RARITAN BAY AND SANDY HOOK BAY
HIGHLANDS, NEW JERSEY
COASTAL STORM RISK MANAGEMENT
FEASIBILITY STUDY

APPENDIX D
COST ENGINEERING
May 2020

RARITAN BAY AND SANDY HOOK BAY

FEASIBILITY STUDY

HIGHLANDS, NEW JERSEY

APPENDIX D - COST ESTIMATES

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INTRODUCTION

This Appendix presents the detailed cost estimates for the Coastal Storm Risk Management Feasibility Study – Raritan Bay and Sandy Hook Bay, Highlands, New Jersey (Highlands) (the NED/Recommended Plan). Raritan Bay and Sandy Hook Bay, Highlands provides solutions to reduce the impact of flooding in the Borough of Highlands, Monmouth County, New Jersey along Sandy Hook Bay and the Shrewsbury River. It consists of various construction features such as floodwalls, pumping plants, closure gate and drainage structures to help minimize the impact of flooding in the region. The Total First Cost is presented in Table C1 below.

Table C1 –First Cost

Raritan Bay and Sandy Hook Bay, Highlands

October 2019 Price Level

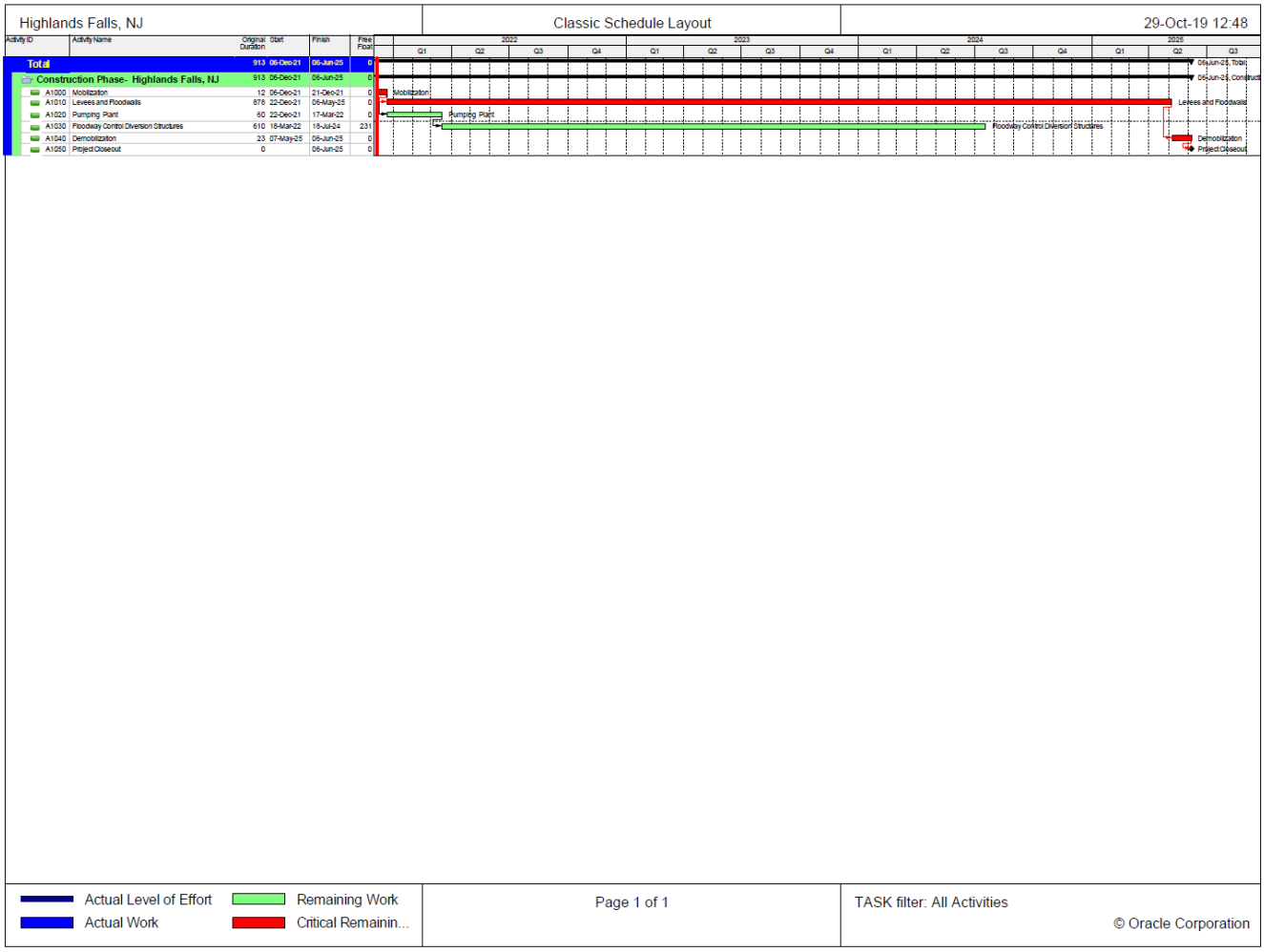
Feasilibity Report Cost Estimate Summary

Feat. Acct.	Description	Qty	UoM	Subtotal	Cont. %	Cont $$	Total Cost
01	LANDS AND DAMAGES	1	LS	$ 8,946,000	40%	$ 3,578,400	$ 12,524,400.00
02	RELOCATIONS	1	LS	$ 50,000	33%	$ 16,500	$ 66,500.00
11	LEVEES & FLOODWALLS	1	LS	$ 60,012,056	33%	$ 19,803,978	$ 79,816,034.48
13	PUMPING PLANT	1	LS	$ 17,733,733	33%	$ 5,852,132	$ 23,585,864.89
15	FLOODWAY CONTROL & DIVERSION STRUCTURE	1	LS	$ 6,524,061	33%	$ 2,152,940	$ 8,677,001.13
18	CULTURAL RESOURCE PRESERVATION	1	LS	$ 2,500,000	33%	$ 825,000	$ 3,325,000.00
30	PLANNING, ENGINEERING & DESIGN	1	LS	$ 17,363,000	33%	$ 5,729,790	$ 23,092,790.00
31	CONSTRUCTION MANAGEMENT	1	LS	$ 8,682,000	33%	$ 2,865,060	$ 11,547,060.00
	Total RARITAN BAY AND SANDY HOOK BAY, HIGHLANDS			$ 121,810,850		$ 40,823,801	$ 162,634,651

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 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 Raritan Bay and Sandy Hook Bay, Highlands was estimated at 42 months, as shown in Figure C1. The construction schedule was developed based on the crew outputs referenced from RSMeans with the assumption that multiple crews would work 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 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 CSRA were applied. The construction cost contingency developed per CSRA for Raritan Bay and Sandy Hook Bay, Highlands is shown in Table C2.

Table C2 – Contingencies

Element	Contingency Factor
Levees & Floodwalls	33.00%
Relocations	33.00%
Pumping Plant	33.00%
Floodway Control & Diversion Structure	33.00%
Cultural Resource Preservation	33.00%
Total Construction Contingency	**33.00%**
Lands & Damages	40.00%
Planning, Engineering, and Design	33.00%
Construction Management	33.00%

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 installation of floodwalls, pumping plants and the floodway control & diversion structures 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, and specifications for Raritan Bay and Sandy Hook Bay, Highlands 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 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 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 (FY20).

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 Raritan Bay and Sandy Hook Bay, Highlands is presented in Table C3 below.

Table C3 – Annualized Cost

Raritan Bay and Sandy Hook Bay, Highlands (HIGH-SELECTED)

First Cost		$	162,634,651
Sunk Cost		$	-
Investment Cost			
Interest During Construction (a)		$	7,778,620
	Total Investment Cost:	$	170,413,271
Annual Costs			
Annualized Investment Cost (b)		$	6,312,264
Annualized Operation & Maintenance Cost (c)		$	208,000
Total Annual Cost*		**$**	**6,520,264**

*October 2019 Price Level

(a) Based on 42 months of construction @ 2.75% (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 = 2.75% and n = 50 yrs

(c) $93,000 + $115,000 = $208,000. $93k based on TPV of $2.21M, 2.75% interest over 50 years. $115k based on 0.5% of first cost of interior drainage features.

COST SUMMARY The Total Fully Funded Project cost is $179,633,000

Figure C2 – Total Project Cost Summary

PROJECT: Raritan Bay and Sandy Hook Bay, Highlands (HIGH-SELECTED)
PROJECT NO: P2 xxxxxx
LOCATION: Highlands, New Jersey

DISTRICT: New York District **PREPARED:** 1/23/2020
POC: CHIEF, COST ENGINEERING, Mukesh Kumar

This Estimate reflects the scope and schedule in report; Draft Feasability Report

Civil Works Work Breakdown Structure		ESTIMATED COST				PROJECT FIRST COST (Constant Dollar Basis)						TOTAL PROJECT COST (FULLY FUNDED)			
						Program Year (Budget EC): 2020 Effective Price Level Date: 1 OCT 19									
WBS NUMBER A	Civil Works Feature & Sub-Feature Description B	COST ($K) C	CNTG ($K) D	CNTG (%) E	TOTAL ($K) F	ESC (%) G	COST ($K) H	CNTG ($K) I	TOTAL ($K) J	Spent Thru: 1-Oct-19 ($K)	TOTAL FIRST COST ($K) K	INFLATED (%) L	COST ($K) M	CNTG ($K) N	FULL ($K) O
02	RELOCATIONS	$50	$17	33.0%	$67	0.0%	$50	$17	$67	$0	$67	12.0%	$56	$18	$74
11	LEVEES & FLOODWALLS	$60,012	$19,804	33.0%	$79,816	0.0%	$60,012	$19,804	$79,816	$0	$79,816	12.0%	$67,202	$22,177	$89,378
13	PUMPING PLANT	$17,734	$5,852	33.0%	$23,586	0.0%	$17,734	$5,852	$23,586	$0	$23,586	12.0%	$19,858	$6,553	$26,412
15	FLOODWAY CONTROL & DIVERSION STRU	$6,524	$2,153	33.0%	$8,677	0.0%	$6,524	$2,153	$8,677	$0	$8,677	12.0%	$7,306	$2,411	$9,717
18	CULTURAL RESOURCE PRESERVATION	$2,500	$825	33.0%	$3,325	0.0%	$2,500	$825	$3,325	$0	$3,325	12.0%	$2,800	$924	$3,723
	CONSTRUCTION ESTIMATE TOTALS:	$86,820	$28,651		$115,470	0.0%	$86,820	$28,651	$115,470	$0	$115,470	12.0%	$97,221	$32,083	$129,304
01	LANDS AND DAMAGES	$8,946	$3,578	40.0%	$12,524	0.0%	$8,946	$3,578	$12,524	$0	$12,524	3.2%	$9,233	$3,693	$12,926
30	PLANNING, ENGINEERING & DESIGN	$17,363	$5,730	33.0%	$23,093	0.0%	$17,363	$5,730	$23,093	$0	$23,093	4.4%	$18,125	$5,981	$24,107
31	CONSTRUCTION MANAGEMENT	$8,682	$2,865	33.0%	$11,547	0.0%	$8,682	$2,865	$11,547	$0	$11,547	15.2%	$9,998	$3,299	$13,297
	PROJECT COST TOTALS:	$121,811	$40,824	33.5%	$162,635		$121,811	$40,824	$162,635	$0	$162,635	10.5%	$134,577	$45,057	$179,633

CHIEF, COST ENGINEERING, Mukesh Kumar

PROJECT MANAGER, David T. Gentile

CHIEF, REAL ESTATE, Lydia William

ESTIMATED TOTAL PROJECT COST: **$179,633**

**** TOTAL PROJECT COST SUMMARY ****

**** CONTRACT COST SUMMARY ****

PROJECT: Raritan Bay and Sandy Hook Bay, Highlands (HIGH-SELECTED)
LOCATION: Highlands, New Jersey
This Estimate reflects the scope and schedule in report; Draft Feasability Report

DISTRICT: New York District
POC: CHIEF, COST ENGINEERING, Mukesh Kumar
PREPARED: 1/23/2020

Civil Works Work Breakdown Structure		ESTIMATED COST				PROJECT FIRST COST (Constant Dollar Basis)				TOTAL PROJECT COST (FULLY FUNDED)				
		Estimate Prepared: 23-Jan-20 Effective Price Level: 1-Oct-19				Program Year (Budget EC): 2020 Effective Price Level Date: 1 OCT 19								
WBS NUMBER	Civil Works Feature & Sub-Feature Description	COST ($K)	CNTG ($K)	RISK BASED 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	$50	$17	33.0%	$67	0.0%	$50	$17	$67	2023Q4	12.0%	$56	$18	$74
11	LEVEES & FLOODWALLS	$60,012	$19,804	33.0%	$79,816	0.0%	$60,012	$19,804	$79,816	2023Q4	12.0%	$67,202	$22,177	$89,378
13	PUMPING PLANT	$17,734	$5,852	33.0%	$23,586	0.0%	$17,734	$5,852	$23,586	2023Q4	12.0%	$19,858	$6,553	$26,412
15	FLOODWAY CONTROL & DIVERSION STRU	$6,524	$2,153	33.0%	$8,677	0.0%	$6,524	$2,153	$8,677	2023Q4	12.0%	$7,306	$2,411	$9,717
18	CULTURAL RESOURCE PRESERVATION	$2,500	$825	33.0%	$3,325	0.0%	$2,500	$825	$3,325	2023Q4	12.0%	$2,800	$924	$3,723
	CONSTRUCTION ESTIMATE TOTALS:	$86,820	$28,651	33.0%	**$115,470**		$86,820	$28,651	$115,470			$97,221	$32,083	$129,304
01	LANDS AND DAMAGES	$8,946	$3,578	40.0%	$12,524	0.0%	$8,946	$3,578	$12,524	2021Q1	3.2%	$9,233	$3,693	$12,926
30	PLANNING, ENGINEERING & DESIGN													
1.0%	Project Management	$868	$286	33.0%	$1,154	0.0%	$868	$286	$1,154	2021Q1	3.8%	$901	$297	$1,199
1.0%	Planning & Environmental Compliance	$868	$286	33.0%	$1,154	0.0%	$868	$286	$1,154	2021Q1	3.8%	$901	$297	$1,199
15.0%	Engineering & Design	$13,023	$4,298	33.0%	$17,321	0.0%	$13,023	$4,298	$17,321	2021Q1	3.8%	$13,521	$4,462	$17,983
1.0%	Reviews, ATRs, IEPRs, VE	$868	$286	33.0%	$1,154	0.0%	$868	$286	$1,154	2021Q1	3.8%	$901	$297	$1,199
1.0%	Life Cycle Updates (cost, schedule, risks)	$868	$286	33.0%	$1,154	0.0%	$868	$286	$1,154	2021Q1	3.8%	$901	$297	$1,199
0.0%	Contracting & Reprographics	$0	$0	33.0%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0
1.0%	Engineering During Construction	$868	$286	33.0%	$1,154	0.0%	$868	$286	$1,154	2023Q4	15.2%	$1,000	$330	$1,329
0.0%	Planning During Construction	$0	$0	33.0%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0
0.0%	Project Operations	$0	$0	33.0%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0
31	CONSTRUCTION MANAGEMENT													
10.0%	Construction Management	$8,682	$2,865	33.0%	$11,547	0.0%	$8,682	$2,865	$11,547	2023Q4	15.2%	$9,998	$3,299	$13,297
0.0%	Project Operation:	$0	$0	33.0%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0
0.0%	Project Management	$0	$0	33.0%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0
	CONTRACT COST TOTALS:	$121,811	$40,824		$162,635		$121,811	$40,824	$162,635			$134,577	$45,057	$179,633

Attachment C1
MII Report

Description	Quantity	UOM	ContractCost	Escalation	ProjectCost
Highlands			86,819,850.01	0.00	86,819,850.01
Raritan Bay and Sandy Hook Bay, Highlands - HIGH PLAN	1.0000	EA	86,819,850.01	0.00	86,819,850.01
02 - RELOCATIONS	1.0000	LS	50,000.00	0.00	50,000.00
11 - LEVEES AND FLOODWALLS	1.0000	LS	60,012,056.29	0.00	60,012,056.29
REACH 1	1.0000	EA	20,774,208.58	0.00	20,774,208.58
REACH 2	1.0000	EA	13,840,164.03	0.00	13,840,164.03
REACH 3	1.0000	EA	15,621,798.78	0.00	15,621,798.78
REACH 4	1.0000	EA	9,775,884.90	0.00	9,775,884.90
13 - PUMPING PLANT	1.0000	LS	17,733,732.99	0.00	17,733,732.99
15 - FLOODWAY CONTROL DIVERSION STRUCTURES	1.0000	LS	6,524,060.73	0.00	6,524,060.73
Mob/Demob and staging area	1.0000	EA	186,000.00	0.00	186,000.00
Drainage Structures (minimum facility only)	1.0000	EA	1,630,773.62	0.00	1,630,773.62
Closure Gate	605.0000	SF	1,845,205.59	0.00	1,845,205.59
Dewatering	1.0000	EA	854,752.98	0.00	854,752.98
Additional Drainage Items	1.0000	EA	2,007,328.54	0.00	2,007,328.54
18 - CULTURAL RESOURCES AND PRESERVATION	1.0000	LS	2,500,000.00	0.00	2,500,000.00

Currency in US dollars

Attachment C2
DQC Comments

Highlands
DQC
05 November 2019
Reviewer: Cynthia Zhang
Response: Kaitlyn Eng

MII: It appears 2016 Equipment book is currently used in the estimate. Recommend updating it to 2018 Equipment book

Response: Concur. Equipment book within MII has been updated to reflect the most recent 2018 version.

MII: Please provide note in the note section on when and where the lump sum relocation cost of $50K was obtained. Please provide email archive in the L drive.

Response: Concur. A note has been added to the MII Estimate to explain where the LS cost of $50,000 for account 02 came from. A correspondence folder has been created and the related file has be properly stored for future reference.

MII: It does not appear the costs for "mob/demob and staging area" are 3% of the project cost as stated in the note. Please revisit and revise as appropriate.

Response: Concur. Markups have been removed from all Mob & Demob folders. 3% of project cost has been recalculated based on updated cost(s). Mob & Demob was added to account 15.

TPCS: It appears the CWCCIS used is dated back to 30-Sept-16. Recommend updating the CWCCIS to 31-Mar-19 version.

Response: Concur. CWCCIS tab/spreadsheet has been updated to the most current version dated for 31-Mar-19.

Midpoint: Per construction schedule provided, the construction will start on 06-Dec-21 and will be completed on 06-Jun-25. Please update the midpoint of construction and the midpoint of design in the TPCS.

Response: Concur. Midpoint of construction and design has been updated within the TPCS spreadsheet.

CSRA: Because the cost has been updated from FY16 to FY20, the cost used in the CSRA and CSRA report need to match. Please revisit the CSRA and CSRA report and update accordingly.

Response: Concur. CSRA and CSRA Report have been updated to match the changes in cost.

Construction contingency: The construction contingency used in Table C1 and the fully funded cost table should match the contingency generated in the CSRA. The construction contingency show in Table C2 should also match the contingency generated in the CSRA with exception of the Lands & Damages.

Response: Concur. Contingencies within Tables C1 and C2 have been updated to match what was generated as part of the CSRA update except for the 40% contingency provided by Real Estate for Lands & Damages.

Highlands
DQC
November 14, 2019
Reviewer: Cynthia Zhang
Response: Kaitlyn Eng

Sales Tax: It appears the sales tax are different for small, medium and large on the MII files. Recommend using the same sales tax throughout (NJ rate)

Response: Concur. Sales tax updated on all MII files to 6.625%.

Account 13 Pumping Station: It appears the cost used for the 250 cfs and the 50 cfs pump stations are different between the 3 plans. Recommend using $2,574,482.97 for the 50 cfs and $9,132,080.39 for the 250 cfs per pump curve at FY20 PL.

Response: Concur. Cost of pump stations updated to $2,574,482.97 for 50 cfs and $9,132,080.39 for 250 cfs on all three MII Estimates.

Escalation: It appears the escalation rate are different for small, medium and large on the MII files. Recommend using the same escalation rate. Since the Equipment is in 2018 rate and labor in 2019, recommend deleting the escalation for account 11, 13 and 15. And then replace it with a direct cost markup of "material escalation". Recommend using 12.05% for account 11, 13.16% for account 15, and 0% for account 13 per CWCCIS Index Factors dated 31-Mar-19.

Response: Concur. Escalation on all three MII Estimates have been updated to reflect what is shown above.

CSRA: Recommend plugging the new cost numbers onto the "base cost summary" tab in the CSRA file and see project cost contingency changes in the "project contingency" tab. If the contingency changes, please reflect it onto the TPCS file.

Response: Concur. ARA updated for Low and Medium. TPCS updated to reflect updated contingencies and cost. CSRA updated for High. TPCS updated to reflect updated contingency and cost.

Attachment C3
ATR Comments

NAN – Highlands NJ Raritan and Sandy Hook Coastal Storm Risk Management
NAN - New York District
REVIEW by: W Bolte 16 December 2019
Responses by: Kaitlyn Eng 9 January 2020

Receipt of Documents
1. This Cost ATR review is based upon MCACES MII files for the Highlands NJ Raritan and Sandy Hook Coastal Storm Risk Management; dated 21 October 2019. The MII estimates totaled some $76.9M for construction and relocation features only. The review comments are primarily based upon the following Corps regulations and Guidance that must be adhered to:

ER 1110-2-1150, Engineering and Design for Civil Works Projects
ER 1110-2-1302, Civil Works Cost Engineering
ETL 1110-2-573, Construction Cost Estimating Guide for Civil Works

Response: Noted.

Documents Received

2. Quantity Takeoffs and Risk Report. CONCERN: Documents received for review include the Main Report and Cost Appendix, Cost Estimate, Schedule, CSRA Model and TPCS. SIGNIFICANCE: MEDIUM RESOLUTION: Please provide Risk Report and quantity takeoffs. I understand many of the working level quantity calculations appear to be in MII, but where did the source areas originate?

Response: Concur. Please view the attached Risk Report and supporting quotes and quantity take-off information.

MII Estimate

3. Contractor Markups. CONCERN: Estimate includes Prime/SubContractor Markups of 13% JOOH, 3.9% HOOH, 10% profit and 2% bond. SIGNIFICANCE: HIGH RESOLUTION: What contractor HOOH rates has district been provided by contractors during previous contract modifications? Cost Reviewer typically uses closer to 10% Contractor HOOH for budgetary estimates.

Response: Non-Concur. Percentage markups for JOOH, HOOH, profit, and bond are based on historical bid results specific to the area.

4. Estimate notes and Quantities CONCERN. MII Estimate notes do not appear to match SOW and state "Quantities derived from the last MCACES (P.L. April 1996) for Flood Control Portion of the Project." SIGNIFICANCE: HIGH RESOLUTION: What's the basis of quantities? Update notes to reflect Scope of Work.

Response: Concur. MII Notes have been updated to properly reflect the SOW of this project.

5. Relocations CONCERN. MII Estimate includes placeholder $50k cost for utility relocations noting information has been requested but not provided. CSRA includes risk TL4- Known and Unknown Utility

Impacts with a worst cost of potentially $8.5M. SIGNIFICANCE: HIGH RESOLUTION: What is known about the utilities? If there is the potential for $8M+ in utility cost growth (over 10% of total construction costs) this scope must be understood!

Response: Concur. $8.5M was an error within the spreadsheet. This has been corrected to properly represent projected cost related to utility relocations. Please view attached email from PM explaining the estimated cost of $50k to account for potential overhead utility conflicts on Bay Avenue in the vicinity of the road closure structure.

6. Armor Stone CONCERN. MII Estimate includes some $7.5M in Class C Armor Stone at $87.20/cy. Cost is inflated from 4/1/2103 quote. SIGNIFICANCE: HIGH RESOLUTION: Armor stone is some 10% of total construction costs. Please obtain updated quote for Class C Armor stone. If all other stone/bedding is from similar date recommend updated quotes for all stone material.

Response: Concur. Unit price of bedding stone and armor stone has been updated based on a quote from Tilcon in September of 2019 for construction in 2021.

7. Pump Plants CONCERN. MII Estimate includes some $15.5M for two pump stations (250cfs and 50cfs) based on pump curve data (Pump Curve_14Nov2019.xlsx). Pump curve appears to be based on three smaller pump station data points (30cfs, 50cfs and 90cfs) from previous awards (2001, 2010 and 2008). SIGNIFICANCE: HIGH RESOLUTION: What's the teams confidence in those Pump Plant costs? Data appears to be quite old and a significant extrapolation to project the 250cfs pump plant costs from 30, 50 and 90cfs data. Only consolation, SAJ - Jacksonville district keeps their own pump curve data (see attached). Cost reviewer doesn't have FY20 data, but FY18 SAJ data suggests a budget of $35,000/CFS for a total budget of $10.5M (in FY18 prices). Project budget of $15.5M is likely sufficient.

Response: Concur. Thank you for providing the updated pump curve data. MII Estimate cost for pump stations has been updated to reflect cost as shown within the pump curve provided. Cost Engineer used cost per cfs in FY17 for similar sized pumps in 2015, 2016, and 2017 to determine average cost per cfs. This data was escalated to 2020. The following note was added to MII Estimate:

"Using historical pump station data from Jacksonville District, I applied the average cost per CFS in FY 17 for pumps constructed in 2015, 2016, and 2017 of $43,650/cfs x 300 cfs = $13,095,000. The pumps constructed within these years are closer in date and size to the pumps being constructed on this project.

$43,650/cfs x 50 cfs = $2,182,500
$43,650/cfs x 250 cfs = $10,912,500

And escalated these numbers from Quarter 1 2017 to Quarter 1 2020 using Account 13 in CWCCIS @12.18%.

$43,650/cfs x 50 cfs = $2,182,500 x 1.2072 = $2,634,714
$43,650/cfs x 250 cfs = $10,912,500 x 1.2072 = $13,173,570

8. Drainage Structures CONCERN. Cost Review was unable to locate specific details about RCP and Box drainage structures. Will temporary protection be required when drainage structures are installed through existing flood protection? SIGNIFICANCE: HIGH RESOLUTION: Please explain the scope of the

drainage structures and construction sequence. If levee must be penetrated determine if temporary protection is required around the breach.

Response: Concur. More details on drainage features can be found in the Hydraulics-Hydrology Engineering Appendix B4 however at this point in time, details of design and sequencing are not well defined. The uncertainty of this was discussed as part of the CSRA and therefore should be captured within the contingency. Please Reference TL2 & TL3.

9. Closure Gate. CONCERN. Closure gate unit cost estimate based on 2016 awarded contract. SIGNIFICANCE: MEDIUM RESOLUTION: Please provide supporting cost information (range of bidders, escalation calculations from FY16 to FY20 etc) so reviewer has and understanding of source data.

Response: Concur. Bid abstract for Port Monmouth Contract 3 (referenced project) provided. The MII notes for this item and folder have been updated to reflect new cost associated with this item.
55 ft x 11 ft = 605SF Cost Based on Pt Monmouth IGE dated June 2016. The cost includes Gate (32ft x 8ft roller gate); concrete, excavation, H-Piles for support, electrical power for gate and other misc. items. The unit cost for the road closure gate was determined using historical bid data from Port Monmouth Contract 3 awarded in July of 2016. There were 16 different bids with an average cost of about $702,000 (not including the IGE) = $702,000.00/256SF = $2,742/SF x 605SF = $1,659,000. Please review the bid abstract within the quantity backup provided. Escalation from Q4 2016 to Q1 2020 per CWCCIS for Account 15 = 11.23%.

10. Dewatering. CONCERN. Estimate includes $285k for dewatering. What structure is this dewatering required for? Is this for the closure gate, and if so was dewatering required in the awarded project used as source for cost data? Closure gate estimate based on 2016 awarded contract. SIGNIFICANCE: MEDIUM RESOLUTION: Please explain dewatering requirement. If dewatering is required estimate assumes 8hrs per day. Recommend increasing to 24hrs per day.

Response: Concur. 8 hrs/day has been increased to 24 hrs/day and a note has been added to the MII Estimate. According to Page 21 of the Civil Engineering Appendix B1, dewatering by pumps will be used during construction of the T-wall sections and does not include dewatering for the closure gate. The cost to dewater related to the construction of the closure gate should be included within the bid data used to determine the overall cost associated with the construction of the closure gate.

11. Cultural Resources. CONCERN. Estimate includes $2.5M for Fish and Wildlife Mitigation Costs "provided by Env Branch." SIGNIFICANCE: MEDIUM RESOLUTION: Please provide basis of cost information, ie email from Env Branch or however the $2.5M cost provided to Cost Engineer.

Response: Concur. The amount $2.5M for Fish & Wildlife has been verified by email by a Biologist at NAN. Email from 2016 and recent confirmation will be provided.

Cost and Schedule Risk Analysis

12. Crystal Ball Forecast. CONCERN: CSRA model records a 21% contingency. Crystal Ball forecast only incorrectly extracted the 10% and 90% confidence on tab "Cost Risk Model." Updating the Forecast to correctly extract all confidence levels results in a 46% contingency (at the recommended 80% confidence level). SIGNIFICANCE: HIGH RESOLUTION: See attached updated CSRA with corrected forecast. Confirm and if questions call reviewer.

Response: Concur. Corrected CSRA model provided by ATR Reviewer used for updates related to other ATR comments and new resulting contingency of 32% used to update all cost related documents. Thank you!

13. Risk Report. CONCERN: Risk Report not provided. SIGNIFICANCE: HIGH RESOLUTION: Please provide Risk Report.

Response: Concur. Updated Risk Report will be provided for review.