

Neuse River Basin Flood Risk Management Technical Report

Appendix C. Cost Engineering



**US Army Corps
of Engineers**

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Neuse River Basin Technical Report - Flood Risk Management Study

Appendix C - Cost Engineering

Introduction

The Neuse River Basin Study developed a preliminary array of alternatives for evaluation, which included combinations of both structural and nonstructural flood risk management measures.

Alternative 1: No Action

Alternative 2: Structure Floodproofing

Alternative 3: Property Buyouts (includes all structures and associated land)

Of these options, only Alternative 2 was determined to be economically feasible. This alternative was a non-structural plan for dry floodproofing of 12 structures, 10 of which were multi-family residential apartment buildings, located adjacent to Crabtree Creek in Raleigh, NC. Ultimately, Alternative 2 was found to potentially conflict with Federal and local regulations. Implementation of a flood risk management plan that potentially conflicts with Federal, State and local regulations could negatively impact a community's, or certain property owners' ability to participate in the National Flood Insurance Program (NFIP) and other Federally funded flood emergency disaster recovery programs. The Alternative 1 for No Action was selected as the Recommended Plan.

Project Scope

Of the flood risk management measures considered, only Alternative 2 was determined to be economically feasible. This alternative would provide dry flood proofing for 12 structures along Crabtree Creek in the City of Raleigh.

Table 1.0 Floodproofing Measures and Structure Count

Project Area	Number of structures addressed:	Elevated	Wet Floodproofing	Dry Floodproofing
Crabtree Creek	12	0	0	12
Total	12	0	0	12

Structural Floodproofing Costs

The estimated nonstructural costs for implementing the floodproofing measures in the Crabtree Creek project area are summarized in the Table 2.0, below. The basis for the unit costs for the dry floodproofing actions was developed using MCACES MII program. Unit costs for labor, materials, and equipment were considered, as well as, profit and overhead for the prime contractors and the sub-contractors. The structure counts and costs in the table below assume 100% owner participation.

The nonstructural costs in the table below do not include: contingency, pre-construction engineering and design (PED) costs or construction management (CM) costs. Contingencies have been assessed through a cost schedule risk analysis, and are included in the total project cost summary, as well as, the estimated PED and CM costs.

Table 2.0 Floodproofing Measures and Estimated Non-Structural Costs

Location	N.S. Costs with Field Office Allocation	Floodproofed Structure Count	Elevation of Structures	Wet Floodproofing	Dry Floodproofing
Crabtree Creek Raleigh, N.C.	\$3,201,077	12	0	0	12
Total	\$3,201,077	12	0	0	12

Non-Structural Costs are without Contingency, without Real Estate costs, without PED costs, and without CM costs.

Contracting Structure and Project Schedule

The acquisition strategy for contracting out the implementation of the floodproofing measures was determined. It is assumed that the construction work at the sites will begin only after completion of initial site inspection, as well as, confirmation of site eligibility and owner participation.

A project construction schedule was developed based on the following assumptions: The project would complete floodproofing measures at 12 sites in the Crabtree Creek area, with 100% owner participation. Due to the proximity of the structures, it is expected that the construction work for floodproofing would be implemented and overseen at two sites, concurrently. It is expected that the performing contractors would be subcontractors of the prime contractor. It is expected that the duration of the construction work to complete dry floodproofing for a structure would last for three months. It is expected that the construction contractors would relocate their floodproofing implementation efforts to new locations, as work at the initial sites is completed. The construction schedule provides an allowance of two months for the contractor to relocate their floodproofing implementation efforts, and field office, to new sites within the project area. The project construction work was estimated to complete within 2.5 years.

Pre-Construction Engineering & Design Costs

Pre-construction engineering and design costs were estimated, and were included in the total project cost summary. The estimated costs included: contracting costs, costs for initial site inspections intended to identify conditions such as HTRW materials or pre-existing damage, costs for legal support, and costs for design review work. The Pre-construction engineering and design costs were assessed based on factors that also included: the proposed contracting structure, site production rates, and the initial project construction schedule. In estimating the pre-construction engineering and design costs, it was assumed that a project participation rate of 100% would be realized. For Alternative 2, the pre-construction engineering and design costs were estimated at \$530K, without contingency.

Construction Management Costs

Construction management costs were estimated, and were included in the total project cost summary. The estimated costs included: staffing and field office costs to provide oversight for the implementation of the floodproofing measures. The Construction management costs were assessed based on factors that included: the proposed contracting structure, site production rates, and the initial project construction schedule. It was expected that dry floodproofing measures would be implemented simultaneously at 2 construction sites within the project area. It was expected that the duration of the construction work at each site would last for three months. It was expected that the construction contractors would relocate their floodproofing implementation efforts to new sites within the project area, as work at the initial sites completed. For Alternative 2, the construction management costs were estimated at \$420K, without contingency.

Total Project Cost Summary

The total project cost summaries for Alternative 2 and for Alternative 3 are included in the appendix for reference.

For Alternative 2 the total project cost summary includes: the cost of constructing the dry floodproofing measures, the cost of universal relocation assistance (Real Estate), as well as, costs for pre-construction engineering and design, and costs for construction management support activities. The total project cost was estimated at \$6,595,000 in FY-2023 dollars. A cost ATR was not completed since this option was not the selected plan. This product did not receive a cost certification.

For Alternative 3 the total project cost summary includes the cost the buyouts for all of the structures and the associated land, the costs for the demolition and disposal of the structures, the cost of universal relocation assistance (Real Estate), as well as, costs for required pre-construction engineering and design, and costs for construction management support activities. The total project cost was estimated at \$116,700,000 in FY-2023 dollars. A cost ATR was not completed since this option was not the selected plan. This product did not receive a cost certification.

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Total Project Cost Summary: Alternative 2 - Structure Floodproofing

PROJECT: Neuse River Basin - Flood Risk Management Study **DISTRICT:** CESAW Wilmington District **PREPARED:** 20-Oct-2022
ALTERNATIVE: Non Structural Floodproofing Measures.
LOCATION: Neuse River Basin: Dry Floodproofing - Crabtree Creek Project Area. **POC:** CHIEF, COST ENGINEERING, Stephen Roman, PE
 This Estimate reflects the Recommended Plan. Neuse River Basin - Flood Risk Management Study

Civil Works Work Breakdown Structure		ESTIMATED COST				PROJECT FIRST COST (Constant Dollar Basis)				TOTAL PROJECT COST (FULLY FUNDED)					
		Price Level	1-Oct-22			Program Year (Budget EC): 2023				MidPoint of Construction: 2028Q1					
WBS NUMBER	Civil Works Feature & Sub-Feature Description	Construction Cost				Effective Price Level Date: 1-Oct-22				Spent Thru: 1-Oct-23	TOTAL FIRST COST (\$K)	Escalation			
		COST (\$K)	CNTG (\$K)	CNTG (%)	TOTAL (\$K)	ESC (%)	COST (\$K)	CNTG (\$K)	REMAINING COST (\$K)			ESC (%)	COST (\$K)	CNTG (\$K)	FULL (\$K)
02	RELOCATIONS (Dry Floodproofing)	\$3,201	\$992	31%	\$4,193	0.0%	\$3,201	\$992	\$4,193	\$0	\$4,193	14.0%	\$3,649	\$1,131	\$4,780
		\$0	\$0	-	\$0	-	\$0	\$0	\$0	\$0	\$0	-	\$0	\$0	\$0
		\$0	\$0	-	\$0	-	\$0	\$0	\$0	\$0	\$0	-	\$0	\$0	\$0
		\$0	\$0	-	\$0	-	\$0	\$0	\$0	\$0	\$0	-	\$0	\$0	\$0
CONSTRUCTION ESTIMATE TOTALS:		\$3,201	\$992		\$4,193	0.0%	\$3,201	\$992	\$4,193	\$0	\$4,193	14.0%	\$3,649	\$1,131	\$4,780
01	LANDS AND DAMAGES (Real Estate)	\$890	\$267	30%	\$1,157	0.0%	\$890	\$267	\$1,157		\$1,157	14.0%	\$1,014	\$304	\$1,319
06	FISH & WILDLIFE FACILITIES (Env Mitigation)	\$0	\$0	-	\$0	-	\$0	\$0	\$0		\$0	-	\$0	\$0	\$0
30	PLANNING, ENGINEERING & DESIGN	\$530	\$164	31%	\$694	0.0%	\$530	\$164	\$694	\$0.00	\$694	11.6%	\$591	\$183	\$774
31	CONSTRUCTION MANAGEMENT	\$420	\$130	31%	\$550	0.0%	\$420	\$130	\$550.18		\$550.18	12.2%	\$471	\$146	\$617
PROJECT COST TOTALS:		\$5,041	\$1,554	31%	\$6,595		\$5,041	\$1,554	\$6,595	\$0	\$6,595	13.6%	\$5,725	\$1,765	\$7,490

- _____ CHIEF, COST ENGINEERING, Stephen Roman, PE
- _____ PROJECT MANAGER, Jim Medlock
- _____ CHIEF, REAL ESTATE, Ralph Werthmann SAS
- _____ CHIEF, PLANNING, Eiden Gatwood
- _____ CHIEF, ENGINEERING, Greg Williams, PE
- _____ CHIEF, OPERATIONS, Daniel Brown, PE
- _____ CHIEF, CONSTRUCTION, Dennis Lynch, PE
- _____ CHIEF, CONTRACTING, Jon Mayo
- _____ CHIEF, PM-PB, Sam Colella
- _____ CHIEF, DPM, Christine Brayman

A cost ATR was not completed, since this option was not the selected plan.
 This project did not receive a cost certification.

ESTIMATED TOTAL PROJECT COST:		\$7,490
ESTIMATED FEDERAL COST:	65%	\$4,868
ESTIMATED NON-FEDERAL COST:	35%	\$2,621
22 - FEASIBILITY STUDY (CAP studies):		\$3,000
ESTIMATED FEDERAL COST:		\$3,000
ESTIMATED NON-FEDERAL COST:		\$0
ESTIMATED FEDERAL COST OF PROJECT		\$7,868

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Total Project Cost Summary: Alternative 3 - Property Buyouts

PROJECT: Neuse River Basin - Flood Risk Management Study **DISTRICT:** CESAW Wilmington District **PREPARED:** 31-Oct-2022
ALTERNATIVE: Non Structural Options for Buyouts.
LOCATION: Neuse River Basin: Buyouts for Mainstem Neuse, Big Ditch, and Hominy Swamp project areas. **POC:** CHIEF, COST ENGINEERING, Stephen Roman, PE
 This Estimate reflects the Alternative for Buyouts. Neuse River Basin - Flood Risk Management Study

Civil Works Work Breakdown Structure		ESTIMATED COST				PROJECT FIRST COST (Constant Dollar Basis)				TOTAL PROJECT COST (FULLY FUNDED)					
		Price Level	1-Oct-22			Program Year (Budget EC): 2023				MidPoint of Construction: 2028Q1					
WBS NUMBER	Civil Works Feature & Sub-Feature Description	Construction Cost COST (\$K)	CNTG (\$K)	CNTG (%)	TOTAL (\$K)	ESC (%)	COST (\$K)	CNTG (\$K)	REMAINING COST (\$K)	Effective Price Level Date: 1-Oct-22 Spent Thru: 1-Oct-23	TOTAL FIRST COST (\$K)	ESC (%)	COST (\$K)	CNTG (\$K)	FULL (\$K)
02	RELOCATIONS (Buyouts)	\$40,039	\$10,009.85	25%	\$50,049.3	-	\$40,039	\$10,010	\$50,049	-	\$50,049	14.0%	\$45,637	\$11,409	\$57,046
CONSTRUCTION ESTIMATE TOTALS:		\$40,039.4	\$10,010	-	\$50,049	-	\$40,039	\$10,010	\$50,049	-	\$50,049	14.0%	\$45,637	\$11,409	\$57,046
01	LANDS AND DAMAGES (Real Estate)	\$39,711	\$11,913	30%	\$51,625	-	\$39,711	\$11,913	\$51,625	-	\$51,625	14.0%	\$45,263	\$13,579	\$58,842
06	FISH & WILDLIFE FACILITIES (Env Mitigation)			-		-						-			
30	PLANNING, ENGINEERING & DESIGN	\$6,006	\$1,501	25%	\$7,507	-	\$6,006	\$1,501	\$7,507	-	\$7,507	12.2%	\$6,737	\$1,684	\$8,422
31	CONSTRUCTION MANAGEMENT	\$6,006	\$1,502	25%	\$7,508	-	\$6,006	\$1,502	\$7,508	-	\$7,508	12.2%	\$6,737	\$1,684	\$8,422
PROJECT COST TOTALS:		\$91,763	\$24,926	27%	\$116,689	-	\$91,763	\$24,926	\$116,689	-	\$116,689	13.7%	\$104,375	\$28,357	\$132,732

_____ CHIEF, COST ENGINEERING, Stephen Roman, PE
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A cost ATR was not completed, since this option was not the selected plan.
This project did not receive a cost certification.

ESTIMATED TOTAL PROJECT COST:		\$132,732
ESTIMATED FEDERAL COST:	65%	\$86,276
ESTIMATED NON-FEDERAL COST:	35%	\$46,456
22 - FEASIBILITY STUDY (CAP studies):		\$3,000
ESTIMATED FEDERAL COST:		\$3,000
ESTIMATED NON-FEDERAL COST:		
ESTIMATED FEDERAL COST OF PROJECT		\$89,276