

**MAMARONECK & SHELDRAKE RIVERS
NEW YORK
FLOOD RISK MANAGEMENT
GENERAL REEVALUATION REPORT
FOR
THE VILLAGE OF MAMARONECK**

APPENDIX C5: COST ESTIMATES



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

JANUARY 2016

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INTRODUCTION

This Appendix presents the detailed cost estimates for the Alternative Z (NED Plan) which provide solutions to reduce the impact of flooding in the Mamaroneck and Sheldrake River Basin, located in the Village of Mamaroneck, Westchester County, NY, an area that is subjected to storm-related flooding on a regular basis. Alternative Z consist of a combination of relocation, bridge replacement and demolition, floodwalls, raising and ringwall of properties in the flood prone areas, as well as incorporation of channel modifications to help minimize the impact of flooding in the Mamaroneck and Sheldrake River Basin. The Total First Cost developed for the project elements is presented in Table C1 below.

Table C1 –First Cost
Mamaroneck and Sheldrake River Basin
 October 2015 Price Level
 Alternative Z

Feasibility Report Cost Estimate Summary

Feat. Acct.	Description	Qty	UoM	Subtotal	Cont. %	Cont \$\$	Total Cost
01	LANDS AND DAMAGES	1	LS	\$ 4,670,171	5.21%	\$ 243,360	\$ 4,913,531.00
02	RELOCATIONS	1	LS	\$ 6,204,969	32%	\$ 1,985,590	\$ 8,190,559.28
08	ROADS, RAILROADS AND BRIDGES	1	LS	\$ 808,293	32%	\$ 258,654	\$ 1,066,947.01
09	CHANNELS AND CANALS	1	LS	\$ 29,432,077	32%	\$ 9,418,265	\$ 38,850,341.22
15	FLOODWAY CONTROL AND DIVERSION STRUCTURES	1	LS	\$ 2,254,459	32%	\$ 721,427	\$ 2,975,886.50
18	CULTURAL RESOURCE PRESERVATION	1	LS	\$ 400,000	32%	\$ 128,000	\$ 528,000.00
19	BUILDINGS, GROUNDS & UTILITIES	1	LS	\$ 1,819,555	32%	\$ 582,258	\$ 2,401,812.30
30	PLANNING, ENGINEERING AND DESIGN	1	LS	\$ 5,842,000	20%	\$ 1,168,400	\$ 7,010,400.00
31	CONSTRUCTION MANAGEMENT	1	LS	\$ 3,274,000	15%	\$ 491,100	\$ 3,765,100.00
Total MAMARONECK AND SHELDRAKE RIVER BASIN				\$ 54,705,524		\$ 14,997,053	\$ 69,702,577

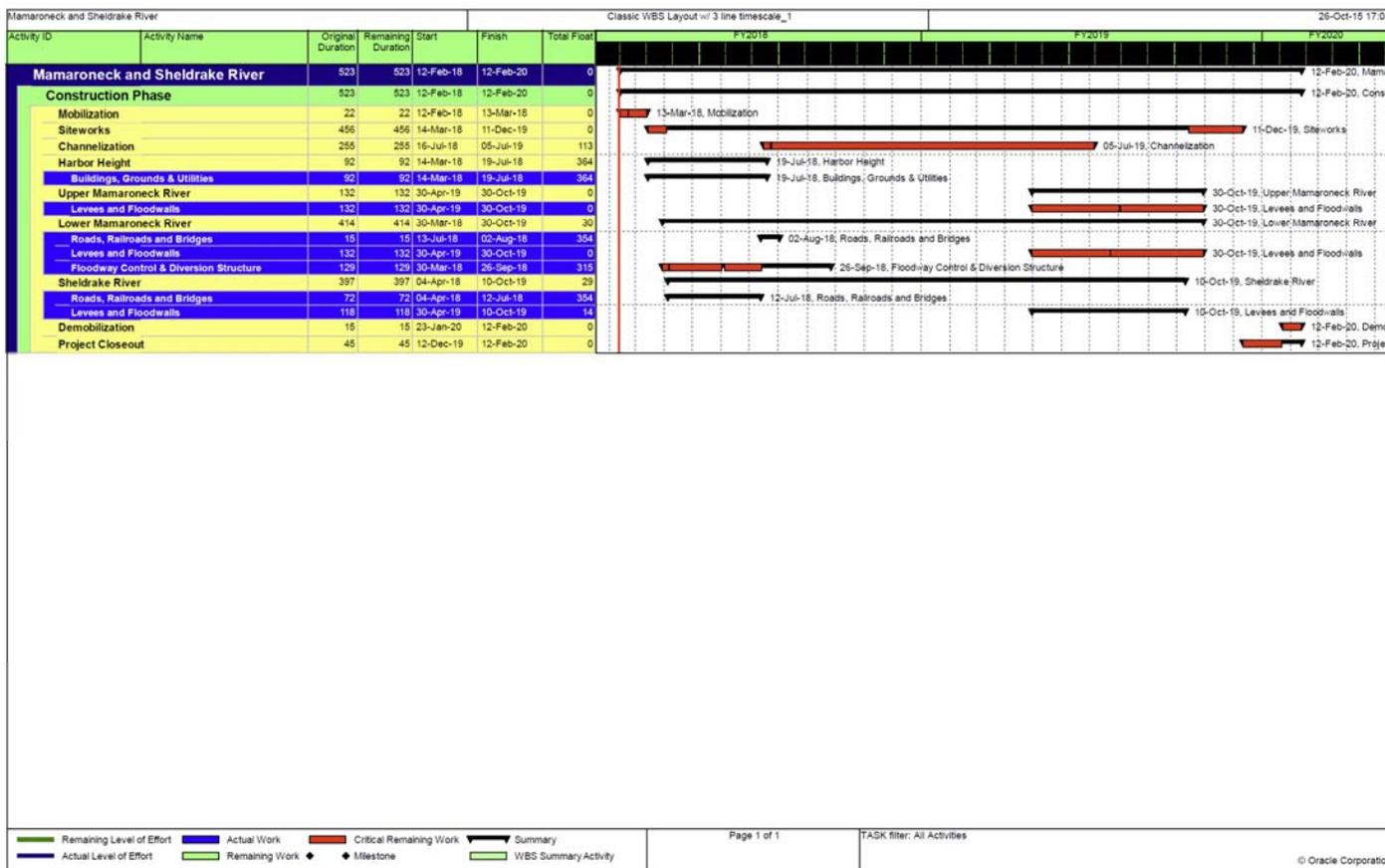
BASIS OF COST

The construction cost estimate was developed in MCACES, Second Generation (MII) using the appropriate Work Breakdown Structure (WBS), based on current estimated quantities provided by the Design and Hydraulics & Hydrology Engineers, Civil Engineers and Structural Engineers. Using the quantities, the cost estimate was developed utilizing cost resources such as RSMeans, historical data on similar construction features and MII Cost



Libraries. The contingencies were developed based on the PDT discussion on various features of the project using the Cost Schedule Risk Analysis (CSRA) 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 alternative Z was estimated at 25 months, as show on Figure C1. Construction schedule was developed based on the crew outputs referenced from RSMMeans and assuming multiple crews working simultaneously.

Figure C1 – 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 significant portion of the overall costs when the lack of investigated data or design details are available. Final contingency development and assignment that describes the potential for cost growth is included in the cost estimate. During development of the cost estimates, sufficient contingency developed via PDT discussion during CSRA were applied to develop the Total Project First Cost. The construction cost contingency developed per CSRA for alternative Z is show in Table C2 below.

Table C2 – Contingencies

Element	Contingency Factor
Relocation	32.00%
Roads, Railroads & Bridges	32.00%
Channels & Canals	32.00%
Floodway Control & Diversion Structure	32.00%
Buildings, Grounds & Utilities	32.00%
Total Construction Contingency	32.00%
Lands & Damages	5.21%
Planning, Engineering, and Design	20.00%
Construction Management	15.00%

LANDS AND DAMAGES

In order to construct the proposed plan of improvement, local interests would be 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, installment of floodwalls, raising and ringwall of 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 and plans and specifications for the alternative Z 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 breakout in the Total Project Cost Summary (TPCS), as show in Figure C2 on page C6, 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 CWBS and include but are not limited to anticipated items such as the salaries of the resident engineer and staff, survey men, inspectors, draftsmen, clerical, and custodial personnel; operation, maintenance and fixed charges for transportation and for other field equipment; field supplies; construction management, general construction supervision; project office administration, distributive cost of area office and general overhead charged to the project. The work items and activities would include, but not be limited to: the salaries of all supervisory, engineering (including resident geologist and geological staff), office and safety field personnel; all on site expenses.

INTEREST DURING CONSTRUCTION

Interest during construction (IDC) is the cost of construction money invested before the beginning of the period of economic analysis and before the accumulation of benefits by the project. 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 3.125 percent (FY16).

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 performed by the local cooperating agency in accordance with federal regulations and operations manual.

ESTIMATED ANNUAL CHARGE

Annual costs are based on an economic period of analysis of 50 years and an interest rate of 3.125%. The annual charges include the annualized investment cost along with annual operation and maintenance cost. A detailed breakdown of annual costs for alternative Z is presented in Table C3 on page C4.



Table C3 – Annualize Cost

Mamaroneck and Sheldrake River Basin

First Cost	\$	69,702,577
Sunk Cost	\$	-
Investment Cost		
Interest During Construction ^(a)	\$	2,190,509
Total Investment Cost:	\$	71,893,086
Annual Costs		
Annualized Investment Cost ^(b)	\$	2,860,838
Annualized Operation & Maintenance Cost ^(c)	\$	305,120
Total Annual Cost*	\$	3,165,958

*October 2015 Price Level

(a) Based on 25 months of construction @ 3.125% (IDC, E&D, RE and Sunk costs calculated separately and included in this total)

(b) Annualized investment cost only includes the remaining features. For annualized investment cost with the sunk cost, please see the economic appendix. I = 3.125% and n = 50 yrs

(c) Assume 0.5% of total Construction Cost base on historical data.

COST SUMMARY

The Total Fully Funded Project cost is \$75,726,000. The costs are to be 65% federally funded and 35% non-federally funded.



Figure C2 – Total Project Cost Summary

PROJECT: Mamaroneck and Sheldrake River Basin
 PROJECT NO: NED
 LOCATION: Village of Mamaroneck, Westchester County, NY

DISTRICT: NAN New York District
 POC: CHIEF, COST ENGINEERING, MUKESH KUMAR
 PREPARED: 10/16/2015

This Estimate reflects the scope and schedule in report; General Design Memorandum January 1989

Civil Works Work Breakdown Structure		ESTIMATED COST				PROJECT FIRST COST (Constant Dollar Basis)					TOTAL PROJECT COST (FULLY FUNDED)				
		COST (\$K)	CNTG (\$K)	CNTG (%)	TOTAL (\$K)	ESC (%)	COST (\$K)	CNTG (\$K)	TOTAL (\$K)	Spent Thru: 10/1/2015 (\$K)	TOTAL FIRST COST (\$K)	INFLATED (%)	COST (\$K)	CNTG (\$K)	FULL (\$K)
WBS NUMBER	Civil Works Feature & Sub-Feature Description	C	D	E	F	G	H	I	J	K	L	M	N	O	
02	RELOCATIONS	\$6,205	\$1,966	32.0%	\$8,191	5.2%	\$6,526	\$2,088	\$8,614	\$0	\$8,614	2.5%	\$6,688	\$2,140	\$8,828
08	ROADS, RAILROADS & BRIDGES	\$808	\$259	32.0%	\$1,067	5.2%	\$850	\$272	\$1,122	\$0	\$1,122	2.5%	\$871	\$279	\$1,150
09	CHANNELS & CANALS	\$29,432	\$9,418	32.0%	\$38,850	5.2%	\$30,955	\$9,906	\$40,861	\$0	\$40,861	2.5%	\$31,721	\$10,151	\$41,872
15	FLOODWAY CONTROL & DIVERSION STRU	\$2,254	\$721	32.0%	\$2,976	5.2%	\$2,371	\$759	\$3,130	\$0	\$3,130	2.5%	\$2,430	\$778	\$3,207
18	CULTURAL RESOURCE PRESERVATION	\$400	\$128	32.0%	\$528	5.2%	\$421	\$135	\$555	\$0	\$555	2.5%	\$431	\$138	\$569
19	BUILDINGS, GROUNDS & UTILITIES	\$1,820	\$582	32.0%	\$2,402	5.2%	\$1,914	\$612	\$2,526	\$0	\$2,526	2.5%	\$1,961	\$628	\$2,589
CONSTRUCTION ESTIMATE TOTALS:		\$40,919	\$13,094		\$54,014	5.2%	\$43,037	\$13,772	\$56,809	\$0	\$56,809	2.5%	\$44,102	\$14,113	\$58,215
01	LANDS AND DAMAGES	\$4,670	\$243	5.21%	\$4,913	5.2%	\$4,912	\$256	\$5,168	\$0	\$5,168	2.5%	\$5,033	\$262	\$5,296
30	PLANNING, ENGINEERING & DESIGN	\$5,842	\$1,168	20.0%	\$7,010	10.2%	\$6,440	\$1,288	\$7,728	\$0	\$7,728	1.7%	\$6,548	\$1,310	\$7,857
31	CONSTRUCTION MANAGEMENT	\$3,274	\$491	15.0%	\$3,765	10.2%	\$3,609	\$541	\$4,150	\$0	\$4,150	5.0%	\$3,790	\$568	\$4,358
PROJECT COST TOTALS:		\$54,706	\$14,997	27.4%	\$69,703		\$57,998	\$15,857	\$73,855	\$0	\$73,855	2.5%	\$59,473	\$16,253	\$75,726

CHIEF, COST ENGINEERING, MUKESH KUMAR

PROJECT MANAGER, PAUL TUMMINELLO

CHIEF, REAL ESTATE, NOREEN DRE

CHIEF, PLANNING, FRANK SANTOMAURO

CHIEF, ENGINEERING, ARTHUR CONNOLLY

CHIEF, OPERATIONS, TOM CREAMER

CHIEF, CONSTRUCTION, TIMOTHY YARGER

CHIEF, CONTRACTING, FRANK CASHMAN

CHIEF, PM-PB, xxxx

CHIEF, DPM, JOSEPH SEEBODE

ESTIMATED FEDERAL COST: **75%** **\$56,795**

ESTIMATED NON-FEDERAL COST: **25%** **\$18,932**

ESTIMATED TOTAL PROJECT COST: \$75,726

Filename: Alt Z TPCS October 16 2015.xlsx
 TPCS



Civil Works Work Breakdown Structure		ESTIMATED COST				PROJECT FIRST COST (Constant Dollar Basis)				TOTAL PROJECT COST (FULLY FUNDED)				
		Estimate Prepared: 16-Oct-15		Effective Price Level: 1-Oct-15		Program Year (Budget EC): 2018		Effective Price Level Date: 1 OCT 17						
		RISK BASED												
WBS NUMBER	Civil Works 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
PHASE 1 or CONTRACT 1														
02	RELOCATIONS	\$6,205	\$1,986	32.0%	\$8,191	5.2%	\$6,526	\$2,088	\$8,614	2019Q2	2.5%	\$6,688	\$2,140	\$8,828
08	ROADS, RAILROADS & BRIDGES	\$808	\$259	32.0%	\$1,067	5.2%	\$850	\$272	\$1,122	2019Q2	2.5%	\$871	\$279	\$1,150
09	CHANNELS & CANALS	\$29,432	\$9,418	32.0%	\$38,850	5.2%	\$30,955	\$9,906	\$40,861	2019Q2	2.5%	\$31,721	\$10,151	\$41,872
15	FLOODWAY CONTROL & DIVERSION STRU	\$2,254	\$721	32.0%	\$2,976	5.2%	\$2,371	\$759	\$3,130	2019Q2	2.5%	\$2,430	\$778	\$3,207
18	CULTURAL RESOURCE PRESERVATION	\$400	\$128	32.0%	\$528	5.2%	\$421	\$135	\$555	2019Q2	2.5%	\$431	\$138	\$569
19	BUILDINGS, GROUNDS & UTILITIES	\$1,820	\$582	32.0%	\$2,402	5.2%	\$1,914	\$612	\$2,526	2019Q2	2.5%	\$1,961	\$628	\$2,589
CONSTRUCTION ESTIMATE TOTALS:		\$40,919	\$13,094	32.0%	\$54,014		\$43,037	\$13,772	\$56,809			\$44,102	\$14,113	\$58,215
01	LANDS AND DAMAGES	\$4,670	\$243	5.2%	\$4,913	5.2%	\$4,912	\$256	\$5,168	2019Q2	2.5%	\$5,033	\$262	\$5,296
30 PLANNING, ENGINEERING & DESIGN														
1.0%	Project Management	\$409	\$82	20.0%	\$491	10.2%	\$451	\$90	\$541	2018Q2	1.0%	\$455	\$91	\$546
1.0%	Planning & Environmental Compliance	\$409	\$82	20.0%	\$491	10.2%	\$451	\$90	\$541	2018Q2	1.0%	\$455	\$91	\$546
7.8%	Engineering & Design	\$3,171	\$634	20.0%	\$3,805	10.2%	\$3,495	\$699	\$4,195	2018Q2	1.0%	\$3,529	\$706	\$4,235
1.0%	Reviews, ATRs, IEPs, VE	\$409	\$82	20.0%	\$491	10.2%	\$451	\$90	\$541	2018Q2	1.0%	\$455	\$91	\$546
0.7%	Life Cycle Updates (cost, schedule, risks)	\$274	\$55	20.0%	\$329	10.2%	\$302	\$60	\$362	2018Q2	1.0%	\$305	\$61	\$366
0.4%	Contracting & Reprographics	\$147	\$29	20.0%	\$176	10.2%	\$162	\$32	\$194	2018Q2	1.0%	\$164	\$33	\$196
1.5%	Engineering During Construction	\$614	\$123	20.0%	\$737	10.2%	\$677	\$135	\$812	2019Q2	5.0%	\$711	\$142	\$853
1.0%	Planning During Construction	\$409	\$82	20.0%	\$491	10.2%	\$451	\$90	\$541	2019Q2	5.0%	\$473	\$95	\$568
0.0%	Project Operations	\$0	\$0	20.0%	\$0	0.0%	\$0	\$0	\$0	0	0.0%	\$0	\$0	\$0
31 CONSTRUCTION MANAGEMENT														
8.0%	Construction Management	\$3,274	\$491	15.0%	\$3,765	10.2%	\$3,609	\$541	\$4,150	2019Q2	5.0%	\$3,790	\$568	\$4,358
0.0%	Project Operation:	\$0	\$0	15.0%	\$0	0.0%	\$0	\$0	\$0	0	0.0%	\$0	\$0	\$0
0.0%	Project Management	\$0	\$0	15.0%	\$0	0.0%	\$0	\$0	\$0	0	0.0%	\$0	\$0	\$0
CONTRACT COST TOTALS:		\$54,706	\$14,997		\$69,703		\$57,998	\$15,857	\$73,855			\$59,473	\$16,253	\$75,726

