted Equipment for HFP	FTE	Full Time Equivalent
UNMOD UC	Unmodified Unit Cost	HR	Hours
UNMOD LIC	Unmodified Line Item Cost	LB	Pounds
UNBUR LIC	Unburdened Line Item Cost	LCY	Loose Cubic Yard
PC OH	Prime Contractor Overhead	LF	Linear Foot
PC PF	Prime Contractor Profit	LS	Lump Sum
BUR LIC	Burdened Line Item Cost	MO	Month
		SF	Square Foot
		SY	Square Yard
		TON	Tons
		YR	Years

Cost Adjustment Checklist:	**NOTES:**
FACTOR:	Field work will be in Level "D" PPE.
H&S Productivity (labor and equipment only)	MII assembly costs include HPF adjustments.
Escalation to Base Year	2016 cost sources are not escalated (EF=1.00). All other costs are escalated based on the USACE CWCCIS, EM 1110-2-1304, Sept 2015.
Area Cost Factor	An AF of 1.05 is used for Oregon, except that an AF of 1.00 (national unmodified average) is used for MII assembly costs and local vendor quotes.
Subcontractor Overhead and Profit	It is assumed that home office OH is 8% and profit is 9% for the Prime Contractor. Professional labor overhead is 100%.
Prime Contractor Overhead and Profit	Allowances and items with mandated costs such as per diem do not have overhead and profit applied.
	Items previously developed by Anchor QEA already include contractor markups, therefore overhead and profit were not applied to those items.
	It is assumed that OH is 1% and profit is 0% for vendor quotes for treatment and disposal at offsite disposal facilities. It is assumed that OH is 5% and profit is 0% for quotes for all other material vendor quotes.
	Items developed using MII already include contractor markups such as overhead and profit, therefore additional overhead and profit were not applied in the PC OH and PC PF to those items.

TABLE CW-F13D

Alternative F **Cost Worksheet:** **CW-F13D**
Capital Cost Sub-Element
CDF Construction - DMM Scenario 1 (CDF and Off-Site Option)

COST WORKSHEET

Site: Portland Harbor Superfund Site
Location: Portland, Oregon
Phase: Feasibility Study
Base Year: 2016

Prepared By: JN **Date:** 3/4/2016
Checked By: AB **Date:** 3/7/2016

Work Statement:
This sub-element involves the construction of the CDF for disposal of contaminated sediments. It includes costs for on-site labor, equipment, and materials developed from previous work. Costs for the placement of the contaminated sediments within the CDF are included in Cost Worksheet CW-F11A

Cost Analysis:
Cost for CDF Disposal (Lump Sum)

COST DATABASE CODE	DESCRIPTION	QTY	UNIT(S)	HPF	LABOR	ADJ LABOR	EQUIP	ADJ EQUIP	MATL	OTHER	UNMOD UC	UNMOD LIC	PC OH	PC PF	BUR LIC	COST SOURCE CITATION	COMMENTS
P49	CDF Construction	1	LS	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$52,439,400.00	$52,439,400.00	$52,439,400.00	0%	0%	$52,439,400	P Anchor QEA	Project-specific cost developed by Anchor QEA (2011)
												TOTAL COST:			$52,439,400		

	Representative Unit Quantity	Unit(s)	Total Cost	Unit Cost
COST WORKSHEET SUMMARY	1	LS	$52,439,400	$52,439,400

Notes:
Further information about the development of cost worksheets can be found in Attachment A - Methodology and Organization of Detailed Cost Estimates.
The quantity bolded in the QTY column is the quantity selected as the representative unit quantity for this cost worksheet. If multiple quantities are bolded, the representative unit quantity is the sum of those quantities. When the LS unit is utilized, the default representative unit quantity is 1.
HTRW productivity factor is from Exhibit B-3 or B-4 of "A Guide to Developing and Documenting Cost Estimates During the Feasibility Study", EPA 2000
EPA developed project-specific unit costs using the Micro Computer Aided Cost Engineering System (MCACES) Second Generation (MII) software version 4.2, build 3

Cost Database Code:
The Cost Database Code is a reference code for linking with line item cost information with the cost source database and is not otherwise used within these cost worksheets. The following cost source database prefixes apply:
L (EPA-Derived Labor Unit Costs), M (Project-Specific Vendor Unit Costs), P (Previously Developed Unit Costs by Anchor QEA for Portland Harbor), A (EPA-Derived MII Unit Costs), O (Unit Costs from Other Projects/Sources)

Source of Cost Data:
For citation references, the following sources apply:
ALL (Allowance), FLC (www.flcdatacenter.com), LD (Costs Derived from Lower Duwamish Waterway Final Feasibility Study), MII (MII), O (Other), P (Previously Developed by Anchor QEA for Portland Harbor), and V (Vendor Quote)

Abbreviations:

QTY	Quantity	AC	Acres
EQUIP	Equipment	CLF	100 Linear Foot
MATL	Material	CY	Cubic Yard
HPF	HTRW Productivity Factor	DY	Days
ADJ LABOR	Adjusted Labor for HFP	EA	Each
ADJ EQUIP	Adjusted Equipment for HFP	FTE	Full Time Equivalent
UNMOD UC	Unmodified Unit Cost	HR	Hours
UNMOD LIC	Unmodified Line Item Cost	LB	Pounds
UNBUR LIC	Unburdened Line Item Cost	LCY	Loose Cubic Yard
PC OH	Prime Contractor Overhead	LF	Linear Foot
PC PF	Prime Contractor Profit	LS	Lump Sum
BUR LIC	Burdened Line Item Cost	MO	Month
		SF	Square Foot
		SY	Square Yard
		TON	Tons
		YR	Years

Cost Adjustment Checklist:	**NOTES:**
FACTOR:	Field work will be in Level "D" PPE.
H&S Productivity (labor and equipment only)	MII assembly costs include HPF adjustments.
Escalation to Base Year	2016 cost sources are not escalated (EF=1.00). All other costs are escalated based on the USACE CWCCIS, EM 1110-2-1304, Sept 2015.
Area Cost Factor	An AF of 1.05 is used for Oregon, except that an AF of 1.00 (national unmodified average) is used for MII assembly costs and local vendor quotes.
Subcontractor Overhead and Profit	It is assumed that home office OH is 8% and profit is 9% for the Prime Contractor. Professional labor overhead is 100%.
Prime Contractor Overhead and Profit	Allowances and items with mandated costs such as per diem do not have overhead and profit applied.
	Items previously developed by Anchor QEA already include contractor markups, therefore overhead and profit were not applied to those items.
	It is assumed that OH is 1% and profit is 0% for vendor quotes for treatment and disposal at offsite disposal facilities. It is assumed that OH is 5% and profit is 0% for quotes for all other material vendor quotes.
	Items developed using MII already include contractor markups such as overhead and profit, therefore additional overhead and profit were not applied in the PC OH and PC PF to those items.

DMM Scenario 1
Alternative G

Note: Cost Worksheets presented herein are specific to DMM Scenario 1. All other Cost Worksheets are the same for both DMM Scenario 1 and DMM Scenario 2, and can be found in the base estimate

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TABLE PV-G

PRESENT VALUE ANALYSIS

Alternative **G DMM Scenario 1 (CDF and Off-Site Option)**

Site: Portland Harbor Superfund Site
Location: Portland, Oregon
Phase: Feasibility Study (-30% to +50%)
Base Year: 2016

Year[1]	Capital Costs (Institutional Controls)[2]	Capital Costs (Monitored Natural Recovery)[2]	Capital Costs (Technology Assignments)[2]	Annual O&M Costs	Periodic Costs (Long Term Monitoring and Monitored Natural Recovery)	Periodic Costs (Long Term Operations and Maintenance and Institutional Controls)	Periodic Costs (Five-Year Site Reviews)	Total Annual Expenditure[3]	Discount Factor (7.0%)	Present Value[4]
0	$264,579	$7,428,000	$126,773,526	$0	$0	$0	$0	$134,466,105	1.0000	$134,466,105
1	$264,579	$0	$126,773,526	$0	$0	$0	$0	$127,038,105	0.9346	$118,729,813
2	$264,579	$0	$126,773,526	$0	$63,513,000	$0	$0	$190,551,105	0.8734	$166,427,335
3	$264,579	$0	$126,773,526	$0	$0	$0	$0	$127,038,105	0.8163	$103,701,205
4	$264,579	$0	$126,773,526	$0	$63,513,000	$0	$0	$190,551,105	0.7629	$145,371,438
5	$264,579	$0	$126,773,526	$0	$0	$11,856,000	$308,000	$139,202,105	0.7130	$99,251,101
6	$264,579	$0	$126,773,526	$0	$63,513,000	$0	$0	$190,551,105	0.6663	$126,964,201
7	$264,579	$0	$126,773,526	$0	$0	$0	$0	$127,038,105	0.6227	$79,106,628
8	$264,579	$0	$126,773,526	$0	$63,513,000	$0	$0	$190,551,105	0.5820	$110,900,743
9	$264,579	$0	$126,773,526	$0	$0	$0	$0	$127,038,105	0.5439	$69,096,025
10	$264,579	$0	$126,773,526	$0	$63,513,000	$11,856,000	$308,000	$202,715,105	0.5083	$103,040,088
11	$264,579	$0	$126,773,526	$0	$0	$0	$0	$127,038,105	0.4751	$60,355,804
12	$264,579	$0	$126,773,526	$0	$0	$0	$0	$127,038,105	0.4440	$56,404,919
13	$264,579	$0	$126,773,526	$0	$0	$0	$0	$127,038,105	0.4150	$52,720,814
14	$264,579	$0	$126,773,526	$0	$63,513,000	$0	$0	$190,551,105	0.3878	$73,895,719
15	$264,579	$0	$126,773,526	$0	$0	$11,856,000	$308,000	$139,202,105	0.3624	$50,446,843
16	$264,579	$0	$126,773,526	$0	$0	$0	$0	$127,038,105	0.3387	$43,027,806
17	$264,579	$0	$126,773,526	$0	$0	$0	$0	$127,038,105	0.3166	$40,220,264
18	$264,579	$0	$126,773,526	$0	$63,513,000	$0	$0	$190,551,105	0.2959	$56,384,072
19	$0	$0	$0	$0	$0	$0	$0	$0	0.2765	$0
20	$0	$0	$0	$0	$0	$11,856,000	$308,000	$12,164,000	0.2584	$3,143,178
21	$0	$0	$0	$0	$0	$0	$0	$0	0.2415	$0
22	$0	$0	$0	$0	$63,513,000	$0	$0	$63,513,000	0.2257	$14,334,884
23	$0	$0	$0	$0	$0	$0	$0	$0	0.2109	$0
24	$0	$0	$0	$0	$0	$0	$0	$0	0.1971	$0
25	$0	$0	$0	$0	$0	$11,856,000	$308,000	$12,164,000	0.1842	$2,240,609
26	$0	$0	$0	$0	$63,513,000	$0	$0	$63,513,000	0.1722	$10,936,939
27	$0	$0	$0	$0	$0	$0	$0	$0	0.1609	$0
28	$0	$0	$0	$0	$0	$0	$0	$0	0.1504	$0
29	$0	$0	$0	$0	$0	$0	$0	$0	0.1406	$0
30	$0	$0	$0	$0	$63,513,000	$11,856,000	$308,000	$75,677,000	0.1314	$9,943,958
TOTALS:	$5,027,000	$7,428,000	$2,408,697,000	$0	$635,130,000	$71,136,000	$1,848,000	$3,129,266,000		$1,731,110,491
TOTAL PRESENT VALUE OF ALTERNATIVE G [5]										**$1,731,110,000**

Notes:

[1] The alternative is expected to require cost expenditures for perpetuity since some contamination within the sediment bed and associated riverbank soils would remain in-place that do not allow for unrestricted use or unlimited exposure to human or ecological receptors. However the period of analysis was assumed to be 30 yrs beyond the construction in Year 0.

[2] Capital costs, for purposes of this analysis, are assumed to be distributed as indicated on Table CS-G.

[3] Total annual expenditure is the total cost per year with no discounting.

[4] Present value is the total cost per year including a 7.0% discount factor for that year. See Table PV-ADRFT for details.

[5] Total present value is rounded to the nearest $10,000. Inflation and depreciation are excluded from the present value cost.

Costs presented for this alternative are expected to have an accuracy between -30% to +50% of actual costs, based on the scope presented.

They are prepared solely to facilitate relative comparisons between alternatives for FS evaluation purposes.

TABLE CS-G

Alternative G DMM Scenario 1 (CDF and Off-Site Option)

DETAILED COST ESTIMATE SUMMARY

Site: Portland Harbor Superfund Site
Location: Portland, Oregon
Phase: Feasibility Study (-30% to +50%)
Base Year: 2016
Date: 5/24/2016

Description: This alternative evaluates a remedy that would involve dredging of contaminated sediments, disposal of the remaining contaminated sediment at offsite facilities (Subtitle D and Subtitle C/TSCA), capping, enhanced natural recovery (ENR), in-situ treatment, and monitored natural recovery (MNR). Capital costs are based on Disposed Material Management (DMM) Scenario 1.

INSTITUTIONAL CONTROLS CAPITAL COSTS: (Assumed to be Incurred During Years 0 through 18)

DESCRIPTION	WORKSHEET	QTY	UNIT(S)	UNIT COST	TOTAL	NOTES
Initial Establishment of Institutional Controls	CW-G2	1	LS	$4,084,988	$4,084,988	
SUBTOTAL					$4,084,988	
Contingency (Scope and Bid)		15%			$612,748	10% Scope, 5% Bid as documented in Attachment A.
SUBTOTAL					$4,697,736	
Project Management		2%			$93,955	Percentage modified as documented in Attachment A.
Remedial Design		2%			$93,955	Percentage modified as documented in Attachment A.
Construction Management		3%			$140,932	Percentage modified as documented in Attachment A.
TOTAL					$5,026,578	
TOTAL CAPITAL COST					**$5,027,000**	Total capital cost is rounded to the nearest $1,000.

MONITORED NATURAL RECOVERY CAPITAL COSTS: (Assumed to be Incurred During Year 0)

DESCRIPTION	WORKSHEET	QTY	UNIT(S)	UNIT COST	TOTAL	NOTES
Monitored Natural Recovery (MNR) for MNR/Enhanced Natural Recovery (ENR) and Broadcast GAC Areas	CW-G22	1,411	AC	$3,686	$5,201,407	Quantity represents dredge, MNR/ENR and in situ treatment areas.
SUBTOTAL					$5,201,407	
Contingency (Scope and Bid)		20%			$1,040,281	10% Scope, 10% Bid (Low end of the recommended range in EPA 540-R-00-002).
SUBTOTAL					$6,241,688	
Project Management		5%			$312,084	Percentage from Exhibit 5-8 in EPA 540-R-00-002 was used.
Remedial Design		8%			$499,335	Percentage from Exhibit 5-8 in EPA 540-R-00-002 was used.
Construction Management		6%			$374,501	Percentage from Exhibit 5-8 in EPA 540-R-00-002 was used.
TOTAL					$7,427,608	
TOTAL CAPITAL COST					**$7,428,000**	Total capital cost is rounded to the nearest $1,000.

TABLE CS-G

Alternative G DMM Scenario 1 (CDF and Off-Site Option)

DETAILED COST ESTIMATE SUMMARY

Site: Portland Harbor Superfund Site
Location: Portland, Oregon
Phase: Feasibility Study (-30% to +50%)
Base Year: 2016
Date: 5/24/2016

Description: This alternative evaluates a remedy that would involve dredging of contaminated sediments, disposal of the remaining contaminated sediment at offsite facilities (Subtitle D and Subtitle C/TSCA), capping, enhanced natural recovery (ENR), in-situ treatment, and monitored natural recovery (MNR). Capital costs are based on Disposed Material Management (DMM) Scenario 1.

TECHNOLOGY ASSIGNMENTS MEASURES CAPITAL Construction COSTS: (Assumed to be Incurred During Years 0 through 18)

DESCRIPTION	WORKSHEET	QTY	UNIT(S)	UNIT COST	TOTAL	NOTES
Mobilization / Demobilization	CW-G1	1	LS	$30,516,000	$30,516,000	
Transload Facility Development	CW-G21	1	LS	$20,773,428	$20,773,428	
Debris Removal and Disposal	CW-G5	776	AC	$13,107	$10,171,040	
Obstruction Removal and Relocation	CW-G6	1	LS	$22,638,241	$22,638,241	
Erosion/Residual Control Measures	CW-G7	1	LS	$28,135,555	$28,135,555	
Dredging of Contaminated Sediments (Open Water)	CW-G8	7,110,364	CY	$24.53	$174,417,229	
Dredging of Contaminated Sediments (Confined)	CW-G9	147,293	CY	$31.10	$4,580,812	
Excavation of Riverbanks	CW-G10	138,942	CY	$5.19	$721,107	
Dewatering and Water Treatment for Dredging Operations	CW-G11	1	LS	$31,511,207	$31,511,207	Includes collection and treatment of water from sediment dewatering during dredging operations
Offloading of the Contaminated Sediments at the CDF - DMM Scenario 1 (CDF and Off-Site Option)	CW-G11A	670,000	CY	$9.70	$6,499,000	
Subtitle C/TSCA Disposal (Handling, Transportation, Treatment of Select PTW Materials, and Disposal)	CW-G12	358,888	TON	$191	$68,535,729	Includes waste going to offsite Subtitle C/TSCA facility for disposal, including the volume of NRC/NAPL PTW that would require treatment
Subtitle D Disposal (Handling, Transportation, and Disposal) - DMM Scenario 1 (CDF and Off-Site Option)	CW-G13C	10,637,099	TON	$111	$1,178,123,466	Includes waste going to offsite Subtitle D facility for disposal without treatment, including the volume of non-PTW contaminated sediments/riverbank soils as well as the volume of highly toxic PTW
CDF Construction - DMM Scenario 1 (CDF and Off-Site Option)	CW-G13D	1	LS	$52,439,400	$52,439,400	
Mitigation	CW-G14	86	AC	$1,070,827	$92,091,122	
Sand Placement for Technology Assignments	CW-G15	1,634,210	CY	$33.23	$54,304,680	
Beach Mix Placement for Technology Assignments	CW-G16	90,647	CY	$72.65	$6,585,212	
Armor Placement for Technology Assignments	CW-G17	245,586	CY	$71.57	$17,577,027	
Reactive/GAC Placement for Technology Assignments	CW-G18	1	LS	$74,728,183	$74,728,183	
Geofabric for Riverbanks	CW-G19	28.7	AC	$14,311	$410,732	
Organoclay Mat Placement for Technology Assignments	CW-G20	174,300	SF	$6.73	$1,173,039	
SUBTOTAL					$1,875,932,209	
Contingency (Scope and Bid)		20%			$375,186,442	10% Scope, 10% Bid (Low end of the recommended range in EPA 540-R-00-002).
SUBTOTAL					$2,251,118,651	
Project Management		2%			$45,022,373	Percentage modified as documented in Attachment A.
Remedial Design		2%			$45,022,373	Percentage modified as documented in Attachment A.
Construction Management		3%			$67,533,560	Percentage modified as documented in Attachment A.
TOTAL					$2,408,696,957	
TOTAL CAPITAL COST					**$2,408,697,000**	Total capital cost is rounded to the nearest $1,000.

TABLE CS-G

Alternative G DMM Scenario 1 (CDF and Off-Site Option)

DETAILED COST ESTIMATE SUMMARY

Site: Portland Harbor Superfund Site
Location: Portland, Oregon
Phase: Feasibility Study (-30% to +50%)
Base Year: 2016
Date: 5/24/2016

Description: This alternative evaluates a remedy that would involve dredging of contaminated sediments, disposal of the remaining contaminated sediment at offsite facilities (Subtitle D and Subtitle C/TSCA), capping, enhanced natural recovery (ENR), in-situ treatment, and monitored natural recovery (MNR). Capital costs are based on Disposed Material Management (DMM) Scenario 1.

SITE-WIDE MONITORING AND MONITORED NATURAL RECOVERY PERIODIC COSTS: (Assumed to be Incurred at Years 2, 4, 6, 8, 10 and Every 4 Years through Period of Analysis)

DESCRIPTION	WORKSHEET	QTY	UNIT(S)	UNIT COST	TOTAL	NOTES
Monitored Natural Recovery (MNR) for MNR/Enhanced Natural Recovery (ENR) and Broadcast GAC Areas	CW-G22	1,411	AC	$3,686	$5,201,407	Quantity represents dredge, MNR/ENR and in situ treatment areas.
Site-Wide Monitoring	CW-G23	1	LS	$957,659	$957,659	
Cap Area Monitoring and Reactive Layer Monitoring	CW-G24	1	LS	$43,306,076	$43,306,076	
SUBTOTAL					$49,465,142	
Contingency (Scope and Bid)		20%			$9,893,028	10% Scope, 10% Bid (Low end of the recommended range in EPA 540-R-00-002).
SUBTOTAL					$59,358,170	
Project Management		2%			$1,187,163	Percentage modified as documented in Attachment A.
Technical Support		5%			$2,967,909	Percentage modified as documented in Attachment A.
TOTAL					$63,513,242	
TOTAL PERIODIC COST					**$63,513,000**	Total periodic cost is rounded to the nearest $1,000.

LONG TERM OPERATIONS AND MAINTENANCE PERIODIC COSTS: (Assumed to be Incurred at Year 5 and Every 5 Years through Period of Analysis)

DESCRIPTION	WORKSHEET	QTY	UNIT(S)	UNIT COST	TOTAL	NOTES
Long-Term Maintenance for Capping, ENR, and In Situ Treatment	CW-G25	1	LS	$7,862,382	$7,862,382	Assume 5% of placement of additional material for capping, ENR and In Situ Treatment. Includes mobilization and demobilization costs.
SUBTOTAL					$7,862,382	
Contingency (Scope and Bid)		20%			$1,572,476	10% Scope, 10% Bid (Low end of the recommended range in EPA 540-R-00-002).
SUBTOTAL					$9,434,858	
Project Management		5%			$471,743	Low end of the recommended range in EPA 540-R-00-002 was used.
Technical Support		10%			$943,486	Low end of the recommended range in EPA 540-R-00-002 was used.
TOTAL					$10,850,087	
TOTAL PERIODIC COST					**$10,850,000**	Total periodic cost is rounded to the nearest $1,000.

TABLE CS-G

Alternative G DMM Scenario 1 (CDF and Off-Site Option)

DETAILED COST ESTIMATE SUMMARY

Site: Portland Harbor Superfund Site
Location: Portland, Oregon
Phase: Feasibility Study (-30% to +50%)
Base Year: 2016
Date: 5/24/2016

Description: This alternative evaluates a remedy that would involve dredging of contaminated sediments, disposal of the remaining contaminated sediment at offsite facilities (Subtitle D and Subtitle C/TSCA), capping, enhanced natural recovery (ENR), in-situ treatment, and monitored natural recovery (MNR). Capital costs are based on Disposed Material Management (DMM) Scenario 1.

INSTITUTIONAL CONTROLS PERIODIC COSTS: (Assumed to be Incurred at Year 5 and Every 5 Years through Period of Analysis)

DESCRIPTION	WORKSHEET	QTY	UNIT(S)	UNIT COST	TOTAL	NOTES
Evaluating and Updating Institutional Controls	CW-G3	1	LS	$795,634	$795,634	
SUBTOTAL					$795,634	
Contingency (Scope and Bid)		10%			$79,563	10% Scope, 0% Bid as documented in Attachment A.
SUBTOTAL					$875,197	
Project Management		5%			$43,760	Low end of the recommended range in EPA 540-R-00-002 was used.
Technical Support		10%			$87,520	Low end of the recommended range in EPA 540-R-00-002 was used.
TOTAL					$1,006,477	
TOTAL PERIODIC COST					**$1,006,000**	Total periodic cost is rounded to the nearest $1,000.

5-YEAR SITE REVIEW PERIODIC COSTS: (Assumed to be Incurred at Year 5 and Every 5 Years through Period of Analysis)

DESCRIPTION	WORKSHEET	QTY	UNIT(S)	UNIT COST	TOTAL	NOTES
5-Year Site Review	CW-G26	1	LS	$243,687	$243,687	
SUBTOTAL					$243,687	
Contingency (Scope and Bid)		10%			$24,369	10% Scope, 0% Bid as documented in Attachment A.
SUBTOTAL					$268,056	
Project Management		5%			$13,403	Low end of the recommended range in EPA 540-R-00-002 was used.
Technical Support		10%			$26,806	Low end of the recommended range in EPA 540-R-00-002 was used.
TOTAL					$308,265	
TOTAL PERIODIC COST					**$308,000**	Total periodic cost is rounded to the nearest $1,000.

Notes:
Percentages used for contingency and professional/technical services costs are based on guidance from Section 5.0 of "A Guide to Developing and Documenting Cost Estimates During the Feasibility Study", EPA 2000. Modifications to the percentages applied for contingency and professional/technical services are documented in Attachment A.
Costs presented for this alternative are expected to have an accuracy between -30% to +50% of actual costs, based on the scope presented. They are prepared solely to facilitate relative comparisons between alternatives for FS evaluation purposes.
Red text indicates Cost Worksheets that are specific to DMM Scenario 1. All other Cost Worksheets are the same for both DMM Scenario 1 and DMM Scenario 2

Abbreviations:

AC	Acre
CY	Cubic Yard
LS	Lump Sum
QTY	Quantity
SF	Square Foot
TON	Ton

TABLE CW-G11A

Alternative G **Cost Worksheet: CW-G11A**
Capital Cost Sub-Element
Offloading of the Contaminated Sediments at the CDF - DMM Scenario 1 (CDF and Off-Site Option)

COST WORKSHEET

Site: Portland Harbor Superfund Site
Location: Portland, Oregon
Phase: Feasibility Study
Base Year: 2016

Prepared By: JN **Date:** 3/4/2016
Checked By: AB **Date:** 3/7/2016

Work Statement:
This sub-element involves the offloading of contaminated sediments at the CDF. It includes costs for on-site labor, equipment, and materials developed from previous work.

Cost Analysis:
Cost for Offloading at the CDF (Lump Sum)

COST DATABASE CODE	DESCRIPTION	QTY	UNIT(S)	HPF	LABOR	ADJ LABOR	EQUIP	ADJ EQUIP	MATL	OTHER	UNMOD UC	UNMOD LIC	PC OH	PC PF	BUR LIC	COST SOURCE CITATION	COMMENTS
	Offloading for CDF Disposal																
A14	Offloading of Sediments	**670,000**	CY	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$9.70	$9.70	$6,499,000.00	0%	0%	$6,499,000	MII MII	Project-specific unit cost developed in MII. Assumes mechanical offloading of sediments at the transload facility.
												TOTAL COST:			$6,499,000		

	Representative Unit Quantity	Unit(s)	Total Cost	Unit Cost
COST WORKSHEET SUMMARY	670,000	CY	$6,499,000	$9.70

Notes:
Further information about the development of cost worksheets can be found in Attachment A - Methodology and Organization of Detailed Cost Estimates.
The quantity bolded in the QTY column is the quantity selected as the representative unit quantity for this cost worksheet. If multiple quantities are bolded, the representative unit quantity is the sum of those quantities. When the LS unit is utilized, the default representative unit quantity is 1.
HTRW productivity factor is from Exhibit B-3 or B-4 of "A Guide to Developing and Documenting Cost Estimates During the Feasibility Study", EPA 2000
EPA developed project-specific unit costs using the Micro Computer Aided Cost Engineering System (MCACES) Second Generation (MII) software version 4.2, build 3

Cost Database Code:
The Cost Database Code is a reference code for linking with line item cost information with the cost source database and is not otherwise used within these cost worksheets. The following cost source database prefixes apply:
L (EPA-Derived Labor Unit Costs), M (Project-Specific Vendor Unit Costs), P (Previously Developed Unit Costs by Anchor QEA for Portland Harbor), A (EPA-Derived MII Unit Costs), O (Unit Costs from Other Projects/Sources)

Source of Cost Data:
For citation references, the following sources apply:
ALL (Allowance), FLC (www.flcdatacenter.com), LD (Costs Derived from Lower Duwamish Waterway Final Feasibility Study), MII (MII), O (Other), P (Previously Developed by Anchor QEA for Portland Harbor), and V (Vendor Quote)

Abbreviations:

QTY	Quantity	AC	Acres
EQUIP	Equipment	CLF	100 Linear Foot
MATL	Material	CY	Cubic Yard
HPF	HTRW Productivity Factor	DY	Days
ADJ LABOR	Adjusted Labor for HFP	EA	Each
ADJ EQUIP	Adjusted Equipment for HFP	FTE	Full Time Equivalent
UNMOD UC	Unmodified Unit Cost	HR	Hours
UNMOD LIC	Unmodified Line Item Cost	LB	Pounds
UNBUR LIC	Unburdened Line Item Cost	LCY	Loose Cubic Yard
PC OH	Prime Contractor Overhead	LF	Linear Foot
PC PF	Prime Contractor Profit	LS	Lump Sum
BUR LIC	Burdened Line Item Cost	MO	Month
		SF	Square Foot
		SY	Square Yard
		TON	Tons
		YR	Years

Cost Adjustment Checklist:	**NOTES:**
FACTOR:	Field work will be in Level "D" PPE.
H&S Productivity (labor and equipment only)	MII assembly costs include HPF adjustments.
Escalation to Base Year	2016 cost sources are not escalated (EF=1.00). All other costs are escalated based on the USACE CWCCIS, EM 1110-2-1304, Sept 2015.
Area Cost Factor	An AF of 1.05 is used for Oregon, except that an AF of 1.00 (national unmodified average) is used for MII assembly costs and local vendor quotes.
Subcontractor Overhead and Profit	It is assumed that home office OH is 8% and profit is 9% for the Prime Contractor. Professional labor overhead is 100%.
Prime Contractor Overhead and Profit	Allowances and items with mandated costs such as per diem do not have overhead and profit applied.
	Items previously developed by Anchor QEA already include contractor markups, therefore overhead and profit were not applied to those items.
	It is assumed that OH is 1% and profit is 0% for vendor quotes for treatment and disposal at offsite disposal facilities. It is assumed that OH is 5% and profit is 0% for quotes for all other material vendor quotes.
	Items developed using MII already include contractor markups such as overhead and profit, therefore additional overhead and profit were not applied in the PC OH and PC PF to those items.

TABLE CW-G13C

Alternative G **Cost Worksheet:** **CW-G13C**

Capital Cost Sub-Element

Subtitle D Disposal (Handling, Transportation, and Disposal) - DMM Scenario 1 (CDF and Off-Site Option)

COST WORKSHEET

Site: Portland Harbor Superfund Site
Location: Portland, Oregon
Phase: Feasibility Study
Base Year: 2016

Prepared By: JN **Date:** 3/4/2016
Checked By: AB **Date:** 3/7/2016

Work Statement:
This sub-element involves the disposal of contaminated sediments at a Subtitle D landfill, including barge transportation of materials to a transload facility, materials handling from the barge to truck, transportation of the sediments to the Subtitle C/TSCA landfill, and disposal of contaminated sediments (including thermal treatment at the landfill facility for a portion of the volume). It includes costs for labor, equipment, and materials as well as recent vendor quotes.

Cost Analysis:
Cost for Subtitle D Disposal (Lump Sum)

COST DATABASE CODE	DESCRIPTION	QTY	UNIT(S)	HPF	LABOR	ADJ LABOR	EQUIP	ADJ EQUIP	MATL	OTHER	UNMOD UC	UNMOD LIC	PC OH	PC PF	BUR LIC	COST SOURCE CITATION	COMMENTS
	Diatomaceous Earth Amendment																
A11	In-Barge Stabilization / Mixing of Amendments	8,484,040	CY	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$24.50	$24.50	$207,858,980.00	0%	0%	$207,858,980	MII MII	Project-specific unit cost developed in MII.
P5	Diatomaceous Earth	506,529	TON	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$105.94	$105.94	$53,661,682.26	0%	0%	$53,661,682	P Anchor QEA	Project-specific cost developed by Anchor QEA (2010) - see Backup Table 24.
	Transportation to Transload Facility																
A13	Barging to Transload Facility	8,484,040	CY	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$13.66	$13.66	$115,891,986.40	0%	0%	$115,891,986	MII MII	Project-specific unit cost developed in MII.
	Transportation and Disposal at Subtitle D Landfill																
M11	Transportation and Disposal at Subtitle D Landfill	**10,637,099**	TON	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$74.53	$74.53	$792,782,988.47	1%	0%	$800,710,818	V Vendor Quote	Project-specific vendor quote - Republic Services (Roosevelt Landfill), 2015. Includes transloading of the sediments, truck transportation from the transload facility to the landfill, and disposal at the landfill.
												TOTAL COST:			$1,178,123,466		

	Representative Unit Quantity	Unit(s)	Total Cost	Unit Cost
COST WORKSHEET SUMMARY	10,637,099	TON	$1,178,123,466	$111

Notes:
Further information about the development of cost worksheets can be found in Attachment A - Methodology and Organization of Detailed Cost Estimates.
The quantity bolded in the QTY column is the quantity selected as the representative unit quantity for this cost worksheet. If multiple quantities are bolded, the representative unit quantity is the sum of those quantities. When the LS unit is utilized, the default representative unit quantity is 1.
HTRW productivity factor is from Exhibit B-3 or B-4 of "A Guide to Developing and Documenting Cost Estimates During the Feasibility Study", EPA 2000
EPA developed project-specific unit costs using the Micro Computer Aided Cost Engineering System (MCACES) Second Generation (MII) software version 4.2, build 3

Cost Database Code:
The Cost Database Code is a reference code for linking with line item cost information with the cost source database and is not otherwise used within these cost worksheets. The following cost source database prefixes apply:
L (EPA-Derived Labor Unit Costs), M (Project-Specific Vendor Unit Costs), P (Previously Developed Unit Costs by Anchor QEA for Portland Harbor), A (EPA-Derived MII Unit Costs), O (Unit Costs from Other Projects/Sources)

Source of Cost Data:
For citation references, the following sources apply:
ALL (Allowance), FLC (www.flcdatacenter.com), LD (Costs Derived from Lower Duwamish Waterway Final Feasibility Study), MII (MII), O (Other), P (Previously Developed by Anchor QEA for Portland Harbor), and V (Vendor Quote)

Abbreviations:

QTY	Quantity	AC	Acres
EQUIP	Equipment	CLF	100 Linear Foot
MATL	Material	CY	Cubic Yard
HPF	HTRW Productivity Factor	DY	Days
ADJ LABOR	Adjusted Labor for HFP	EA	Each
ADJ EQUIP	Adjusted Equipment for HFP	FTE	Full Time Equivalent
UNMOD UC	Unmodified Unit Cost	HR	Hours
UNMOD LIC	Unmodified Line Item Cost	LB	Pounds
UNBUR LIC	Unburdened Line Item Cost	LCY	Loose Cubic Yard
PC OH	Prime Contractor Overhead	LF	Linear Foot
PC PF	Prime Contractor Profit	LS	Lump Sum
BUR LIC	Burdened Line Item Cost	MO	Month
		SF	Square Foot
		SY	Square Yard
		TON	Tons
		YR	Years

Cost Adjustment Checklist:	**NOTES:**
FACTOR:	Field work will be in Level "D" PPE.
H&S Productivity (labor and equipment only)	MII assembly costs include HPF adjustments.
Escalation to Base Year	2016 cost sources are not escalated (EF=1.00). All other costs are escalated based on the USACE CWCCIS, EM 1110-2-1304, Sept 2015.
Area Cost Factor	An AF of 1.05 is used for Oregon, except that an AF of 1.00 (national unmodified average) is used for MII assembly costs and local vendor quotes.
Subcontractor Overhead and Profit	It is assumed that home office OH is 8% and profit is 9% for the Prime Contractor. Professional labor overhead is 100%.
Prime Contractor Overhead and Profit	Allowances and items with mandated costs such as per diem do not have overhead and profit applied.
	Items previously developed by Anchor QEA already include contractor markups, therefore overhead and profit were not applied to those items.
	It is assumed that OH is 1% and profit is 0% for vendor quotes for treatment and disposal at offsite disposal facilities. It is assumed that OH is 5% and profit is 0% for quotes for all other material vendor quotes.
	Items developed using MII already include contractor markups such as overhead and profit, therefore additional overhead and profit were not applied in the PC OH and PC PF to those items.

TABLE CW-G13D

Alternative G **Cost Worksheet:** **CW-G13D**
Capital Cost Sub-Element
CDF Construction - DMM Scenario 1 (CDF and Off-Site Option)

COST WORKSHEET

Site: Portland Harbor Superfund Site
Location: Portland, Oregon
Phase: Feasibility Study
Base Year: 2016

Prepared By: JN **Date:** 3/4/2016
Checked By: AB **Date:** 3/7/2016

Work Statement:
This sub-element involves the construction of the CDF for disposal of contaminated sediments. It includes costs for on-site labor, equipment, and materials developed from previous work. Costs for the placement of the contaminated sediments within the CDF are included in Cost Worksheet CW-G11A

Cost Analysis:
Cost for CDF Disposal (Lump Sum)

COST DATABASE CODE	DESCRIPTION	QTY	UNIT(S)	HPF	LABOR	ADJ LABOR	EQUIP	ADJ EQUIP	MATL	OTHER	UNMOD UC	UNMOD LIC	PC OH	PC PF	BUR LIC	COST SOURCE CITATION	COMMENTS
P49	CDF Construction	1	LS	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$52,439,400.00	$52,439,400.00	$52,439,400.00	0%	0%	$52,439,400	P Anchor QEA	Project-specific cost developed by Anchor QEA (2011)
												TOTAL COST:			$52,439,400		

	Representative Unit Quantity	Unit(s)	Total Cost	Unit Cost
COST WORKSHEET SUMMARY	1	LS	$52,439,400	$52,439,400

Notes:
Further information about the development of cost worksheets can be found in Attachment A - Methodology and Organization of Detailed Cost Estimates.
The quantity bolded in the QTY column is the quantity selected as the representative unit quantity for this cost worksheet. If multiple quantities are bolded, the representative unit quantity is the sum of those quantities. When the LS unit is utilized, the default representative unit quantity is 1.
HTRW productivity factor is from Exhibit B-3 or B-4 of "A Guide to Developing and Documenting Cost Estimates During the Feasibility Study", EPA 2000
EPA developed project-specific unit costs using the Micro Computer Aided Cost Engineering System (MCACES) Second Generation (MII) software version 4.2, build 3

Cost Database Code:
The Cost Database Code is a reference code for linking with line item cost information with the cost source database and is not otherwise used within these cost worksheets. The following cost source database prefixes apply:
L (EPA-Derived Labor Unit Costs), M (Project-Specific Vendor Unit Costs), P (Previously Developed Unit Costs by Anchor QEA for Portland Harbor), A (EPA-Derived MII Unit Costs), O (Unit Costs from Other Projects/Sources)

Source of Cost Data:
For citation references, the following sources apply:
ALL (Allowance), FLC (www.flcdatacenter.com), LD (Costs Derived from Lower Duwamish Waterway Final Feasibility Study), MII (MII), O (Other), P (Previously Developed by Anchor QEA for Portland Harbor), and V (Vendor Quote)

Abbreviations:

QTY	Quantity	AC	Acres
EQUIP	Equipment	CLF	100 Linear Foot
MATL	Material	CY	Cubic Yard
HPF	HTRW Productivity Factor	DY	Days
ADJ LABOR	Adjusted Labor for HFP	EA	Each
ADJ EQUIP	Adjusted Equipment for HFP	FTE	Full Time Equivalent
UNMOD UC	Unmodified Unit Cost	HR	Hours
UNMOD LIC	Unmodified Line Item Cost	LB	Pounds
UNBUR LIC	Unburdened Line Item Cost	LCY	Loose Cubic Yard
PC OH	Prime Contractor Overhead	LF	Linear Foot
PC PF	Prime Contractor Profit	LS	Lump Sum
BUR LIC	Burdened Line Item Cost	MO	Month
		SF	Square Foot
		SY	Square Yard
		TON	Tons
		YR	Years

Cost Adjustment Checklist:	**NOTES:**
FACTOR:	Field work will be in Level "D" PPE.
H&S Productivity (labor and equipment only)	MII assembly costs include HPF adjustments.
Escalation to Base Year	2016 cost sources are not escalated (EF=1.00). All other costs are escalated based on the USACE CWCCIS, EM 1110-2-1304, Sept 2015.
Area Cost Factor	An AF of 1.05 is used for Oregon, except that an AF of 1.00 (national unmodified average) is used for MII assembly costs and local vendor quotes.
Subcontractor Overhead and Profit	It is assumed that home office OH is 8% and profit is 9% for the Prime Contractor. Professional labor overhead is 100%.
Prime Contractor Overhead and Profit	Allowances and items with mandated costs such as per diem do not have overhead and profit applied.
	Items previously developed by Anchor QEA already include contractor markups, therefore overhead and profit were not applied to those items.
	It is assumed that OH is 1% and profit is 0% for vendor quotes for treatment and disposal at offsite disposal facilities. It is assumed that OH is 5% and profit is 0% for quotes for all other material vendor quotes.
	Items developed using MII already include contractor markups such as overhead and profit, therefore additional overhead and profit were not applied in the PC OH and PC PF to those items.

DMM Scenario 1
Alternative H

Note: Cost Worksheets presented herein are specific to DMM Scenario 1. All other Cost Worksheets are the same for both DMM Scenario 1 and DMM Scenario 2, and can be found in the base estimate

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TABLE PV-H

PRESENT VALUE ANALYSIS

Alternative **H DMM Scenario 1 (CDF and Off-Site Option)**

Site: Portland Harbor Superfund Site
Location: Portland, Oregon
Phase: Feasibility Study (-30% to +50%)
Base Year: 2016

Year[1]	Capital Costs (Institutional Controls)[2]	Capital Costs (Monitored Natural Recovery)[2]	Capital Costs (Technology Assignments)[2]	Annual O&M Costs	Periodic Costs (Long Term Monitoring and Monitored Natural Recovery)	Periodic Costs (Long Term Operations and Maintenance and Institutional Controls)	Periodic Costs (Five-Year Site Reviews)	Total Annual Expenditure[3]	Discount Factor (7.0%)	Present Value[4]
0	$8,863,147,000	$0	$6,033,000	$0	$0	$0	$0	$8,869,180,000	1.0000	$8,869,180,000
1	$0	$0	$0	$0	$0	$0	$0	$0	0.9346	$0
2	$0	$0	$0	$0	$113,448,000	$0	$0	$113,448,000	0.8734	$99,085,483
3	$0	$0	$0	$0	$0	$0	$0	$0	0.8163	$0
4	$0	$0	$0	$0	$113,448,000	$0	$0	$113,448,000	0.7629	$86,549,479
5	$0	$0	$0	$0	$0	$24,641,000	$308,000	$24,949,000	0.7130	$17,788,637
6	$0	$0	$0	$0	$113,448,000	$0	$0	$113,448,000	0.6663	$75,590,402
7	$0	$0	$0	$0	$0	$0	$0	$0	0.6227	$0
8	$0	$0	$0	$0	$113,448,000	$0	$0	$113,448,000	0.5820	$66,026,736
9	$0	$0	$0	$0	$0	$0	$0	$0	0.5439	$0
10	$0	$0	$0	$0	$113,448,000	$24,641,000	$308,000	$138,397,000	0.5083	$70,347,195
11	$0	$0	$0	$0	$0	$0	$0	$0	0.4751	$0
12	$0	$0	$0	$0	$0	$0	$0	$0	0.4440	$0
13	$0	$0	$0	$0	$0	$0	$0	$0	0.4150	$0
14	$0	$0	$0	$0	$113,448,000	$0	$0	$113,448,000	0.3878	$43,995,134
15	$0	$0	$0	$0	$0	$24,641,000	$308,000	$24,949,000	0.3624	$9,041,518
16	$0	$0	$0	$0	$0	$0	$0	$0	0.3387	$0
17	$0	$0	$0	$0	$0	$0	$0	$0	0.3166	$0
18	$0	$0	$0	$0	$113,448,000	$0	$0	$113,448,000	0.2959	$33,569,263
19	$0	$0	$0	$0	$0	$0	$0	$0	0.2765	$0
20	$0	$0	$0	$0	$0	$24,641,000	$308,000	$24,949,000	0.2584	$6,446,822
21	$0	$0	$0	$0	$0	$0	$0	$0	0.2415	$0
22	$0	$0	$0	$0	$113,448,000	$0	$0	$113,448,000	0.2257	$25,605,214
23	$0	$0	$0	$0	$0	$0	$0	$0	0.2109	$0
24	$0	$0	$0	$0	$0	$0	$0	$0	0.1971	$0
25	$0	$0	$0	$0	$0	$24,641,000	$308,000	$24,949,000	0.1842	$4,595,606
26	$0	$0	$0	$0	$113,448,000	$0	$0	$113,448,000	0.1722	$19,535,746
27	$0	$0	$0	$0	$0	$0	$0	$0	0.1609	$0
28	$0	$0	$0	$0	$0	$0	$0	$0	0.1504	$0
29	$0	$0	$0	$0	$0	$0	$0	$0	0.1406	$0
30	$0	$0	$0	$0	$113,448,000	$24,641,000	$308,000	$138,397,000	0.1314	$18,185,366
TOTALS:	$8,863,147,000	$0	$6,033,000	$0	$1,134,480,000	$147,846,000	$1,848,000	$10,153,354,000		$9,445,542,601
TOTAL PRESENT VALUE OF ALTERNATIVE H[5]										**$9,445,540,000**

Notes:

[1] The alternative is expected to require cost expenditures for perpetuity since some contamination within the sediment bed and associated riverbank soils would remain in-place that do not allow for unrestricted use or unlimited exposure to human or ecological receptors. However the period of analysis was assumed to be 30 yrs beyond the construction in Year 0.

[2] Capital costs, for purposes of this analysis, are assumed to be distributed as indicated on Table CS-H.

[3] Total annual expenditure is the total cost per year with no discounting.

[4] Present value is the total cost per year including a 7.0% discount factor for that year. See Table PV-ADRFT for details.

[5] Total present value is rounded to the nearest $10,000. Inflation and depreciation are excluded from the present value cost.

Costs presented for this alternative are expected to have an accuracy between -30% to +50% of actual costs, based on the scope presented.

They are prepared solely to facilitate relative comparisons between alternatives for FS evaluation purposes.

TABLE CS-H

Alternative **H DMM Scenario 1 (CDF and Off-Site Option)**

DETAILED COST ESTIMATE SUMMARY

Site: Portland Harbor Superfund Site
Location: Portland, Oregon
Phase: Feasibility Study (-30% to +50%)
Base Year: 2016
Date: 5/24/2016

Description: This alternative evaluates a remedy that would involve dredging of contaminated sediments, disposal of the remaining contaminated sediment at offsite facilities (Subtitle D and Subtitle C/TSCA), capping, enhanced natural recovery (ENR), in-situ treatment, and monitored natural recovery (MNR). Capital costs are based on Disposed Material Management (DMM) Scenario 1.

INSTITUTIONAL CONTROLS CAPITAL COSTS: (Assumed to be Incurred During Year 0)

DESCRIPTION	WORKSHEET	QTY	UNIT(S)	UNIT COST	TOTAL	NOTES
Initial Establishment of Institutional Controls	CW-H2	1	LS	$4,902,480	$4,902,480	
SUBTOTAL					$4,902,480	
Contingency (Scope and Bid)		15%			$735,372	10% Scope, 5% Bid as documented in Attachment A.
SUBTOTAL					$5,637,852	
Project Management		2%			$112,757	Percentage modified as documented in Attachment A.
Remedial Design		2%			$112,757	Percentage modified as documented in Attachment A.
Construction Management		3%			$169,136	Percentage modified as documented in Attachment A.
TOTAL					$6,032,502	
TOTAL CAPITAL COST					**$6,033,000**	Total capital cost is rounded to the nearest $1,000.

MONITORED NATURAL RECOVERY CAPITAL COSTS: (Assumed to be Incurred During Year 0)

DESCRIPTION	WORKSHEET	QTY	UNIT(S)	UNIT COST	TOTAL	NOTES
Monitored Natural Recovery (MNR) for MNR/Enhanced Natural Recovery (ENR) and Broadcast GAC Areas	CW-H22	0	AC	$0	$0	Quantity represents dredge, MNR/ENR and in situ treatment areas.
SUBTOTAL					$0	
Contingency (Scope and Bid)		20%			$0	10% Scope, 10% Bid (Low end of the recommended range in EPA 540-R-00-002).
SUBTOTAL					$0	
Project Management		10%			$0	Percentage from Exhibit 5-8 in EPA 540-R-00-002 was used.
Remedial Design		20%			$0	Percentage from Exhibit 5-8 in EPA 540-R-00-002 was used.
Construction Management		15%			$0	Percentage from Exhibit 5-8 in EPA 540-R-00-002 was used.
TOTAL					$0	
TOTAL CAPITAL COST					**$0**	Total capital cost is rounded to the nearest $1,000.

TABLE CS-H

Alternative **H DMM Scenario 1 (CDF and Off-Site Option)**

DETAILED COST ESTIMATE SUMMARY

Site: Portland Harbor Superfund Site
Location: Portland, Oregon
Phase: Feasibility Study (-30% to +50%)
Base Year: 2016
Date: 5/24/2016

Description: This alternative evaluates a remedy that would involve dredging of contaminated sediments, disposal of the remaining contaminated sediment at offsite facilities (Subtitle D and Subtitle C/TSCA), capping, enhanced natural recovery (ENR), in-situ treatment, and monitored natural recovery (MNR). Capital costs are based on Disposed Material Management (DMM) Scenario 1.

TECHNOLOGY ASSIGNMENTS MEASURES CAPITAL CONSTRUCTION COSTS: (Assumed to be Incurred During Year 0)

DESCRIPTION	WORKSHEET	QTY	UNIT(S)	UNIT COST	TOTAL	NOTES
Mobilization / Demobilization	CW-H1	1	LS	$109,679,000	$109,679,000	
Transload Facility Development	CW-H21	1	LS	$57,482,635	$57,482,635	
Debris Removal and Disposal	CW-H5	2,168	AC	$13,107	$28,415,998	
Obstruction Removal and Relocation	CW-H6	1	LS	$30,652,381	$30,652,381	
Erosion/Residual Control Measures	CW-H7	1	LS	$32,012,435	$32,012,435	
Dredging of Contaminated Sediments (Open Water)	CW-H8	29,111,838	CY	$24.53	$714,113,386	
Dredging of Contaminated Sediments (Confined)	CW-H9	189,478	CY	$31.10	$5,892,766	
Excavation of Riverbanks	CW-H10	158,368	CY	$5.19	$821,932	
Dewatering and Water Treatment for Dredging Operations	CW-H11	1	LS	$126,680,092	$126,680,092	Includes collection and treatment of water from sediment dewatering during dredging operations
Offloading of the Contaminated Sediments at the CDF - DMM Scenario 1 (CDF and Off-Site Option)	CW-H11A	670,000	CY	$9.70	$6,499,000	
Subtitle C/TSCA Disposal (Handling, Transportation, Treatment of Select PTW Materials, and Disposal)	CW-H12	358,888	TON	$191	$68,535,729	Includes waste going to offsite Subtitle C/TSCA facility for disposal, including the volume of NRC/NAPL PTW that would require treatment
Subtitle D Disposal (Handling, Transportation, and Disposal) - DMM Scenario 1 (CDF and Off-Site Option)	CW-H13C	46,548,564	TON	$111	$5,155,536,286	Includes waste going to offsite Subtitle D facility for disposal without treatment, including the volume of non-PTW contaminated sediments/riverbank soils as well as the volume of highly toxic PTW
CDF Construction - DMM Scenario 1 (CDF and Off-Site Option)	CW-H13D	1	LS	$52,439,400	$52,439,400	
Mitigation	CW-H14	174	AC	$1,070,827	$186,323,898	
Sand Placement for Technology Assignments	CW-H15	4,641,736	CY	$32.61	$151,374,012	
Beach Mix Placement for Technology Assignments	CW-H16	162,557	CY	$71.75	$11,663,371	
Armor Placement for Technology Assignments	CW-H17	760,401	CY	$70.73	$53,785,475	
Reactive/GAC Placement for Technology Assignments	CW-H18	1	LS	$109,213,285	$109,213,285	
Geofabric for Riverbanks	CW-H19	32.7	AC	$14,311	$467,977	
Organoclay Mat Placement for Technology Assignments	CW-H20	174,300	SF	$6.73	$1,173,039	
SUBTOTAL					$6,902,762,097	
Contingency (Scope and Bid)		20%			$1,380,552,419	10% Scope, 10% Bid (Low end of the recommended range in EPA 540-R-00-002).
SUBTOTAL					$8,283,314,516	
Project Management		2%			$165,666,290	Percentage modified as documented in Attachment A.
Remedial Design		2%			$165,666,290	Percentage modified as documented in Attachment A.
Construction Management		3%			$248,499,435	Percentage modified as documented in Attachment A.
TOTAL					$8,863,146,531	
TOTAL CAPITAL COST					**$8,863,147,000**	Total capital cost is rounded to the nearest $1,000.

TABLE CS-H

Alternative H DMM Scenario 1 (CDF and Off-Site Option)

DETAILED COST ESTIMATE SUMMARY

Site: Portland Harbor Superfund Site
Location: Portland, Oregon
Phase: Feasibility Study (-30% to +50%)
Base Year: 2016
Date: 5/24/2016

Description: This alternative evaluates a remedy that would involve dredging of contaminated sediments, disposal of the remaining contaminated sediment at offsite facilities (Subtitle D and Subtitle C/TSCA), capping, enhanced natural recovery (ENR), in-situ treatment, and monitored natural recovery (MNR). Capital costs are based on Disposed Material Management (DMM) Scenario 1.

SITE-WIDE MONITORING AND MONITORED NATURAL RECOVERY PERIODIC COSTS: (Assumed to be Incurred at Years 2, 4, 6, 8, 10 and Every 4 Years through Period of Analysis)

DESCRIPTION	WORKSHEET	QTY	UNIT(S)	UNIT COST	TOTAL	NOTES
Monitored Natural Recovery (MNR) for MNR/Enhanced Natural Recovery (ENR) and Broadcast GAC Areas	CW-H22	0	AC	$0	$0	Quantity represents dredge, MNR/ENR and in situ treatment areas.
Site-Wide Monitoring	CW-H23	1	LS	$957,659	$957,659	
Cap Area Monitoring and Reactive Layer Monitoring	CW-H24	1	LS	$87,397,498	$87,397,498	
SUBTOTAL					$88,355,157	
Contingency (Scope and Bid)		20%			$17,671,031	10% Scope, 10% Bid (Low end of the recommended range in EPA 540-R-00-002).
SUBTOTAL					$106,026,188	
Project Management		2%			$2,120,524	Percentage modified as documented in Attachment A.
Technical Support		5%			$5,301,309	Percentage modified as documented in Attachment A.
TOTAL					$113,448,021	
TOTAL PERIODIC COST					**$113,448,000**	Total periodic cost is rounded to the nearest $1,000.

LONG TERM OPERATIONS AND MAINTENANCE PERIODIC COSTS: (Assumed to be Incurred at Year 5 and Every 5 Years through Period of Analysis)

DESCRIPTION	WORKSHEET	QTY	UNIT(S)	UNIT COST	TOTAL	NOTES
Long-Term Maintenance for Capping, ENR, and In Situ Treatment	CW-H25	1	LS	$16,645,396	$16,645,396	Assume 5% of placement of additional material for capping, ENR and In Situ Treatment. Includes mobilization and demobilization costs.
SUBTOTAL					$16,645,396	
Contingency (Scope and Bid)		20%			$3,329,079	10% Scope, 10% Bid (Low end of the recommended range in EPA 540-R-00-002).
SUBTOTAL					$19,974,475	
Project Management		5%			$998,724	Low end of the recommended range in EPA 540-R-00-002 was used.
Technical Support		10%			$1,997,448	Low end of the recommended range in EPA 540-R-00-002 was used.
TOTAL					$22,970,647	
TOTAL PERIODIC COST					**$22,971,000**	Total periodic cost is rounded to the nearest $1,000.

TABLE CS-H

Alternative **H DMM Scenario 1 (CDF and Off-Site Option)**

DETAILED COST ESTIMATE SUMMARY

Site: Portland Harbor Superfund Site
Location: Portland, Oregon
Phase: Feasibility Study (-30% to +50%)
Base Year: 2016
Date: 5/24/2016

Description: This alternative evaluates a remedy that would involve dredging of contaminated sediments, disposal of the remaining contaminated sediment at offsite facilities (Subtitle D and Subtitle C/TSCA), capping, enhanced natural recovery (ENR), in-situ treatment, and monitored natural recovery (MNR). Capital costs are based on Disposed Material Management (DMM) Scenario 1.

INSTITUTIONAL CONTROLS PERIODIC COSTS: (Assumed to be Incurred at Year 5 and Every 5 Years through Period of Analysis)

DESCRIPTION	WORKSHEET	QTY	UNIT(S)	UNIT COST	TOTAL	NOTES
Evaluating and Updating Institutional Controls	CW-H3	1	LS	$1,320,255	$1,320,255	
SUBTOTAL					$1,320,255	
Contingency (Scope and Bid)		10%			$132,026	10% Scope, 0% Bid as documented in Attachment A.
SUBTOTAL					$1,452,281	
Project Management		5%			$72,614	Low end of the recommended range in EPA 540-R-00-002 was used.
Technical Support		10%			$145,228	Low end of the recommended range in EPA 540-R-00-002 was used.
TOTAL					$1,670,123	
TOTAL PERIODIC COST					**$1,670,000**	Total periodic cost is rounded to the nearest $1,000.

5-YEAR SITE REVIEW PERIODIC COSTS: (Assumed to be Incurred at Year 5 and Every 5 Years through Period of Analysis)

DESCRIPTION	WORKSHEET	QTY	UNIT(S)	UNIT COST	TOTAL	NOTES
5-Year Site Review	CW-H26	1	LS	$243,687	$243,687	
SUBTOTAL					$243,687	
Contingency (Scope and Bid)		10%			$24,369	10% Scope, 0% Bid as documented in Attachment A.
SUBTOTAL					$268,056	
Project Management		5%			$13,403	Low end of the recommended range in EPA 540-R-00-002 was used.
Technical Support		10%			$26,806	Low end of the recommended range in EPA 540-R-00-002 was used.
TOTAL					$308,265	
TOTAL PERIODIC COST					**$308,000**	Total periodic cost is rounded to the nearest $1,000.

Notes:
Percentages used for contingency and professional/technical services costs are based on guidance from Section 5.0 of "A Guide to Developing and Documenting Cost Estimates During the Feasibility Study", EPA 2000. Modifications to the percentages applied for contingency and professional/technical services are documented in Attachment A.
Costs presented for this alternative are expected to have an accuracy between -30% to +50% of actual costs, based on the scope presented. They are prepared solely to facilitate relative comparisons between alternatives for FS evaluation purposes.
Red text indicates Cost Worksheets that are specific to DMM Scenario 1. All other Cost Worksheets are the same for both DMM Scenario 1 and DMM Scenario 2

Abbreviations:

AC	Acre
CY	Cubic Yard
LS	Lump Sum
QTY	Quantity
SF	Square Foot
TON	Ton

TABLE CW-H11A

Alternative H **Cost Worksheet: CW-H11A**
Capital Cost Sub-Element
Offloading of the Contaminated Sediments at the CDF - DMM Scenario 1 (CDF and Off-Site Option)

COST WORKSHEET

Site: Portland Harbor Superfund Site
Location: Portland, Oregon
Phase: Feasibility Study
Base Year: 2016

Prepared By: JN **Date:** 3/4/2016
Checked By: AB **Date:** 3/7/2016

Work Statement:
This sub-element involves the offloading of contaminated sediments at the CDF. It includes costs for on-site labor, equipment, and materials developed from previous work.

Cost Analysis:
Cost for Offloading at the CDF (Lump Sum)

COST DATABASE CODE	DESCRIPTION	QTY	UNIT(S)	HPF	LABOR	ADJ LABOR	EQUIP	ADJ EQUIP	MATL	OTHER	UNMOD UC	UNMOD LIC	PC OH	PC PF	BUR LIC	COST SOURCE CITATION	COMMENTS
	Offloading for CDF Disposal																
A14	Offloading of Sediments	**670,000**	CY	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$9.70	$9.70	$6,499,000.00	0%	0%	$6,499,000	MII MII	Project-specific unit cost developed in MII. Assumes mechanical offloading of sediments at the transload facility.
												TOTAL COST:			$6,499,000		

	Representative Unit Quantity	Unit(s)	Total Cost	Unit Cost
COST WORKSHEET SUMMARY	670,000	CY	$6,499,000	$9.70

Notes:
Further information about the development of cost worksheets can be found in Attachment A - Methodology and Organization of Detailed Cost Estimates.
The quantity bolded in the QTY column is the quantity selected as the representative unit quantity for this cost worksheet. If multiple quantities are bolded, the representative unit quantity is the sum of those quantities. When the LS unit is utilized, the default representative unit quantity is 1.
HTRW productivity factor is from Exhibit B-3 or B-4 of "A Guide to Developing and Documenting Cost Estimates During the Feasibility Study", EPA 2000
EPA developed project-specific unit costs using the Micro Computer Aided Cost Engineering System (MCACES) Second Generation (MII) software version 4.2, build 3

Cost Database Code:
The Cost Database Code is a reference code for linking with line item cost information with the cost source database and is not otherwise used within these cost worksheets. The following cost source database prefixes apply:
L (EPA-Derived Labor Unit Costs), M (Project-Specific Vendor Unit Costs), P (Previously Developed Unit Costs by Anchor QEA for Portland Harbor), A (EPA-Derived MII Unit Costs), O (Unit Costs from Other Projects/Sources)

Source of Cost Data:
For citation references, the following sources apply:
ALL (Allowance), FLC (www.flcdatacenter.com), LD (Costs Derived from Lower Duwamish Waterway Final Feasibility Study), MII (MII), O (Other), P (Previously Developed by Anchor QEA for Portland Harbor), and V (Vendor Quote)

Abbreviations:

QTY	Quantity	AC	Acres
EQUIP	Equipment	CLF	100 Linear Foot
MATL	Material	CY	Cubic Yard
HPF	HTRW Productivity Factor	DY	Days
ADJ LABOR	Adjusted Labor for HFP	EA	Each
ADJ EQUIP	Adjusted Equipment for HFP	FTE	Full Time Equivalent
UNMOD UC	Unmodified Unit Cost	HR	Hours
UNMOD LIC	Unmodified Line Item Cost	LB	Pounds
UNBUR LIC	Unburdened Line Item Cost	LCY	Loose Cubic Yard
PC OH	Prime Contractor Overhead	LF	Linear Foot
PC PF	Prime Contractor Profit	LS	Lump Sum
BUR LIC	Burdened Line Item Cost	MO	Month
		SF	Square Foot
		SY	Square Yard
		TON	Tons
		YR	Years

Cost Adjustment Checklist:	**NOTES:**
FACTOR:	Field work will be in Level "D" PPE.
H&S Productivity (labor and equipment only)	MII assembly costs include HPF adjustments.
Escalation to Base Year	2016 cost sources are not escalated (EF=1.00). All other costs are escalated based on the USACE CWCCIS, EM 1110-2-1304, Sept 2015.
Area Cost Factor	An AF of 1.05 is used for Oregon, except that an AF of 1.00 (national unmodified average) is used for MII assembly costs and local vendor quotes.
Subcontractor Overhead and Profit	It is assumed that home office OH is 8% and profit is 9% for the Prime Contractor. Professional labor overhead is 100%.
Prime Contractor Overhead and Profit	Allowances and items with mandated costs such as per diem do not have overhead and profit applied.
	Items previously developed by Anchor QEA already include contractor markups, therefore overhead and profit were not applied to those items.
	It is assumed that OH is 1% and profit is 0% for vendor quotes for treatment and disposal at offsite disposal facilities. It is assumed that OH is 5% and profit is 0% for quotes for all other material vendor quotes.
	Items developed using MII already include contractor markups such as overhead and profit, therefore additional overhead and profit were not applied in the PC OH and PC PF to those items.

TABLE CW-H13C

Alternative H **Cost Worksheet:** **CW-H13C**

Capital Cost Sub-Element

Subtitle D Disposal (Handling, Transportation, and Disposal) - DMM Scenario 1 (CDF and Off-Site Option)

COST WORKSHEET

Site: Portland Harbor Superfund Site
Location: Portland, Oregon
Phase: Feasibility Study
Base Year: 2016

Prepared By: JN **Date:** 3/4/2016
Checked By: AB **Date:** 3/7/2016

Work Statement:
This sub-element involves the disposal of contaminated sediments at a Subtitle D landfill, including barge transportation of materials to a transload facility, materials handling from the barge to truck, transportation of the sediments to the Subtitle C/TSCA landfill, and disposal of contaminated sediments (including thermal treatment at the landfill facility for a portion of the volume). It includes costs for labor, equipment, and materials as well as recent vendor quotes.

Cost Analysis:
Cost for Subtitle D Disposal (Lump Sum)

COST DATABASE CODE	DESCRIPTION	QTY	UNIT(S)	HPF	LABOR	ADJ LABOR	EQUIP	ADJ EQUIP	MATL	OTHER	UNMOD UC	UNMOD LIC	PC OH	PC PF	BUR LIC	COST SOURCE CITATION	COMMENTS
	Diatomaceous Earth Amendment																
A11	In-Barge Stabilization / Mixing of Amendments	37,126,645	CY	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$24.50	$24.50	$909,602,802.50	0%	0%	$909,602,803	MII MII	Project-specific unit cost developed in MII.
P5	Diatomaceous Earth	2,216,598	TON	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$105.94	$105.94	$234,826,392.12	0%	0%	$234,826,392	P Anchor QEA	Project-specific cost developed by Anchor QEA (2010) - see Backup Table 24.
	Transportation to Transload Facility																
A13	Barging to Transload Facility	37,126,645	CY	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$13.66	$13.66	$507,149,970.70	0%	0%	$507,149,971	MII MII	Project-specific unit cost developed in MII.
	Transportation and Disposal at Subtitle D Landfill																
M11	Transportation and Disposal at Subtitle D Landfill	**46,548,564**	TON	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$74.53	$74.53	$3,469,264,474.92	1%	0%	$3,503,957,120	V Vendor Quote	Project-specific vendor quote - Republic Services (Roosevelt Landfill), 2015. Includes transloading of the sediments, truck transportation from the transload facility to the landfill, and disposal at the landfill.
												TOTAL COST:			$5,155,536,286		

	Representative Unit Quantity	Unit(s)	Total Cost	Unit Cost
COST WORKSHEET SUMMARY	46,548,564	TON	$5,155,536,286	$111

Notes:
Further information about the development of cost worksheets can be found in Attachment A - Methodology and Organization of Detailed Cost Estimates.
The quantity bolded in the QTY column is the quantity selected as the representative unit quantity for this cost worksheet. If multiple quantities are bolded, the representative unit quantity is the sum of those quantities. When the LS unit is utilized, the default representative unit quantity is 1.
HTRW productivity factor is from Exhibit B-3 or B-4 of "A Guide to Developing and Documenting Cost Estimates During the Feasibility Study", EPA 2000
EPA developed project-specific unit costs using the Micro Computer Aided Cost Engineering System (MCACES) Second Generation (MII) software version 4.2, build 3

Cost Database Code:
The Cost Database Code is a reference code for linking with line item cost information with the cost source database and is not otherwise used within these cost worksheets. The following cost source database prefixes apply:
L (EPA-Derived Labor Unit Costs), M (Project-Specific Vendor Unit Costs), P (Previously Developed Unit Costs by Anchor QEA for Portland Harbor), A (EPA-Derived MII Unit Costs), O (Unit Costs from Other Projects/Sources)

Source of Cost Data:
For citation references, the following sources apply:
ALL (Allowance), FLC (www.flcdatacenter.com), LD (Costs Derived from Lower Duwamish Waterway Final Feasibility Study), MII (MII), O (Other), P (Previously Developed by Anchor QEA for Portland Harbor), and V (Vendor Quote)

Abbreviations:

QTY	Quantity	AC	Acres
EQUIP	Equipment	CLF	100 Linear Foot
MATL	Material	CY	Cubic Yard
HPF	HTRW Productivity Factor	DY	Days
ADJ LABOR	Adjusted Labor for HFP	EA	Each
ADJ EQUIP	Adjusted Equipment for HFP	FTE	Full Time Equivalent
UNMOD UC	Unmodified Unit Cost	HR	Hours
UNMOD LIC	Unmodified Line Item Cost	LB	Pounds
UNBUR LIC	Unburdened Line Item Cost	LCY	Loose Cubic Yard
PC OH	Prime Contractor Overhead	LF	Linear Foot
PC PF	Prime Contractor Profit	LS	Lump Sum
BUR LIC	Burdened Line Item Cost	MO	Month
		SF	Square Foot
		SY	Square Yard
		TON	Tons
		YR	Years

Cost Adjustment Checklist:	**NOTES:**
FACTOR:	Field work will be in Level "D" PPE.
H&S Productivity (labor and equipment only)	MII assembly costs include HPF adjustments.
Escalation to Base Year	2016 cost sources are not escalated (EF=1.00). All other costs are escalated based on the USACE CWCCIS, EM 1110-2-1304, Sept 2015.
Area Cost Factor	An AF of 1.05 is used for Oregon, except that an AF of 1.00 (national unmodified average) is used for MII assembly costs and local vendor quotes.
Subcontractor Overhead and Profit	It is assumed that home office OH is 8% and profit is 9% for the Prime Contractor. Professional labor overhead is 100%.
Prime Contractor Overhead and Profit	Allowances and items with mandated costs such as per diem do not have overhead and profit applied.
	Items previously developed by Anchor QEA already include contractor markups, therefore overhead and profit were not applied to those items.
	It is assumed that OH is 1% and profit is 0% for vendor quotes for treatment and disposal at offsite disposal facilities. It is assumed that OH is 5% and profit is 0% for quotes for all other material vendor quotes.
	Items developed using MII already include contractor markups such as overhead and profit, therefore additional overhead and profit were not applied in the PC OH and PC PF to those items.

TABLE CW-H13D

Alternative H **Cost Worksheet:** **CW-H13D**
Capital Cost Sub-Element
CDF Construction - DMM Scenario 1 (CDF and Off-Site Option)

COST WORKSHEET

Site: Portland Harbor Superfund Site
Location: Portland, Oregon
Phase: Feasibility Study
Base Year: 2016

Prepared By: JN **Date:** 3/4/2016
Checked By: AB **Date:** 3/7/2016

Work Statement:
This sub-element involves the construction of the CDF for disposal of contaminated sediments. It includes costs for on-site labor, equipment, and materials developed from previous work. Costs for the placement of the contaminated sediments within the CDF are included in Cost Worksheet CW-H11A

Cost Analysis:
Cost for CDF Disposal (Lump Sum)

COST DATABASE CODE	DESCRIPTION	QTY	UNIT(S)	HPF	LABOR	ADJ LABOR	EQUIP	ADJ EQUIP	MATL	OTHER	UNMOD UC	UNMOD LIC	PC OH	PC PF	BUR LIC	COST SOURCE CITATION	COMMENTS
P49	CDF Construction	1	LS	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$52,439,400.00	$52,439,400.00	$52,439,400.00	0%	0%	$52,439,400	P Anchor QEA	Project-specific cost developed by Anchor QEA (2011)
												TOTAL COST:			$52,439,400		

	Representative Unit Quantity	Unit(s)	Total Cost	Unit Cost
COST WORKSHEET SUMMARY	1	LS	$52,439,400	$52,439,400

Notes:
Further information about the development of cost worksheets can be found in Attachment A - Methodology and Organization of Detailed Cost Estimates.
The quantity bolded in the QTY column is the quantity selected as the representative unit quantity for this cost worksheet. If multiple quantities are bolded, the representative unit quantity is the sum of those quantities. When the LS unit is utilized, the default representative unit quantity is 1.
HTRW productivity factor is from Exhibit B-3 or B-4 of "A Guide to Developing and Documenting Cost Estimates During the Feasibility Study", EPA 2000
EPA developed project-specific unit costs using the Micro Computer Aided Cost Engineering System (MCACES) Second Generation (MII) software version 4.2, build 3

Cost Database Code:
The Cost Database Code is a reference code for linking with line item cost information with the cost source database and is not otherwise used within these cost worksheets. The following cost source database prefixes apply:
L (EPA-Derived Labor Unit Costs), M (Project-Specific Vendor Unit Costs), P (Previously Developed Unit Costs by Anchor QEA for Portland Harbor), A (EPA-Derived MII Unit Costs), O (Unit Costs from Other Projects/Sources)

Source of Cost Data:
For citation references, the following sources apply:
ALL (Allowance), FLC (www.flcdatacenter.com), LD (Costs Derived from Lower Duwamish Waterway Final Feasibility Study), MII (MII), O (Other), P (Previously Developed by Anchor QEA for Portland Harbor), and V (Vendor Quote)

Abbreviations:

QTY	Quantity	AC	Acres
EQUIP	Equipment	CLF	100 Linear Foot
MATL	Material	CY	Cubic Yard
HPF	HTRW Productivity Factor	DY	Days
ADJ LABOR	Adjusted Labor for HFP	EA	Each
ADJ EQUIP	Adjusted Equipment for HFP	FTE	Full Time Equivalent
UNMOD UC	Unmodified Unit Cost	HR	Hours
UNMOD LIC	Unmodified Line Item Cost	LB	Pounds
UNBUR LIC	Unburdened Line Item Cost	LCY	Loose Cubic Yard
PC OH	Prime Contractor Overhead	LF	Linear Foot
PC PF	Prime Contractor Profit	LS	Lump Sum
BUR LIC	Burdened Line Item Cost	MO	Month
		SF	Square Foot
		SY	Square Yard
		TON	Tons
		YR	Years

Cost Adjustment Checklist:	**NOTES:**
FACTOR:	Field work will be in Level "D" PPE.
H&S Productivity (labor and equipment only)	MII assembly costs include HPF adjustments.
Escalation to Base Year	2016 cost sources are not escalated (EF=1.00). All other costs are escalated based on the USACE CWCCIS, EM 1110-2-1304, Sept 2015.
Area Cost Factor	An AF of 1.05 is used for Oregon, except that an AF of 1.00 (national unmodified average) is used for MII assembly costs and local vendor quotes.
Subcontractor Overhead and Profit	It is assumed that home office OH is 8% and profit is 9% for the Prime Contractor. Professional labor overhead is 100%.
Prime Contractor Overhead and Profit	Allowances and items with mandated costs such as per diem do not have overhead and profit applied.
	Items previously developed by Anchor QEA already include contractor markups, therefore overhead and profit were not applied to those items.
	It is assumed that OH is 1% and profit is 0% for vendor quotes for treatment and disposal at offsite disposal facilities. It is assumed that OH is 5% and profit is 0% for quotes for all other material vendor quotes.
	Items developed using MII already include contractor markups such as overhead and profit, therefore additional overhead and profit were not applied in the PC OH and PC PF to those items.

DMM Scenario 1
Alternative I

Note: Cost Worksheets presented herein are specific to DMM Scenario 1. All other Cost Worksheets are the same for both DMM Scenario 1 and DMM Scenario 2, and can be found in the base estimate

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TABLE PV-I

PRESENT VALUE ANALYSIS

Alternative **I DMM Scenario 1 (CDF and Off-Site Option)**

Site: Portland Harbor Superfund Site
Location: Portland, Oregon
Phase: Feasibility Study (-30% to +50%)
Base Year: 2016

Year[1]	Capital Costs (Institutional Controls)[2]	Capital Costs (Monitored Natural Recovery)[2]	Capital Costs (Technology Assignments)[2]	Annual O&M Costs	Periodic Costs (Long Term Monitoring and Monitored Natural Recovery)	Periodic Costs (Long Term Operations and Maintenance and Institutional Controls)	Periodic Costs (Five-Year Site Reviews)	Total Annual Expenditure[3]	Discount Factor (7.0%)	Present Value[4]
0	$532,286	$10,197,000	$94,006,143	$0	$0	$0	$0	$104,735,429	1.0000	$104,735,429
1	$532,286	$0	$94,006,143	$0	$0	$0	$0	$94,538,429	0.9346	$88,355,616
2	$532,286	$0	$94,006,143	$0	$38,426,000	$0	$0	$132,964,429	0.8734	$116,131,132
3	$532,286	$0	$94,006,143	$0	$0	$0	$0	$94,538,429	0.8163	$77,171,720
4	$532,286	$0	$94,006,143	$0	$38,426,000	$0	$0	$132,964,429	0.7629	$101,438,563
5	$532,286	$0	$94,006,143	$0	$0	$5,972,000	$308,000	$100,818,429	0.7130	$71,883,540
6	$532,286	$0	$94,006,143	$0	$38,426,000	$0	$0	$132,964,429	0.6663	$88,594,199
7	$0	$0	$0	$0	$0	$0	$0	$0	0.6227	$0
8	$0	$0	$0	$0	$38,426,000	$0	$0	$38,426,000	0.5820	$22,363,932
9	$0	$0	$0	$0	$0	$0	$0	$0	0.5439	$0
10	$0	$0	$0	$0	$38,426,000	$5,972,000	$308,000	$44,706,000	0.5083	$22,724,060
11	$0	$0	$0	$0	$0	$0	$0	$0	0.4751	$0
12	$0	$0	$0	$0	$0	$0	$0	$0	0.4440	$0
13	$0	$0	$0	$0	$0	$0	$0	$0	0.4150	$0
14	$0	$0	$0	$0	$38,426,000	$0	$0	$38,426,000	0.3878	$14,901,603
15	$0	$0	$0	$0	$0	$5,972,000	$308,000	$6,280,000	0.3624	$2,275,872
16	$0	$0	$0	$0	$0	$0	$0	$0	0.3387	$0
17	$0	$0	$0	$0	$0	$0	$0	$0	0.3166	$0
18	$0	$0	$0	$0	$38,426,000	$0	$0	$38,426,000	0.2959	$11,370,253
19	$0	$0	$0	$0	$0	$0	$0	$0	0.2765	$0
20	$0	$0	$0	$0	$0	$5,972,000	$308,000	$6,280,000	0.2584	$1,622,752
21	$0	$0	$0	$0	$0	$0	$0	$0	0.2415	$0
22	$0	$0	$0	$0	$38,426,000	$0	$0	$38,426,000	0.2257	$8,672,748
23	$0	$0	$0	$0	$0	$0	$0	$0	0.2109	$0
24	$0	$0	$0	$0	$0	$0	$0	$0	0.1971	$0
25	$0	$0	$0	$0	$0	$5,972,000	$308,000	$6,280,000	0.1842	$1,156,776
26	$0	$0	$0	$0	$38,426,000	$0	$0	$38,426,000	0.1722	$6,616,957
27	$0	$0	$0	$0	$0	$0	$0	$0	0.1609	$0
28	$0	$0	$0	$0	$0	$0	$0	$0	0.1504	$0
29	$0	$0	$0	$0	$0	$0	$0	$0	0.1406	$0
30	$0	$0	$0	$0	$38,426,000	$5,972,000	$308,000	$44,706,000	0.1314	$5,874,368
TOTALS:	$3,726,000	$10,197,000	$658,043,000	$0	$384,260,000	$35,832,000	$1,848,000	$1,093,906,000		$745,889,520
TOTAL PRESENT VALUE OF ALTERNATIVE I [5]										**$745,890,000**

Notes:

[1] The alternative is expected to require cost expenditures for perpetuity since some contamination within the sediment bed and associated riverbank soils would remain in-place that do not allow for unrestricted use or unlimited exposure to human or ecological receptors. However the period of analysis was assumed to be 30 yrs beyond the construction in Year 0.

[2] Capital costs, for purposes of this analysis, are assumed to be distributed as indicated on Table CS-I.

[3] Total annual expenditure is the total cost per year with no discounting.

[4] Present value is the total cost per year including a 7.0% discount factor for that year. See Table PV-ADRFT for details.

[5] Total present value is rounded to the nearest $10,000. Inflation and depreciation are excluded from the present value cost.

Costs presented for this alternative are expected to have an accuracy between -30% to +50% of actual costs, based on the scope presented.

They are prepared solely to facilitate relative comparisons between alternatives for FS evaluation purposes.

TABLE CS-I

Alternative I DMM Scenario 1 (CDF and Off-Site Option)

DETAILED COST ESTIMATE SUMMARY

Site: Portland Harbor Superfund Site
Location: Portland, Oregon
Phase: Feasibility Study (-30% to +50%)
Base Year: 2016
Date: 5/24/2016

Description: This alternative evaluates a remedy that would involve dredging of contaminated sediments, disposal of the remaining contaminated sediment at offsite facilities (Subtitle D and Subtitle C/TSCA), capping, enhanced natural recovery (ENR), in-situ treatment, and monitored natural recovery (MNR). Capital costs are based on Disposed Material Management (DMM) Scenario 1.

INSTITUTIONAL CONTROLS CAPITAL COSTS: (Assumed to be Incurred During Years 0 through 6)

DESCRIPTION	WORKSHEET	QTY	UNIT(S)	UNIT COST	TOTAL	NOTES
Initial Establishment of Institutional Controls	CW-I2	1	LS	$3,028,033	$3,028,033	
SUBTOTAL					$3,028,033	
Contingency (Scope and Bid)		15%			$454,205	10% Scope, 5% Bid as documented in Attachment A.
SUBTOTAL					$3,482,238	
Project Management		2%			$69,645	Percentage modified as documented in Attachment A.
Remedial Design		2%			$69,645	Percentage modified as documented in Attachment A.
Construction Management		3%			$104,467	Percentage modified as documented in Attachment A.
TOTAL					$3,725,995	
TOTAL CAPITAL COST					**$3,726,000**	Total capital cost is rounded to the nearest $1,000.

MONITORED NATURAL RECOVERY CAPITAL COSTS: (Assumed to be Incurred During Year 0)

DESCRIPTION	WORKSHEET	QTY	UNIT(S)	UNIT COST	TOTAL	NOTES
Monitored Natural Recovery (MNR) for MNR/Enhanced Natural Recovery (ENR) and Broadcast GAC Areas	CW-I22	1937	AC	$3,686	$7,140,415	Quantity represents dredge, MNR/ENR and in situ treatment areas.
SUBTOTAL					$7,140,415	
Contingency (Scope and Bid)		20%			$1,428,083	10% Scope, 10% Bid (Low end of the recommended range in EPA 540-R-00-002).
SUBTOTAL					$8,568,498	
Project Management		5%			$428,425	Percentage from Exhibit 5-8 in EPA 540-R-00-002 was used.
Remedial Design		8%			$685,480	Percentage from Exhibit 5-8 in EPA 540-R-00-002 was used.
Construction Management		6%			$514,110	Percentage from Exhibit 5-8 in EPA 540-R-00-002 was used.
TOTAL					$10,196,513	
TOTAL CAPITAL COST					**$10,197,000**	Total capital cost is rounded to the nearest $1,000.

TABLE CS-I

Alternative I DMM Scenario 1 (CDF and Off-Site Option)

DETAILED COST ESTIMATE SUMMARY

Site: Portland Harbor Superfund Site
Location: Portland, Oregon
Phase: Feasibility Study (-30% to +50%)
Base Year: 2016
Date: 5/24/2016

Description: This alternative evaluates a remedy that would involve dredging of contaminated sediments, disposal of the remaining contaminated sediment at offsite facilities (Subtitle D and Subtitle C/TSCA), capping, enhanced natural recovery (ENR), in-situ treatment, and monitored natural recovery (MNR). Capital costs are based on Disposed Material Management (DMM) Scenario 1.

TECHNOLOGY ASSIGNMENTS MEASURES CAPITAL Construction COSTS: (Assumed to be Incurred During Years 0 through 6)

DESCRIPTION	WORKSHEET	QTY	UNIT(S)	UNIT COST	TOTAL	NOTES
Mobilization / Demobilization	CW-I1	1	LS	$9,045,000	$9,045,000	
Transload Facility Development	CW-I21	1	LS	$10,528,998	$10,528,998	
Debris Removal and Disposal	CW-I5	292	AC	$13,107	$3,827,247	
Obstruction Removal and Relocation	CW-I6	1	LS	$15,146,379	$15,146,379	
Erosion/Residual Control Measures	CW-I7	1	LS	$25,227,895	$25,227,895	
Dredging of Contaminated Sediments (Open Water)	CW-I8	1,556,599	CY	$24.53	$38,183,373	
Dredging of Contaminated Sediments (Confined)	CW-I9	93,151	CY	$31.10	$2,896,996	
Excavation of Riverbanks	CW-I10	102,624	CY	$5.19	$532,618	
Dewatering and Water Treatment for Dredging Operations	CW-I11	1	LS	$7,261,269	$7,261,269	Includes collection and treatment of water from sediment dewatering during dredging operations
Offloading of the Contaminated Sediments at the CDF - DMM Scenario 1 (CDF and Off-Site Option)	CW-I11A	670,000	CY	$9.70	$6,499,000	
Subtitle C/TSCA Disposal (Handling, Transportation, Treatment of Select PTW Materials, and Disposal)	CW-I12	358,888	TON	$191	$68,535,729	Includes waste going to offsite Subtitle C/TSCA facility for disposal, including the volume of NRC/NAPL PTW that would require treatment
Subtitle D Disposal (Handling, Transportation, and Disposal) - DMM Scenario 1 (CDF and Off-Site Option)	CW-I13C	1,444,029	TON	$111	$159,934,943	Includes waste going to offsite Subtitle D facility for disposal without treatment, including the volume of non-PTW contaminated sediments/riverbank soils as well as the volume of highly toxic PTW
CDF Construction - DMM Scenario 1 (CDF and Off-Site Option)	CW-I13D	1	LS	$52,439,400	$52,439,400	
Mitigation	CW-I14	34	AC	$1,070,827	$36,408,118	
Sand Placement for Technology Assignments	CW-I15	598,578	CY	$34.00	$20,353,254	
Beach Mix Placement for Technology Assignments	CW-I16	49,511	CY	$73.43	$3,635,422	
Armor Placement for Technology Assignments	CW-I17	80,297	CY	$72.27	$5,802,915	
Reactive/GAC Placement for Technology Assignments	CW-I18	1	LS	$44,759,377	$44,759,377	
Geofabric for Riverbanks	CW-I19	21.2	AC	$14,311	$303,398	
Organoclay Mat Placement for Technology Assignments	CW-I20	174,300	SF	$6.73	$1,173,039	
SUBTOTAL					$512,494,370	
Contingency (Scope and Bid)		20%			$102,498,874	10% Scope, 10% Bid (Low end of the recommended range in EPA 540-R-00-002).
SUBTOTAL					$614,993,244	
Project Management		2%			$12,299,865	Percentage modified as documented in Attachment A.
Remedial Design		2%			$12,299,865	Percentage modified as documented in Attachment A.
Construction Management		3%			$18,449,797	Percentage modified as documented in Attachment A.
TOTAL					$658,042,771	
TOTAL CAPITAL COST					**$658,043,000**	Total capital cost is rounded to the nearest $1,000.

TABLE CS-I

Alternative I DMM Scenario 1 (CDF and Off-Site Option)

DETAILED COST ESTIMATE SUMMARY

Site: Portland Harbor Superfund Site
Location: Portland, Oregon
Phase: Feasibility Study (-30% to +50%)
Base Year: 2016
Date: 5/24/2016

Description: This alternative evaluates a remedy that would involve dredging of contaminated sediments, disposal of the remaining contaminated sediment at offsite facilities (Subtitle D and Subtitle C/TSCA), capping, enhanced natural recovery (ENR), in-situ treatment, and monitored natural recovery (MNR). Capital costs are based on Disposed Material Management (DMM) Scenario 1.

SITE-WIDE MONITORING AND MONITORED NATURAL RECOVERY PERIODIC COSTS: (Assumed to be Incurred at Years 2, 4, 6, 8, 10 and Every 4 Years through Period of Analysis)

DESCRIPTION	WORKSHEET	QTY	UNIT(S)	UNIT COST	TOTAL	NOTES
Monitored Natural Recovery (MNR) for MNR/Enhanced Natural Recovery (ENR) and Broadcast GAC Areas	CW-I22	1937	AC	$3,686	$7,140,415	Quantity represents dredge, MNR/ENR and in situ treatment areas.
Site-Wide Monitoring	CW-I23	1	LS	$957,659	$957,659	
Cap Area Monitoring and Reactive Layer Monitoring	CW-I24	1	LS	$21,828,717	$21,828,717	
SUBTOTAL					$29,926,791	
Contingency (Scope and Bid)		20%			$5,985,358	10% Scope, 10% Bid (Low end of the recommended range in EPA 540-R-00-002).
SUBTOTAL					$35,912,149	
Project Management		2%			$718,243	Percentage modified as documented in Attachment A.
Technical Support		5%			$1,795,607	Percentage modified as documented in Attachment A.
TOTAL					$38,425,999	
TOTAL PERIODIC COST					**$38,426,000**	Total periodic cost is rounded to the nearest $1,000.

LONG TERM OPERATIONS AND MAINTENANCE PERIODIC COSTS: (Assumed to be Incurred at Year 5 and Every 5 Years through Period of Analysis)

DESCRIPTION	WORKSHEET	QTY	UNIT(S)	UNIT COST	TOTAL	NOTES
Long-Term Maintenance for Capping, ENR, and In Situ Treatment	CW-I25	1	LS	$3,862,654	$3,862,654	Assume 5% of placement of additional material for capping, ENR and In Situ Treatment. Includes mobilization and demobilization costs.
SUBTOTAL					$3,862,654	
Contingency (Scope and Bid)		20%			$772,531	10% Scope, 10% Bid (Low end of the recommended range in EPA 540-R-00-002).
SUBTOTAL					$4,635,185	
Project Management		5%			$231,759	Low end of the recommended range in EPA 540-R-00-002 was used.
Technical Support		10%			$463,519	Low end of the recommended range in EPA 540-R-00-002 was used.
TOTAL					$5,330,463	
TOTAL PERIODIC COST					**$5,330,000**	Total periodic cost is rounded to the nearest $1,000.

TABLE CS-I

Alternative I DMM Scenario 1 (CDF and Off-Site Option)

DETAILED COST ESTIMATE SUMMARY

Site: Portland Harbor Superfund Site
Location: Portland, Oregon
Phase: Feasibility Study (-30% to +50%)
Base Year: 2016
Date: 5/24/2016

Description: This alternative evaluates a remedy that would involve dredging of contaminated sediments, disposal of the remaining contaminated sediment at offsite facilities (Subtitle D and Subtitle C/TSCA), capping, enhanced natural recovery (ENR), in-situ treatment, and monitored natural recovery (MNR). Capital costs are based on Disposed Material Management (DMM) Scenario 1.

INSTITUTIONAL CONTROLS PERIODIC COSTS: (Assumed to be Incurred at Year 5 and Every 5 Years through Period of Analysis)

DESCRIPTION	WORKSHEET	QTY	UNIT(S)	UNIT COST	TOTAL	NOTES
Evaluating and Updating Institutional Controls	CW-I3	1	LS	$507,467	$507,467	
SUBTOTAL					$507,467	
Contingency (Scope and Bid)		10%			$50,747	10% Scope, 0% Bid as documented in Attachment A.
SUBTOTAL					$558,214	
Project Management		5%			$27,911	Low end of the recommended range in EPA 540-R-00-002 was used.
Technical Support		10%			$55,821	Low end of the recommended range in EPA 540-R-00-002 was used.
TOTAL					$641,946	
TOTAL PERIODIC COST					**$642,000**	Total periodic cost is rounded to the nearest $1,000.

5-YEAR SITE REVIEW PERIODIC COSTS: (Assumed to be Incurred at Year 5 and Every 5 Years through Period of Analysis)

DESCRIPTION	WORKSHEET	QTY	UNIT(S)	UNIT COST	TOTAL	NOTES
5-Year Site Review	CW-I26	1	LS	$243,687	$243,687	
SUBTOTAL					$243,687	
Contingency (Scope and Bid)		10%			$24,369	10% Scope, 0% Bid as documented in Attachment A.
SUBTOTAL					$268,056	
Project Management		5%			$13,403	Low end of the recommended range in EPA 540-R-00-002 was used.
Technical Support		10%			$26,806	Low end of the recommended range in EPA 540-R-00-002 was used.
TOTAL					$308,265	
TOTAL PERIODIC COST					**$308,000**	Total periodic cost is rounded to the nearest $1,000.

Notes:
Percentages used for contingency and professional/technical services costs are based on guidance from Section 5.0 of "A Guide to Developing and Documenting Cost Estimates During the Feasibility Study", EPA 2000. Modifications to the percentages applied for contingency and professional/technical services are documented in Attachment A.
Costs presented for this alternative are expected to have an accuracy between -30% to +50% of actual costs, based on the scope presented. They are prepared solely to facilitate relative comparisons between alternatives for FS evaluation purposes.
Red text indicates Cost Worksheets that are specific to DMM Scenario 1. All other Cost Worksheets are the same for both DMM Scenario 1 and DMM Scenario 2

Abbreviations:

AC	Acre
CY	Cubic Yard
LS	Lump Sum
QTY	Quantity
SF	Square Foot
TON	Ton

TABLE CW-I11A

Alternative I **Cost Worksheet:** **CW-I11A**
Capital Cost Sub-Element
Offloading of the Contaminated Sediments at the CDF - DMM Scenario 1 (CDF and Off-Site Option)

COST WORKSHEET

Site: Portland Harbor Superfund Site
Location: Portland, Oregon
Phase: Feasibility Study
Base Year: 2016

Prepared By: JN **Date:** 3/4/2016
Checked By: AB **Date:** 3/7/2016

Work Statement:
This sub-element involves the offloading of contaminated sediments at the CDF. It includes costs for on-site labor, equipment, and materials developed from previous work.

Cost Analysis:
Cost for Offloading at the CDF (Lump Sum)

COST DATABASE CODE	DESCRIPTION	QTY	UNIT(S)	HPF	LABOR	ADJ LABOR	EQUIP	ADJ EQUIP	MATL	OTHER	UNMOD UC	UNMOD LIC	PC OH	PC PF	BUR LIC	COST SOURCE CITATION	COMMENTS
	Offloading for CDF Disposal																
A14	Offloading of Sediments	**670,000**	CY	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$9.70	$9.70	$6,499,000.00	0%	0%	$6,499,000	MII MII	Project-specific unit cost developed in MII. Assumes mechanical offloading of sediments at the transload facility.
												TOTAL COST:			$6,499,000		

	Representative Unit Quantity	Unit(s)	Total Cost	Unit Cost
COST WORKSHEET SUMMARY	670,000	CY	$6,499,000	$9.70

Notes:
Further information about the development of cost worksheets can be found in Attachment A - Methodology and Organization of Detailed Cost Estimates.
The quantity bolded in the QTY column is the quantity selected as the representative unit quantity for this cost worksheet. If multiple quantities are bolded, the representative unit quantity is the sum of those quantities. When the LS unit is utilized, the default representative unit quantity is 1.
HTRW productivity factor is from Exhibit B-3 or B-4 of "A Guide to Developing and Documenting Cost Estimates During the Feasibility Study", EPA 2000
EPA developed project-specific unit costs using the Micro Computer Aided Cost Engineering System (MCACES) Second Generation (MII) software version 4.2, build 3

Cost Database Code:
The Cost Database Code is a reference code for linking with line item cost information with the cost source database and is not otherwise used within these cost worksheets. The following cost source database prefixes apply:
L (EPA-Derived Labor Unit Costs), M (Project-Specific Vendor Unit Costs), P (Previously Developed Unit Costs by Anchor QEA for Portland Harbor), A (EPA-Derived MII Unit Costs), O (Unit Costs from Other Projects/Sources)

Source of Cost Data:
For citation references, the following sources apply:
ALL (Allowance), FLC (www.flcdatacenter.com), LD (Costs Derived from Lower Duwamish Waterway Final Feasibility Study), MII (MII), O (Other), P (Previously Developed by Anchor QEA for Portland Harbor), and V (Vendor Quote)

Abbreviations:

QTY	Quantity	AC	Acres
EQUIP	Equipment	CLF	100 Linear Foot
MATL	Material	CY	Cubic Yard
HPF	HTRW Productivity Factor	DY	Days
ADJ LABOR	Adjusted Labor for HFP	EA	Each
ADJ EQUIP	Adjusted Equipment for HFP	FTE	Full Time Equivalent
UNMOD UC	Unmodified Unit Cost	HR	Hours
UNMOD LIC	Unmodified Line Item Cost	LB	Pounds
UNBUR LIC	Unburdened Line Item Cost	LCY	Loose Cubic Yard
PC OH	Prime Contractor Overhead	LF	Linear Foot
PC PF	Prime Contractor Profit	LS	Lump Sum
BUR LIC	Burdened Line Item Cost	MO	Month
		SF	Square Foot
		SY	Square Yard
		TON	Tons
		YR	Years

Cost Adjustment Checklist:	**NOTES:**
FACTOR:	Field work will be in Level "D" PPE.
H&S Productivity (labor and equipment only)	MII assembly costs include HPF adjustments.
Escalation to Base Year	2016 cost sources are not escalated (EF=1.00). All other costs are escalated based on the USACE CWCCIS, EM 1110-2-1304, Sept 2015.
Area Cost Factor	An AF of 1.05 is used for Oregon, except that an AF of 1.00 (national unmodified average) is used for MII assembly costs and local vendor quotes.
Subcontractor Overhead and Profit	It is assumed that home office OH is 8% and profit is 9% for the Prime Contractor. Professional labor overhead is 100%.
Prime Contractor Overhead and Profit	Allowances and items with mandated costs such as per diem do not have overhead and profit applied.
	Items previously developed by Anchor QEA already include contractor markups, therefore overhead and profit were not applied to those items.
	It is assumed that OH is 1% and profit is 0% for vendor quotes for treatment and disposal at offsite disposal facilities. It is assumed that OH is 5% and profit is 0% for quotes for all other material vendor quotes.
	Items developed using MII already include contractor markups such as overhead and profit, therefore additional overhead and profit were not applied in the PC OH and PC PF to those items.

TABLE CW-I13C

Alternative I **Cost Worksheet:** **CW-I13C**
Capital Cost Sub-Element
Subtitle D Disposal (Handling, Transportation, and Disposal) - DMM Scenario 1 (CDF and Off-Site Option)

COST WORKSHEET

Site: Portland Harbor Superfund Site
Location: Portland, Oregon
Phase: Feasibility Study
Base Year: 2016

Prepared By: JN **Date:** 3/4/2016
Checked By: AB **Date:** 3/7/2016

Work Statement:
This sub-element involves the disposal of contaminated sediments at a Subtitle D landfill, including barge transportation of materials to a transload facility, materials handling from the barge to truck, transportation of the sediments to the Subtitle C/TSCA landfill, and disposal of contaminated sediments (including thermal treatment at the landfill facility for a portion of the volume). It includes costs for labor, equipment, and materials as well as recent vendor quotes.
Quantity development presented in Appendix D.

Cost Analysis:
Cost for Subtitle D Disposal (Lump Sum)

COST DATABASE CODE	DESCRIPTION	QTY	UNIT(S)	HPF	LABOR	ADJ LABOR	EQUIP	ADJ EQUIP	MATL	OTHER	UNMOD UC	UNMOD LIC	PC OH	PC PF	BUR LIC	COST SOURCE CITATION	COMMENTS
	Diatomaceous Earth Amendment																
A11	In-Barge Stabilization / Mixing of Amendments	1,151,742	CY	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$24.50	$24.50	$28,217,679.00	0%	0%	$28,217,679	MII MII	Project-specific unit cost developed in MII.
P5	Diatomaceous Earth	68,763	TON	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$105.94	$105.94	$7,284,752.22	0%	0%	$7,284,752	P Anchor QEA	Project-specific cost developed by Anchor QEA (2010) - see Backup Table 24.
	Transportation to Transload Facility																
A13	Barging to Transload Facility	1,151,742	CY	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$13.66	$13.66	$15,732,795.72	0%	0%	$15,732,796	MII MII	Project-specific unit cost developed in MII.
	Transportation and Disposal at Subtitle D Landfill																
M11	Transportation and Disposal at Subtitle D Landfill	**1,444,029**	TON	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$74.53	$74.53	$107,623,481.37	1%	0%	$108,699,716	V Vendor Quote	Project-specific vendor quote - Republic Services (Roosevelt Landfill), 2015. Includes transloading of the sediments, truck transportation from the transload facility to the landfill, and disposal at the landfill.
														TOTAL COST:	$159,934,943		

	Representative Unit Quantity	Unit(s)	Total Cost	Unit Cost
COST WORKSHEET SUMMARY	1,444,029	TON	$159,934,943	$111

Notes:
Further information about the development of cost worksheets can be found in Attachment A - Methodology and Organization of Detailed Cost Estimates.
The quantity bolded in the QTY column is the quantity selected as the representative unit quantity for this cost worksheet. If multiple quantities are bolded, the representative unit quantity is the sum of those quantities. When the LS unit is utilized, the default representative unit quantity is 1.
HTRW productivity factor is from Exhibit B-3 or B-4 of "A Guide to Developing and Documenting Cost Estimates During the Feasibility Study", EPA 2000
EPA developed project-specific unit costs using the Micro Computer Aided Cost Engineering System (MCACES) Second Generation (MII) software version 4.2, build 3

Cost Database Code:
The Cost Database Code is a reference code for linking with line item cost information with the cost source database and is not otherwise used within these cost worksheets. The following cost source database prefixes apply:
L (EPA-Derived Labor Unit Costs), M (Project-Specific Vendor Unit Costs), P (Previously Developed Unit Costs by Anchor QEA for Portland Harbor), A (EPA-Derived MII Unit Costs), O (Unit Costs from Other Projects/Sources)

Source of Cost Data:
For citation references, the following sources apply:
ALL (Allowance), FLC (www.flcdatacenter.com), LD (Costs Derived from Lower Duwamish Waterway Final Feasibility Study), MII (MII), O (Other), P (Previously Developed by Anchor QEA for Portland Harbor), and V (Vendor Quote)

Abbreviations:

QTY	Quantity	AC	Acres
EQUIP	Equipment	CLF	100 Linear Foot
MATL	Material	CY	Cubic Yard
HPF	HTRW Productivity Factor	DY	Days
ADJ LABOR	Adjusted Labor for HFP	EA	Each
ADJ EQUIP	Adjusted Equipment for HFP	FTE	Full Time Equivalent
UNMOD UC	Unmodified Unit Cost	HR	Hours
UNMOD LIC	Unmodified Line Item Cost	LB	Pounds
UNBUR LIC	Unburdened Line Item Cost	LCY	Loose Cubic Yard
PC OH	Prime Contractor Overhead	LF	Linear Foot
PC PF	Prime Contractor Profit	LS	Lump Sum
BUR LIC	Burdened Line Item Cost	MO	Month
		SF	Square Foot
		SY	Square Yard
		TON	Tons
		YR	Years

Cost Adjustment Checklist:	**NOTES:**
FACTOR:	Field work will be in Level "D" PPE.
H&S Productivity (labor and equipment only)	MII assembly costs include HPF adjustments.
Escalation to Base Year	2016 cost sources are not escalated (EF=1.00). All other costs are escalated based on the USACE CWCCIS, EM 1110-2-1304, Sept 2015.
Area Cost Factor	An AF of 1.05 is used for Oregon, except that an AF of 1.00 (national unmodified average) is used for MII assembly costs and local vendor quotes.
Subcontractor Overhead and Profit	It is assumed that home office OH is 8% and profit is 9% for the Prime Contractor. Professional labor overhead is 100%.
Prime Contractor Overhead and Profit	Allowances and items with mandated costs such as per diem do not have overhead and profit applied.
	Items previously developed by Anchor QEA already include contractor markups, therefore overhead and profit were not applied to those items.
	It is assumed that OH is 1% and profit is 0% for vendor quotes for treatment and disposal at offsite disposal facilities. It is assumed that OH is 5% and profit is 0% for quotes for all other material vendor quotes.
	Items developed using MII already include contractor markups such as overhead and profit, therefore additional overhead and profit were not applied in the PC OH and PC PF to those items.

TABLE CW-I13D

Alternative I **Cost Worksheet:** **CW-I13D**
Capital Cost Sub-Element
CDF Construction - DMM Scenario 1 (CDF and Off-Site Option)

COST WORKSHEET

Site: Portland Harbor Superfund Site
Location: Portland, Oregon
Phase: Feasibility Study
Base Year: 2016

Prepared By: JN **Date:** 3/4/2016
Checked By: AB **Date:** 3/7/2016

Work Statement:
This sub-element involves the construction of the CDF for disposal of contaminated sediments. It includes costs for on-site labor, equipment, and materials developed from previous work. Costs for the placement of the contaminated sediments within the CDF are included in Cost Worksheet CW-I11A

Cost Analysis:
Cost for CDF Disposal (Lump Sum)

COST DATABASE CODE	DESCRIPTION	QTY	UNIT(S)	HPF	LABOR	ADJ LABOR	EQUIP	ADJ EQUIP	MATL	OTHER	UNMOD UC	UNMOD LIC	PC OH	PC PF	BUR LIC	COST SOURCE CITATION	COMMENTS
P49	CDF Construction	1	LS	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$52,439,400.00	$52,439,400.00	$52,439,400.00	0%	0%	$52,439,400	P Anchor QEA	Project-specific cost developed by Anchor QEA (2011)
												TOTAL COST:			$52,439,400		

	Representative Unit Quantity	Unit(s)	Total Cost	Unit Cost
COST WORKSHEET SUMMARY	1	LS	$52,439,400	$52,439,400

Notes:
Further information about the development of cost worksheets can be found in Attachment A - Methodology and Organization of Detailed Cost Estimates.
The quantity bolded in the QTY column is the quantity selected as the representative unit quantity for this cost worksheet. If multiple quantities are bolded, the representative unit quantity is the sum of those quantities. When the LS unit is utilized, the default representative unit quantity is 1.
HTRW productivity factor is from Exhibit B-3 or B-4 of "A Guide to Developing and Documenting Cost Estimates During the Feasibility Study", EPA 2000
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