

**PECKMAN RIVER BASIN, NEW JERSEY
FLOOD RISK MANAGEMENT FEASIBILITY STUDY**

**DRAFT INTEGRATED FEASIBILITY REPORT &
ENVIRONMENTAL ASSESSMENT**

APPENDIX D – COST APPENDIX



**US Army Corps of Engineers
New York District**

MAY 2018

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INTRODUCTION

This Appendix presents the detailed cost estimates for Peckman River (NED). Peckman River project provides solutions to reduce the impact of flooding in Peckman River located in Essex and Passaic Counties, NJ, which is subjected to storm-related flooding on a regular basis. It consists of a combination of bridge replacement, channel modifications, retaining walls, a diversion culvert, ringwalls, and elevation of properties in the flood prone areas. The Total First Cost is presented in Table D1 below.

Table D1 –First Cost

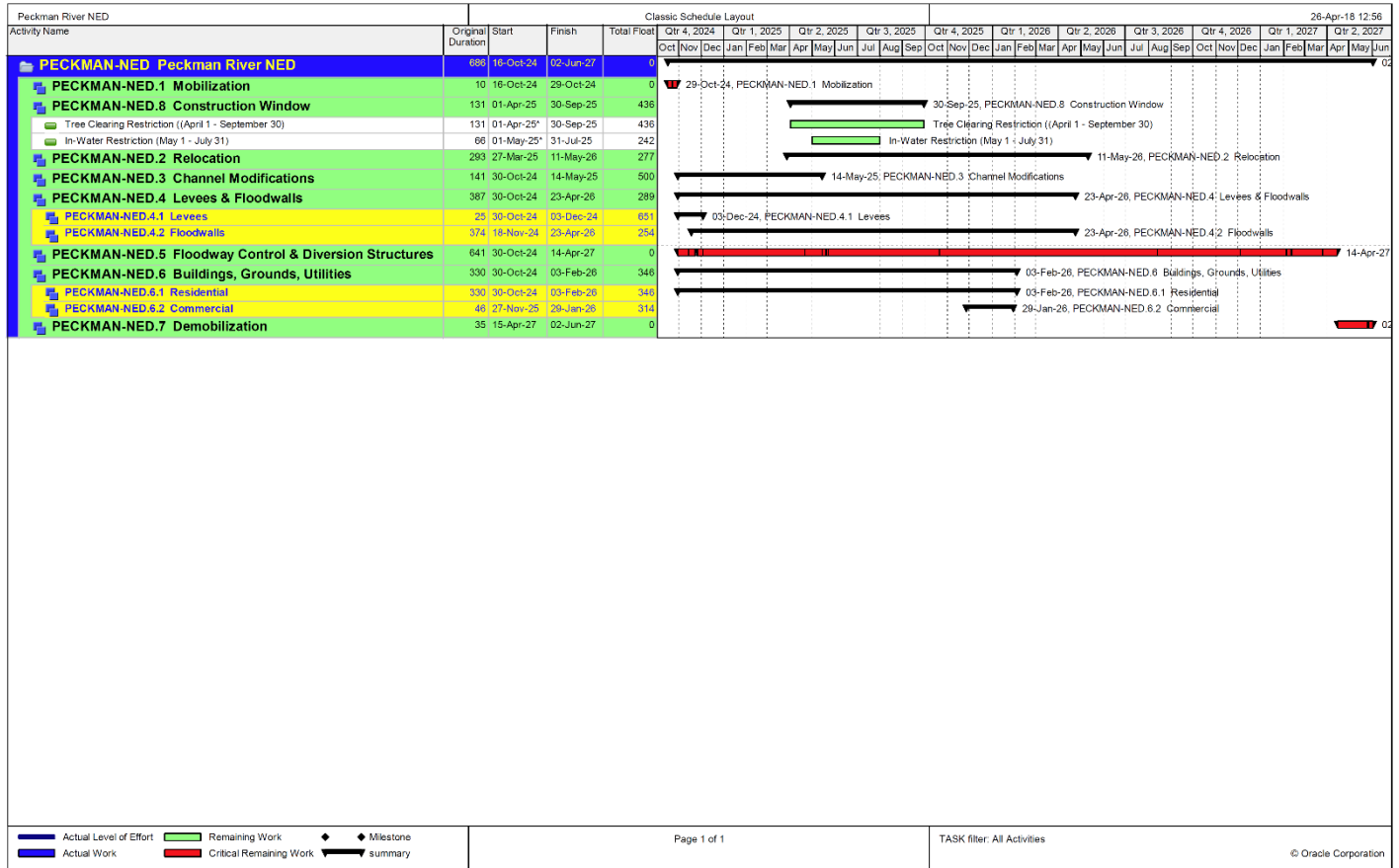
Peckman River (NED) Option 2 October 2017 Price Level NED - Option 2 Feasibility Report Cost Estimate Summary									
Feat. Acct.	Description	Qty	UoM	Subtotal	Cont. %	Cont \$\$	Total Cost		
01	LANDS AND DAMAGES	1	LS	\$ 5,217,500	30%	\$ 1,565,250	\$		6,782,750
02	RELOCATIONS	1	LS	\$ 1,293,596	49%	\$ 630,212	\$		1,923,808
06	FISH & WILDLIFE FACILITIES	1	LS	\$ 8,695,124	49%	\$ 4,236,077	\$		12,931,201
09	CHANNELS & CANALS	1	LS	\$ 3,400,817	49%	\$ 1,656,805	\$		5,057,622
11	LEVEES & FLOODWALLS	1	LS	\$ 5,169,245	49%	\$ 2,518,345	\$		7,687,590
15	FLOODWAY CONTROL & DIVERSION STR	1	LS	\$ 24,571,892	49%	\$ 11,970,896	\$		36,542,789
18	CULTURAL RESOURCE PRESERVATION	1	LS	\$ 2,900,000	49%	\$ 1,412,817	\$		4,312,817
19	BUILDINGS, GROUNDS & UTILITIES	1	LS	\$ 34,217,844	49%	\$ 16,670,196	\$		50,888,040
30	PLANNING, ENGINEERING AND DESIGN	1	LS	\$ 15,888,000	22%	\$ 3,478,742	\$		19,366,742
31	CONSTRUCTION MANAGEMENT	1	LS	\$ 7,543,000	18%	\$ 1,357,540	\$		8,900,540
Total PECKMAN RIVER			\$	108,897,019		\$ 45,496,880	\$		154,393,899

BASIS OF COST

The construction cost estimate was developed in MCACES, Second Generation (MII) using the appropriate Work Breakdown Structure (WBS) and based on current estimated quantities provided by the Hydraulics & Hydrology, Civil, and Structural Engineers. The cost estimate was developed from these quantities using cost resources such as RSMeans, historical data from similar construction features, and MII Cost Libraries. The contingencies were developed based on input to the Abbreviated Cost Schedule Risk Analysis (ARA) (template provided by the Cost Mandatory Center of Expertise, MCX, Walla Walla District). These contingencies were applied to the construction cost estimates to develop the Total Project First Cost. The construction duration for Peckman River was estimated at 30 months, as shown in

Figure D1. The construction schedule was developed based on the crew outputs referenced from RSMeans with the assumption that multiple crews would work simultaneously.

Figure D1 – Construction Schedule



CONTINGENCIES

As stated in ER 1110-2-1302, the goal in contingency development is to identify the uncertainty associated with an item of work or task to an acceptable degree of confidence. Consideration must be given to the detail available at each stage of planning, design, or construction for which a cost estimate is being prepared. Contingency may vary throughout the cost estimate and could constitute a significant portion of the overall costs when data or design details are unavailable. Final contingency development and assessment of the potential for cost growth is included in this cost estimate. To develop the Total Project First Cost, contingencies developed in the ARA were applied. The construction cost contingency developed per ARA for Peckman River is shown in Table D2.

Table D2 – Contingencies

Element	Contingency Factor
Relocations	56.84%
Fish & Wildlife Facilities	46.67%
Channels & Canals	32.14%
Levees and Floodwalls	52.83%
Floodway Control & Diversion Structure	73.82%
Cultural Resource Preservation	33.45%
Buildings, Grounds & Utilities	33.37%
Total Construction Contingency	48.72%
Lands & Damages	30.00%
Planning, Engineering, and Design	21.90%
Construction Management	18.00%

LANDS AND DAMAGES

To construct the proposed plan, local stakeholders are required to provide certain lands and easements. Studies were conducted by the Real Estate Division to determine the estimated value of lands and easements needed for the channel improvement, floodway control & diversion structures, installation of retaining walls, elevation of and installation of ringwalls around residential and commercial properties.

PLANNING, ENGINEERING AND DESIGN

The cost was developed for all activities associated with the planning, engineering and design effort. The cost for this account includes the preparation of Design Documentation Reports, plans, specifications, and engineering support during construction through project completion. It includes all the in-house labor based upon work-hour requirements, material and facility costs, travel, and overhead. The percentage breakdown in the Total Project Cost Summary (TPCS), as shown in Figure D2, was developed based on input from respective offices in accordance with the CWBS.

CONSTRUCTION MANAGEMENT

The cost was developed for all construction management activities from pre-award requirements through final contract closeout. This cost includes the in-house labor based upon work-hour requirements, materials, facility costs, support contracts, travel and overhead. The cost was developed based on the input from the construction division in accordance with the Civil Works Breakdown Structure (CWBS) and includes, but is not limited to, anticipated items such as the salaries of the resident engineer and staff, surveyors, inspectors, drafters, clerical, and custodial personnel; operation, maintenance and fixed charges for transportation and for other field equipment; field supplies; construction management, general construction supervision; and project office administration, distributive cost of area office and general overhead charged to the project.

INTEREST DURING CONSTRUCTION

Interest during construction (IDC) is the amount of interest the construction cost would earn were it invested from the beginning of construction until the accumulation of benefits begins. IDC cost has been added to the project cost to determine investment cost. Average annual cost was determined based on investment cost, which includes IDC. The pre-base year costs were estimated using the Federal interest rate of 2.75 percent (FY18).

OPERATION AND MAINTENANCE

The Operation and Maintenance (O&M) cost was estimated to represent the anticipated annual costs necessary to maintain the project at full operating efficiency throughout the project life. Following completion of the project, operation and maintenance of project facilities would be the responsibility of the non-Federal sponsor in accordance with Federal regulations and operations manual.

ESTIMATED ANNUAL COST

Annual costs are based on an economic period of analysis of 50 years and an interest rate of 2.75%. The annual costs include the annualized investment cost along with annual operation and maintenance cost. A detailed breakdown of annual costs for Peckman River is presented in Table D3 below.

Table D3 – Annualized Cost

Peckman River (NED) Option 2 Annualized Cost Summary	
First Cost	\$ 154,393,899
Sunk Cost	\$ -
Investment Cost	
Interest During Construction ^(a)	\$ 5,175,516
Total Investment Cost:	\$ 159,569,415
Annual Costs	
Annualized Investment Cost ^(b)	\$ 5,910,598
Annualized Operation & Maintenance Repair, Replacement & Rehabilitation Cost ^(c)	\$ 596,719
Total Annual Cost*	\$ 6,507,317
<small>*October 2017 Price Level</small>	
<small>(a) Based on 30 months of construction @ 2.75% (IDC, E&D, RE and Sunk costs calculated separately and included in this total)</small>	
<small>(b) Annualized investment cost only includes the remaining features. For annualized investment cost with the sunk cost, please see the economic appendix. I = 2.75% and n = 50 yrs</small>	
<small>(c) Assume 0.5% of total Construction Cost base on historical data.</small>	

COST SUMMARY

The Total Project Cost is \$186,804,000. The costs are to be 65 percent Federally funded and 35 percent non-Federally funded.

Figure D2 – Total Project Cost Summary

PROJECT: Peckman River (NED) Option 2
PROJECT NO: P2 109001
LOCATION: Peckman River Basin, NJ

DISTRICT: NAN
POC: CHIEF, COST ENGINEERING, Mukesh Kumar

PREPARED: 2/15/2018

This Estimate reflects the scope and schedule in report;

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Civil Works Work Breakdown Structure		ESTIMATED COST				PROJECT FIRST COST (Constant Dollar Basis)					TOTAL PROJECT COST (FULLY FUNDED)				
WBS NUMBER	Civil Works Feature & Sub-Feature Description	COST (\$K)	CNTG (\$K)	CNTG (%)	TOTAL (\$K)	Program Year (Budget EC): Effective Price Level Date:				Spent Thru: 1-Oct-17 (\$K)	TOTAL FIRST COST (\$K)	INFLATED (%)	COST (\$K)	CNTG (\$K)	FULL (\$K)
						2020 1 OCT 19	ESC (%)	COST (\$K)	CNTG (\$K)						
A	B	C	D	E	F	G	H	I	J		K	L	M	N	O
02	RELOCATIONS	\$1,294	\$630	48.7%	\$1,924	4.1%	\$1,347	\$656	\$2,003	\$0	\$2,003	13.2%	\$1,524	\$742	\$2,267
06	FISH & WILDLIFE FACILITIES	\$8,695	\$4,236	48.7%	\$12,931	4.1%	\$9,051	\$4,410	\$13,461	\$0	\$13,461	13.2%	\$10,244	\$4,991	\$15,235
09	CHANNELS & CANALS	\$3,401	\$1,657	48.7%	\$5,058	4.1%	\$3,540	\$1,725	\$5,265	\$0	\$5,265	13.2%	\$4,007	\$1,952	\$5,959
11	LEVEES & FLOODWALLS	\$5,169	\$2,518	48.7%	\$7,688	4.1%	\$5,381	\$2,621	\$8,002	\$0	\$8,002	13.2%	\$6,090	\$2,967	\$9,057
15	FLOODWAY CONTROL & DIVERSION STRUCTURES	\$24,572	\$11,971	48.7%	\$36,543	4.1%	\$25,678	\$12,461	\$38,039	\$0	\$38,039	13.2%	\$28,960	\$14,104	\$43,064
18	CULTURAL RESOURCE PRESERVATION	\$2,900	\$1,413	48.7%	\$4,313	4.1%	\$3,019	\$1,471	\$4,489	\$0	\$4,489	13.2%	\$3,417	\$1,665	\$5,081
19	BUILDINGS, GROUNDS & UTILITIES	\$34,218	\$16,670	48.7%	\$50,888	4.1%	\$35,618	\$17,353	\$52,971	\$0	\$52,971	13.2%	\$40,314	\$19,640	\$59,954
CONSTRUCTION ESTIMATE TOTALS:		\$80,249	\$39,095		\$119,344	4.1%	\$83,533	\$40,696	\$124,229	\$0	\$124,229	13.2%	\$94,546	\$46,061	\$140,607
01	LANDS AND DAMAGES	\$5,218	\$1,565	30.0%	\$6,783	4.1%	\$5,431	\$1,629	\$7,060	\$0	\$7,060	10.4%	\$5,996	\$1,799	\$7,795
30	PLANNING, ENGINEERING & DESIGN	\$15,888	\$3,479	21.9%	\$19,367	8.2%	\$17,190	\$3,764	\$20,953	\$0	\$20,953	23.9%	\$21,300	\$4,664	\$25,963
31	CONSTRUCTION MANAGEMENT	\$7,543	\$1,358	18.0%	\$8,901	8.2%	\$8,161	\$1,469	\$9,630	\$0	\$9,630	29.2%	\$10,542	\$1,897	\$12,439
PROJECT COST TOTALS:		\$108,897	\$45,497	41.8%	\$154,394		\$114,315	\$47,558	\$161,873	\$0	\$161,873	15.4%	\$132,384	\$54,421	\$186,804

CHIEF, COST ENGINEERING, Mukesh Kumar

PROJECT MANAGER, Aleksander Petersen

CHIEF, REAL ESTATE, Noreen Dres:

ESTIMATED FEDERAL COST: 65% \$121,423

ESTIMATED NON-FEDERAL COST: 35% \$65,382

ESTIMATED TOTAL PROJECT COST: \$186,804

PROJECT: Peckman River (NED) Option 2
LOCATION: Peckman River Basin, NJ
This Estimate reflects the scope and schedule in report;

DISTRICT: NAN
POC: CHIEF, COST ENGINEERING, Mukesh Kumar

PREPARED: 2/15/2018

0

Civil Works Work Breakdown Structure		ESTIMATED COST				PROJECT FIRST COST (Constant Dollar Basis)				TOTAL PROJECT COST (FULLY FUNDED)				
		Estimate Prepared: 15-Feb-18 Effective Price Level: 1-Oct-17				Program Year (Budget EC): 2020 Effective Price Level Date: 1 OCT 19								
WBS	Civil Works	RISK BASED												
NUMBER	Feature & Sub-Feature Description	COST (\$K)	CNTG (\$K)	CNTG (%)	TOTAL (\$K)	ESC (%)	COST (\$K)	CNTG (\$K)	TOTAL (\$K)	Mid-Point Date	INFLATED (%)	COST (\$K)	CNTG (\$K)	FULL (\$K)
A	B	C	D	E	F	G	H	I	J	P	L	M	N	O
02	PHASE 1 or CONTRACT 1 RELOCATIONS	\$1,294	\$630	48.7%	\$1,924	4.1%	\$1,347	\$656	\$2,003	2026Q2	13.2%	\$1,524	\$742	\$2,267
06	FISH & WILDLIFE FACILITIES	\$8,695	\$4,236	48.7%	\$12,931	4.1%	\$9,051	\$4,410	\$13,461	2026Q2	13.2%	\$10,244	\$4,991	\$15,235
09	CHANNELS & CANALS	\$3,401	\$1,657	48.7%	\$5,058	4.1%	\$3,540	\$1,725	\$5,265	2026Q2	13.2%	\$4,007	\$1,952	\$5,959
11	LEVEES & FLOODWALLS	\$5,169	\$2,518	48.7%	\$7,688	4.1%	\$5,381	\$2,621	\$8,002	2026Q2	13.2%	\$6,090	\$2,967	\$9,057
15	FLOODWAY CONTROL & DIVERSION STR	\$24,572	\$11,971	48.7%	\$36,543	4.1%	\$25,678	\$12,461	\$38,039	2026Q2	13.2%	\$28,960	\$14,104	\$43,054
18	CULTURAL RESOURCE PRESERVATION	\$2,900	\$1,413	48.7%	\$4,313	4.1%	\$3,019	\$1,471	\$4,489	2026Q2	13.2%	\$3,417	\$1,665	\$5,081
19	BUILDINGS, GROUNDS & UTILITIES	\$34,218	\$16,670	48.7%	\$50,888	4.1%	\$35,618	\$17,353	\$52,971	2026Q2	13.2%	\$40,314	\$19,640	\$59,954
CONSTRUCTION ESTIMATE TOTALS:		\$80,249	\$39,095	48.7%	\$119,344		\$83,533	\$40,696	\$124,229			\$94,546	\$46,061	\$140,607
01	LANDS AND DAMAGES	\$5,218	\$1,565	30.0%	\$6,783	4.1%	\$5,431	\$1,629	\$7,060	2025Q1	10.4%	\$5,996	\$1,799	\$7,795
30	PLANNING, ENGINEERING & DESIGN													
1.0%	Project Mangement	\$802	\$176	21.9%	\$978	8.2%	\$868	\$190	\$1,058	2025Q1	22.6%	\$1,064	\$233	\$1,296
2.0%	Planning & Environmental Compliance	\$1,605	\$351	21.9%	\$1,956	8.2%	\$1,736	\$380	\$2,117	2025Q1	22.6%	\$2,129	\$466	\$2,595
10.0%	Engineering & Design	\$8,025	\$1,757	21.9%	\$9,782	8.2%	\$8,682	\$1,901	\$10,583	2025Q1	22.6%	\$10,643	\$2,330	\$12,973
1.8%	Reviews, ATRs, IEPRs, VE	\$1,444	\$316	21.9%	\$1,760	8.2%	\$1,562	\$342	\$1,904	2025Q1	22.6%	\$1,915	\$419	\$2,334
0.0%	Life Cycle Updates (cost, schedule, risks)	\$0	\$0	21.9%	\$0	0.0%	\$0	\$0	\$0	0	0.0%	\$0	\$0	\$0
1.0%	Contracting & Reprographics	\$802	\$176	21.9%	\$978	8.2%	\$868	\$190	\$1,058	2025Q1	22.6%	\$1,064	\$233	\$1,296
2.5%	Engineering During Construction	\$2,006	\$439	21.9%	\$2,445	8.2%	\$2,170	\$475	\$2,646	2026Q2	29.2%	\$2,804	\$614	\$3,417
1.5%	Planning During Construction	\$1,204	\$264	21.9%	\$1,468	8.2%	\$1,303	\$285	\$1,588	2026Q2	29.2%	\$1,683	\$368	\$2,051
0.0%	Project Operations	\$0	\$0	21.9%	\$0	0.0%	\$0	\$0	\$0	0	0.0%	\$0	\$0	\$0
31	CONSTRUCTION MANAGEMENT													
9.4%	Construction Management	\$7,543	\$1,358	18.0%	\$8,901	8.2%	\$8,161	\$1,469	\$9,630	2026Q2	29.2%	\$10,542	\$1,897	\$12,439
0.0%	Project Operation:	\$0	\$0	18.0%	\$0	0.0%	\$0	\$0	\$0	0	0.0%	\$0	\$0	\$0
0.0%	Project Management	\$0	\$0	18.0%	\$0	0.0%	\$0	\$0	\$0	0	0.0%	\$0	\$0	\$0
CONTRACT COST TOTALS:		\$108,897	\$45,497		\$154,394		\$114,315	\$47,558	\$161,873			\$132,384	\$54,421	\$186,804

MII Reports

Print Date Thu 26 April 2018
Eff. Date 2/14/2018

U.S. Army Corps of Engineers
Project : Peckman River NED 02-15-2018
Peckman River NED

Time 13:09:23
Project Cost Page 1

<u>Description</u>	<u>Quantity</u>	<u>UOM</u>	<u>ProjectCost</u>
Project Cost			80,248,519.25
Option 2: High Range Impact/Mitigation	1.0000	EA	80,248,519.25
02 Relocations	1.0000	EA	1,293,595.93
06 Fish & Wildlife Facilities	1.0000	EA	8,695,124.16
09 Channel Modifications	1.0000	LS	3,400,817.28
11 Levees & Floodwalls	1.0000	LS	5,169,245.01
15 Floodway Control & Diversion Structure	1.0000	EA	24,571,892.46
18 Cultural Resource Preservation	1.0000	EA	2,900,000.00
19 Buildings, Grounds & Utilities	1.0000	EA	34,217,844.40

Abbreviated Risk Analysis
(ARA)

Abbreviated Risk Analysis

Project (less than \$40M): **Peckman River**
 Project Development Stage/Alternative: **Alternative Formulation**
 Risk Category: **Moderate Risk: Typical Project Construction Type**

Alternative: **NED**

Meeting Date: **4/2/2014**

Total Estimated Construction Contract Cost = \$ **80,033,093**

	CWWBS	Feature of Work	Contract Cost	% Contingency	\$ Contingency	Total
	01 LANDS AND DAMAGES	Real Estate	\$ -	0.00%	\$ -	\$ -
1	02 RELOCATIONS	Relocations	\$ 1,293,596	56.84%	\$ 735,337	\$ 2,028,933
2	06 FISH AND WILDLIFE FACILITIES	Environmental Mitigation	\$ 8,675,540	46.67%	\$ 4,049,059	\$ 12,724,599
3	09 CHANNELS AND CANALS (Except Navigation Ports and Harbors)	Channel Modifications	\$ 3,400,817	32.14%	\$ 1,092,926	\$ 4,493,743
4	11 01 LEVEES	Levees	\$ 750,593	34.04%	\$ 255,508	\$ 1,006,101
5	11 02 FLOODWALLS	Floodwalls	\$ 4,418,652	56.02%	\$ 2,475,365	\$ 6,894,017
6	15 FLOODWAY CONTROL AND DIVERSION STRUCTURES	Diversion Culverts and Weirs	\$ 24,376,051	73.82%	\$ 17,993,659	\$ 42,369,710
7	18 CULTURAL RESOURCE PRESERVATION	Cultural Resource	\$ 2,900,000	33.45%	\$ 970,097	\$ 3,870,096.59
8	19 BUILDINGS, GROUNDS, AND UTILITIES	10-Year Nonstructural	\$ 34,217,844	33.37%	\$ 11,418,446	\$ 45,636,290.37
9			\$ -	0.00%	\$ -	\$ -
10			\$ -	0.00%	\$ -	\$ -
11			\$ -	0.00%	\$ -	\$ -
12	All Other	Remaining Construction Items	\$ -	0.0%	\$ -	\$ -
13	30 PLANNING, ENGINEERING, AND DESIGN	Planning, Engineering, & Design	\$ 15,846,000	21.90%	\$ 3,469,546	\$ 19,315,546
14	31 CONSTRUCTION MANAGEMENT	Construction Management	\$ 7,523,000	18.00%	\$ 1,353,940	\$ 8,876,940
XX	FIXED DOLLAR RISK ADD (EQUALLY DISPERSED TO ALL, MUST INCLUDE JUSTIFICATION SEE BELOW)				\$ -	

Totals					
	Real Estate	\$ -	0.00%	\$ -	\$ -
	Total Construction Estimate	\$ 80,033,093	48.72%	\$ 38,990,397	\$ 119,023,491
	Total Planning, Engineering & Design	\$ 15,846,000	21.90%	\$ 3,469,546	\$ 19,315,546
	Total Construction Management	\$ 7,523,000	18.00%	\$ 1,353,940	\$ 8,876,940
	Total Excluding Real Estate	\$ 103,402,093	42%	\$ 43,813,884	\$ 147,215,977

Confidence Level Range Estimate (\$000's)			
	Base	50%	80%
	\$103,402k	\$129,690k	\$147,216k

Peckman River NED

Alternative Formulation
Abbreviated Risk Analysis

Meeting Date: 2-Apr-14

Risk Level					
Very Likely	2	3	4	5	6
Likely	1	2	3	4	5
Possible	0	1	2	3	4
Unlikely	0	0	1	2	3
	Negligible	Marginal	Moderate	Significant	Critical

Risk Register

Risk Element	Feature of Work	Concerns	PDT Discussions & Conclusions (Include logic & justification for choice of Likelihood & Impact)	Impact	Likelihood	Risk Level
Project Management & Scope Growth						Maximum Project Growth 75%
PS-1	Relocations	• Design confidence?	Much uncertainty in relocation qtys - likely to change and could have a moderate impact on the cost.	Moderate	Very LIKELY	4
PS-2	Environmental Mitigation	• Potential for scope growth, added features and quantities? • Design confidence?	Current mitigation based on conceptual design of FRM alternative. Changes to FRM alternative will result in changes to current mitigation assumptions.	Moderate	Likely	3
PS-3	Channel Modifications	• Design confidence?	The channel work quantities could very possibly change. An increase in the amount of excavation would present a marginal impact to the cost.	Marginal	Possible	1
PS-4	Levees	• Potential for scope growth, added features and quantities? • Design confidence?	Settlement has not been taken into account in qtys - will impact the levee quantities, and the cost associated with them, marginally.	Marginal	Possible	1
PS-5	Floodwalls	• Potential for scope growth, added features and quantities? • Design confidence?	Floodwall height may change based on new updated optimized plan. Current quantities have taken floodwall type into account. Therefore, should a design change, there would be a marginal cost impact.	Marginal	Likely	2
PS-6	Diversion Culverts and Weirs	• Potential for scope growth, added features and quantities? • Design confidence?	There is little to no risk that diversion culvert design/qtys would change, unless the new culvert inlet elevation goes through more rock and the strata must be blasted or excavated. Any change in the culvert would present a significant cost impact to the project.	Significant	Possible	3
PS-7	Cultural Resource	• Identification of resources during construction would require additional investigation	Diversion culvert and peckman levee and floodwalls have the potential for archeological resources that require testing and monitoring during construction. If resources identified phase 2 and possibly phase 3, investigation might be required.	Moderate	Likely	3
PS-8	10-Year Nonstructural	• Potential for scope growth, added features and quantities? • Investigations sufficient to support design assumptions? • Design confidence?	There is a possibility that with a more in-depth model, there will be more structures that need to be added to the list. This could add significant cost to the project.	Significant	Possible	3
PS-9	0			Negligible	Unlikely	0
PS-10	0			Negligible	Unlikely	0

PS-11	0			Negligible	Unlikely	0
PS-12	Remaining Construction Items			Negligible	Unlikely	0
PS-13	Planning, Engineering, & Design	<ul style="list-style-type: none"> Potential for scope growth, added features and quantities? 	It is unlikely that the design would change. However if it does change, this would have a marginal impact planning, engineering and design effort.	Marginal	Unlikely	0
PS-14	Construction Management	<ul style="list-style-type: none"> Potential for scope growth, added features and quantities? 	Increase scope of work would have a marginal impact on the construction management effort however it is unlikely there will be a scope change.	Marginal	Unlikely	0
Acquisition Strategy						Maximum Project Growth
						30%
AS-1	Relocations	<ul style="list-style-type: none"> Contracting plan firmly established? 8a or small business likely? Limited bid competition anticipated? 	Project is anticipated to go full and open with an adequate amount of work being subcontracted out. Should the project be broken up into smaller sub-projects and advertised to small businesses, the price would increase, but not significantly. This is likely to happen, and would only present a moderate increase in cost.	Moderate	Likely	3
AS-2	Environmental Mitigation	<ul style="list-style-type: none"> Contracting plan firmly established? 8a or small business likely? Limited bid competition anticipated? 	Project is anticipated to go full and open with an adequate amount of work being subcontracted out. Should the project be broken up into smaller sub-projects and advertised to small businesses, the price would increase, but not significantly. This is unlikely to happen, and would only present a marginal increase in cost.	Marginal	Unlikely	0
AS-3	Channel Modifications	<ul style="list-style-type: none"> Contracting plan firmly established? 8a or small business likely? Limited bid competition anticipated? 	Project is anticipated to go full and open with an adequate amount of work being subcontracted out. Should the project be broken up into smaller sub-projects and advertised to small businesses, the price would increase, but not significantly. This is unlikely to happen, and would only present a moderate increase in cost.	Moderate	Likely	3
AS-4	Levees	<ul style="list-style-type: none"> Contracting plan firmly established? 8a or small business likely? Limited bid competition anticipated? 	Project is anticipated to go full and open with an adequate amount of work being subcontracted out. Should the project be broken up into smaller sub-projects and advertised to small businesses, the price would increase, but not significantly. This is unlikely to happen, and would only present a moderate increase in cost.	Moderate	Likely	3
AS-5	Floodwalls	<ul style="list-style-type: none"> Contracting plan firmly established? 8a or small business likely? Limited bid competition anticipated? 	Project is anticipated to go full and open with an adequate amount of work being subcontracted out. Should the project be broken up into smaller sub-projects and advertised to small businesses, the price would increase, but not significantly. This is unlikely to happen, and would only present a significant increase in cost.	Significant	Likely	4
AS-6	Diversion Culverts and Weirs	<ul style="list-style-type: none"> Contracting plan firmly established? 8a or small business likely? Limited bid competition anticipated? 	Project is anticipated to go full and open with an adequate amount of work being subcontracted out. Should the project be broken up into smaller sub-projects and advertised to small businesses, the price would increase, but not significantly. This is likely to happen, and would only present a significant increase in cost.	Significant	Likely	4

AS-7	Cultural Resource	<ul style="list-style-type: none"> Contracting plan firmly established? 8a or small business likely? Limited bid competition anticipated? 	Project is anticipated to go full and open with an adequate amount of work being subcontracted out. Should the project be broken up into smaller sub-projects and advertised to small businesses, the price would increase, but not significantly. This is unlikely to happen, and would only present a marginal increase in cost.	Marginal	Unlikely	0
AS-8	10-Year Nonstructural	<ul style="list-style-type: none"> Contracting plan firmly established? 8a or small business likely? Limited bid competition anticipated? 	Project is anticipated to go full and open with an adequate amount of work being subcontracted out. Should the project be broken up into smaller sub-projects and advertised to small businesses, the price would increase, but not significantly. This is unlikely to happen, and would only present a marginal increase in cost.	Marginal	Unlikely	0
AS-9	0			Negligible	Unlikely	0
AS-10	0			Negligible	Unlikely	0
AS-11	0			Negligible	Unlikely	0
AS-12	Remaining Construction Items			Negligible	Unlikely	0
AS-13	Planning, Engineering, & Design	<ul style="list-style-type: none"> Contracting plan firmly established? 8a or small business likely? Limited bid competition anticipated? 	Should the project be broken up into smaller sub-projects, the cost for this account would increase marginally. The likelihood of this happening is unlikely.	Marginal	Unlikely	0
AS-14	Construction Management	<ul style="list-style-type: none"> Contracting plan firmly established? 8a or small business likely? Limited bid competition anticipated? 	Should the project be broken up into smaller sub-projects, the cost for this account would increase marginally. The likelihood of this happening is unlikely.	Marginal	Unlikely	0
Construction Elements				Maximum Project Growth		25%
CON-1	Relocations	<ul style="list-style-type: none"> Accelerated schedule or harsh weather schedule? Potential for construction modification and claims? 	Harsh weather condition and construction modification & claims are always a potential. Construction crews will need staging area, but there will be enough room. Concrete work can be delayed due to seasonal work however this will be a marginal impact.	Marginal	Likely	2
CE-2	Environmental Mitigation	<ul style="list-style-type: none"> Accelerated schedule or harsh weather schedule? Potential for construction modification and claims? 	Construction may be delayed due to seasonal work restrictions.	Marginal	Possible	1
CE-3	Channel Modifications	<ul style="list-style-type: none"> Accelerated schedule or harsh weather schedule? Potential for construction modification and claims? 	Harsh weather condition and construction modification & claims are always a potential. Construction crew will need a staging area, but there will be room.	Negligible	Possible	0

CE-4	Levees	<ul style="list-style-type: none"> • Accelerated schedule or harsh weather schedule? • Potential for construction modification and claims? 	Harsh weather condition and construction modification & claims are always a potential. Construction crews will need staging area, but there will be enough room. Levee construction can have an impact on both cost and schedule during the harsh winter condition where the soil cannot be compacted under such condition. However this will have a marginal impact as the contractors will most likely consider this on their schedule.	Marginal	Possible	1
CE-5	Floodwalls	<ul style="list-style-type: none"> • Accelerated schedule or harsh weather schedule? • Potential for construction modification and claims? 	Harsh weather condition and construction modification & claims are always a potential. Construction crews will need staging area, but there will be enough room. Floodwall construction can have an impact on both cost and schedule during the harsh winter condition where the soil cannot be compacted under such condition. However this will have a significant impact as the contractors will most likely consider this on their schedule. Possible requirement to blast rock or even tunnel through large rock strata - borings unknown. Construction and material of weir might get affected by construction window.	Significant	Likely	4
CE-6	Diversion Culverts and Weirs	<ul style="list-style-type: none"> • Potential for construction modification and claims? • Special equipment or subcontractors needed? 	Harsh weather condition and construction modification & claims are always a potential. Construction crews will need staging area, but there will be enough room. Diversion Culverts & Weirs construction can have an impact on both cost and schedule during the harsh winter condition where the soil cannot be compacted under such condition. However this will have a significant impact as the contractors will most likely consider this on their schedule. Possible requirement to blast rock or even tunnel through large rock strata - borings unknown. Construction and material of weir might get affected by construction window.	Significant	Likely	4
CE-7	Cultural Resource	<ul style="list-style-type: none"> • Accelerated schedule or harsh weather schedule? • Potential for construction modification and claims? 	Construction may be delayed due to seasonal restrictions.	Marginal	Possible	1
CE-8	10-Year Nonstructural	<ul style="list-style-type: none"> • Potential for construction modification and claims? • Special equipment or subcontractors needed? 	If the current plan holds and individual homeowners are put in charge of their own floodproofing contracts, then there could be some issues with them hiring competent contractors, thus resulting in claims or mods. Also, there could be increased costs due to the number of similar contracts in a small area, causing contractors to raise prices due to rising demand. This could lead to a significant increase in cost.	Significant	Unlikely	2
CE-9	0			Negligible	Unlikely	0
CE-10	0			Negligible	Unlikely	0
CE-11	0			Negligible	Unlikely	0
CE-12	Remaining Construction Items			Negligible	Unlikely	0
CE-13	Planning, Engineering, & Design	<ul style="list-style-type: none"> • Potential for construction modification and claims? 	There is always a potential for modification and claims during construction. If the modification and claims are enforced, this will result in a marginal impact on the 30 account cost	Marginal	Likely	2

CE-14	Construction Management	• Potential for construction modification and claims?	There is always a potential for modification and claims during construction. If the modification and claims are enforced, this will result in a marginal impact on the 31 account cost	Marginal	Likely	2	
Specialty Construction or Fabrication						Maximum Project Growth	65%
SC-1	Relocations	• Confidence in contractor's ability to install?	No special fabrication / equipment foreseen	Negligible	Unlikely	0	
SC-2	Environmental Mitigation	• Confidence in contractor's ability to install?	No special fabrication / equipment foreseen	Negligible	Unlikely	0	
SC-3	Channel Modifications	• Confidence in contractor's ability to install?	No special fabrication / equipment foreseen	Negligible	Unlikely	0	
SC-4	Levees	• Confidence in contractor's ability to install?	No special fabrication / equipment foreseen	Negligible	Unlikely	0	
SC-5	Floodwalls	• Confidence in contractor's ability to install?	No special fabrication / equipment foreseen	Negligible	Unlikely	0	
SC-6	Diversion Culverts and Weirs	• Confidence in contractor's ability to install?	The weirs will require cofferdam and dewatering, and will be cast in place.	Marginal	Likely	2	
SC-7	Cultural Resource	• Confidence in contractor's ability to install?	No special fabrication / equipment foreseen	Negligible	Unlikely	0	
SC-8	10-Year Nonstructural	• Confidence in contractor's ability to install?	No special fabrication / equipment foreseen	Negligible	Unlikely	0	
SC-9	0			Negligible	Unlikely	0	
SC-10	0			Negligible	Unlikely	0	
SC-11	0			Negligible	Unlikely	0	
SC-12	Remaining Construction Items			Negligible	Unlikely	0	
SC-13	Planning, Engineering, & Design	• Confidence in contractor's ability to install?	No special fabrication / equipment foreseen	Negligible	Unlikely	0	
SC-14	Construction Management	• Confidence in contractor's ability to install?	No special fabrication / equipment foreseen	Negligible	Unlikely	0	
Technical Design & Quantities						Maximum Project Growth	30%
T-1	Relocations	• Level of confidence based on design and assumptions? • Sufficient investigations to develop quantities? • Appropriate methods applied to calculate quantities?	Much uncertainty in relocation qtls - likely to change and could have a marginal impact on the cost.	Marginal	Likely	2	
T-2	Environmental Mitigation	• Level of confidence based on design and assumptions? • Sufficient investigations to develop quantities?	Design and Quantities can change based on any changes to the design of the FRM alternative.	Moderate	Very LIKELY	4	
T-3	Channel Modifications	• Level of confidence based on design and assumptions? • Sufficient investigations to develop quantities? • Appropriate methods applied to calculate quantities?	The channel work quantities could very possibly change however not drastic. An increase in the amount of excavation would present a moderate impact to the cost.	Moderate	Likely	3	

T-4	Levees	<ul style="list-style-type: none"> • Level of confidence based on design and assumptions? • Sufficient investigations to develop quantities? • Appropriate methods applied to calculate quantities? 	Settlement has not been taken into account in qtys - will impact the levee quantities, and the cost associated with them will have a moderate impact	Moderate	Likely	3
T-5	Floodwalls	<ul style="list-style-type: none"> • Level of confidence based on design and assumptions? • Sufficient investigations to develop quantities? • Appropriate methods applied to calculate quantities? 	Floodwall height may change based on new updated optimized plan. Therefore, should a design changed, there would be a moderate cost impact.	Moderate	Likely	3
T-6	Diversion Culverts and Weirs	<ul style="list-style-type: none"> • Level of confidence based on design and assumptions? • Sufficient investigations to develop quantities? • Appropriate methods applied to calculate quantities? 	There is little to no risk that diversion culvert design/qtys would change. However, there could be a need to blast rock or even tunnel through large rock strata - borings unknown. Rock excavation quantity just a SWAG. Could be a moderate impact to cost.	Moderate	Likely	3
T-7	Cultural Resource	<ul style="list-style-type: none"> • Level of confidence based on design and assumptions? • Sufficient investigations to develop quantities? 	Design and Quantities can change based on any changes to the design of the FRM alternative.	Marginal	Possible	1
T-8	10-Year Nonstructural	<ul style="list-style-type: none"> • Level of confidence based on design and assumptions? • Sufficient investigations to develop quantities? • Appropriate methods applied to calculate quantities? 	Template for non-structural costs was developed and has been used on multiple other projects. Based on the current scope, estimator is confident in the costs and quantities, and as such, it is unlikely that any quantity change would have much impact on the cost.	Marginal	Unlikely	0
T-9	0			Negligible	Unlikely	0
T-10	0			Negligible	Unlikely	0
T-11	0			Negligible	Unlikely	0
T-12	Remaining Construction Items			Negligible	Unlikely	0
T-13	Planning, Engineering, & Design	<ul style="list-style-type: none"> • Level of confidence based on design and assumptions? 	Likelihood of quantity changes/updates on the project features will have a marginal cost impact on the planning, engineering & design effort	Marginal	Likely	2
T-14	Construction Management		No impact to cost	Negligible	Unlikely	0
Cost Estimate Assumptions				Maximum Project Growth		35%
EST-1	Relocations	<ul style="list-style-type: none"> • Overuse of Cost Book, lump sum, allowances? • Assumptions regarding crew, productivity, overtime? 	Cost book is predominately used to developed the cost for relocations, along with crew productivity. There is always a differences in contractors' means and method which will result in a marginal impact however unlikely since the numbers from the cost book is considered as a national average	Marginal	Unlikely	0
EST-2	Environmental Mitigation	<ul style="list-style-type: none"> • Lack of confidence on critical cost items 	Features are mostly captured in the estimate and therefore it is unlikely to change. The estimate is mostly based on costbook assumptions, so there could be some areas where costs have been underestimated. However, the impacts due to this would be marginal.	Marginal	Likely	2

EST-3	Channel Modifications	<ul style="list-style-type: none">• Overuse of Cost Book, lump sum, allowances?	Cost book is predominately used to developed the cost for channel modification, along with crew productivity. There is always a differences in contractors' means and method which will result in a marginal impact however unlikely since the numbers from the cost book is considered as a national average	Marginal	Unlikely	0
EST-4	Levees	<ul style="list-style-type: none">• Overuse of Cost Book, lump sum, allowances?• Assumptions regarding crew, productivity, overtime?	Cost book is predominately used to developed the cost for levee, along with crew productivity. There is always a differences in contractors' means and method which will result in a marginal impact however unlikely since the numbers from the cost book is considered as a national average	Marginal	Unlikely	0
EST-5	Floodwalls	<ul style="list-style-type: none">• Overuse of Cost Book, lump sum, allowances?	Cost book is predominately used to developed the cost for floodwall, along with crew productivity. There is always a differences in contractors' means and method which will result in a marginal impact however unlikely since the numbers from the cost book is considered as a national average	Marginal	Unlikely	0
EST-6	Diversion Culverts and Weirs	<ul style="list-style-type: none">• Overuse of Cost Book, lump sum, allowances?• Reliability and number of key quotes?• Lack confidence on critical cost items?	Features are mostly captured in the estimate and therefore it is unlikely to change. The estimate is mostly based on costbook assumptions, so there could be some areas where costs have been underestimated. However, the impacts due to this would be marginal.	Marginal	Unlikely	0
EST-7	Cultural Resource	<ul style="list-style-type: none">• Lack confidence on critical cost items?	Cost developed base on historical data on similar projects and mitigation features, and updated base on the most recent information	Marginal	Likely	2
EST-8	10-Year Nonstructural	<ul style="list-style-type: none">• Overuse of Cost Book, lump sum, allowances?• Reliability and number of key quotes?• Lack confidence on critical cost items?	The estimate is mostly based on costbook assumptions, so there could be some areas where costs have been underestimated. However, the impacts due to this would be marginal, as the majority of items are priced in the ballpark.	Marginal	Possible	1
EST-9	0			Negligible	Unlikely	0
EST-10	0			Negligible	Unlikely	0
EST-11	0			Negligible	Unlikely	0
EST-12	Remaining Construction Items			Negligible	Unlikely	0
EST-13	Planning, Engineering, & Design		No impact to cost	Negligible	Unlikely	0
EST-14	Construction Management		No impact to cost	Negligible	Unlikely	0
External Project Risks					Maximum Project Growth	40%
EX-1	Relocations	<ul style="list-style-type: none">• Political influences, lack of support, obstacles?	This feature of work should not be subject to many external risks, as the construction is a fairly standard practice. However, severe adverse weather would impact this marginally if it were to happen.	Marginal	Unlikely	0

EX-2	Environmental Mitigation	<ul style="list-style-type: none"> • Potential for scope growth, added features and quantities? • Unanticipated inflations in fuel, key materials? 	This feature of work should not be subject to many external risks, as the construction is a fairly standard practice. However, severe adverse weather would impact this marginally if it were to happen. Additional mitigation may be required based on permit conditions.	Marginal	Possible	1
EX-3	Channel Modifications	<ul style="list-style-type: none"> • Potential for severe adverse weather? • Unanticipated inflations in fuel, key materials? 	This feature of work should not be subject to many external risks, as the construction is a fairly standard practice. However, severe adverse weather would impact this significantly if it were to happen.	Significant	Unlikely	2
EX-4	Levees	<ul style="list-style-type: none"> • Potential for severe adverse weather? • Unanticipated inflations in fuel, key materials? 	This feature of work should not be subject to many external risks, as the construction is a fairly standard practice. However, severe adverse weather would impact this significantly if it were to happen.	Significant	Unlikely	2
EX-5	Floodwalls	<ul style="list-style-type: none"> • Potential for severe adverse weather? • Unanticipated inflations in fuel, key materials? 	This feature of work should not be subject to many external risks, as the construction is a fairly standard practice. However, severe adverse weather would impact this significantly if it were to happen.	Significant	Unlikely	2
EX-6	Diversion Culverts and Weirs	<ul style="list-style-type: none"> • Potential for severe adverse weather? • Unanticipated inflations in fuel, key materials? 	This feature of work should not be subject to many external risks, as the construction is a fairly standard practice. However, severe adverse weather would impact this critical if it were to happen.	Critical	Unlikely	3
EX-7	Cultural Resource	<ul style="list-style-type: none"> • Potential for scope growth, added features and quantities? • Unanticipated inflations in fuel, key materials? 	Coordination with SHPO is ongoing. Additional mitigation requirements may be identified as a result of consultation.	Marginal	Possible	1
EX-8	10-Year Nonstructural	<ul style="list-style-type: none"> • Potential for severe adverse weather? • Unanticipated inflations in fuel, key materials? 	This feature of work should not be subject to many external risks, as the construction is a fairly standard practice. However, severe adverse weather would impact this significantly if it were to happen.	Significant	Unlikely	2
EX-9	0			Negligible	Unlikely	0
EX-10	0			Negligible	Unlikely	0
EX-11	0			Negligible	Unlikely	0
EX-12	Remaining Construction Items			Negligible	Unlikely	0
EX-13	Planning, Engineering, & Design	<ul style="list-style-type: none"> • Political influences, lack of support, obstacles? 	If this project is put on the shelf due to lack of public and political support, this will result in a significant impact to the planning, engineering and design effort later on the future.	Significant	Unlikely	2
EX-14	Construction Management	<ul style="list-style-type: none"> • Political influences, lack of support, obstacles? 	If this project is put on the shelf due to lack of public and political support, this will result in a significant impact to the construction management account due to cost inflation.	Significant	Unlikely	2