



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

Integrated Hurricane Sandy General Reevaluation Report and Environmental Impact Statement

Atlantic Coast of New York

**East Rockaway Inlet to
Rockaway Inlet and Jamaica Bay**

Sub Appendix A1-B: SCREENING LEVEL COST ESTIMATES SUPPORTING DATA

US Army Corps of Engineers



B. SUB-APPENDIX A1.B: SCREENING LEVEL COST ESTIMATES SUPPORTING DATA



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B.1 INTRODUCTION

This Atlantic Coast of New York, East Rockaway Inlet to Rockaway Inlet Hurricane Sandy General Revaluation Report Cost Engineering Screening Appendix summarizes the cost engineering and analyses applied to evaluate and compare alternative features for each planning reach within the study area. There are two reaches within the study area: 1) the Atlantic Shorefront, 2) Jamaica Bay. Since each planning reach is exposed to different risk mechanisms two engineering appendices are included within this GRR/EIS: Appendix A1 - Shorefront Engineering and Design Appendix, and Appendix A2 - Jamaica Bay High Frequency Flood Risk Reduction Features Engineering and Design Appendix.

This Cost Engineering Screening Appendix provides an overview of the cost analyses supporting both the screening process for the High Frequency Flood Risk Reduction Features (HFFRRF) for Jamaica Bay and the shorefront alternatives.

The initial study was initially limited to the Atlantic Ocean Shoreline Planning Reach and was conducted as a legacy study. The engineering analyses were conducted to satisfy a more rigorous design level and the Atlantic Ocean shorefront summary engineering documents were written to satisfy those study requirements (USACE-NAN, 2016). The Jamaica Bay Planning Reach analysis was added following Hurricane Sandy and was conducted to broaden the recommended plan to the entire authorized study area and was conducted under SMART planning guidelines.

As a result of the Agency Decision Milestone, the storm surge barrier component of the Tentatively Selected Plan was moved into the New York and New Jersey Harbor and Tributaries Study for further study and possible recommendation. Without the barrier, the communities surrounding Jamaica Bay still experience substantial risk for coastal flooding. Therefore, the study team sought to identify stand-alone features that could complement a potential future storm surge barrier, but also be economically justified on their own. Residents in many parts of the Jamaica Bay area experience regular flooding due to rainfall events and high tides that occur frequently. Since the proposed barrier would not be closed at every high tide or rainfall event, there is an opportunity to recommend features to mitigate flood risk for high frequency flooding events where the proposed storm surge barrier would remain open yet inundation still occurs.

B.2 PROJECT DESCRIPTION

Location

Please refer to Figure 1-1 of the Shorefront Engineering Appendix A1 and Figure 2-4 in the HFFRRF Engineering Appendix A2 for details relating to the project location.

Feature Descriptions

The alternative development options for the shorefront are detailed in Section 7 of the Shorefront Engineering Appendix (A1).

B.3 ROCKAWAY SHOREFRONT SCREENING

The Rockaway shorefront E&D Appendix presents and discusses Erosion Control alternatives and Coastal Storm Risk Management (CSRM) alternatives for the Atlantic Ocean Shorefront Planning Reach. Although previously presented and screened (USACE-NAN, 2016)¹, the cost estimates and benefits were updated to current price levels.

This screening process was updated for this report, with the composite seawall still providing the most benefits (see Appendix A1). Cost estimates for all shorefront reach alternatives (both Erosion Control Alternatives and CSRM alternatives) are provided in Attachment A - D.

¹ USACE-NAN. (2016). Atlantic Coast of New York, East Rockaway Inlet to Rockaway Inlet and Jamaica Bay - Draft Integrated Hurricane Sandy General Reevaluation Report and Environmental Impact Statement.

**ATTACHMENT A
EROSION CONTROL ALTERNATIVES
SCREENING LEVEL COST ESTIMATES**

**EROSION CONTROL
ALTERNATIVE 1N**

Contract No.: W912DS-09-0009
 Task Order No.: 26

Alternative 1n
Feasibility Estimate

Discipline: Annualized Cost Sheet: 1 OF 5
 Prepared by: R. Hampson Date: 4/20/2015
 Updated: S. Jessup Date: 7/11/2018
M. Kluijver Date: 7/12/2018

Project Title: Integrated Hurricane Sandy General Reevaluation Report and Environmental Impact Statement - Atlantic Coast of New York - East Rockaway Inlet to Rockaway Inlet and Jamaica Bay
 Consultant Name: Moffatt & Nichol Consultant Contact: M. Kluijver

Item #	Description	Quantity	Unit	Unit Price \$	Total \$	Assumption / Basis
Annualized Costs						
Items						
1	Total Investment	1	LS	\$ 1,225,000.00	\$ 1,225,000	
2	Renourishment	1	LS	\$ 7,975,000.00	\$ 7,975,000	
3	Major Rehab	1	LS	\$332,000.00	\$ 332,000	
4	Groin Maintenance	1	LS	\$ -	\$ -	
5	Monitoring	1	LS	\$403,000.00	\$ 403,000	
	SUBTOTAL				\$ 9,935,000	

Total Annual Cost \$ 9,935,000

Contract No.: W912DS-09-0009
 Task Order No.: 26

Alternative 1n
Feasibility Estimate

Discipline: First Costs Sheet: 2 OF 5
 Prepared by: R. Hampson Date: 4/20/2015
 Updated: S. Jessup Date: 7/11/2018
M. Kluijver Date: 7/12/2018

Project Title: Integrated Hurricane Sandy General Reevaluation Report and Environmental Impact Statement - Atlantic Coast of New York - East Rockaway Inlet to Rockaway Inlet and Jamaica Bay

Consultant Name: Moffatt & Nichol Consultant Contact: R. Hampson

Item #	Description	Quantity	Unit	Unit Price \$	Total \$	Assumption / Basis
Construction Costs						
WBS	Items					
17	Mob/Demob	1	LS	\$ 3,300,000.00	\$ 3,300,000	
17	Beachfill	1	LS	\$ 19,548,000.00	\$ 19,548,000	
	SUBTOTAL				\$ 22,848,000	
	CONTINGENCY 18.60%				\$ 4,250,000	
	SUBTOTAL				\$ 27,098,000	

Lands & Damages						
WBS	Items					
01	Lands & Damages	1	LS	\$ -	\$ -	
	CONTINGENCY 20%				\$ -	
	SUBTOTAL				\$ -	

Planning, Engineering & Design						
WBS	Items					
30	Planning, Engineering & Design	1	LS	10.00%	\$ 2,285,000	
	CONTINGENCY 15.25%				\$ 348,000	
	SUBTOTAL				\$ 2,633,000	

Construction Management						
WBS	Items					
30	Construction Management	1	LS	7.85%	\$ 1,794,000	
	CONTINGENCY 15.25%				\$ 274,000	
	SUBTOTAL				\$ 2,068,000	

First Cost		\$ 31,799,000
Escalation 2Q 2016 to 2Q 2018	3.31%	\$ 1,051,000
Interest During Construction		\$ 215,000
Total Investment Cost		\$ 33,065,000

Annualized Total Investment Cost \$ **1,225,000**

Interest Rate 2.750%
 Life 50
 Capital Recovery Factor 0.03704
 Construction Period in months 6.70
 IDC Factor 0.006559521

Contract No.: W912DS-09-0009
 Task Order No.: 26

Alternative 1n
Feasibility Estimate

Discipline: Ren. Costs Sheet: 3 OF 5
 Prepared by: R. Hampson Date: 4/20/2015
 Updated: S. Jessup Date: 7/11/2018
M. Kluijver Date: 7/12/2018

Project Title: Integrated Hurricane Sandy General Reevaluation Report and Environmental Impact Statement - Atlantic Coast of New York - East Rockaway Inlet to Rockaway Inlet and Jamaica Bay

Consultant Name: Moffatt & Nichol Consultant Contact: M. Kluijver

Item #	Description	Quantity	Unit	Unit Price \$	Total \$	Assumption / Basis
Construction Costs						
WBS	Items					
17	Mob/Demob	1	LS	\$ 3,300,000.00	\$ 3,300,000	
17	Beachfill	1	LS	\$ 12,867,000.00	\$ 12,867,000	
	SUBTOTAL				\$ 16,167,000	
	CONTINGENCY 30.47%				\$ 4,926,000	
	SUBTOTAL				\$ 21,093,000	

Lands & Damages						
WBS	Items					
01	Lands & Damages	1	LS	\$ -	\$ -	
	CONTINGENCY 20%				\$ -	
	SUBTOTAL				\$ -	

Planning, Engineering & Design						
WBS	Items					
30	Planning, Engineering & Design	1	LS	10.00%	\$ 1,617,000	
	CONTINGENCY 15.25%				\$ 247,000	
	SUBTOTAL				\$ 1,864,000	

Construction Management						
WBS	Items					
30	Construction Management	1	LS	8.16%	\$ 1,319,000	
	CONTINGENCY 15.25%				\$ 201,000	
	SUBTOTAL				\$ 1,520,000	

First Cost		\$ 24,477,000
Escalation 2Q 2016 to 2Q 2018	3.31%	\$ 809,000
Interest During Construction		\$ -
Total Renourishment Cost		\$ 25,286,000

Annualized TotalRenourishment Cost **\$ 7,975,261** from amortization file

Interest Rate 2.750%
 Life 50
 Capital Recovery Factor 0.03704
 Present Value Factor 7.609319

Contract No.: W912DS-09-0009
 Task Order No.: 26

**Alternative 1n
 Feasibility Estimate**

Discipline: Beachfill-Initial Sheet: 4 OF 5
 Prepared by: R. Hampson Date: 4/20/2015
 Updated: S. Jessup Date: 7/11/2018
M. Kluijver Date: 7/12/2018

Integrated Hurricane Sandy General Reevaluation Report and Environmental Impact
 Statement - Atlantic Coast of New York - East Rockaway Inlet to Rockaway Inlet and Jamaica

Project Title: Bay

Consultant Name: Moffatt & Nichol Consultant Contact: M. Kluijver

Item #	Description	Quantity	Unit	Unit Price \$	Total \$	Assumption / Basis
Beachfill - Initial Construction						
Items						
1	Beachfill-Reach 1	-	CY	\$ 12.88	\$ -	
2	Beachfill-Reach 2	-	CY	\$ 12.88	\$ -	
3	Beachfill-Reach 3	304,000	CY	\$ 12.88	\$ 3,915,520	design + advance fill
4	Beachfill-Reach 4	456,000	CY	\$ 12.88	\$ 5,873,280	design + advance fill
5	Beachfill-Reach 5	252,000	CY	\$ 12.88	\$ 3,245,760	design + advance fill
6	Beachfill-Reach 6a	391,000	CY	\$ 12.88	\$ 5,036,080	design + advance fill
7	Beachfill-Reach 6b	20,000	CY	\$ 12.88	\$ 257,600	design + advance fill
8	Dune Grass Planting	61	AC	\$ 20,000.00	\$ 1,220,000	32,000 LF of dune grass planting
	SUBTOTAL		CY		\$ 19,548,000	

General						
Items						
1	Mob/Demob	1	EA	\$ 3,300,000.00	\$ 3,300,000	30" Cutter Head Dredge
	SUBTOTAL				\$ 3,300,000	

TOTAL	\$ 22,848,000
CONTINGENCY 18.6%	\$ 4,249,728
Escalation 2Q 2016 to 2Q 2018	3.31% \$ 896,000
GRAND TOTAL CONSTRUCTION COST	\$ 27,993,728

Contract No.: W912DS-09-0009
 Task Order No.: 26

**Alternative 1n
 Feasibility Estimate**

Discipline: Beachfill-Ren. Sheet: 5 OF 5
 Prepared by: R. Hampson Date: 4/20/2015
 Updated: S. Jessup Date: 7/11/2018
M. Kluijver Date: 7/12/2018

Integrated Hurricane Sandy General Reevaluation Report and Environmental Impact
 Statement - Atlantic Coast of New York - East Rockaway Inlet to Rockaway Inlet and Jamaica

Project Title: Bay

Consultant Name: Moffatt & Nichol Consultant Contact: M. Kluijver

Item #	Description	Quantity	Unit	Unit Price \$	Total \$	Assumption / Basis
Beachfill-Renourishment Operation						
Items						
1	Beachfill-Reach 1	-	CY	\$ 12.88	\$ -	estimate for a single renourishment operation
2	Beachfill-Reach 2	-	CY	\$ 12.88	\$ -	renourishment operations occur in 4-year cycles
3	Beachfill-Reach 3	133,000	CY	\$ 12.88	\$ 1,713,040	advance fill - 3-year cycle
4	Beachfill-Reach 4	416,000	CY	\$ 12.88	\$ 5,358,080	advance fill - 3-year cycle
5	Beachfill-Reach 5	250,000	CY	\$ 12.88	\$ 3,220,000	advance fill - 3-year cycle
6	Beachfill-Reach 6a	200,000	CY	\$ 12.88	\$ 2,576,000	advance fill - 3-year cycle
	SUBTOTAL	999,000	CY		\$ 12,867,000	

General						
Items						
1	Mob/Demob	1	EA	\$ 3,300,000.00	\$ 3,300,000	30" Cutter Head Dredge
	SUBTOTAL				\$ 3,300,000	

TOTAL	\$ 16,167,000
CONTINGENCY 30.47%	\$ 4,926,000
Escalation 2Q 2016 to 2Q 2018	3.31% \$ 697,000
GRAND TOTAL CONSTRUCTION COST	\$ 21,093,000

**EROSION CONTROL
ALTERNATIVE 2N**

Contract No.: W912DS-09-0009
 Task Order No.: 26

Alternative 2n
Feasibility Estimate

Discipline: Annualized Cost Sheet: 1 OF 7
 Prepared by: R. Hampson Date: 4/20/2015
 Updated: M. Kluijver Date: 7/12/2018

Project Title: Integrated Hurricane Sandy General Reevaluation Report and Environmental Impact Statement - Atlantic Coast of New York - East Rockaway Inlet to Rockaway Inlet and Jamaica Bay
 Consultant Name: Moffatt & Nichol Consultant Contact: M. Kluijver

Item #	Description	Quantity	Unit	Unit Price \$	Total \$	Assumption / Basis
Annualized Costs						
Items						
1	Total Investment	1	LS	\$ 5,314,000.00	\$ 5,314,000	
2	Renourishment	1	LS	\$ 6,153,000.00	\$ 6,153,000	
3	Major Rehab	1	LS	\$332,000	\$ 332,000	
4	Groin Maintenance	1	LS	\$ 62,000	\$ 62,000	
5	Monitoring	1	LS	\$403,000	\$ 403,000	
	SUBTOTAL				\$ 12,264,000	

Total Annual Cost \$ 12,264,000

Contract No.: W912DS-09-0009
 Task Order No.: 26

**Alternative 2n
 Feasibility Estimate**

Discipline: First Costs Sheet: 2 OF 7
 Prepared by: R. Hampson Date: 4/20/2015
 Updated: S. Jessup Date: 7/11/2018
 Updated: M. Kluijver Date: 7/12/2018

Project Title: Integrated Hurricane Sandy General Reevaluation Report and Environmental Impact Statement -
 Atlantic Coast of New York - East Rockaway Inlet to Rockaway Inlet and Jamaica Bay

Consultant Name: Moffatt & Nichol Consultant Contact: M. Kluijver

Item #	Description	Quantity	Unit	Unit Price \$	Total \$	Assumption / Basis
Construction Costs						
WBS	Items					
17	Mob/Demob	1	LS	\$ 3,300,000.00	\$ 3,300,000	
17	Beachfill	1	LS	\$ 15,890,000.00	\$ 15,890,000	
10	Mob/Demob	1	LS	\$ 2,500,000.00	\$ 2,500,000	
10	Groin Shortening in Reach 5	1	LS	\$ 8,998,000.00	\$ 8,998,000	
02	Boardwalk Relocation	1	LS	\$ 19,677,000.00	\$ 19,677,000	
	SUBTOTAL				\$ 50,365,000	
	CONTINGENCY 33.46%				\$ 16,852,000	
	SUBTOTAL				\$ 67,217,000	

Lands & Damages						
WBS	Items					
01	Lands & Damages	1	LS	\$ 40,000,000.00	\$ 40,000,000	
	CONTINGENCY 48.97%				\$ 19,588,000	
	SUBTOTAL				\$ 59,588,000	

Planning, Engineering & Design						
WBS	Items					
30	Planning, Engineering & Design	1	LS	10.00%	\$ 5,037,000	
	CONTINGENCY 15.25%				\$ 768,000	
	SUBTOTAL				\$ 5,805,000	

Construction Management						
WBS	Items					
30	Construction Management	1	LS	7.13%	\$ 3,591,000	
	CONTINGENCY 15.25%				\$ 548,000	
	SUBTOTAL				\$ 4,139,000	

First Cost		\$ 136,749,000
Escalation 2Q 2016 to 2Q 2018	3.31%	\$ 4,520,000
Interest During Construction		\$ 2,207,000
Total Investment Cost		\$ 143,476,000

Annualized Total Investment Cost		\$ 5,314,000
Interest Rate	2.750%	
Life	50	
Capital Recovery Factor	0.03704	
Construction Period in months	14.51	
IDC Factor	0.015623805	

Contract No.: W912DS-09-0009
 Task Order No.: 26

Alternative 2n
Feasibility Estimate

Discipline: Ren. Costs Sheet: 3 OF 7
 Prepared by: R. Hampson Date: 4/20/2015
 Updated: S. Jessup Date: 7/11/2018
 Updated: M. Kluijver Date: 7/12/2018

Project Title: Integrated Hurricane Sandy General Reevaluation Report and Environmental Impact Statement - Atlantic Coast of New York - East Rockaway Inlet to Rockaway Inlet and Jamaica Bay

Consultant Name: Moffatt & Nichol Consultant Contact: M. Kluijver

Item #	Description	Quantity	Unit	Unit Price \$	Total \$	Assumption / Basis
Construction Costs						
WBS	Items					
17	Mob/Demob	1	LS	\$ 3,300,000.00	\$ 3,300,000	
17	Beachfill	1	LS	\$ 13,717,000.00	\$ 13,717,000	
	SUBTOTAL				\$ 17,017,000	
	CONTINGENCY 30.47%				\$ 5,185,000	
	SUBTOTAL				\$ 22,202,000	

Lands & Damages						
WBS	Items					
01	Lands & Damages	1	LS	\$ -	\$ -	
	CONTINGENCY 20%				\$ -	
	SUBTOTAL				\$ -	

Planning, Engineering & Design						
WBS	Items					
30	Planning, Engineering & Design	1	LS	10.00%	\$ 1,702,000	
	CONTINGENCY 15.25%				\$ 260,000	
	SUBTOTAL				\$ 1,962,000	

Construction Management						
WBS	Items					
30	Construction Management	1	LS	8.12%	\$ 1,382,000	
	CONTINGENCY 15.25%				\$ 211,000	
	SUBTOTAL				\$ 1,593,000	

First Cost		\$ 25,757,000
Escalation 2Q 2016 to 2Q 2018	3.31%	\$ 851,000
Interest During Construction		\$ -
Total Renourishment Cost		\$ 26,608,000

Annualized TotalRenourishment Cost **\$ 6,152,870** from amortization file

Interest Rate 2.750%
 Life 50
 Capital Recovery Factor 0.03704
 Present Value Factor 5.61125

Contract No.: W912DS-09-0009
 Task Order No.: 26

**Alternative 2n
 Feasibility Estimate**

Discipline: Beachfill-Initial Sheet: 4 OF 7
 Prepared by: R. Hampson Date: 4/20/2015
 Updated: S. Jessup Date: 7/11/2018
 Updated: M. Kluijver Date: 7/12/2018

Integrated Hurricane Sandy General Reevaluation Report and Environmental Impact
 Statement - Atlantic Coast of New York - East Rockaway Inlet to Rockaway Inlet and Jamaica
 Project Title: Bay

Consultant Name: Moffatt & Nichol Consultant Contact: M. Kluijver

Item #	Description	Quantity	Unit	Unit Price \$	Total \$	Assumption / Basis
Beachfill - Initial Construction						
Items						
1	Beachfill-Reach 1	-	CY	\$ 12.88	\$ -	
2	Beachfill-Reach 2	-	CY	\$ 12.88	\$ -	
3	Beachfill-Reach 3	315,000	CY	\$ 12.88	\$ 4,057,200	design + advance fill
4	Beachfill-Reach 4	378,000	CY	\$ 12.88	\$ 4,868,640	design + advance fill
5	Beachfill-Reach 5	341,000	CY	\$ 12.88	\$ 4,392,080	design + advance fill
6	Beachfill-Reach 6a	85,000	CY	\$ 12.88	\$ 1,094,800	design + advance fill
7	Beachfill-Reach 6b	20,000	CY	\$ 12.88	\$ 257,600	design + advance fill
8	Dune Grass Planting	61	AC	\$ 20,000.00	\$ 1,220,000	32,000 LF of dune grass planting
	SUBTOTAL		CY		\$ 15,890,000	

General						
Items						
1	Mob/Demob	1	EA	\$ 3,300,000.00	\$ 3,300,000	30" Cutter Head Dredge
	SUBTOTAL				\$ 3,300,000	

TOTAL		\$ 19,190,000
CONTINGENCY 33.46%		\$ 6,421,000
Escalation 2Q 2016 to 2Q 2018	3.31%	\$ 847,000
GRAND TOTAL CONSTRUCTION COST		\$ 26,458,000

Contract No.: W912DS-09-0009
 Task Order No.: 26

**Alternative 2n
 Feasibility Estimate**

Discipline: Groins Sheet: 5 OF 7
 Prepared by: R. Hampson Date: 4/20/2015
 Updated: S. Jessup Date: 7/11/2018
 Updated: M. Kluijver Date: 7/12/2018

Integrated Hurricane Sandy General Reevaluation Report and Environmental Impact
 Statement - Atlantic Coast of New York - East Rockaway Inlet to Rockaway Inlet and Jamaica

Project Title: Bay
 Consultant Name: Moffatt & Nichol Consultant Contact: M. Kluijver

Item #	Description	Quantity	Unit	Unit Price \$	Total \$	Assumption / Basis
Groin Shortening in Reach 5 - Excavation						
Items						
1	Excavation - Armor Stone (8 TON)	27,900	TON	\$ 59.74	\$ 1,666,746	Excavate 150 feet of groin (OS & Head)
2	Excavation - Underlayer Stone (500-1500 lbs)	5,850	TON	\$ 43.38	\$ 253,773	
3	Excavation - Core Stone (30-130 lbs)	3,300	TON	\$ 34.70	\$ 114,510	
4	Excavation - Bedding Stone (30-130 lbs)	13,650	TON	\$ 34.70	\$ 473,655	
5	Excavation - Geotextile Filter Layer	12,750	SY	\$ 9.18	\$ 117,045	
6	Excavation - Sand	21,900	CY	\$ 7.24	\$ 158,556	
	SUBTOTAL				\$ 2,784,000	<i>\$1,856 per LF</i>

Groin Shortening in Reach 5 - Reset Stone						
Items						
1	Reset - Armor Stone (8 TON)	16,300	TON	\$ 66.38	\$ 1,081,994	
2	Reset - Bedding Stone (30-130 lbs)	8,350	TON	\$ 27.54	\$ 229,959	
3	Replace - Geotextile Filter Layer	5,200	SY	\$ 23.68	\$ 123,136	
	SUBTOTAL				\$ 1,435,000	<i>\$2,870 per LF</i>

Groin Shortening in Reach 5 - Disposal						
Items						
1	Dispose - Armor Stone (8 TON)	11,600	TON	\$ 118.00	\$ 1,368,800	
2	Dispose - Underlayer Stone (500-1500 lbs)	5,900	TON	\$ 66.00	\$ 389,400	
3	Dispose - Core Stone (30-130 lbs)	3,300	TON	\$ 52.00	\$ 171,600	
4	Dispose - Bedding Stone (30-130 lbs)	5,400	TON	\$ 52.00	\$ 280,800	
5	Dispose - Filter Fabric	7,600	SY	\$ 9.00	\$ 68,400	
	SUBTOTAL				\$ 2,279,000	<i>\$2,279 per LF</i>

General						
Items						
1	Mob/Demob	1	EA	\$ 2,500,000.00	\$ 2,500,000	
	SUBTOTAL				\$ 2,500,000	

TOTAL		\$ 8,998,000
CONTINGENCY 33.46%		\$ 3,011,000
Escalation 2Q 2016 to 2Q 2018	3.31%	\$ 397,000
GRAND TOTAL CONSTRUCTION COST		\$ 12,406,000

Contract No.: W912DS-09-0009
 Task Order No.: 26

**Alternative 2n
 Feasibility Estimate**

Discipline: Beachfill-Ren Sheet: 6 OF 7
 Prepared by: R. Hampson Date: 4/20/2015
 Updated: S. Jessup Date: 7/11/2018
 Updated: M. Kluijver Date: 7/12/2018

Integrated Hurricane Sandy General Reevaluation Report and Environmental Impact
 Statement - Atlantic Coast of New York - East Rockaway Inlet to Rockaway Inlet and Jamaica
 Project Title: Bay

Consultant Name: Moffatt & Nichol Consultant Contact: M. Kluijver

Item #	Description	Quantity	Unit	Unit Price \$	Total \$	Assumption / Basis
Beachfill-Renourishment Operation						
Items						
1	Beachfill-Reach 1	-	CY	\$ 12.88	\$ -	estimate for a single renourishment operation
2	Beachfill-Reach 2	-	CY	\$ 12.88	\$ -	renourishment operations occur in 4-year cycles
3	Beachfill-Reach 3	133,000	CY	\$ 12.88	\$ 1,713,040	advance fill - 4-year cycle
4	Beachfill-Reach 4	333,000	CY	\$ 12.88	\$ 4,289,040	advance fill - 4-year cycle
5	Beachfill-Reach 5	599,000	CY	\$ 12.88	\$ 7,715,120	advance fill - 4-year cycle
6	Beachfill-Reach 6a	-	CY	\$ 12.88	\$ -	advance fill - 4-year cycle
	SUBTOTAL	1,065,000	CY		\$ 13,717,000	

General						
Items						
1	Mob/Demob	1	EA	\$ 3,300,000.00	\$ 3,300,000	30" Cutter Head Dredge
	SUBTOTAL				\$ 3,300,000	

TOTAL	\$ 17,017,000
CONTINGENCY 30.47%	\$ 5,185,000
Escalation 2Q 2016 to 2Q 2018	3.31% \$ 734,000
GRAND TOTAL CONSTRUCTION COST	\$ 22,202,000

Contract No.: W912DS-09-0009
 Task Order No.: 26

**Alternative 2n
 Feasibility Estimate**

Discipline: Structural Sheet: 7 OF 7
 Prepared by: R. Hampson Date: 12/2/2014
 Updated: S. Jessup Date: 7/11/2018
 Updated: M. Kluijver Date: 7/12/2018

Integrated Hurricane Sandy General Reevaluation Report and Environmental Impact
 Statement - Atlantic Coast of New York - East Rockaway Inlet to Rockaway Inlet and Jamaica
 Project Title: Bay

Consultant Name: Moffatt & Nichol Consultant Contact: M. Kluijver

Item #	Description	Quantity	Unit	Unit Price \$	Total \$	Assumption / Basis
Boardwalk						
Items						
1	Precast Concrete Pile Cap	1,232	CY	\$ 1,500.00	\$ 1,848,000	77 caps @ 16 cy each
2	Precast Concrete Pile Cap with Light Post	360	CY	\$ 1,500.00	\$ 540,000	20 caps @ 18 cy each
3	Precast Concrete Deck Plank	4,296	CY	\$ 1,000.00	\$ 4,296,000	2,900' x 40' x 1'
4	24" Steel Pipe Pile	19,400	LF	\$ 135.00	\$ 2,619,000	194 piles @ 24x1/2" WT (100 ft long)
5	Cast in Place Concrete Plug	135	CY	\$ 500.00	\$ 67,500	194 plugs
6	Handrail	5,800	LF	\$ 150.00	\$ 870,000	Furnish and Install
7	Benches	52	EA	\$ 4,000.00	\$ 208,000	Furnish and Install
8	Sand Fill	34,370	CY	\$ 10.00	\$ 343,700	Move, Stockpile, Rehandle
Other Items						
	Electrical Utilities	1	EA	\$ 431,688.00	\$ 431,688	4% of total cost
	Pedestrian Access Stairs/Ramps	1	EA	\$ 431,688.00	\$ 431,688	4% of total cost
	Mechanical Utilities	1	EA	\$ 215,844.00	\$ 215,844	2% of total cost
	Misc. Boardwalk Furniture/Utilities	1	EA	\$ 215,844.00	\$ 215,844	2% of total cost
SUBTOTAL					\$ 12,087,000	

Sand Retaining Wall						
Items						
1	HP14x89 Pile	10,150	LF	\$ 110.00	\$ 1,116,500	290 HP @ 35 ft each
2	Precast Concrete Panel	859	CY	\$ 850.00	\$ 730,150	2900'x10'x0.8'
SUBTOTAL					\$ 1,847,000	

Demolition						
Items						
1	Boardwalk	116,000	SF	\$ 35.00	\$ 4,060,000	Demo and Dispose of Boardwalk
2	Sand Retaining Wall	2,900	LF	\$ 150.00	\$ 435,000	Demo and Dispose of Boardwalk
3	Credit for reuse of 24" Steel Pipe Piles	19,400	LF	\$ (95.00)	\$ (1,843,000)	Reuse 24" Piles and Splice 5' of Pile
4	Credit for reuse of HP14x89 Piles	10,150	LF	\$ (50.00)	\$ (507,500)	Reuse HP Piles and Splice 5' of Pile
5	Credit for reuse Precast Concrete Panel	859	CY	\$ 400.00	\$ 343,600	Reuse Precast Concrete Panels
6	Credit on disposal of reused Items	116,000	SF	\$ (10.00)	\$ (1,160,000)	Disposal not required for reused Items
SUBTOTAL					\$ 1,328,000	

General						
Items						
1	Mob/Demob	1	EA	\$ 1,000,000.00	\$ 1,000,000	
SUBTOTAL					\$ 1,000,000	

SUBTOTAL	\$ 16,262,000	
GENERAL CONDITIONS 10%	\$ 1,626,000	
SUBTOTAL (ALL ITEMS)	\$ 17,888,000	
G. C. OVERHEAD & PROFIT 10%	\$ 1,789,000	
TOTAL	\$ 19,677,000	
CONTINGENCY 33.46%	\$ 6,584,000	
Escalation 2Q 2016 to 2Q 2018 3.31%	\$ 868,000	26,261,000
GRAND TOTAL CONSTRUCTION COST	\$ 27,129,000	59,588,000

**EROSION CONTROL
ALTERNATIVE 3N**

Contract No.: W912DS-09-0009
 Task Order No.: 26

**Alternative 3n
 Feasibility Estimate**

Discipline: Annualized Cost Sheet: 1 OF 6
 Prepared by: R. Hampson Date: 4/20/2015
 Updated: S. Jessup Date: 7/11/2018
M. Kluijver Date: 7/12/2018

Project Title: Integrated Hurricane Sandy General Reevaluation Report and Environmental Impact Statement -
 Atlantic Coast of New York - East Rockaway Inlet to Rockaway Inlet and Jamaica Bay

Consultant Name: Moffatt & Nichol Consultant Contact: M. Kluijver

Item #	Description	Quantity	Unit	Unit Price \$	Total \$	Assumption / Basis
Annualized Costs						
Items						
1	Total Investment	1	LS	\$ 2,679,000.00	\$ 2,679,000	
2	Renourishment	1	LS	\$ 5,950,000.00	\$ 5,950,000	
3	Major Rehab	1	LS	\$332,000	\$ 332,000	
4	Groin Maintenance	1	LS	\$ 176,000.00	\$ 176,000	
5	Monitoring	1	LS	\$403,000	\$ 403,000	
	SUBTOTAL				\$ 9,540,000	

Total Annual Cost \$ 9,540,000

Contract No.: W912DS-09-0009
 Task Order No.: 26

**Alternative 3n
 Feasibility Estimate**

Discipline: First Costs Sheet: 2 OF 6
 Prepared by: R. Hampson Date: 4/20/2015
 Updated: S. Jessup Date: 7/11/2018
M. Kluijver Date: 7/12/2018

Project Title: Integrated Hurricane Sandy General Reevaluation Report and Environmental Impact Statement -
 Atlantic Coast of New York - East Rockaway Inlet to Rockaway Inlet and Jamaica Bay

Consultant Name: Moffatt & Nichol Consultant Contact: M. Kluijver

Item #	Description	Quantity	Unit	Unit Price \$	Total \$	Assumption / Basis
Construction Costs						
WBS	Items					
17	Mob/Demob	1	LS	\$ 3,300,000.00	\$ 3,300,000	
17	Beachfill	1	LS	\$ 17,204,000.00	\$ 17,204,000	
10	Mob/Demob	1	LS	\$ 2,500,000.00	\$ 2,500,000	
10	New Groins in Reach 3 & 4	1	LS	\$ 17,620,000.00	\$ 17,620,000	build 12 new groins
10	New Groin in Reach 6	1	LS	\$ 2,184,000.00	\$ 2,184,000	build 1 new groin
10	Groin Extensions in Reach 6	1	LS	\$ 5,540,000.00	\$ 5,540,000	extend 5 groins
	SUBTOTAL				\$ 48,348,000	
	CONTINGENCY 22.41%				\$ 10,835,000	
	SUBTOTAL				\$ 59,183,000	

Lands & Damages						
WBS	Items					
01	Lands & Damages	1	LS	\$ -	\$ -	
	CONTINGENCY 20%				\$ -	
	SUBTOTAL				\$ -	

Planning, Engineering & Design						
WBS	Items					
30	Planning, Engineering & Design	1	LS	10.00%	\$ 4,835,000	
	CONTINGENCY 15.25%				\$ 737,000	
	SUBTOTAL				\$ 5,572,000	

Construction Management						
WBS	Items					
30	Construction Management	1	LS	7.16%	\$ 3,462,000	
	CONTINGENCY 15.25%				\$ 528,000	
	SUBTOTAL				\$ 3,990,000	

First Cost \$ 68,745,000
 Escalation 2Q 2016 to 2Q 2018 3.31% \$ 2,272,000
 Interest During Construction \$ 1,307,000

Total Investment Cost \$ **72,324,000**

Annualized Total Investment Cost \$ **2,679,000**

Interest Rate 2.750%
 Life 50
 Capital Recovery Factor 0.03704
 Construction Period in months 16.88
 IDC Factor 0.018406369

Contract No.: W912DS-09-0009
 Task Order No.: 26

**Alternative 3n
 Feasibility Estimate**

Discipline: Ren. Costs Sheet: 3 OF 6
 Prepared by: R. Hampson Date: 4/20/2015
 Updated: S. Jessup Date: 7/11/2018
M. Kluijver Date: 7/12/2018

Project Title: Integrated Hurricane Sandy General Reevaluation Report and Environmental Impact Statement -
 Atlantic Coast of New York - East Rockaway Inlet to Rockaway Inlet and Jamaica Bay

Consultant Name: Moffatt & Nichol Consultant Contact: M. Kluijver

Item #	Description	Quantity	Unit	Unit Price \$	Total \$	Assumption / Basis
Construction Costs						
WBS	Items					
17	Mob/Demob	1	LS	\$ 3,300,000.00	\$ 3,300,000	
17	Beachfill	1	LS	\$ 13,150,000.00	\$ 13,150,000	
	SUBTOTAL				\$ 16,450,000	
	CONTINGENCY 30.47%				\$ 5,012,000	
	SUBTOTAL				\$ 21,462,000	

Lands & Damages						
WBS	Items					
01	Lands & Damages	1	LS	\$ -	\$ -	
	CONTINGENCY 20%				\$ -	
	SUBTOTAL				\$ -	

Planning, Engineering & Design						
WBS	Items					
30	Planning, Engineering & Design	1	LS	10.00%	\$ 1,645,000	
	CONTINGENCY 15.25%				\$ 251,000	
	SUBTOTAL				\$ 1,896,000	

Construction Management						
WBS	Items					
30	Construction Management	1	LS	8.15%	\$ 1,341,000	
	CONTINGENCY 15.25%				\$ 205,000	
	SUBTOTAL				\$ 1,546,000	

First Cost		\$ 24,904,000
Escalation 2Q 2016 to 2Q 2018	3.31%	\$ 823,000
Interest During Construction		\$ -
Total Renourishment Cost		\$ 25,727,000

Annualized TotalRenourishment Cost **\$ 5,950,011** from amortization file

Interest Rate 2.750%
 Life 50
 Capital Recovery Factor 0.03704
 Present Value Factor 5.61125

Contract No.: W912DS-09-0009
 Task Order No.: 26

**Alternative 3n
 Feasibility Estimate**

Discipline: Beachfill-Initial Sheet: 4 OF 6
 Prepared by: R. Hampson Date: 4/20/2015
 Updated: S. Jessup Date: 7/11/2018
M. Kluijver Date: 7/12/2018

Integrated Hurricane Sandy General Reevaluation Report and Environmental Impact
 Statement - Atlantic Coast of New York - East Rockaway Inlet to Rockaway Inlet and Jamaica
 Project Title: Bay

Consultant Name: Moffatt & Nichol Consultant Contact: M. Kluijver

Item #	Description	Quantity	Unit	Unit Price \$	Total \$	Assumption / Basis
Beachfill - Initial Construction						
Items						
1	Beachfill-Reach 1	-	CY	\$ 12.88	\$ -	
2	Beachfill-Reach 2	-	CY	\$ 12.88	\$ -	
3	Beachfill-Reach 3	356,000	CY	\$ 12.88	\$ 4,585,280	design + advance fill
4	Beachfill-Reach 4	294,000	CY	\$ 12.88	\$ 3,786,720	design + advance fill
5	Beachfill-Reach 5	321,000	CY	\$ 12.88	\$ 4,134,480	design + advance fill
6	Beachfill-Reach 6a	250,000	CY	\$ 12.88	\$ 3,220,000	design + advance fill
7	Beachfill-Reach 6b	20,000	CY	\$ 12.88	\$ 257,600	design + advance fill
8	Dune Grass Planting	61	AC	\$ 20,000.00	\$ 1,220,000	32,000 LF of dune grass planting
	SUBTOTAL		CY		\$ 17,204,000	

General						
Items						
1	Mob/Demob	1	EA	\$ 3,300,000.00	\$ 3,300,000	30" Cutter Head Dredge
	SUBTOTAL				\$ 3,300,000	

TOTAL		\$ 20,504,000
CONTINGENCY 22.41%		\$ 4,594,946
Escalation 2Q 2016 to 2Q 2018	3.31%	\$ 830,000
GRAND TOTAL CONSTRUCTION COST		\$ 25,928,946

Contract No.: W912DS-09-0009
 Task Order No.: 26

**Alternative 3n
 Feasibility Estimate**

Discipline: Groins Sheet: 5 OF 6
 Prepared by: R. Hampson Date: 4/20/2015
 Updated: S. Jessup Date: 7/11/2018
M. Kluijver Date: 7/12/2018

Integrated Hurricane Sandy General Reevaluation Report and Environmental Impact
 Statement - Atlantic Coast of New York - East Rockaway Inlet to Rockaway Inlet and Jamaica

Project Title: Bay
 Consultant Name: Moffatt & Nichol Consultant Contact: M. Kluijver

Item #	Description	Quantity	Unit	Unit Price \$	Total \$	Assumption / Basis
New Groins in Reach 3 & 4						
Items						
1	Armor Stone (4-8 TON)	55,175	TON	\$ 193.30	\$ 10,665,231	12 groins @ a total of 4087 ft
2	Underlayer Stone (500-1500 lbs)	17,983	TON	\$ 104.68	\$ 1,882,440	
3	Core Stone (30-130 lbs)	11,035	TON	\$ 92.87	\$ 1,024,811	
4	Bedding Stone (30-130 lbs)	28,200	CY	\$ 92.87	\$ 2,618,962	
5	Geotextile Filter Fabric	31,470	SY	\$ 23.68	\$ 745,207	
6	Excavation - Sand	94,410	CY	\$ 7.24	\$ 683,526	
	SUBTOTAL				\$ 17,620,000	<i>\$4,311 per LF of groin</i>

New Groin in Reach 6a						
Items						
1	Armor Stone (3-10 TON)	6,838	TON	\$ 193.30	\$ 1,321,785	1 groin @ 526 ft
2	Underlayer Stone (500-1500 lbs)	2,420	TON	\$ 104.68	\$ 253,284	
3	Core Stone (30-130 lbs)	1,473	TON	\$ 92.87	\$ 136,779	
4	Bedding Stone (30-130 lbs)	3,314	CY	\$ 92.87	\$ 307,753	
5	Geotextile Filter Fabric	3,945	SY	\$ 23.68	\$ 93,418	
6	Excavation - Sand	9,784	CY	\$ 7.24	\$ 70,833	
	SUBTOTAL				\$ 2,184,000	<i>\$4,152 per LF of groin</i>

Groin Extensions in Reach 6a						
Items						
1	Armor Stone (10 TON)	19,760	TON	\$ 193.30	\$ 3,819,608	5 groin extensions @ a total of 800'
2	Underlayer & Core Stone (500-1500 lbs)	4,160	TON	\$ 104.68	\$ 435,469	
3	Core Stone (30-130 lbs)	2,640	TON	\$ 92.87	\$ 245,177	
4	Bedding Stone (30-130 lbs)	8,320	CY	\$ 92.87	\$ 772,678	
5	Geotextile Filter Fabric	7,520	SY	\$ 23.68	\$ 178,074	
6	Excavation - Sand	12,240	CY	\$ 7.24	\$ 88,618	
	SUBTOTAL				\$ 5,540,000	<i>\$6,925 per LF of groin</i>

General						
Items						
1	Mob/Demob	1	EA	\$ 2,500,000.00	\$ 2,500,000	
	SUBTOTAL				\$ 2,500,000	

TOTAL		\$ 27,844,000
CONTINGENCY 22.41%		\$ 6,239,840
Escalation 2Q 2016 to 2Q 2018	3.31%	\$ 1,127,000
GRAND TOTAL CONSTRUCTION COST		\$ 35,210,840

Contract No.: W912DS-09-0009
 Task Order No.: 26

**Alternative 3n
 Feasibility Estimate**

Discipline: Beachfill-Ren Sheet: 6 OF 6
 Prepared by: R. Hampson Date: 4/20/2015
 Updated: S. Jessup Date: 7/11/2018
M. Kluijver Date: 7/12/2018

Integrated Hurricane Sandy General Reevaluation Report and Environmental Impact
 Statement - Atlantic Coast of New York - East Rockaway Inlet to Rockaway Inlet and Jamaica

Project Title: Bay

Consultant Name: Moffatt & Nichol Consultant Contact: M. Kluijver

Item #	Description	Quantity	Unit	Unit Price \$	Total \$	Assumption / Basis
Beachfill-Renourishment Operation						
Items						
1	Beachfill-Reach 1	-	CY	\$ 12.88	\$ -	estimate for a single renourishment operation
2	Beachfill-Reach 2	-	CY	\$ 12.88	\$ -	renourishment operations occur in 4-year cycles
3	Beachfill-Reach 3	444,000	CY	\$ 12.88	\$ 5,718,720	advance fill - 4-year cycle
4	Beachfill-Reach 4	133,000	CY	\$ 12.88	\$ 1,713,040	advance fill - 4-year cycle
5	Beachfill-Reach 5	444,000	CY	\$ 12.88	\$ 5,718,720	advance fill - 4-year cycle
6	Beachfill-Reach 6a	-	CY	\$ 12.88	\$ -	advance fill - 4-year cycle
	SUBTOTAL	1,021,000	CY		\$ 13,150,000	

General						
Items						
1	Mob/Demob	1	EA	\$ 3,300,000.00	\$ 3,300,000	large hopper dredge
	SUBTOTAL				\$ 3,300,000	

TOTAL		\$ 16,450,000
CONTINGENCY 30.47%		\$ 5,012,000
Escalation 2Q 2016 to 2Q 2018	3.31%	\$ 709,000
GRAND TOTAL CONSTRUCTION COST		\$ 21,462,000

Contract No.: W912DS-09-0009
 Task Order No.: 26

**Summary
 Feasibility Estimate**

Discipline: Annualized Cost Sheet: 1 OF 1
 Prepared by: R. Hampson Date: 4/20/2015
 Updated: M. Kluijver Date: 7/12/2018

Project Title: Integrated Hurricane Sandy General Reevaluation Report and Environmental Impact Statement - Atlantic Coast of New York - East Rockaway Inlet to Rockaway Inlet and Jamaica Bay
 Consultant Name: Moffatt & Nichol Consultant Contact: M. Kluijver

Item #	Description	Alt 1n	Alt 2n	Alt 3n			
Annualized Costs - 4 year Cycle							
Items							
1	Total Investment	\$1,225,000	\$5,314,000	\$2,679,000			
2	Renourishment	\$7,975,000	\$6,153,000	\$5,950,000			
3	Major Rehab	\$332,000	\$332,000	\$332,000			
4	Groin Maintenance	\$0	\$62,000	\$176,000			
5	Monitoring	\$403,000	\$403,000	\$403,000			
	Total	\$9,935,000	\$12,264,000	\$9,540,000			

Contract No.: W912DS-09-0009
 Task Order No.: 26

**Summary
 Feasibility Estimate**

Discipline: Initial Costs Sheet: 1 OF 1
 Prepared by: R. Hampson Date: 4/20/2015
 Updated: M. Kluijver Date: 7/12/2018

Project Title: Integrated Hurricane Sandy General Reevaluation Report and Environmental Impact Statement -
 Atlantic Coast of New York - East Rockaway Inlet to Rockaway Inlet and Jamaica Bay
 Consultant Name: Moffatt & Nichol Consultant Contact: M. Kluijver

Item #	Description	Alt 1n	Alt 2n	Alt 3n			
Initial Costs							
Items							
1	Beachfill	\$22,848,000	\$19,190,000	\$20,504,000			
2	Groin Construction/Modification	\$0	\$11,498,000	\$27,844,000			
3	Boardwalk Relocation	\$0	\$59,677,000	\$0			
4	PED	\$2,285,000	\$5,037,000	\$4,835,000			
5	Construction Mangement	\$1,794,000	\$3,591,000	\$3,462,000			
6	Contingency	\$5,923,000	\$42,276,000	\$14,372,000			
	Total	\$32,850,000	\$141,269,000	\$71,017,000			
	IDC	\$215,000	\$2,207,000	\$1,307,000			
		\$33,065,000	\$143,476,000	\$72,324,000			

Contract No.: W912DS-09-0009
 Task Order No.: 26

**Summary
 Feasibility Estimate**

Discipline: Ren Cost Sheet: 1 OF 1
 Prepared by: R. Hampson Date: 4/20/2015
 Updated: M. Kluijver Date: 7/12/2018

Project Title: Integrated Hurricane Sandy General Reevaluation Report and Environmental Impact Statement -
 Atlantic Coast of New York - East Rockaway Inlet to Rockaway Inlet and Jamaica Bay
 Consultant Name: Moffatt & Nichol Consultant Contact: M. Kluijver

Item #	Description	Alt 1n	Alt 2n	Alt 3n			
Renourishment Costs - Per Operation							
Items							
1	Beachfill	\$16,167,000	\$17,017,000	\$16,450,000			
2	PED	\$1,617,000	\$1,702,000	\$1,645,000			
3	Construction Mangement	\$1,319,000	\$1,382,000	\$1,341,000			
4	Contingencies	\$6,183,000	\$6,507,000	\$6,291,000			
	Total	\$25,286,000	\$26,608,000	\$25,727,000			
	Total over project life	\$215,309,467	\$166,110,072	\$160,633,447			

**ATTACHMENT
CSRM ALTERNATIVES
LOW SEA LEVEL CHANGE
SCREENING LEVEL COST
ESTIMATES**

**CSRM ALTERNATIVES
LOW SEA LEVEL CHANGE SCENARIO
ALTERNATIVE 3N MEDIUM DUNE**

Contract No.: W912DS-09-0009
 Task Order No.: 26

**Alternative 3n - Medium
 Feasibility Estimate**

Discipline: Annualized Cost Sheet: 1 OF 6
 Prepared by: R. Hampson Date: 4/20/2015
 Updated: S. Jessup Date: 7/11/2018

Integrated Hurricane Sandy General Reevaluation Report and Environmental Impact Statement -
 Project Title: Atlantic Coast of New York - East Rockaway Inlet to Rockaway Inlet and Jamaica Bay Updated: M. Kluijver Date: 7/13/2018
 Consultant Name: Moffatt & Nichol Consultant Contact: M. Kluijver

Item #	Description	Quantity	Unit	Unit Price \$	Total \$	Assumption / Basis
Annualized Costs						
Items						
1	Total Investment	1	LS	\$ 2,679,000.00	\$ 2,679,000	
2	Renourishment	1	LS	\$ 5,950,000.00	\$ 5,950,000	
3	Major Rehab	1	LS	\$ 332,000.00	\$ 332,000	
4	Groin Maintenance	1	LS	\$ 176,000.00	\$ 176,000	
5	Monitoring	1	LS	\$403,000	\$ 403,000	
	SUBTOTAL				\$ 9,540,000	

Total Annual Cost \$ 9,540,000

Contract No.: W912DS-09-0009
 Task Order No.: 26

**Alternative 3n - Medium
 Feasibility Estimate**

Discipline: First Costs Sheet: 2 OF 6
 Prepared by: R. Hampson Date: 4/20/2015
 Updated: S. Jessup Date: 7/11/2018

Integrated Hurricane Sandy General Reevaluation Report and Environmental Impact Statement -
 Project Title: Atlantic Coast of New York - East Rockaway Inlet to Rockaway Inlet and Jamaica Bay Updated: M. Kluijver Date: 7/13/2018
 Consultant Name: Moffatt & Nichol Consultant Contact: M. Kluijver

Item #	Description	Quantity	Unit	Unit Price \$	Total \$	Assumption / Basis
Construction Costs						
WBS	Items					
17	Mob/Demob	1	LS	\$ 3,300,000.00	\$ 3,300,000	
17	Beachfill	1	LS	\$ 17,204,000.00	\$ 17,204,000	
10	Mob/Demob	1	LS	\$ 2,500,000.00	\$ 2,500,000	
10	New Groins in Reach 3 & 4	1	LS	\$ 17,620,000.00	\$ 17,620,000	build 12 new groins
10	New Groin in Reach 6	1	LS	\$ 2,184,000.00	\$ 2,184,000	build 1 new groin
10	Groin Extensions in Reach 6	1	LS	\$ 5,540,000.00	\$ 5,540,000	extend 5 groins
	SUBTOTAL				\$ 48,348,000	
	CONTINGENCY 22.41%				\$ 10,835,000	
	SUBTOTAL				\$ 59,183,000	

Lands & Damages						
WBS	Items					
01	Lands & Damages	1	LS	\$ -	\$ -	
	CONTINGENCY 20%				\$ -	
	SUBTOTAL				\$ -	

Planning, Engineering & Design						
WBS	Items					
30	Planning, Engineering & Design	1	LS	10.00%	\$ 4,835,000	
	CONTINGENCY 15.25%				\$ 737,000	
	SUBTOTAL				\$ 5,572,000	

Construction Management						
WBS	Items					
30	Construction Management	1	LS	7.16%	\$ 3,462,000	
	CONTINGENCY 15.25%				\$ 528,000	
	SUBTOTAL				\$ 3,990,000	

First Cost		\$ 68,745,000
Escalation 2Q 2016 to 2Q 2018	3.31%	\$ 2,272,000
Interest During Construction		\$ 1,307,000
Total Investment Cost		\$ 72,324,000

Annualized Total Investment Cost \$ **2,679,000**

Interest Rate 2.750%
 Life 50
 Capital Recovery Factor 0.03704
 Construction Period in months 16.88
 IDC Factor 0.018406454

Contract No.: W912DS-09-0009
 Task Order No.: 26

**Alternative 3n - Medium
 Feasibility Estimate**

Discipline: Ren. Costs Sheet: 3 OF 6
 Prepared by: R. Hampson Date: 4/20/2015
 Updated: S. Jessup Date: 7/11/2018

Integrated Hurricane Sandy General Reevaluation Report and Environmental Impact Statement -
 Project Title: Atlantic Coast of New York - East Rockaway Inlet to Rockaway Inlet and Jamaica Bay Updated: M. Kluijver Date: 7/13/2018
 Consultant Name: Moffatt & Nichol Consultant Contact: M. Kluijver

Item #	Description	Quantity	Unit	Unit Price \$	Total \$	Assumption / Basis
Construction Costs						
WBS	Items					
17	Mob/Demob	1	LS	\$ 3,300,000.00	\$ 3,300,000	
17	Beachfill	1	LS	\$ 13,150,000.00	\$ 13,150,000	
	SUBTOTAL				\$ 16,450,000	
	CONTINGENCY 30.47%				\$ 5,012,000	
	SUBTOTAL				\$ 21,462,000	

Lands & Damages						
WBS	Items					
01	Lands & Damages	1	LS	\$ -	\$ -	
	CONTINGENCY 20%				\$ -	
	SUBTOTAL				\$ -	

Planning, Engineering & Design						
WBS	Items					
30	Planning, Engineering & Design	1	LS	10.00%	\$ 1,645,000	
	CONTINGENCY 15.25%				\$ 251,000	
	SUBTOTAL				\$ 1,896,000	

Construction Management						
WBS	Items					
30	Construction Management	1	LS	8.15%	\$ 1,341,000	
	CONTINGENCY 15.25%				\$ 205,000	
	SUBTOTAL				\$ 1,546,000	

First Cost		\$ 24,904,000
Escalation 2Q 2016 to 2Q 2018	3.31%	\$ 823,000
Interest During Construction		\$ -
Total Renourishment Cost		\$ 25,727,000

Annualized TotalRenourishment Cost **\$ 5,950,000** from ammoritization file

Interest Rate 2.750%
 Life 50
 Capital Recovery Factor 0.03704
 Present Value Factor 5.61125

Contract No.: W912DS-09-0009
 Task Order No.: 26

Alternative 3n - Medium
Feasibility Estimate

Discipline: Beachfill-Initial Sheet: 4 OF 6
 Prepared by: R. Hampson Date: 4/20/2015
 Updated: S. Jessup Date: 7/11/2018

Integrated Hurricane Sandy General Reevaluation Report and Environmental Impact
 Statement - Atlantic Coast of New York - East Rockaway Inlet to Rockaway Inlet and Jamaica

Project Title: Bay Updated: M. Kluijver Date: 7/13/2018

Consultant Name: Moffatt & Nichol Consultant Contact: M. Kluijver

Item #	Description	Quantity	Unit	Unit Price \$	Total \$	Assumption / Basis
Beachfill - Initial Construction						
Items						
1	Beachfill-Reach 1	-	CY	\$ 12.88	\$ -	
2	Beachfill-Reach 2	-	CY	\$ 12.88	\$ -	
3	Beachfill-Reach 3	356,000	CY	\$ 12.88	\$ 4,585,280	design + advance fill
4	Beachfill-Reach 4	294,000	CY	\$ 12.88	\$ 3,786,720	design + advance fill
5	Beachfill-Reach 5	321,000	CY	\$ 12.88	\$ 4,134,480	design + advance fill
6	Beachfill-Reach 6a	250,000	CY	\$ 12.88	\$ 3,220,000	design + advance fill
7	Beachfill-Reach 6b	20,000	CY	\$ 12.88	\$ 257,600	design + advance fill
8	Dune Grass Planting	61	AC	\$ 20,000.00	\$ 1,220,000	32,000 LF of dune grass planting
	SUBTOTAL		CY		\$ 17,204,000	

General						
Items						
1	Mob/Demob	1	EA	\$ 3,300,000.00	\$ 3,300,000	30" Cutter Head Dredge
	SUBTOTAL				\$ 3,300,000	

TOTAL \$ 20,504,000
 CONTINGENCY 22.41% \$ 4,594,946
 Escalation 2Q 2016 to 2Q 2018 3.31% \$ 830,000
GRAND TOTAL CONSTRUCTION COST \$ **25,928,946**

Contract No.: W912DS-09-0009
 Task Order No.: 26

**Alternative 3n - Medium
 Feasibility Estimate**

Discipline: Groins Sheet: 5 OF 6
 Prepared by: R. Hampson Date: 4/20/2015
 Updated: S. Jessup Date: 7/11/2018

Integrated Hurricane Sandy General Reevaluation Report and Environmental Impact
 Statement - Atlantic Coast of New York - East Rockaway Inlet to Rockaway Inlet and Jamaica

Project Title: Bay Updated: M. Kluijver Date: 7/13/2018
 Consultant Name: Moffatt & Nichol Consultant Contact: M. Kluijver

Item #	Description	Quantity	Unit	Unit Price \$	Total \$	Assumption / Basis
New Groins in Reach 3 & 4						
Items						
1	Armor Stone (4-8 TON)	55,175	TON	\$ 193.30	\$ 10,665,231	12 groins @ a total of 4087 ft
2	Underlayer Stone (500-1500 lbs)	17,983	TON	\$ 104.68	\$ 1,882,440	
3	Core Stone (30-130 lbs)	11,035	TON	\$ 92.87	\$ 1,024,811	
4	Bedding Stone (30-130 lbs)	28,200	CY	\$ 92.87	\$ 2,618,962	
5	Geotextile Filter Fabric	31,470	SY	\$ 23.68	\$ 745,207	
6	Excavation - Sand	94,410	CY	\$ 7.24	\$ 683,526	
	SUBTOTAL				\$ 17,620,000	\$4,311 per LF of groin

New Groin in Reach 6a						
Items						
1	Armor Stone (3-10 TON)	6,838	TON	\$ 193.30	\$ 1,321,785	1 groin @ 526 ft
2	Underlayer Stone (500-1500 lbs)	2,420	TON	\$ 104.68	\$ 253,284	
3	Core Stone (30-130 lbs)	1,473	TON	\$ 92.87	\$ 136,779	
4	Bedding Stone (30-130 lbs)	3,314	CY	\$ 92.87	\$ 307,753	
5	Geotextile Filter Fabric	3,945	SY	\$ 23.68	\$ 93,418	
6	Excavation - Sand	9,784	CY	\$ 7.24	\$ 70,833	
	SUBTOTAL				\$ 2,184,000	\$4,152 per LF of groin

Groin Extensions in Reach 6a						
Items						
1	Armor Stone (10 TON)	19,760	TON	\$ 193.30	\$ 3,819,608	5 groin extensions @ a total of 800'
2	Underlayer & Core Stone (500-1500 lbs)	4,160	TON	\$ 104.68	\$ 435,469	
3	Core Stone (30-130 lbs)	2,640	TON	\$ 92.87	\$ 245,177	
4	Bedding Stone (30-130 lbs)	8,320	CY	\$ 92.87	\$ 772,678	
5	Geotextile Filter Fabric	7,520	SY	\$ 23.68	\$ 178,074	
6	Excavation - Sand	12,240	CY	\$ 7.24	\$ 88,618	
	SUBTOTAL				\$ 5,540,000	\$6,925 per LF of groin

General						
Items						
1	Mob/Demob	1	EA	\$ 2,500,000.00	\$ 2,500,000	
	SUBTOTAL				\$ 2,500,000	

TOTAL		\$ 27,844,000
CONTINGENCY 22.41%		\$ 6,239,840
Escalation 2Q 2016 to 2Q 2018	3.31%	\$ 1,127,000
GRAND TOTAL CONSTRUCTION COST		\$ 35,210,840

Contract No.: W912DS-09-0009
 Task Order No.: 26

Alternative 3n - Medium
Feasibility Estimate

Integrated Hurricane Sandy General Reevaluation Report and Environmental Impact
 Statement - Atlantic Coast of New York - East Rockaway Inlet to Rockaway Inlet and Jamaica

Discipline: Beachfill-Ren Sheet: 6 OF 6
 Prepared by: R. Hampson Date: 4/20/2015
 Updated: S. Jessup Date: 7/11/2018

Project Title: Bay Updated: M. Kluijver Date: 7/13/2018
 Consultant Name: Moffatt & Nichol Consultant Contact: M. Kluijver

Item #	Description	Quantity	Unit	Unit Price \$	Total \$	Assumption / Basis
Beachfill-Renourishment Operation						
Items						
1	Beachfill-Reach 1	-	CY	\$ 12.88	\$ -	estimate for a single renourishment operation
2	Beachfill-Reach 2	-	CY	\$ 12.88	\$ -	renourishment operations occur in 4-year cycles
3	Beachfill-Reach 3	444,000	CY	\$ 12.88	\$ 5,718,720	advance fill - 4-year cycle
4	Beachfill-Reach 4	133,000	CY	\$ 12.88	\$ 1,713,040	advance fill - 4-year cycle
5	Beachfill-Reach 5	444,000	CY	\$ 12.88	\$ 5,718,720	advance fill - 4-year cycle
6	Beachfill-Reach 6a	-	CY	\$ 12.88	\$ -	advance fill - 4-year cycle
	SUBTOTAL	1,021,000	CY		\$ 13,150,000	

General						
Items						
1	Mob/Demob	1	EA	\$ 3,300,000.00	\$ 3,300,000	large hopper dredge
	SUBTOTAL				\$ 3,300,000	

TOTAL		\$ 16,450,000
CONTINGENCY 30.47%		\$ 5,012,000
Escalation 2Q 2016 to 2Q 2018	3.31%	\$ 709,000
GRAND TOTAL CONSTRUCTION COST		\$ 22,171,000

**CSRM ALTERNATIVES
LOW SEA LEVEL CHANGE SCENARIO
ALTERNATIVE 3N LARGE DUNE**

Contract No.: W912DS-09-0009
 Task Order No.: 26

**Alternative 3n - Large
 Feasibility Estimate**

Discipline: Annualized Cost Sheet: 1 OF 6
 Prepared by: R. Hampson Date: 4/20/2015
 Updated: S. Jessup Date: 7/11/2018

Integrated Hurricane Sandy General Reevaluation Report and Environmental Impact Statement -
 Project Title: Atlantic Coast of New York - East Rockaway Inlet to Rockaway Inlet and Jamaica Bay Updated: M. Kluijver Date: 7/13/2018
 Consultant Name: Moffatt & Nichol Consultant Contact: M. Kluijver

Item #	Description	Quantity	Unit	Unit Price \$	Total \$	Assumption / Basis
Annualized Costs						
Items						
1	Total Investment	1	LS	\$ 3,616,000.00	\$ 3,616,000	
2	Renourishment	1	LS	\$ 6,392,000.00	\$ 6,392,000	
3	Major Rehab	1	LS	\$ 332,000.00	\$ 332,000	
4	Groin Maintenance	1	LS	\$ 195,000.00	\$ 195,000	
5	Monitoring	1	LS	\$ 403,000.00	\$ 403,000	
	SUBTOTAL				\$ 10,938,000	

Total Annual Cost \$ 10,938,000

Contract No.: W912DS-09-0009
 Task Order No.: 26

**Alternative 3n - Large
 Feasibility Estimate**

Discipline: First Costs Sheet:
 Prepared by: R. Hampson Date:
 Updated: S. Jessup Date:

Integrated Hurricane Sandy General Reevaluation Report and Environmental Impact Statement - Atlantic
 Project Title: Coast of New York - East Rockaway Inlet to Rockaway Inlet and Jamaica Bay

Updated: M. Kluijver Date:

Consultant Name: Moffatt & Nichol Consultant Contact: M. Kluijver

Item #	Description	Quantity	Unit	Unit Price \$	Total \$	Assumption
Construction Costs						
WBS	Items					
17	Mob/Demob	1	LS	\$ 3,300,000.00	\$ 3,300,000	
17	Beachfill	1	LS	\$ 31,110,000.00	\$ 31,110,000	
10	Mob/Demob	1	LS	\$ 2,500,000.00	\$ 2,500,000	
10	New Groins in Reach 3 & 4	1	LS	\$ 19,483,000.00	\$ 19,483,000	build 12 new groins
10	New Groin in Reach 6	1	LS	\$ 2,333,000.00	\$ 2,333,000	build 1 new groin
10	Groin Extensions in Reach 6	1	LS	\$ 6,786,000.00	\$ 6,786,000	extend 5 groins
	SUBTOTAL				\$ 65,512,000	
	CONTINGENCY 21.64%				\$ 14,177,000	
	SUBTOTAL				\$ 79,689,000	

Lands & Damages						
WBS	Items					
01	Lands & Damages	1	LS	\$ -	\$ -	
	CONTINGENCY 20%				\$ -	
	SUBTOTAL				\$ -	

Planning, Engineering & Design						
WBS	Items					
30	Planning, Engineering & Design	1	LS	10.00%	\$ 6,551,000	
	CONTINGENCY 15.25%				\$ 999,000	
	SUBTOTAL				\$ 7,550,000	

Construction Management						
WBS	Items					
30	Construction Management	1	LS	6.89%	\$ 4,514,000	
	CONTINGENCY 15.25%				\$ 688,000	
	SUBTOTAL				\$ 5,202,000	

First Cost		\$	92,441,000
Escalation 2Q 2016 to 2Q 2018	3.31%	\$	3,056,000
Interest During Construction		\$	2,129,000
Total Investment Cost		\$	97,626,000

Annualized Total Investment Cost \$ **3,616,000**

Interest Rate 2.750%
 Life 50
 Capital Recovery Factor 0.03704
 Construction Period in months 20.19
 IDC Factor 0.022297379

/ Basis

Contract No.: W912DS-09-0009
 Task Order No.: 26

**Alternative 3n - Large
 Feasibility Estimate**

Discipline: Ren. Costs Sheet: 3 OF 6
 Prepared by: R. Hampson Date: 4/20/2015
 Updated: S. Jessup Date: 7/11/2018

Integrated Hurricane Sandy General Reevaluation Report and Environmental Impact Statement -
 Project Title: Atlantic Coast of New York - East Rockaway Inlet to Rockaway Inlet and Jamaica Bay Updated: M. Kluijver Date: 7/13/2018
 Consultant Name: Moffatt & Nichol Consultant Contact: M. Kluijver

Item #	Description	Quantity	Unit	Unit Price \$	Total \$	Assumption / Basis
Construction Costs						
WBS	Items					
17	Mob/Demob	1	LS	\$ 3,300,000.00	\$ 3,300,000	
17	Beachfill	1	LS	\$ 14,387,000.00	\$ 14,387,000	
	SUBTOTAL				\$ 17,687,000	
	CONTINGENCY 30.47%				\$ 5,389,000	
	SUBTOTAL				\$ 23,076,000	

Lands & Damages						
WBS	Items					
01	Lands & Damages	1	LS	\$ -	\$ -	
	CONTINGENCY 20%				\$ -	
	SUBTOTAL				\$ -	

Planning, Engineering & Design						
WBS	Items					
30	Planning, Engineering & Design	1	LS	10.00%	\$ 1,769,000	
	CONTINGENCY 15.25%				\$ 270,000	
	SUBTOTAL				\$ 2,039,000	

Construction Management						
WBS	Items					
30	Construction Management	1	LS	8.08%	\$ 1,429,000	
	CONTINGENCY 15.25%				\$ 218,000	
	SUBTOTAL				\$ 1,647,000	

First Cost		\$ 26,762,000
Escalation 2Q 2016 to 2Q 2018	3.31%	\$ 885,000
Interest During Construction		\$ -
Total Renourishment Cost		\$ 27,647,000

Annualized TotalRenourishment Cost \$ **6,392,000**

Interest Rate 2.750%
 Life 50
 Capital Recovery Factor 0.03704
 Present Value Factor 5.61125

Contract No.: W912DS-09-0009
 Task Order No.: 26

**Alternative 3n - Large
 Feasibility Estimate**

Discipline: Beachfill-Initial Sheet: 4 OF 6
 Prepared by: R. Hampson Date: 4/20/2015
 Updated: S. Jessup Date: 7/11/2018

Integrated Hurricane Sandy General Reevaluation Report and Environmental Impact
 Statement - Atlantic Coast of New York - East Rockaway Inlet to Rockaway Inlet and Jamaica

Project Title: Bay Updated: M. Kluijver Date: 7/13/2018
 Consultant Name: Moffatt & Nichol Consultant Contact: M. Kluijver

Item #	Description	Quantity	Unit	Unit Price \$	Total \$	Assumption / Basis
Beachfill - Initial Construction						
Items						
1	Beachfill-Reach 1	-	CY	\$ 12.88	\$ -	
2	Beachfill-Reach 2	-	CY	\$ 12.88	\$ -	
3	Beachfill-Reach 3	611,000	CY	\$ 12.88	\$ 7,869,680	design + advance fill
4	Beachfill-Reach 4	478,000	CY	\$ 12.88	\$ 6,156,640	design + advance fill
5	Beachfill-Reach 5	758,000	CY	\$ 12.88	\$ 9,763,040	design + advance fill
6	Beachfill-Reach 6a	417,000	CY	\$ 12.88	\$ 5,370,960	design + advance fill
7	Beachfill-Reach 6b	38,000	CY	\$ 12.88	\$ 489,440	design + advance fill
8	Dune Grass Planting	73	AC	\$ 20,000.00	\$ 1,460,000	32,000 LF of dune grass planting
	SUBTOTAL		CY		\$ 31,110,000	

General						
Items						
1	Mob/Demob	1	EA	\$ 3,300,000.00	\$ 3,300,000	30" Cutter Head Dredge
	SUBTOTAL				\$ 3,300,000	

TOTAL		\$	34,410,000
CONTINGENCY 21.64%		\$	7,446,324
Escalation 2Q 2016 to 2Q 2018	3.31%	\$	1,384,000
GRAND TOTAL CONSTRUCTION COST		\$	43,240,324

Contract No.: W912DS-09-0009
 Task Order No.: 26

**Alternative 3n - Large
 Feasibility Estimate**

Discipline: Groins Sheet: 5 OF 6
 Prepared by: R. Hampson Date: 4/20/2015
 Updated: S. Jessup Date: 7/11/2018

Integrated Hurricane Sandy General Reevaluation Report and Environmental Impact
 Statement - Atlantic Coast of New York - East Rockaway Inlet to Rockaway Inlet and Jamaica

Project Title: Bay Updated: M. Kluijver Date: 7/13/2018
 Consultant Name: Moffatt & Nichol Consultant Contact: M. Kluijver

Item #	Description	Quantity	Unit	Unit Price \$	Total \$	Assumption / Basis
New Groins in Reach 3 & 4						
Items						
1	Armor Stone (4-8 TON)	61,007	TON	\$ 193.30	\$ 11,792,556	12 groins @ a total of 4519 ft
2	Underlayer Stone (500-1500 lbs)	19,884	TON	\$ 104.68	\$ 2,081,415	
3	Core Stone (30-130 lbs)	12,201	TON	\$ 92.87	\$ 1,133,135	
4	Bedding Stone (30-130 lbs)	31,181	CY	\$ 92.87	\$ 2,895,789	
5	Geotextile Filter Fabric	34,796	SY	\$ 23.68	\$ 823,976	
6	Excavation - Sand	104,389	CY	\$ 7.24	\$ 755,776	
	SUBTOTAL				\$ 19,483,000	<i>\$4,311 per LF of groin</i>

New Groin in Reach 6a						
Items						
1	Armor Stone (3-10 TON)	7,306	TON	\$ 193.30	\$ 1,412,250	1 groin @ 562 ft
2	Underlayer Stone (500-1500 lbs)	2,585	TON	\$ 104.68	\$ 270,619	
3	Core Stone (30-130 lbs)	1,574	TON	\$ 92.87	\$ 146,140	
4	Bedding Stone (30-130 lbs)	3,541	CY	\$ 92.87	\$ 328,816	
5	Geotextile Filter Fabric	4,215	SY	\$ 23.68	\$ 99,811	
6	Excavation - Sand	10,453	CY	\$ 7.24	\$ 75,681	
	SUBTOTAL				\$ 2,333,000	<i>\$4,151 per LF of groin</i>

Groin Extensions in Reach 6a						
Items						
1	Armor Stone (10 TON)	24,206	TON	\$ 193.30	\$ 4,679,020	5 groin extensions @ a total of 980'
2	Underlayer & Core Stone (500-1500 lbs)	5,096	TON	\$ 104.68	\$ 533,449	
3	Core Stone (30-130 lbs)	3,234	TON	\$ 92.87	\$ 300,342	
4	Bedding Stone (30-130 lbs)	10,192	CY	\$ 92.87	\$ 946,531	
5	Geotextile Filter Fabric	9,212	SY	\$ 23.68	\$ 218,140	
6	Excavation - Sand	14,994	CY	\$ 7.24	\$ 108,557	
	SUBTOTAL				\$ 6,786,000	<i>\$6,924 per LF of groin</i>

General						
Items						
1	Mob/Demob	1	EA	\$ 2,500,000.00	\$ 2,500,000	
	SUBTOTAL				\$ 2,500,000	

TOTAL		\$ 31,102,000
CONTINGENCY 21.64%		\$ 6,730,473
Escalation 2Q 2016 to 2Q 2018	3.31%	\$ 1,251,000
GRAND TOTAL CONSTRUCTION COST		\$ 39,083,473

Contract No.: W912DS-09-0009
 Task Order No.: 26

**Alternative 3n - Large
 Feasibility Estimate**

Discipline: Beachfill-Ren Sheet: 6 OF 6
 Prepared by: R. Hampson Date: 4/20/2015
 Updated: S. Jessup Date: 7/11/2018

Integrated Hurricane Sandy General Reevaluation Report and Environmental Impact
 Statement - Atlantic Coast of New York - East Rockaway Inlet to Rockaway Inlet and Jamaica

Project Title: Bay Updated: M. Kluijver Date: 7/13/2018
 Consultant Name: Moffatt & Nichol Consultant Contact: M. Kluijver

Item #	Description	Quantity	Unit	Unit Price \$	Total \$	Assumption / Basis
Beachfill-Renourishment Operation						
Items						
1	Beachfill-Reach 1	-	CY	\$ 12.88	\$ -	estimate for a single renourishment operation
2	Beachfill-Reach 2	-	CY	\$ 12.88	\$ -	renourishment operations occur in 4-year cycles
3	Beachfill-Reach 3	511,000	CY	\$ 12.88	\$ 6,581,680	advance fill - 4-year cycle
4	Beachfill-Reach 4	133,000	CY	\$ 12.88	\$ 1,713,040	advance fill - 4-year cycle
5	Beachfill-Reach 5	473,000	CY	\$ 12.88	\$ 6,092,240	advance fill - 4-year cycle
6	Beachfill-Reach 6a	-	CY	\$ 12.88	\$ -	advance fill - 4-year cycle
	SUBTOTAL	1,117,000	CY		\$ 14,387,000	

General						
Items						
1	Mob/Demob	1	EA	\$ 3,300,000.00	\$ 3,300,000	large hopper dredge
	SUBTOTAL				\$ 3,300,000	

TOTAL		\$ 17,687,000
CONTINGENCY 30.47%		\$ 5,389,000
Escalation 2Q 2016 to 2Q 2018	3.31%	\$ 763,000
GRAND TOTAL CONSTRUCTION COST		\$ 23,839,000

Contract No.: W912DS-09-0009
 Task Order No.: 26

Alternative 3n - XL
Feasibility Estimate

Discipline: Annualized Cost Sheet: 1 OF 7
 Prepared by: R. Hampson Date: 5/1/2015
 Updated: S. Jessup Date: 7/11/2018

Integrated Hurricane Sandy General Reevaluation Report and Environmental Impact Statement -
 Project Title: Atlantic Coast of New York - East Rockaway Inlet to Rockaway Inlet and Jamaica Bay Updated: M. Kluijver Date: 7/13/2018
 Consultant Name: Moffatt & Nichol Consultant Contact: M. Kluijver

Item #	Description	Quantity	Unit	Unit Price \$	Total \$	Assumption / Basis
Annualized Costs						
Items						
1	Total Investment	1	LS	\$ 5,581,000.00	\$ 5,581,000	
2	Renourishment	1	LS	\$ 6,829,000.00	\$ 6,829,000	
3	Major Rehab	1	LS	\$ 332,000.00	\$ 332,000	
4	Groin Maintenance	1	LS	\$ 218,000.00	\$ 218,000	
5	Monitoring	1	LS	\$ 403,000.00	\$ 403,000	
	SUBTOTAL				\$ 13,363,000	

Total Annual Cost

\$ 13,363,000

**CSRM ALTERNATIVES
LOW SEA LEVEL CHANGE SCENARIO
ALTERNATIVE 3N BURRIED SEAWALL**

Contract No.: W912DS-09-0009
 Task Order No.: 26

Alternative 3n - XL
Feasibility Estimate

Discipline: First Costs Sheet: 2 OF 7
 Prepared by: R. Hampson Date: 5/1/2015
 Updated: S. Jessup Date: 7/11/2018

Project Title: Integrated Hurricane Sandy General Reevaluation Report and Environmental Impact Statement - Atlantic Coast of New York - East Rockaway Inlet to Rockaway Inlet and Jamaica Bay Updated: M. Kluijver Date: 7/13/2018
 Consultant Name: Moffatt & Nichol Consultant Contact: M. Kluijver

Item #	Description	Quantity	Unit	Unit Price \$	Total \$	Assumption / Basis
Construction Costs						
WBS	Items					
17	Mob/Demob	1	LS	\$ 6,600,000.00	\$ 6,600,000	
17	Beachfill	1	LS	\$ 52,885,000.00	\$ 52,885,000	
2	Access Ramps	8	LS	\$ 825,000.00	\$ 6,600,000	Demo & Rebuild 8 Concrete Access Ramps
10	Mob/Demob	1	LS	\$ 2,500,000.00	\$ 2,500,000	
10	New Groins in Reach 3 & 4	1	LS	\$ 21,345,000.00	\$ 21,345,000	build 12 new groins
10	New Groin in Reach 6	1	LS	\$ 2,483,000.00	\$ 2,483,000	build 1 new groin
10	Groin Extensions in Reach 6	1	LS	\$ 8,032,000.00	\$ 8,032,000	extend 5 groins
	SUBTOTAL				\$ 100,445,000	
	CONTINGENCY 22.84%				\$ 22,942,000	
	SUBTOTAL				\$ 123,387,000	

Lands & Damages						
WBS	Items					
01	Lands & Damages	1	LS	\$ -	\$ -	
	CONTINGENCY 20%				\$ -	
	SUBTOTAL				\$ -	

Planning, Engineering & Design						
WBS	Items					
30	Planning, Engineering & Design	1	LS	10.00%	\$ 10,045,000	
	CONTINGENCY 15.25%				\$ 1,532,000	
	SUBTOTAL				\$ 11,577,000	

Construction Management						
WBS	Items					
30	Construction Management	1	LS	6.50%	\$ 6,529,000	
	CONTINGENCY 15.25%				\$ 996,000	
	SUBTOTAL				\$ 7,525,000	

First Cost		\$ 142,489,000
Escalation 2Q 2016 to 2Q 2018	3.31%	\$ 4,710,000
Interest During Construction		\$ 3,462,000
Total Investment Cost		\$ 150,661,000

Annualized Total Investment Cost \$ **5,581,000**

Interest Rate 2.750%
 Life 50
 Capital Recovery Factor 0.03704
 Construction Period in months 21.22
 IDC Factor 0.023517518

Contract No.: W912DS-09-0009
 Task Order No.: 26

**Alternative 3n - XL
 Feasibility Estimate**

Discipline: Ren. Costs Sheet: 3 OF 7
 Prepared by: R. Hampson Date: 5/1/2015
 Updated: S. Jessup Date: 7/11/2018

Integrated Hurricane Sandy General Reevaluation Report and Environmental Impact Statement -
 Project Title: Atlantic Coast of New York - East Rockaway Inlet to Rockaway Inlet and Jamaica Bay Updated: M. Kluijver Date: 7/13/2018
 Consultant Name: Moffatt & Nichol Consultant Contact: M. Kluijver

Item #	Description	Quantity	Unit	Unit Price \$	Total \$	Assumption / Basis
Construction Costs						
WBS	Items					
17	Mob/Demob	1	LS	\$ 3,300,000.00	\$ 3,300,000	
17	Beachfill	1	LS	\$ 15,611,000.00	\$ 15,611,000	
	SUBTOTAL				\$ 18,911,000	
	CONTINGENCY 30.47%				\$ 5,762,000	
	SUBTOTAL				\$ 24,673,000	

Lands & Damages						
WBS	Items					
01	Lands & Damages	1	LS	\$ -	\$ -	
	CONTINGENCY 20%				\$ -	
	SUBTOTAL				\$ -	

Planning, Engineering & Design						
WBS	Items					
30	Planning, Engineering & Design	1	LS	10.00%	\$ 1,891,000	
	CONTINGENCY 15.25%				\$ 288,000	
	SUBTOTAL				\$ 2,179,000	

Construction Management						
WBS	Items					
30	Construction Management	1	LS	8.02%	\$ 1,517,000	
	CONTINGENCY 15.25%				\$ 231,000	
	SUBTOTAL				\$ 1,748,000	

First Cost		\$ 28,600,000
Escalation 2Q 2016 to 2Q 2018	3.31%	\$ 945,000
Interest During Construction		\$ -
Total Renourishment Cost		\$ 29,545,000

Annualized TotalRenourishment Cost **\$ 6,829,000** from amortization file

Interest Rate	2.750%
Life	50
Capital Recovery Factor	0.03704
Present Value Factor	5.61125

Contract No.: W912DS-09-0009 **Alternative 3n - XL**
 Task Order No.: 26 **Feasibility Estimate**
 Integrated Hurricane Sandy General Reevaluation Report and Environmental Impact
 Statement - Atlantic Coast of New York - East Rockaway Inlet to Rockaway Inlet and Jamaica
 Project Title: Bay
 Consultant Name: Moffatt & Nichol

Discipline: Beachfill-Initial Sheet: 4 OF 7
 Prepared by: R. Hampson Date: 5/1/2015
 Updated: S. Jessup Date: 7/11/2018
 Updated: M. Kluijver Date: 7/13/2018
 Consultant Contact: M. Kluijver

Item #	Description	Quantity	Unit	Unit Price \$	Total \$	Assumption / Basis
Beachfill - Initial Construction						
Items						
1	Beachfill-Reach 1	-	CY	\$ 12.88	\$ -	
2	Beachfill-Reach 2	-	CY	\$ 12.88	\$ -	
3	Beachfill-Reach 3	1,044,000	CY	\$ 12.88	\$ 13,446,720	design + advance fill
4	Beachfill-Reach 4	827,000	CY	\$ 12.88	\$ 10,651,760	design + advance fill
5	Beachfill-Reach 5	1,424,000	CY	\$ 12.88	\$ 18,341,120	design + advance fill
6	Beachfill-Reach 6a	621,000	CY	\$ 12.88	\$ 7,998,480	design + advance fill
7	Beachfill-Reach 6b	58,000	CY	\$ 12.88	\$ 747,040	design + advance fill
8	Dune Grass Planting	85	AC	\$ 20,000.00	\$ 1,700,000	32,000 LF of dune grass planting
	SUBTOTAL		CY		\$ 52,885,000	

General						
Items						
1	Mob/Demob	2	EA	\$ 3,300,000.00	\$ 6,600,000	30" Cutter Head Dredge
	SUBTOTAL				\$ 6,600,000	

TOTAL		\$	59,485,000
CONTINGENCY 22.84%		\$	13,586,374
Escalation 2Q 2016 to 2Q 2018	3.31%	\$	2,415,000
GRAND TOTAL CONSTRUCTION COST		\$	75,486,374

Contract No.: W912DS-09-0009
 Task Order No.: 26

Alternative 3n - XL
Feasibility Estimate
 Integrated Hurricane Sandy General Reevaluation Report and Environmental Impact
 Statement - Atlantic Coast of New York - East Rockaway Inlet to Rockaway Inlet and Jamaica

Discipline: Groins Sheet: 5 OF 7
 Prepared by: R. Hampson Date: 5/1/2015
 Updated: S. Jessup Date: 7/11/2018

Project Title: Bay Updated: M. Kluijver Date: 7/13/2018
 Consultant Name: Moffatt & Nichol Consultant Contact: M. Kluijver

Item #	Description	Quantity	Unit	Unit Price \$	Total \$	Assumption / Basis
New Groins in Reach 3 & 4						
Items						
1	Armor Stone (4-8 TON)	66,839	TON	\$ 193.30	\$ 12,919,882	12 groins @ a total of 4087 ft
2	Underlayer Stone (500-1500 lbs)	21,784	TON	\$ 104.68	\$ 2,280,391	
3	Core Stone (30-130 lbs)	13,368	TON	\$ 92.87	\$ 1,241,458	
4	Bedding Stone (30-130 lbs)	34,162	CY	\$ 92.87	\$ 3,172,616	
5	Geotextile Filter Fabric	38,123	SY	\$ 23.68	\$ 902,746	
6	Excavation - Sand	114,368	CY	\$ 7.24	\$ 828,025	
	SUBTOTAL				\$ 21,345,000	<i>\$4,311 per LF of groin</i>

New Groin in Reach 6a						
Items						
1	Armor Stone (3-10 TON)	7,774	TON	\$ 193.30	\$ 1,502,714	1 groin @ 526 ft
2	Underlayer Stone (500-1500 lbs)	2,751	TON	\$ 104.68	\$ 287,954	
3	Core Stone (30-130 lbs)	1,674	TON	\$ 92.87	\$ 155,502	
4	Bedding Stone (30-130 lbs)	3,767	CY	\$ 92.87	\$ 349,878	
5	Geotextile Filter Fabric	4,485	SY	\$ 23.68	\$ 106,205	
6	Excavation - Sand	11,123	CY	\$ 7.24	\$ 80,529	
	SUBTOTAL				\$ 2,483,000	<i>\$4,152 per LF of groin</i>

Groin Extensions in Reach 6a						
Items						
1	Armor Stone (10 TON)	28,652	TON	\$ 193.30	\$ 5,538,432	5 groin extensions @ a total of 800'
2	Underlayer & Core Stone (500-1500 lbs)	6,032	TON	\$ 104.68	\$ 631,430	
3	Core Stone (30-130 lbs)	3,828	TON	\$ 92.87	\$ 355,506	
4	Bedding Stone (30-130 lbs)	12,064	CY	\$ 92.87	\$ 1,120,384	
5	Geotextile Filter Fabric	10,904	SY	\$ 23.68	\$ 258,207	
6	Excavation - Sand	17,748	CY	\$ 7.24	\$ 128,496	
	SUBTOTAL				\$ 8,032,000	<i>\$6,924 per LF of groin</i>

General						
Items						
1	Mob/Demob	1	EA	\$ 2,500,000.00	\$ 2,500,000	
	SUBTOTAL				\$ 2,500,000	

TOTAL		\$ 34,360,000
CONTINGENCY 22.84%		\$ 7,847,824
Escalation 2Q 2016 to 2Q 2018	3.31%	\$ 1,395,000
GRAND TOTAL CONSTRUCTION COST		\$ 43,602,824

Contract No.: W912DS-09-0009
 Task Order No.: 26

Alternative 3n - XL
Feasibility Estimate
 Integrated Hurricane Sandy General Reevaluation Report and Environmental Impact
 Statement - Atlantic Coast of New York - East Rockaway Inlet to Rockaway Inlet and Jamaica

Discipline: Beachfill-Ren Sheet: 6 OF 7
 Prepared by: R. Hampson Date: 5/1/2015
 Updated: S. Jessup Date: 7/11/2018

Project Title: Bay Updated: M. Kluijver Date: 7/13/2018
 Consultant Name: Moffatt & Nichol Consultant Contact: M. Kluijver

Item #	Description	Quantity	Unit	Unit Price \$	Total \$	Assumption / Basis
Beachfill-Renourishment Operation						
Items						
1	Beachfill-Reach 1	-	CY	\$ 12.88	\$ -	estimate for a single renourishment operation
2	Beachfill-Reach 2	-	CY	\$ 12.88	\$ -	renourishment operations occur in 4-year cycles
3	Beachfill-Reach 3	577,000	CY	\$ 12.88	\$ 7,431,760	advance fill - 4-year cycle
4	Beachfill-Reach 4	133,000	CY	\$ 12.88	\$ 1,713,040	advance fill - 4-year cycle
5	Beachfill-Reach 5	502,000	CY	\$ 12.88	\$ 6,465,760	advance fill - 4-year cycle
6	Beachfill-Reach 6a	-	CY	\$ 12.88	\$ -	advance fill - 4-year cycle
	SUBTOTAL	1,212,000	CY		\$ 15,611,000	

General						
Items						
1	Mob/Demob	1	EA	\$ 3,300,000.00	\$ 3,300,000	large hopper dredge
	SUBTOTAL				\$ 3,300,000	

TOTAL		\$ 18,911,000
CONTINGENCY 30.47%		\$ 5,762,000
Escalation 2Q 2016 to 2Q 2018	3.31%	\$ 816,000
GRAND TOTAL CONSTRUCTION COST		\$ 25,489,000

Contract No.: W912DS-09-0009
 Task Order No.: 26

Alternative 3n - XL
Feasibility Estimate
 Integrated Hurricane Sandy General Reevaluation Report and Environmental Impact
 Statement - Atlantic Coast of New York - East Rockaway Inlet to Rockaway Inlet and Jamaica

Discipline: Structural Sheet: 7 OF 7
 Prepared by: R. Hampson Date: 5/1/2015
 Updated: S. Jessup Date: 7/11/2018

Project Title: Bay Updated: M. Kluijver Date: 7/13/2018
 Consultant Name: Moffatt & Nichol Consultant Contact: M. Kluijver

Item #	Description	Quantity	Unit	Unit Price \$	Total \$	Assumption / Basis
Boardwalk Access Ramps						
Items						
1	24" Steel Pipe Pile	342	LF	\$ 135.00	\$ 46,170	9 piles @ 24x1/2" WT (38 ft long)
2	Precast Concrete Pile Cap	46	CY	\$ 1,500.00	\$ 69,000	9 caps @ 5.1 cy each
3	Cast in Place Concrete Plug	6	CY	\$ 500.00	\$ 3,000	9 plugs
4	Cast in Place Concrete Deck	18	CY	\$ 1,000.00	\$ 17,500	9 @ 4'6" x 10' x 14"
5	Precast Concrete Deck	102	CY	\$ 1,000.00	\$ 102,000	278' x 10' x 14"
6	RPL Decking	2,780	SF	\$ 50.00	\$ 139,000	Furnish and Install
7	Handrail	556	LF	\$ 150.00	\$ 83,400	Furnish and Install
SUBTOTAL					\$ 460,000	

Demolition						
Items						
1	Access Ramps	2,780	SF	\$ 35.00	\$ 97,300	Demo and Dispose of Access Ramp
SUBTOTAL					\$ 97,000	

General						
Items						
1	Mob/Demob	0.125	EA	\$ 1,000,000.00	\$ 125,000	
SUBTOTAL					\$ 125,000	

SUBTOTAL	\$ 682,000
GENERAL CONDITIONS 10%	\$ 68,000
SUBTOTAL (ALL ITEMS)	\$ 750,000
G. C. OVERHEAD & PROFIT 10%	\$ 75,000
TOTAL	\$ 825,000
CONTINGENCY 22.84%	\$ 188,000
Escalation 2Q 2016 to 2Q 2018 3.31%	\$ 33,000
GRAND TOTAL CONSTRUCTION COST	\$ 1,046,000

Contract No.: W912DS-09-0009
 Task Order No.: 26

**Alternative 3n - Buried Seawall
 Feasibility Estimate**

Discipline: Annualized Cost Sheet: 1 OF 7
 Prepared by: R. Hampson Date: 4/20/2015
 Updated: S. Jessup Date: 7/11/2018

Integrated Hurricane Sandy General Reevaluation Report and Environmental Impact Statement -
 Project Title: Atlantic Coast of New York - East Rockaway Inlet to Rockaway Inlet and Jamaica Bay Updated: M. Kluijver Date: 7/13/2018
 Consultant Name: Moffatt & Nichol Consultant Contact: M. Kluijver

Item #	Description	Quantity	Unit	Unit Price \$	Total \$	Assumption / Basis
Annualized Costs						
Items						
1	Total Investment	1	LS	\$ 5,898,000.00	\$ 5,898,000	
2	Renourishment	1	LS	\$ 5,950,000.00	\$ 5,950,000	
3	Major Rehab	1	LS	\$ 332,000.00	\$ 332,000	
4	Groin & Seawall Maintenance	1	LS	\$ 324,000.00	\$ 324,000	
5	Monitoring	1	LS	\$ 403,000.00	\$ 403,000	
	SUBTOTAL				\$ 12,907,000	

Total Annual Cost \$ 12,907,000

Contract No.: W912DS-09-0009
 Task Order No.: 26

**Alternative 3n - Buried Seawall
 Feasibility Estimate**

Discipline: First Costs Sheet: 2 OF 7
 Prepared by: R. Hampson Date: 4/20/2015
 Updated: S. Jessup Date: 7/11/2018

Integrated Hurricane Sandy General Reevaluation Report and Environmental Impact Statement -
 Project Title: Atlantic Coast of New York - East Rockaway Inlet to Rockaway Inlet and Jamaica Bay Updated: M. Kluijver Date: 7/13/2018
 Consultant Name: Moffatt & Nichol Consultant Contact: M. Kluijver

Item #	Description	Quantity	Unit	Unit Price \$	Total \$	Assumption / Basis
Construction Costs						
WBS	Items					
17	Mob/Demob	1	LS	\$ 3,300,000.00	\$ 3,300,000	
17	Beachfill	1	LS	\$ 17,444,000.00	\$ 17,444,000	
10	Mob/Demob - Groins	1	LS	\$ 2,500,000.00	\$ 2,500,000	
10	New Groins in Reach 3 & 4	1	LS	\$ 17,620,000.00	\$ 17,620,000	build 12 new groins
10	New Groin in Reach 6	1	LS	\$ 2,184,000.00	\$ 2,184,000	build 1 new groin
10	Groin Extensions in Reach 6	1	LS	\$ 5,540,000.00	\$ 5,540,000	extend 5 groins
10	Mob/Demob - Seawall	1	LS	\$ 2,600,000.00	\$ 2,600,000	
10	Buried Seawall	1	LS	\$ 53,674,000.00	\$ 53,674,000	32,000 lf of buried seawall
	SUBTOTAL				\$ 104,862,000	
	CONTINGENCY 24.56%				\$ 25,754,000	
	SUBTOTAL				\$ 130,616,000	

Lands & Damages						
WBS	Items					
01	Lands & Damages	1	LS	\$ -	\$ -	
	CONTINGENCY 20%				\$ -	
	SUBTOTAL				\$ -	

Planning, Engineering & Design						
WBS	Items					
30	Planning, Engineering & Design	1	LS	10.00%	\$ 10,486,000	
	CONTINGENCY 15.25%				\$ 1,599,000	
	SUBTOTAL				\$ 12,085,000	

Construction Management						
WBS	Items					
30	Construction Management	1	LS	6.46%	\$ 6,774,000	
	CONTINGENCY 15.25%				\$ 1,033,000	
	SUBTOTAL				\$ 7,807,000	

First Cost		\$ 150,508,000
Escalation 2Q 2016 to 2Q 2018	3.31%	\$ 4,975,000
Interest During Construction		\$ 3,752,000
Total Investment Cost		\$ 159,235,000
Annualized Total Investment Cost		\$ 5,898,000

Interest Rate	2.750%
Life	50
Capital Recovery Factor	0.03704
Construction Period in months	21.75
IDC Factor	0.024133159

Contract No.: W912DS-09-0009
 Task Order No.: 26

**Alternative 3n - Buried Seawall
 Feasibility Estimate**

Discipline: Ren. Costs Sheet: 3 OF 7
 Prepared by: R. Hampson Date: 4/20/2015
 Updated: S. Jessup Date: 7/11/2018

Project Title: Integrated Hurricane Sandy General Reevaluation Report and Environmental Impact Statement - Atlantic Coast of New York - East Rockaway Inlet to Rockaway Inlet and Jamaica Bay Updated: M. Kluijver Date: 7/13/2018
 Consultant Name: Moffatt & Nichol Consultant Contact: M. Kluijver

Item #	Description	Quantity	Unit	Unit Price \$	Total \$	Assumption / Basis
Construction Costs						
WBS	Items					
17	Mob/Demob	1	LS	\$ 3,300,000.00	\$ 3,300,000	
17	Beachfill	1	LS	\$ 13,150,000.00	\$ 13,150,000	
	SUBTOTAL				\$ 16,450,000	
	CONTINGENCY 30.47%				\$ 5,012,000	
	SUBTOTAL				\$ 21,462,000	

Lands & Damages						
WBS	Items					
01	Lands & Damages	1	LS	\$ -	\$ -	
	CONTINGENCY 20%				\$ -	
	SUBTOTAL				\$ -	

Planning, Engineering & Design						
WBS	Items					
30	Planning, Engineering & Design	1	LS	10.00%	\$ 1,645,000	
	CONTINGENCY 15.25%				\$ 251,000	
	SUBTOTAL				\$ 1,896,000	

Construction Management						
WBS	Items					
30	Construction Management	1	LS	8.15%	\$ 1,341,000	
	CONTINGENCY 15.25%				\$ 205,000	
	SUBTOTAL				\$ 1,546,000	

First Cost		\$ 24,904,000
Escalation 2Q 2016 to 2Q 2018	3.31%	\$ 823,000
Interest During Construction		\$ -
Total Renourishment Cost		\$ 25,727,000

Annualized TotalRenourishment Cost **\$ 5,950,000** from amortization file

Interest Rate 2.750%
 Life 50
 Capital Recovery Factor 0.03704
 Present Value Factor 5.61125

Contract No.: W912DS-09-0009
 Task Order No.: 26

**Alternative 3n - Buried Seawall
 Feasibility Estimate**

Discipline: Beachfill-Initial Sheet: 4 OF 7
 Prepared by: R. Hampson Date: 4/20/2015
 Updated: S. Jessup Date: 7/11/2018

Integrated Hurricane Sandy General Reevaluation Report and Environmental Impact
 Statement - Atlantic Coast of New York - East Rockaway Inlet to Rockaway Inlet and Jamaica

Project Title: Bay Updated: M. Kluijver Date: 7/13/2018
 Consultant Name: Moffatt & Nichol Consultant Contact: M. Kluijver

Item #	Description	Quantity	Unit	Unit Price \$	Total \$	Assumption / Basis
Beachfill - Initial Construction						
Items						
1	Beachfill-Reach 1	-	CY	\$ 12.88	\$ -	
2	Beachfill-Reach 2	-	CY	\$ 12.88	\$ -	
3	Beachfill-Reach 3	356,000	CY	\$ 12.88	\$ 4,585,280	design + advance fill
4	Beachfill-Reach 4	294,000	CY	\$ 12.88	\$ 3,786,720	design + advance fill
5	Beachfill-Reach 5	321,000	CY	\$ 12.88	\$ 4,134,480	design + advance fill
6	Beachfill-Reach 6a	250,000	CY	\$ 12.88	\$ 3,220,000	design + advance fill
7	Beachfill-Reach 6b	20,000	CY	\$ 12.88	\$ 257,600	design + advance fill
8	Dune Grass Planting	73	AC	\$ 20,000.00	\$ 1,460,000	32,000 LF of dune grass planting
	SUBTOTAL		CY		\$ 17,444,000	

General						
Items						
1	Mob/Demob	1	EA	\$ 3,300,000.00	\$ 3,300,000	30" Cutter Head Dredge
	SUBTOTAL				\$ 3,300,000	

TOTAL		\$ 20,744,000
CONTINGENCY 24.56%		\$ 5,094,726
Escalation 2Q 2016 to 2Q 2018	3.31%	\$ 854,000
GRAND TOTAL CONSTRUCTION COST		\$ 26,692,726

Contract No.: W912DS-09-0009
 Task Order No.: 26

**Buried Seawall
 Feasibility Estimate**

Discipline: Buried Seawall Sheet: 5 OF 7
 Prepared by: R. Hampson Date: 3/24/2015
 Updated: S. Jessup Date: 7/11/2018

Integrated Hurricane Sandy General Reevaluation Report and Environmental Impact
 Statement - Atlantic Coast of New York - East Rockaway Inlet to Rockaway Inlet and Jamaica

Project Title: Bay Updated: M. Kluijver Date: 7/13/2018
 Consultant Name: Moffatt & Nichol Consultant Contact: M. Kluijver

Item #	Description	Quantity	Unit	Unit Price \$	Total \$	Assumption / Basis
Buried Seawall						
Items						
1	Armor Stone (1.5 TON)	272,960	TON	\$ 124.71	\$ 34,040,842	
2	Core Stone	202,560	TON	\$ 87.47	\$ 17,717,923	
3	Geotextile	155,520	SY	\$ 7.72	\$ 1,200,614	
4	Excavation - Sand	186,560	CY	\$ 3.83	\$ 714,525	
	SUBTOTAL				\$ 53,674,000	

General						
Items						
1	Mob/Demob	2	EA	\$ 1,300,000.00	\$ 2,600,000	
	SUBTOTAL				\$ 2,600,000	

TOTAL		\$ 56,274,000
CONTINGENCY 24.56%		\$ 13,820,894
Escalation 2Q 2016 to 2Q 2018	3.31%	\$ 2,317,000
GRAND TOTAL CONSTRUCTION COST		\$ 72,411,894

Contract No.: W912DS-09-0009
 Task Order No.: 26

**Alternative 3n - Buried Seawall
 Feasibility Estimate**

Discipline: Groins Sheet: 6 OF 7
 Prepared by: R. Hampson Date: 4/20/2015
 Updated: S. Jessup Date: 7/11/2018

Integrated Hurricane Sandy General Reevaluation Report and Environmental Impact
 Statement - Atlantic Coast of New York - East Rockaway Inlet to Rockaway Inlet and Jamaica

Project Title: Bay Updated: M. Kluijver Date: 7/13/2018
 Consultant Name: Moffatt & Nichol Consultant Contact: M. Kluijver

Item #	Description	Quantity	Unit	Unit Price \$	Total \$	Assumption / Basis
New Groins in Reach 3 & 4						
Items						
1	Armor Stone (4-8 TON)	55,175	TON	\$ 193.30	\$ 10,665,231	12 groins @ a total of 4087 ft
2	Underlayer Stone (500-1500 lbs)	17,983	TON	\$ 104.68	\$ 1,882,440	
3	Core Stone (30-130 lbs)	11,035	TON	\$ 92.87	\$ 1,024,811	
4	Bedding Stone (30-130 lbs)	28,200	CY	\$ 92.87	\$ 2,618,962	
5	Geotextile Filter Fabric	31,470	SY	\$ 23.68	\$ 745,207	
6	Excavation - Sand	94,410	CY	\$ 7.24	\$ 683,526	
	SUBTOTAL				\$ 17,620,000	\$4,311 per LF of groin

New Groin in Reach 6a						
Items						
1	Armor Stone (3-10 TON)	6,838	TON	\$ 193.30	\$ 1,321,785	1 groin @ 526 ft
2	Underlayer Stone (500-1500 lbs)	2,420	TON	\$ 104.68	\$ 253,284	
3	Core Stone (30-130 lbs)	1,473	TON	\$ 92.87	\$ 136,779	
4	Bedding Stone (30-130 lbs)	3,314	CY	\$ 92.87	\$ 307,753	
5	Geotextile Filter Fabric	3,945	SY	\$ 23.68	\$ 93,418	
6	Excavation - Sand	9,784	CY	\$ 7.24	\$ 70,833	
	SUBTOTAL				\$ 2,184,000	\$4,152 per LF of groin

Groin Extensions in Reach 6a						
Items						
1	Armor Stone (10 TON)	19,760	TON	\$ 193.30	\$ 3,819,608	5 groin extensions @ a total of 800'
2	Underlayer & Core Stone (500-1500 lbs)	4,160	TON	\$ 104.68	\$ 435,469	
3	Core Stone (30-130 lbs)	2,640	TON	\$ 92.87	\$ 245,177	
4	Bedding Stone (30-130 lbs)	8,320	CY	\$ 92.87	\$ 772,678	
5	Geotextile Filter Fabric	7,520	SY	\$ 23.68	\$ 178,074	
6	Excavation - Sand	12,240	CY	\$ 7.24	\$ 88,618	
	SUBTOTAL				\$ 5,540,000	\$6,925 per LF of groin

General						
Items						
1	Mob/Demob	1	EA	\$ 2,500,000.00	\$ 2,500,000	
	SUBTOTAL				\$ 2,500,000	

TOTAL		\$ 27,844,000
CONTINGENCY 24.56%		\$ 6,838,486
Escalation 2Q 2016 to 2Q 2018	3.31%	\$ 1,146,000
GRAND TOTAL CONSTRUCTION COST		\$ 35,828,486

Contract No.: W912DS-09-0009
 Task Order No.: 26

**Alternative 3n - Buried Seawall
 Feasibility Estimate**

Discipline: Beachfill-Ren Sheet: 7 OF 7
 Prepared by: R. Hampson Date: 4/20/2015
 Updated: S. Jessup Date: 7/11/2018

Integrated Hurricane Sandy General Reevaluation Report and Environmental Impact
 Statement - Atlantic Coast of New York - East Rockaway Inlet to Rockaway Inlet and Jamaica

Project Title: Bay Updated: M. Kluijver Date: 7/13/2018
 Consultant Name: Moffatt & Nichol Consultant Contact: M. Kluijver

Item #	Description	Quantity	Unit	Unit Price \$	Total \$	Assumption / Basis
Beachfill-Renourishment Operation						
Items						
1	Beachfill-Reach 1	-	CY	\$ 12.88	\$ -	estimate for a single renourishment operation
2	Beachfill-Reach 2	-	CY	\$ 12.88	\$ -	renourishment operations occur in 4-year cycles
3	Beachfill-Reach 3	444,000	CY	\$ 12.88	\$ 5,718,720	advance fill - 4-year cycle
4	Beachfill-Reach 4	133,000	CY	\$ 12.88	\$ 1,713,040	advance fill - 4-year cycle
5	Beachfill-Reach 5	444,000	CY	\$ 12.88	\$ 5,718,720	advance fill - 4-year cycle
6	Beachfill-Reach 6a	-	CY	\$ 12.88	\$ -	advance fill - 4-year cycle
	SUBTOTAL	1,021,000	CY		\$ 13,150,000	

General						
Items						
1	Mob/Demob	1	EA	\$ 3,300,000.00	\$ 3,300,000	large hopper dredge
	SUBTOTAL				\$ 3,300,000	

TOTAL		\$ 16,450,000
CONTINGENCY 24.56%		\$ 4,040,120
Escalation 2Q 2016 to 2Q 2018	3.31%	\$ 677,000
GRAND TOTAL CONSTRUCTION COST		\$ 21,167,120

**CSRM ALTERNATIVES
LOW SEA LEVEL CHANGE SCENARIO
ALTERNATIVE 3N COMPOSITE SEAWALL**

Contract No.: W912DS-09-0009
 Task Order No.: 26

**Alternative 3n - Composite Seawall
 Feasibility Estimate**

Discipline: Annualized Cost Sheet: 1 OF 8
 Prepared by: R. Hampson Date: 4/20/2015
 Updated: S. Jessup Date: 7/11/2018

Integrated Hurricane Sandy General Reevaluation Report and Environmental Impact Statement -
 Project Title: Atlantic Coast of New York - East Rockaway Inlet to Rockaway Inlet and Jamaica Bay Updated: M. Kluijver Date: 7/13/2018
 Consultant Name: Moffatt & Nichol Consultant Contact: M. Kluijver

Item #	Description	Quantity	Unit	Unit Price \$	Total \$	Assumption / Basis
Annualized Costs						
Items						
1	Total Investment	1	LS	\$ 8,436,000.00	\$ 8,436,000	
2	Renourishment	1	LS	\$ 5,950,000.00	\$ 5,950,000	
3	Major Rehab	1	LS	\$ 332,000.00	\$ 332,000	
4	Groin & Seawall Maintenance	1	LS	\$ 433,000.00	\$ 433,000	
5	Monitoring	1	LS	\$ 403,000.00	\$ 403,000	
	SUBTOTAL				\$ 15,554,000	

Total Annual Cost \$ 15,554,000

Contract No.: W912DS-09-0009
 Task Order No.: 26

**Alternative 3n - Composite Seawall
 Feasibility Estimate**

Discipline: First Costs Sheet: 2 OF 8
 Prepared by: R. Hampson Date: 4/20/2015
 Updated: S. Jessup Date: 7/11/2018

Integrated Hurricane Sandy General Reevaluation Report and Environmental Impact Statement -
 Project Title: Atlantic Coast of New York - East Rockaway Inlet to Rockaway Inlet and Jamaica Bay Updated: M. Kluijver Date: 7/13/2018
 Consultant Name: Moffatt & Nichol Consultant Contact: M. Kluijver

Item #	Description	Quantity	Unit	Unit Price \$	Total \$	Assumption / Basis
Construction Costs						
WBS	Items					
17	Mob/Demob	1	LS	\$ 3,300,000.00	\$ 3,300,000	
17	Beachfill	1	LS	\$ 17,444,000.00	\$ 17,444,000	
2	Boardwalk Access Ramps	8	LS	\$ 333,000.00	\$ 2,664,000	
10	Mob/Demob - Groin	1	LS	\$ 2,500,000.00	\$ 2,500,000	
10	New Groins in Reach 3 & 4	1	LS	\$ 17,620,000.00	\$ 17,620,000	build 12 new groins
10	New Groin in Reach 6	1	LS	\$ 2,184,000.00	\$ 2,184,000	build 1 new groin
10	Groin Extensions in Reach 6	1	LS	\$ 5,540,000.00	\$ 5,540,000	extend 5 groins
10	Mob/Demob - Composite Wall	1	LS	\$ 3,400,000.00	\$ 3,400,000	
10	Composite Seawall	1	LS	\$ 93,786,000.00	\$ 93,786,000	32,000 lf of composite seawall
	SUBTOTAL				\$ 148,438,000	
	CONTINGENCY 25.51%				\$ 37,867,000	
	SUBTOTAL				\$ 186,305,000	

Lands & Damages						
WBS	Items					
01	Lands & Damages	1	LS	\$ -	\$ -	
	CONTINGENCY 20%				\$ -	
	SUBTOTAL				\$ -	

Planning, Engineering & Design						
WBS	Items					
30	Planning, Engineering & Design	1	LS	10.00%	\$ 14,844,000	
	CONTINGENCY 15.25%				\$ 2,264,000	
	SUBTOTAL				\$ 17,108,000	

Construction Management						
WBS	Items					
30	Construction Management	1	LS	6.14%	\$ 9,114,000	
	CONTINGENCY 15.25%				\$ 1,390,000	
	SUBTOTAL				\$ 10,504,000	

First Cost		\$ 213,917,000
Escalation 2Q 2016 to 2Q 2018	3.31%	\$ 7,071,000
Interest During Construction		\$ 6,760,000
Total Investment Cost		\$ 227,748,000
Annualized Total Investment Cost		\$ 8,436,000

Interest Rate 2.750%
 Life 50
 Capital Recovery Factor 0.03704
 Construction Period in months 27.19
 IDC Factor 0.030589177

Contract No.: W912DS-09-0009
 Task Order No.: 26

**Alternative 3n - Composite Seawall
 Feasibility Estimate**

Discipline: Ren. Costs Sheet: 3 OF 8
 Prepared by: R. Hampson Date: 4/20/2015
 Updated: S. Jessup Date: 7/11/2018

Integrated Hurricane Sandy General Reevaluation Report and Environmental Impact Statement -
 Project Title: Atlantic Coast of New York - East Rockaway Inlet to Rockaway Inlet and Jamaica Bay Updated: M. Kluijver Date: 7/13/2018
 Consultant Name: Moffatt & Nichol Consultant Contact: M. Kluijver

Item #	Description	Quantity	Unit	Unit Price \$	Total \$	Assumption / Basis
Construction Costs						
WBS	Items					
17	Mob/Demob	1	LS	\$ 3,300,000.00	\$ 3,300,000	
17	Beachfill	1	LS	\$ 13,150,000.00	\$ 13,150,000	
	SUBTOTAL				\$ 16,450,000	
	CONTINGENCY 30.47%				\$ 5,012,000	
	SUBTOTAL				\$ 21,462,000	

Lands & Damages						
WBS	Items					
01	Lands & Damages	1	LS	\$ -	\$ -	
	CONTINGENCY 20%				\$ -	
	SUBTOTAL				\$ -	

Planning, Engineering & Design						
WBS	Items					
30	Planning, Engineering & Design	1	LS	10.00%	\$ 1,645,000	
	CONTINGENCY 15.25%				\$ 251,000	
	SUBTOTAL				\$ 1,896,000	

Construction Management						
WBS	Items					
30	Construction Management	1	LS	8.15%	\$ 1,341,000	
	CONTINGENCY 15.25%				\$ 205,000	
	SUBTOTAL				\$ 1,546,000	

First Cost		\$ 24,904,000
Escalation 2Q 2016 to 2Q 2018	3.31%	\$ 823,000
Interest During Construction		\$ 144,361,000
Total Renourishment Cost		\$ 170,088,000

Annualized TotalRenourishment Cost **\$ 5,950,000** from amortization file

Interest Rate	2.750%
Life	50
Capital Recovery Factor	0.03704
Present Value Factor	5.61125

Contract No.: W912DS-09-0009
 Task Order No.: 26

**Alternative 3n - Composite Seawall
 Feasibility Estimate**

Discipline: Beachfill-Initial Sheet: 4 OF 8
 Prepared by: R. Hampson Date: 4/20/2015
 Updated: S. Jessup Date: 7/11/2018

Integrated Hurricane Sandy General Reevaluation Report and Environmental Impact
 Statement - Atlantic Coast of New York - East Rockaway Inlet to Rockaway Inlet and Jamaica

Project Title: Bay Updated: M. Kluijver Date: 7/13/2018
 Consultant Name: Moffatt & Nichol Consultant Contact: M. Kluijver

Item #	Description	Quantity	Unit	Unit Price \$	Total \$	Assumption / Basis
Beachfill - Initial Construction						
Items						
1	Beachfill-Reach 1	-	CY	\$ 12.88	\$ -	
2	Beachfill-Reach 2	-	CY	\$ 12.88	\$ -	
3	Beachfill-Reach 3	356,000	CY	\$ 12.88	\$ 4,585,280	design + advance fill
4	Beachfill-Reach 4	294,000	CY	\$ 12.88	\$ 3,786,720	design + advance fill
5	Beachfill-Reach 5	321,000	CY	\$ 12.88	\$ 4,134,480	design + advance fill
6	Beachfill-Reach 6a	250,000	CY	\$ 12.88	\$ 3,220,000	design + advance fill
7	Beachfill-Reach 6b	20,000	CY	\$ 12.88	\$ 257,600	design + advance fill
8	Dune Grass Planting	73	AC	\$ 20,000.00	\$ 1,460,000	32,000 LF of dune grass planting
	SUBTOTAL		CY		\$ 17,444,000	

General						
Items						
1	Mob/Demob	1	EA	\$ 3,300,000.00	\$ 3,300,000	30" Cutter Head Dredge
	SUBTOTAL				\$ 3,300,000	

TOTAL		\$ 20,744,000
CONTINGENCY 25.51%		\$ 5,291,794
Escalation 2Q 2016 to 2Q 2018	3.31%	\$ 861,000
GRAND TOTAL CONSTRUCTION COST		\$ 26,896,794

Contract No.: W912DS-09-0009
 Task Order No.: 26

**Composite Seawall
 Feasibility Estimate**

Discipline: Composite Seawall Sheet: 5 OF 8
 Prepared by: R. Hampson Date: 3/24/2015
 Updated: S. Jessup Date: 7/11/2018

Integrated Hurricane Sandy General Reevaluation Report and Environmental Impact
 Statement - Atlantic Coast of New York - East Rockaway Inlet to Rockaway Inlet and Jamaica

Project Title: Bay Updated: M. Kluijver Date: 7/13/2018
 Consultant Name: Moffatt & Nichol Consultant Contact: M. Kluijver

Item #	Description	Quantity	Unit	Unit Price \$	Total \$	Assumption / Basis
Composite Seawall						
Items						
1	Armor Stone (3 TON)	348,160	TON	\$ 124.29	\$ 43,272,806	
2	Core Stone	135,360	TON	\$ 86.15	\$ 11,661,264	
3	Geotextile	151,040	SY	\$ 9.18	\$ 1,386,547	
4	Excavation - Sand	312,960	CY	\$ 3.73	\$ 1,167,341	
5	Concrete Cap	11,520	CY	\$ 820.91	\$ 9,456,883	
6	AZ 12-770	7,040	TON	\$ 3,462.40	\$ 24,375,296	
7	Splash - Armor Stone	14,940	TON	\$ 110.00	\$ 1,643,400	
8	Splash - Bedding Stone	6,360	TON	\$ 80.00	\$ 508,800	
9	Splash - Geotextile	10,020	SY	\$ 9.18	\$ 91,984	
10	Splash - Fill	4,440	CY	\$ 50.00	\$ 222,000	
	SUBTOTAL				\$ 93,786,000	

General						
Items						
1	Mob/Demob	2	EA	\$ 1,700,000.00	\$ 3,400,000	
	SUBTOTAL				\$ 3,400,000	

TOTAL		\$ 97,186,000
CONTINGENCY 25.51%		\$ 24,792,149
Escalation 2Q 2016 to 2Q 2018	3.31%	\$ 4,032,000
GRAND TOTAL CONSTRUCTION COST		\$ 126,010,149

Contract No.: W912DS-09-0009
 Task Order No.: 26

**Composite Seawall
 Feasibility Estimate**

Discipline: Composite Seawall Sheet: 5 OF 8
 Prepared by: R. Hampson Date: 3/24/2015
 Updated: S. Jessup Date: 7/11/2018

Integrated Hurricane Sandy General Reevaluation Report and Environmental Impact
 Statement - Atlantic Coast of New York - East Rockaway Inlet to Rockaway Inlet and Jamaica

Project Title: Bay Updated: M. Kluijver Date: 7/13/2018
 Consultant Name: Moffatt & Nichol Consultant Contact: M. Kluijver

Item #	Description	Quantity	Unit	Unit Price \$	Total \$	Assumption / Basis
Composite Seawall						
Items						
1	Armor Stone (3 TON)	10.880	TON	\$ 124.29	\$ 1,352	
2	Core Stone	4.230	TON	\$ 86.15	\$ 364	
3	Geotextile	4.720	SY	\$ 9.18	\$ 43	
4	Excavation - Sand	9.780	CY	\$ 3.73	\$ 36	
5	Concrete Cap	0.360	CY	\$ 820.91	\$ 296	
6	AZ 12-770	0.220	TON	\$ 3,462.40	\$ 762	
7	Splash - Armor Stone	2.490	TON	\$ 110.00	\$ 274	
8	Splash - Bedding Stone	1.060	TON	\$ 80.00	\$ 85	
9	Splash - Geotextile	1.670	SY	\$ 9.18	\$ 15	
10	Splash - Fill	0.740	CY	\$ 50.00	\$ 37	
11	Beach Fill (Dune)	18.500	CY	\$ 40.00	\$ 740	
12	Dune Grass Planting	0.001722	AC	\$ 20,000.00	\$ 34	
	SUBTOTAL				\$ 4,040	

General						
Items						
1	Mob/Demob	1	EA	\$ 1,700,000.00	\$ 1,700,000	
	SUBTOTAL				\$ 1,700,000	

TOTAL		\$ 1,704,040
CONTINGENCY 25.51%		\$ 434,701
Escalation 2Q 2016 to 2Q 2018	3.31%	\$ 71,000
GRAND TOTAL CONSTRUCTION COST		\$ 2,209,741

Contract No.: W912DS-09-0009
 Task Order No.: 26
 Project Title: East Rockaway to Rockaway Inlet Reformulation Study

**Alternative 3n - Composite Seawall
 Feasibility Estimate**

Discipline: Groins Sheet: 6 OF 8
 Prepared by: R. Hampson Date: 4/20/2015
 Updated: S. Jessup Date: 7/11/2018
 Updated: M. Kluijver Date: 7/13/2018
 Consultant Name: Moffatt & Nichol Consultant Contact: M. Kluijver

Item #	Description	Quantity	Unit	Unit Price \$	Total \$	Assumption / Basis
New Groins in Reach 3 & 4						
Items						
1	Armor Stone (4-8 TON)	55,175	TON	\$ 193.30	\$ 10,665,231	12 groins @ a total of 4087 ft
2	Underlayer Stone (500-1500 lbs)	17,983	TON	\$ 104.68	\$ 1,882,440	
3	Core Stone (30-130 lbs)	11,035	TON	\$ 92.87	\$ 1,024,811	
4	Bedding Stone (30-130 lbs)	28,200	CY	\$ 92.87	\$ 2,618,962	
5	Geotextile Filter Fabric	31,470	SY	\$ 23.68	\$ 745,207	
6	Excavation - Sand	94,410	CY	\$ 7.24	\$ 683,526	
	SUBTOTAL				\$ 17,620,000	<i>\$4,311 per LF of groin</i>

New Groin in Reach 6a						
Items						
1	Armor Stone (3-10 TON)	6,838	TON	\$ 193.30	\$ 1,321,785	1 groin @ 526 ft
2	Underlayer Stone (500-1500 lbs)	2,420	TON	\$ 104.68	\$ 253,284	
3	Core Stone (30-130 lbs)	1,473	TON	\$ 92.87	\$ 136,779	
4	Bedding Stone (30-130 lbs)	3,314	CY	\$ 92.87	\$ 307,753	
5	Geotextile Filter Fabric	3,945	SY	\$ 23.68	\$ 93,418	
6	Excavation - Sand	9,784	CY	\$ 7.24	\$ 70,833	
	SUBTOTAL				\$ 2,184,000	<i>\$4,152 per LF of groin</i>

Groin Extensions in Reach 6a						
Items						
1	Armor Stone (10 TON)	19,760	TON	\$ 193.30	\$ 3,819,608	5 groin extensions @ a total of 800'
2	Underlayer & Core Stone (500-1500 lbs)	4,160	TON	\$ 104.68	\$ 435,469	
3	Core Stone (30-130 lbs)	2,640	TON	\$ 92.87	\$ 245,177	
4	Bedding Stone (30-130 lbs)	8,320	CY	\$ 92.87	\$ 772,678	
5	Geotextile Filter Fabric	7,520	SY	\$ 23.68	\$ 178,074	
6	Excavation - Sand	12,240	CY	\$ 7.24	\$ 88,618	
	SUBTOTAL				\$ 5,540,000	<i>\$6,925 per LF of groin</i>

General						
Items						
1	Mob/Demob	1	EA	\$ 2,500,000.00	\$ 2,500,000	
	SUBTOTAL				\$ 2,500,000	

TOTAL		\$ 27,844,000
CONTINGENCY 25.51%		\$ 7,103,004
Escalation 2Q 2016 to 2Q 2018	3.31%	\$ 1,155,000
GRAND TOTAL CONSTRUCTION COST		\$ 36,102,004

Contract No.: W912DS-09-0009
 Task Order No.: 26

**Alternative 3n - Composite Seawall
 Feasibility Estimate**

Discipline: Beachfill-Ren Sheet: 7 OF 8
 Prepared by: R. Hampson Date: 4/20/2015
 Updated: S. Jessup Date: 7/11/2018

Integrated Hurricane Sandy General Reevaluation Report and Environmental Impact
 Statement - Atlantic Coast of New York - East Rockaway Inlet to Rockaway Inlet and Jamaica

Project Title: Bay Updated: M. Kluijver Date: 7/13/2018
 Consultant Name: Moffatt & Nichol Consultant Contact: M. Kluijver

Item #	Description	Quantity	Unit	Unit Price \$	Total \$	Assumption / Basis
Beachfill-Renourishment Operation						
Items						
1	Beachfill-Reach 1	-	CY	\$ 12.88	\$ -	estimate for a single renourishment operation
2	Beachfill-Reach 2	-	CY	\$ 12.88	\$ -	renourishment operations occur in 4-year cycles
3	Beachfill-Reach 3	444,000	CY	\$ 12.88	\$ 5,718,720	advance fill - 4-year cycle
4	Beachfill-Reach 4	133,000	CY	\$ 12.88	\$ 1,713,040	advance fill - 4-year cycle
5	Beachfill-Reach 5	444,000	CY	\$ 12.88	\$ 5,718,720	advance fill - 4-year cycle
6	Beachfill-Reach 6a	-	CY	\$ 12.88	\$ -	advance fill - 4-year cycle
	SUBTOTAL	1,021,000	CY		\$ 13,150,000	

General						
Items						
1	Mob/Demob	1	EA	\$ 3,300,000.00	\$ 3,300,000	large hopper dredge
	SUBTOTAL				\$ 3,300,000	

TOTAL		\$ 16,450,000
CONTINGENCY 30.47%		\$ 5,012,000
Escalation 2Q 2016 to 2Q 2018	3.31%	\$ 709,000
GRAND TOTAL CONSTRUCTION COST		\$ 22,171,000

Contract No.: W912DS-09-0009
 Task Order No.: 26
 Project Title: East Rockaway to Rockaway Inlet Reformulation Study

**Alternative 3n - Composite Seawall
 Feasibility Estimate**

Discipline: Structural Sheet: 8 OF 8
 Prepared by: R. Hampson Date: 5/1/2015
 Updated: S. Jessup Date: 7/11/2018

Consultant Name: Moffatt & Nichol Consultant Contact: R. Hampson

Item #	Description	Quantity	Unit	Unit Price \$	Total \$	Assumption / Basis
Boardwalk Access Ramps						
Items						
1	24" Steel Pipe Pile	114	LF	\$ 135.00	\$ 15,390	3 piles @ 24x1/2" WT (38 ft long)
2	Precast Concrete Pile Cap	15	CY	\$ 1,500.00	\$ 22,500	3 caps @ 5.1 cy each
3	Cast in Place Concrete Plug	2	CY	\$ 500.00	\$ 1,000	3 plugs
4	Cast in Place Concrete Deck	6	CY	\$ 1,000.00	\$ 6,000	3 @ 4'6" x 10' x 14"
5	Precast Concrete Deck	25	CY	\$ 1,000.00	\$ 25,000	70' x 10' x 14"
6	RPL Decking	695	SF	\$ 50.00	\$ 34,750	Furnish and Install
7	Handrail	139	LF	\$ 150.00	\$ 20,850	Furnish and Install

SUBTOTAL					\$ 125,000	
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Demolition						
Items						
1	Access Ramps	700	SF	\$ 35.00	\$ 24,500	Demo and Dispose of Access Ramp

SUBTOTAL					\$ 25,000	
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General						
Items						
1	Mob/Demob	0.125	EA	\$ 1,000,000.00	\$ 125,000	

SUBTOTAL					\$ 125,000	
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SUBTOTAL	\$ 275,000
GENERAL CONDITIONS 10%	\$ 28,000
SUBTOTAL (ALL ITEMS)	\$ 303,000
G. C. OVERHEAD & PROFIT 10%	\$ 30,000
TOTAL	\$ 333,000
CONTINGENCY 25.51%	\$ 85,000
Escalation 2Q 2016 to 2Q 2018 3.31%	\$ 14,000
GRAND TOTAL CONSTRUCTION COST	\$ 432,000

Contract No.: W912DS-09-0009
 Task Order No.: 26

**Summary - Annualized Costs - Low SLR
 Feasibility Estimate**

Discipline: Annualized Cost Sheet: 1 OF 1
 Prepared by: R. Hampson Date: 6/17/2015

Project Title: Integrated Hurricane Sandy General Reevaluation Report and Environmental Impact Statement - Atlantic Coast of
 New York - East Rockaway Inlet to Rockaway Inlet and Jamaica Bay Updated: M. Kluijver Date: 7/13/2018
 Consultant Name: Moffatt & Nichol Consultant Contact: M. Kluijver

Item #	Description	Medium +16'	Large +18'	XL +20'	Buried Seawall	Composite Seawall	
Annualized Costs - 4 year Cycle							
Items							
1	Total Investment	\$2,679,000	\$3,616,000	\$5,581,000	\$5,898,000	\$8,436,000	
2	Renourishment	\$5,950,000	\$6,392,000	\$6,829,000	\$5,950,000	\$5,950,000	
3	Major Rehab	\$332,000	\$332,000	\$332,000	\$332,000	\$332,000	
4	Groin & Seawall Maintenance	\$176,000	\$195,000	\$218,000	\$324,000	\$433,000	
5	Monitoring	\$403,000	\$403,000	\$403,000	\$403,000	\$403,000	
	Total	\$9,540,000	\$10,938,000	\$13,363,000	\$12,907,000	\$15,554,000	

Contract No.: W912DS-09-0009
 Task Order No.: 26

**Summary - Initial Costs - Low SLR
 Feasibility Estimate**

Discipline: Initial Cost Sheet: 1 OF 1
 Prepared by: R. Hampson Date: 6/17/2015

Project Title: Integrated Hurricane Sandy General Reevaluation Report and Environmental Impact Statement - Atlantic Coast of New York - East Rockaway Inlet to Rockaway Inlet and Jamaica Bay Updated: M. Kluijver Date: 7/13/2018
 Consultant Name: Moffatt & Nichol Consultant Contact: M. Kluijver

Item #	Description	Medium	Large	XL	Buried Seawall	Composite Seawall	
Initial Construction Costs							
Items							
1	Beachfill	\$20,504,000	\$34,410,000	\$59,485,000	\$20,744,000	\$20,744,000	
2	Groin Construction/Modification	\$27,844,000	\$31,102,000	\$34,360,000	\$27,844,000	\$27,844,000	
3	Reinforced Dune	\$0	\$0	\$0	\$56,274,000	\$97,186,000	
4	Boardwalk Access Ramps	\$0	\$0	\$6,600,000	\$0	\$2,664,000	
5	PED	\$4,835,000	\$6,551,000	\$10,045,000	\$10,486,000	\$14,844,000	
6	Construction Mangement	\$3,462,000	\$4,514,000	\$6,529,000	\$6,774,000	\$9,114,000	
7	Contingency	\$12,100,000	\$15,864,000	\$25,470,000	\$28,386,000	\$41,521,000	
8	Escalation to Q2 2018	\$2,272,000	\$3,056,000	\$4,710,000	\$4,975,000	\$7,071,000	
	Total	\$71,017,000	\$95,497,000	\$147,199,000	\$155,483,000	\$220,988,000	
	IDC	\$1,307,000	\$2,129,000	\$3,462,000	\$3,752,000	\$6,760,000	
	check	\$72,324,000	\$97,626,000	\$150,661,000	\$159,235,000	\$227,748,000	

Contract No.: W912DS-09-0009
 Task Order No.: 26

**Summary - Renourishment Costs - Low SLR
 Feasibility Estimate**

Discipline: Renourishment Cost Sheet: 1 OF 1
 Prepared by: R. Hampson Date: 6/17/2015

Project Title: Integrated Hurricane Sandy General Reevaluation Report and Environmental Impact Statement -
 Atlantic Coast of New York - East Rockaway Inlet to Rockaway Inlet and Jamaica Bay Updated: M. Kluijver Date: 7/13/2018
 Consultant Name: Moffatt & Nichol Consultant Contact: M. Kluijver

Item #	Description	Medium	Large	XL	Buried Seawall	Composite Seawall	
Renourishment Costs Per Operation							
Items							
1	Beachfill	\$21,462,000	\$23,076,000	\$24,673,000	\$21,462,000	\$21,462,000	
2	PED	\$1,896,000	\$2,039,000	\$2,179,000	\$1,896,000	\$1,896,000	
3	Construction Mangement	\$1,546,000	\$1,647,000	\$1,748,000	\$1,546,000	\$1,546,000	
4	Escalation to Q2 2018	\$823,000	\$885,000	\$945,000	\$823,000	\$823,000	
	Total	\$25,727,000	\$27,647,000	\$29,545,000	\$25,727,000	\$25,727,000	

**ATTACHMENT C
CSRM ALTERNATIVES
INTERMEDIATE SEA
LEVEL CHANGE
SCREENING LEVEL COST
ESTIMATES**

**CSRM ALTERNATIVES
INTERMEDIATE SEA LEVEL CHANGE SCENARIO
ALTERNATIVE 3N MEDIUM DUNE**

Contract No.: W912DS-09-0009
 Task Order No.: 26

**Alternative 3n - Medium
 Feasibility Estimate**

Discipline: Annualized Cost Sheet: 1 OF 6
 Prepared by: R. Hampson Date: 4/20/2015
 Updated: S. Jessup Date: 7/11/2018
M. Kluijver Date: 7/12/2018

Project Title: Integrated Hurricane Sandy General Reevaluation Report and Environmental Impact Statement -
 Atlantic Coast of New York - East Rockaway Inlet to Rockaway Inlet and Jamaica Bay

Consultant Name: Moffatt & Nichol Consultant Contact: M. Kluijver

Item #	Description	Quantity	Unit	Unit Price \$	Total \$	Assumption / Basis
Annualized Costs						
Items						
1	Total Investment	1	LS	\$ 2,679,000.00	\$ 2,679,000	
2	Renourishment	1	LS	\$ 6,364,000.00	\$ 6,364,000	
3	Major Rehab	1	LS	\$ 332,000.00	\$ 332,000	
4	Groin Maintenance	1	LS	\$ 176,000.00	\$ 176,000	
5	Monitoring	1	LS	\$ 403,000.00	\$ 403,000	
6	SLR Adaption	1	LS	\$ 210,000.00	\$ 210,000	
	SUBTOTAL				\$ 10,164,000	

Total Annual Cost \$ 10,164,000

Contract No.: W912DS-09-0009
 Task Order No.: 26

**Alternative 3n - Medium
 Feasibility Estimate**

Discipline: First Costs Sheet: 2 OF 6
 Prepared by: R. Hampson Date: 4/20/2015
 Updated: S. Jessup Date: 7/11/2018
M. Kluijver Date: 7/12/2018

Project Title: Integrated Hurricane Sandy General Reevaluation Report and Environmental Impact Statement -
 Atlantic Coast of New York - East Rockaway Inlet to Rockaway Inlet and Jamaica Bay

Consultant Name: Moffatt & Nichol Consultant Contact: M. Kluijver

Item #	Description	Quantity	Unit	Unit Price \$	Total \$	Assumption / Basis
Construction Costs						
WBS	Items					
17	Mob/Demob	1	LS	\$ 3,300,000.00	\$ 3,300,000	
17	Beachfill	1	LS	\$ 17,204,000.00	\$ 17,204,000	
10	Mob/Demob	1	LS	\$ 2,500,000.00	\$ 2,500,000	
10	New Groins in Reach 3 & 4	1	LS	\$ 17,620,000.00	\$ 17,620,000	build 12 new groins
10	New Groin in Reach 6	1	LS	\$ 2,184,000.00	\$ 2,184,000	build 1 new groin
10	Groin Extensions in Reach 6	1	LS	\$ 5,540,000.00	\$ 5,540,000	extend 5 groins
	SUBTOTAL				\$ 48,348,000	
	CONTINGENCY 22.41%				\$ 10,835,000	
	SUBTOTAL				\$ 59,183,000	

Lands & Damages						
WBS	Items					
01	Lands & Damages	1	LS	\$ -	\$ -	
	CONTINGENCY 20%				\$ -	
	SUBTOTAL				\$ -	

Planning, Engineering & Design						
WBS	Items					
30	Planning, Engineering & Design	1	LS	10.00%	\$ 4,835,000	
	CONTINGENCY 15.25%				\$ 737,000	
	SUBTOTAL				\$ 5,572,000	

Construction Management						
WBS	Items					
30	Construction Management	1	LS	7.16%	\$ 3,462,000	
	CONTINGENCY 15.25%				\$ 528,000	
	SUBTOTAL				\$ 3,990,000	

First Cost		\$ 68,745,000
Escalation 2Q 2016 to 2Q 2018	3.31%	\$ 2,272,000
Interest During Construction		\$ 1,307,000
Total Investment Cost		\$ 72,324,000

Annualized Total Investment Cost \$ **2,679,000**

Interest Rate 2.750%
 Life 50
 Capital Recovery Factor 0.03704
 Construction Period in months 16.88
 IDC Factor 0.018404314

Contract No.: W912DS-09-0009
 Task Order No.: 26

**Alternative 3n - Medium
 Feasibility Estimate**

Discipline: Ren. Costs Sheet: 3 OF 6
 Prepared by: R. Hampson Date: 4/20/2015
 Updated: S. Jessup Date: 7/11/2018
M. Kluijver Date: 7/12/2018

Integrated Hurricane Sandy General Reevaluation Report and Environmental Impact Statement -
 Project Title: Atlantic Coast of New York - East Rockaway Inlet to Rockaway Inlet and Jamaica Bay

Consultant Name: **Moffatt & Nichol** Consultant Contact: **M. Kluijver**

Item #	Description	Quantity	Unit	Unit Price \$	Total \$	Assumption / Basis
Construction Costs						
WBS	Items					
17	Mob/Demob	1	LS	\$ 3,300,000.00	\$ 3,300,000	
17	Beachfill	1	LS	\$ 14,310,000.00	\$ 14,310,000	
	SUBTOTAL				\$ 17,610,000	
	CONTINGENCY 30.47%				\$ 5,366,000	
	SUBTOTAL				\$ 22,976,000	

Lands & Damages						
WBS	Items					
01	Lands & Damages	1	LS	\$ -	\$ -	
	CONTINGENCY 20%				\$ -	
	SUBTOTAL				\$ -	

Planning, Engineering & Design						
WBS	Items					
30	Planning, Engineering & Design	1	LS	10.00%	\$ 1,761,000	
	CONTINGENCY 15.25%				\$ 269,000	
	SUBTOTAL				\$ 2,030,000	

Construction Management						
WBS	Items					
30	Construction Management	1	LS	8.08%	\$ 1,423,000	
	CONTINGENCY 15.25%				\$ 217,000	
	SUBTOTAL				\$ 1,640,000	

First Cost		\$ 26,646,000
Escalation 2Q 2016 to 2Q 2018	3.31%	\$ 881,000
Interest During Construction		\$ -
Total Renourishment Cost		\$ 27,527,000

Annualized Total Renourishment Cost **\$ 6,364,000** from ammoritization file

Interest Rate 2.750%
 Life 50
 Capital Recovery Factor 0.03704
 Present Value Factor 5.61125

Contract No.: W912DS-09-0009
 Task Order No.: 26

**Alternative 3n - Medium
 Feasibility Estimate**

Discipline: Ren. Costs Sheet: 3 OF 6
 Prepared by: R. Hampson Date: 4/20/2015
 Updated: S. Jessup Date: 7/11/2018
M. Kluijver Date: 7/12/2018

Project Title: Integrated Hurricane Sandy General Reevaluation Report and Environmental Impact Statement -
 Atlantic Coast of New York - East Rockaway Inlet to Rockaway Inlet and Jamaica Bay

Consultant Name: Moffatt & Nichol Consultant Contact: M. Kluijver

Item #	Description	Quantity	Unit	Unit Price \$	Total \$	Assumption / Basis
Construction Costs						
WBS	Items					
17	Mob/Demob	-	EA	\$ 3,300,000.00	\$ -	
17	Beachfill	553,000	CY	\$ 12.88	\$ 7,123,000	
17	Dune Grass Planting	73	AC	\$ 20,000.00	\$ 1,460,000	32,000 LF of dune grass planting
17	Access Ramps	-	EA	\$ 825,000.00	\$ -	
	SUBTOTAL				\$ 8,583,000	
	CONTINGENCY 30.47%				\$ 2,615,000	
	SUBTOTAL				\$ 11,198,000	

Lands & Damages						
WBS	Items					
01	Lands & Damages	1	LS	\$ -	\$ -	
	CONTINGENCY 20%				\$ -	
	SUBTOTAL				\$ -	

Planning, Engineering & Design						
WBS	Items					
30	Planning, Engineering & Design	1	LS	10.00%	\$ 858,000	
	CONTINGENCY 15.25%				\$ 131,000	
	SUBTOTAL				\$ 989,000	

Construction Management						
WBS	Items					
30	Construction Management	1	LS	8.74%	\$ 750,000	
	CONTINGENCY 15.25%				\$ 114,000	
	SUBTOTAL				\$ 864,000	

First Cost		\$	13,051,000
Escalation 2Q 2016 to 2Q 2018	3.31%	\$	431,000
Interest During Construction		\$	-
Total Renourishment Cost		\$	13,482,000

Annualized TotalRenourishment Cost **\$ 210,000** from ammortization file

Interest Rate 2.750%
 Life 50
 Capital Recovery Factor 0.03704
 Present Value Factor 5.61125

Contract No.: W912DS-09-0009
 Task Order No.: 26

**Alternative 3n - Medium
 Feasibility Estimate**

Discipline: Beachfill-Initial Sheet: 4 OF 6
 Prepared by: R. Hampson Date: 4/20/2015
 Updated: S. Jessup Date: 7/11/2018
M. Kluijver Date: 7/12/2018

Integrated Hurricane Sandy General Reevaluation Report and Environmental Impact
 Statement - Atlantic Coast of New York - East Rockaway Inlet to Rockaway Inlet and Jamaica
 Bay
 Project Title: _____

Consultant Name: **Moffatt & Nichol**

Consultant Contact: _____

M. Kluijver

Item #	Description	Quantity	Unit	Unit Price \$	Total \$	Assumption / Basis
Beachfill - Initial Construction						
Items						
1	Beachfill-Reach 1	-	CY	\$ 12.88	\$ -	
2	Beachfill-Reach 2	-	CY	\$ 12.88	\$ -	
3	Beachfill-Reach 3	356,000	CY	\$ 12.88	\$ 4,585,280	design + advance fill
4	Beachfill-Reach 4	294,000	CY	\$ 12.88	\$ 3,786,720	design + advance fill
5	Beachfill-Reach 5	321,000	CY	\$ 12.88	\$ 4,134,480	design + advance fill
6	Beachfill-Reach 6a	250,000	CY	\$ 12.88	\$ 3,220,000	design + advance fill
7	Beachfill-Reach 6b	20,000	CY	\$ 12.88	\$ 257,600	design + advance fill
8	Dune Grass Planting	61	AC	\$ 20,000.00	\$ 1,220,000	32,000 LF of dune grass planting
	SUBTOTAL		CY		\$ 17,204,000	

General						
Items						
1	Mob/Demob	1	EA	\$ 3,300,000.00	\$ 3,300,000	30" Cutter Head Dredge
	SUBTOTAL				\$ 3,300,000	

TOTAL	\$ 20,504,000
CONTINGENCY 22.41%	\$ 4,594,946
Escalation 2Q 2016 to 2Q 2018 3.31%	\$ 830,000
GRAND TOTAL CONSTRUCTION COST	\$ 25,928,946

Contract No.: W912DS-09-0009
 Task Order No.: 26

**Alternative 3n - Medium
 Feasibility Estimate**

Discipline: Groins Sheet: 5 OF 6
 Prepared by: R. Hampson Date: 4/20/2015
 Updated: S. Jessup Date: 7/11/2018
M. Kluijver Date: 7/12/2018

Integrated Hurricane Sandy General Reevaluation Report and Environmental Impact
 Statement - Atlantic Coast of New York - East Rockaway Inlet to Rockaway Inlet and Jamaica
 Bay

Project Title:

Consultant Name: **Moffatt & Nichol**

Consultant Contact:

M. Kluijver

Item #	Description	Quantity	Unit	Unit Price \$	Total \$	Assumption / Basis
New Groins in Reach 3 & 4						
Items						
1	Armor Stone (4-8 TON)	55,175	TON	\$ 193.30	\$ 10,665,231	12 groins @ a total of 4087 ft
2	Underlayer Stone (500-1500 lbs)	17,983	TON	\$ 104.68	\$ 1,882,440	
3	Core Stone (30-130 lbs)	11,035	TON	\$ 92.87	\$ 1,024,811	
4	Bedding Stone (30-130 lbs)	28,200	CY	\$ 92.87	\$ 2,618,962	
5	Geotextile Filter Fabric	31,470	SY	\$ 23.68	\$ 745,207	
6	Excavation - Sand	94,410	CY	\$ 7.24	\$ 683,526	
	SUBTOTAL				\$ 17,620,000	<i>\$4,311 per LF of groin</i>

New Groin in Reach 6a						
Items						
1	Armor Stone (3-10 TON)	6,838	TON	\$ 193.30	\$ 1,321,785	1 groin @ 526 ft
2	Underlayer Stone (500-1500 lbs)	2,420	TON	\$ 104.68	\$ 253,284	
3	Core Stone (30-130 lbs)	1,473	TON	\$ 92.87	\$ 136,779	
4	Bedding Stone (30-130 lbs)	3,314	CY	\$ 92.87	\$ 307,753	
5	Geotextile Filter Fabric	3,945	SY	\$ 23.68	\$ 93,418	
6	Excavation - Sand	9,784	CY	\$ 7.24	\$ 70,833	
	SUBTOTAL				\$ 2,184,000	<i>\$4,152 per LF of groin</i>

Groin Extensions in Reach 6a						
Items						
1	Armor Stone (10 TON)	19,760	TON	\$ 193.30	\$ 3,819,608	5 groin extensions @ a total of 800'
2	Underlayer & Core Stone (500-1500 lbs)	4,160	TON	\$ 104.68	\$ 435,469	
3	Core Stone (30-130 lbs)	2,640	TON	\$ 92.87	\$ 245,177	
4	Bedding Stone (30-130 lbs)	8,320	CY	\$ 92.87	\$ 772,678	
5	Geotextile Filter Fabric	7,520	SY	\$ 23.68	\$ 178,074	
6	Excavation - Sand	12,240	CY	\$ 7.24	\$ 88,618	
	SUBTOTAL				\$ 5,540,000	<i>\$6,925 per LF of groin</i>

General						
Items						
1	Mob/Demob	1	EA	\$ 2,500,000.00	\$ 2,500,000	
	SUBTOTAL				\$ 2,500,000	

TOTAL		\$ 27,844,000
CONTINGENCY 22.41%		\$ 6,239,840
Escalation 2Q 2016 to 2Q 2018	3.31%	\$ 1,127,000
GRAND TOTAL CONSTRUCTION COST		\$ 35,210,840

Contract No.: W912DS-09-0009
 Task Order No.: 26

**Alternative 3n - Medium
 Feasibility Estimate**

Discipline: Beachfill-Ren Sheet: 6 OF 6
 Prepared by: R. Hampson Date: 4/20/2015
 Updated: S. Jessup Date: 7/11/2018
M. Kluijver Date: 7/12/2018

Integrated Hurricane Sandy General Reevaluation Report and Environmental Impact
 Statement - Atlantic Coast of New York - East Rockaway Inlet to Rockaway Inlet and Jamaica
 Bay
 Project Title: _____

Consultant Name: **Moffatt & Nichol** Consultant Contact: **M. Kluijver**

Item #	Description	Quantity	Unit	Unit Price \$	Total \$	Assumption / Basis
Beachfill-Renourishment Operation						
Items						
1	Beachfill-Reach 1	-	CY	\$ 12.88	\$ -	estimate for a single renourishment operation
2	Beachfill-Reach 2	-	CY	\$ 12.88	\$ -	renourishment operations occur in 4-year cycles
3	Beachfill-Reach 3	475,000	CY	\$ 12.88	\$ 6,118,000	advance fill - 4-year cycle
4	Beachfill-Reach 4	149,000	CY	\$ 12.88	\$ 1,919,120	advance fill - 4-year cycle
5	Beachfill-Reach 5	476,000	CY	\$ 12.88	\$ 6,130,880	advance fill - 4-year cycle
6	Beachfill-Reach 6a	11,000	CY	\$ 12.88	\$ 141,680	advance fill - 4-year cycle
	SUBTOTAL	1,111,000	CY		\$ 14,310,000	

General						
Items						
1	Mob/Demob	1	EA	\$ 3,300,000.00	\$ 3,300,000	large hopper dredge
	SUBTOTAL				\$ 3,300,000	

TOTAL \$ 17,610,000
 CONTINGENCY 30.47% \$ 5,366,000
 Escalation 2Q 2016 to 2Q 2018 3.31% \$ 760,000
GRAND TOTAL CONSTRUCTION COST \$ **23,736,000**

**CSRM ALTERNATIVES
INTERMEDIATE SEA LEVEL CHANGE SCENARIO
ALTERNATIVE 3N LARGE DUNE**

Contract No.: W912DS-09-0009
 Task Order No.: 26

**Alternative 3n - Large
 Feasibility Estimate**

Discipline: Annualized Cost Sheet: 1 OF 6
 Prepared by: R. Hampson Date: 4/20/2015
 Updated: S. Jessup Date: 7/11/2018
M. Kluijver Date: 7/12/2018

Project Title: Integrated Hurricane Sandy General Reevaluation Report and Environmental Impact Statement -
 Atlantic Coast of New York - East Rockaway Inlet to Rockaway Inlet and Jamaica Bay

Consultant Name: **Moffatt & Nichol** Consultant Contact: **M. Kluijver**

Item #	Description	Quantity	Unit	Unit Price \$	Total \$	Assumption / Basis
Annualized Costs						
Items						
1	Total Investment	1	LS	\$ 3,616,000.00	\$ 3,616,000	
2	Renourishment	1	LS	\$ 6,801,000.00	\$ 6,801,000	
3	Major Rehab	1	LS	\$ 332,000.00	\$ 332,000	
4	Groin Maintenance	1	LS	\$ 195,000.00	\$ 195,000	
5	Monitoring	1	LS	\$ 403,000.00	\$ 403,000	
6	SLR Adaption	1	LS	\$ 373,000.00	\$ 373,000	
	SUBTOTAL				\$ 11,720,000	

Total Annual Cost

\$ 11,720,000

Contract No.: W912DS-09-0009
 Task Order No.: 26

**Alternative 3n - Large
 Feasibility Estimate**

Discipline: First Costs Sheet: 2 OF 6
 Prepared by: R. Hampson Date: 4/20/2015
 Updated: S. Jessup Date: 7/11/2018
M. Kluijver Date: 7/12/2018

Project Title: Integrated Hurricane Sandy General Reevaluation Report and Environmental Impact Statement -
 Atlantic Coast of New York - East Rockaway Inlet to Rockaway Inlet and Jamaica Bay

Consultant Name: Moffatt & Nichol Consultant Contact: M. Kluijver

Item #	Description	Quantity	Unit	Unit Price \$	Total \$	Assumption / Basis
Construction Costs						
WBS	Items					
17	Mob/Demob	1	LS	\$ 3,300,000.00	\$ 3,300,000	
17	Beachfill	1	LS	\$ 31,110,000.00	\$ 31,110,000	
10	Mob/Demob	1	LS	\$ 2,500,000.00	\$ 2,500,000	
10	New Groins in Reach 3 & 4	1	LS	\$ 19,483,000.00	\$ 19,483,000	build 12 new groins
10	New Groin in Reach 6	1	LS	\$ 2,333,000.00	\$ 2,333,000	build 1 new groin
10	Groin Extensions in Reach 6	1	LS	\$ 6,786,000.00	\$ 6,786,000	extend 5 groins
	SUBTOTAL				\$ 65,512,000	
	CONTINGENCY 21.64%				\$ 14,177,000	
	SUBTOTAL				\$ 79,689,000	

Lands & Damages						
WBS	Items					
01	Lands & Damages	1	LS	\$ -	\$ -	
	CONTINGENCY 20%				\$ -	
	SUBTOTAL				\$ -	

Planning, Engineering & Design						
WBS	Items					
30	Planning, Engineering & Design	1	LS	10.00%	\$ 6,551,000	
	CONTINGENCY 15.25%				\$ 999,000	
	SUBTOTAL				\$ 7,550,000	

Construction Management						
WBS	Items					
30	Construction Management	1	LS	6.89%	\$ 4,514,000	
	CONTINGENCY 15.25%				\$ 688,000	
	SUBTOTAL				\$ 5,202,000	

First Cost		\$ 92,441,000
Escalation 2Q 2016 to 2Q 2018	3.31%	\$ 3,056,000
Interest During Construction		\$ 2,129,000
Total Investment Cost		\$ 97,626,000

Annualized Total Investment Cost \$ 3,616,000

Interest Rate 2.750%
 Life 50
 Capital Recovery Factor 0.03704
 Construction Period in months 20.19
 IDC Factor 0.022297107

Contract No.: W912DS-09-0009
 Task Order No.: 26

**Alternative 3n - Large
 Feasibility Estimate**

Discipline: Ren. Costs Sheet: 3 OF 6
 Prepared by: R. Hampson Date: 4/20/2015
 Updated: S. Jessup Date: 7/11/2018
M. Kluijver Date: 7/12/2018

Project Title: Integrated Hurricane Sandy General Reevaluation Report and Environmental Impact Statement -
 Atlantic Coast of New York - East Rockaway Inlet to Rockaway Inlet and Jamaica Bay

Consultant Name: **Moffatt & Nichol** Consultant Contact: **M. Kluijver**

Item #	Description	Quantity	Unit	Unit Price \$	Total \$	Assumption / Basis
Construction Costs						
WBS	Items					
17	Mob/Demob	1	LS	\$ 3,300,000.00	\$ 3,300,000	
17	Beachfill	1	LS	\$ 15,533,000.00	\$ 15,533,000	
	SUBTOTAL				\$ 18,833,000	
	CONTINGENCY 30.47%				\$ 5,738,000	
	SUBTOTAL				\$ 24,571,000	

Lands & Damages						
WBS	Items					
01	Lands & Damages	1	LS	\$ -	\$ -	
	CONTINGENCY 20%				\$ -	
	SUBTOTAL				\$ -	

Planning, Engineering & Design						
WBS	Items					
30	Planning, Engineering & Design	1	LS	10.00%	\$ 1,883,000	
	CONTINGENCY 15.25%				\$ 287,000	
	SUBTOTAL				\$ 2,170,000	

Construction Management						
WBS	Items					
30	Construction Management	1	LS	8.02%	\$ 1,510,000	
	CONTINGENCY 15.25%				\$ 230,000	
	SUBTOTAL				\$ 1,740,000	

First Cost		\$ 28,481,000
Escalation 2Q 2016 to 2Q 2018	3.31%	\$ 941,000
Interest During Construction		\$ -
Total Renourishment Cost		\$ 29,422,000

Annualized TotalRenourishment Cost **\$ 6,801,000** from ammoritization file

Interest Rate 2.750%
 Life 50
 Capital Recovery Factor 0.03704
 Present Value Factor 5.61125

Contract No.: W912DS-09-0009
 Task Order No.: 26

**Alternative 3n - Large
 Feasibility Estimate**

Discipline: Adaption Costs Sheet: 3 OF 6
 Prepared by: R. Hampson Date: 4/20/2015
 Updated: S. Jessup Date: 7/11/2018
M. Kluijver Date: 7/12/2018

Project Title: Integrated Hurricane Sandy General Reevaluation Report and Environmental Impact Statement -
 Atlantic Coast of New York - East Rockaway Inlet to Rockaway Inlet and Jamaica Bay

Consultant Name: Moffatt & Nichol Consultant Contact: M. Kluijver

Item #	Description	Quantity	Unit	Unit Price \$	Total \$	Assumption / Basis
Construction Costs						
WBS	Items					
17	Mob/Demob	-	EA	\$ 3,300,000.00	\$ -	
17	Beachfill	566,000	CY	\$ 12.88	\$ 7,290,000	
17	Dune Grass Planting	73	AC	\$ 20,000.00	\$ 1,460,000	32,000 LF of dune grass planting
17	Access Ramps	8	EA	\$ 825,000.00	\$ 6,600,000	Demo & Rebuild 8 Concrete Access Ramps
	SUBTOTAL				\$ 15,350,000	
	CONTINGENCY 30.47%				\$ 4,677,000	
	SUBTOTAL				\$ 20,027,000	

Lands & Damages						
WBS	Items					
01	Lands & Damages	1	LS	\$ -	\$ -	
	CONTINGENCY 20%				\$ -	
	SUBTOTAL				\$ -	

Planning, Engineering & Design						
WBS	Items					
30	Planning, Engineering & Design	1	LS	10.00%	\$ 1,535,000	
	CONTINGENCY 15.25%				\$ 234,000	
	SUBTOTAL				\$ 1,769,000	

Construction Management						
WBS	Items					
30	Construction Management	1	LS	8.21%	\$ 1,260,000	
	CONTINGENCY 15.25%				\$ 192,000	
	SUBTOTAL				\$ 1,452,000	

First Cost		\$ 23,248,000
Escalation 2Q 2016 to 2Q 2018	3.31%	\$ 768,000
Interest During Construction		\$ -
Total Adaption Cost		\$ 24,016,000

Annualized Adaption Cost **\$ 373,000** from amortization

Interest Rate 2.750%
 Life 50
 Capital Recovery Factor 0.03704
 Present Value Factor 5.61125

Contract No.: W912DS-09-0009
 Task Order No.: 26

**Alternative 3n - Large
 Feasibility Estimate**

Discipline: Beachfill-Initial Sheet: 4 OF 6
 Prepared by: R. Hampson Date: 4/20/2015
 Updated: S. Jessup Date: 7/11/2018
M. Kluijver Date: 7/12/2018

Integrated Hurricane Sandy General Reevaluation Report and Environmental Impact
 Statement - Atlantic Coast of New York - East Rockaway Inlet to Rockaway Inlet and Jamaica

Project Title: Bay

Consultant Name: **Moffatt & Nichol**

Consultant Contact:

M. Kluijver

Item #	Description	Quantity	Unit	Unit Price \$	Total \$	Assumption / Basis
Beachfill - Initial Construction						
Items						
1	Beachfill-Reach 1	-	CY	\$ 12.88	\$ -	
2	Beachfill-Reach 2	-	CY	\$ 12.88	\$ -	
3	Beachfill-Reach 3	611,000	CY	\$ 12.88	\$ 7,869,680	design + advance fill
4	Beachfill-Reach 4	478,000	CY	\$ 12.88	\$ 6,156,640	design + advance fill
5	Beachfill-Reach 5	758,000	CY	\$ 12.88	\$ 9,763,040	design + advance fill
6	Beachfill-Reach 6a	417,000	CY	\$ 12.88	\$ 5,370,960	design + advance fill
7	Beachfill-Reach 6b	38,000	CY	\$ 12.88	\$ 489,440	design + advance fill
8	Dune Grass Planting	73	AC	\$ 20,000.00	\$ 1,460,000	32,000 LF of dune grass planting
	SUBTOTAL		CY		\$ 31,110,000	

General						
Items						
1	Mob/Demob	1	EA	\$ 3,300,000.00	\$ 3,300,000	30" Cutter Head Dredge
	SUBTOTAL				\$ 3,300,000	

TOTAL		\$ 34,410,000
CONTINGENCY 21.64%		\$ 7,446,324
Escalation 2Q 2016 to 2Q 2018	3.31%	\$ 1,384,000
GRAND TOTAL CONSTRUCTION COST		\$ 43,240,324

Contract No.: W912DS-09-0009
 Task Order No.: 26

**Alternative 3n - Large
 Feasibility Estimate**

Discipline: Groins Sheet: 5 OF 6
 Prepared by: R. Hampson Date: 4/20/2015
 Updated: S. Jessup Date: 7/11/2018
M. Kluijver Date: 7/12/2018

Integrated Hurricane Sandy General Reevaluation Report and Environmental Impact
 Statement - Atlantic Coast of New York - East Rockaway Inlet to Rockaway Inlet and Jamaica

Project Title: Bay

Consultant Name: **Moffatt & Nichol**

Consultant Contact:

M. Kluijver

Item #	Description	Quantity	Unit	Unit Price \$	Total \$	Assumption / Basis
New Groins in Reach 3 & 4						
Items						
1	Armor Stone (4-8 TON)	61,007	TON	\$ 193.30	\$ 11,792,556	12 groins @ a total of 4519 ft
2	Underlayer Stone (500-1500 lbs)	19,884	TON	\$ 104.68	\$ 2,081,415	
3	Core Stone (30-130 lbs)	12,201	TON	\$ 92.87	\$ 1,133,135	
4	Bedding Stone (30-130 lbs)	31,181	CY	\$ 92.87	\$ 2,895,789	
5	Geotextile Filter Fabric	34,796	SY	\$ 23.68	\$ 823,976	
6	Excavation - Sand	104,389	CY	\$ 7.24	\$ 755,776	
	SUBTOTAL				\$ 19,483,000	<i>\$4,311 per LF of groin</i>

New Groin in Reach 6a						
Items						
1	Armor Stone (3-10 TON)	7,306	TON	\$ 193.30	\$ 1,412,250	1 groin @ 562 ft
2	Underlayer Stone (500-1500 lbs)	2,585	TON	\$ 104.68	\$ 270,619	
3	Core Stone (30-130 lbs)	1,574	TON	\$ 92.87	\$ 146,140	
4	Bedding Stone (30-130 lbs)	3,541	CY	\$ 92.87	\$ 328,816	
5	Geotextile Filter Fabric	4,215	SY	\$ 23.68	\$ 99,811	
6	Excavation - Sand	10,453	CY	\$ 7.24	\$ 75,681	
	SUBTOTAL				\$ 2,333,000	<i>\$4,151 per LF of groin</i>

Groin Extensions in Reach 6a						
Items						
1	Armor Stone (10 TON)	24,206	TON	\$ 193.30	\$ 4,679,020	5 groin extensions @ a total of 980'
2	Underlayer & Core Stone (500-1500 lbs)	5,096	TON	\$ 104.68	\$ 533,449	
3	Core Stone (30-130 lbs)	3,234	TON	\$ 92.87	\$ 300,342	
4	Bedding Stone (30-130 lbs)	10,192	CY	\$ 92.87	\$ 946,531	
5	Geotextile Filter Fabric	9,212	SY	\$ 23.68	\$ 218,140	
6	Excavation - Sand	14,994	CY	\$ 7.24	\$ 108,557	
	SUBTOTAL				\$ 6,786,000	<i>\$6,924 per LF of groin</i>

General						
Items						
1	Mob/Demob	1	EA	\$ 2,500,000.00	\$ 2,500,000	
	SUBTOTAL				\$ 2,500,000	

TOTAL	\$	31,102,000
CONTINGENCY 21.64%	\$	6,730,473
Escalation 2Q 2016 to 2Q 2018	3.31%	\$ 1,251,000
GRAND TOTAL CONSTRUCTION COST	\$	39,083,473

Contract No.: W912DS-09-0009
 Task Order No.: 26

**Alternative 3n - Large
 Feasibility Estimate**

Discipline: Beachfill-Ren Sheet: 6 OF 6
 Prepared by: R. Hampson Date: 4/20/2015
 Updated: S. Jessup Date: 7/11/2018
M. Kluijver Date: 7/12/2018

Integrated Hurricane Sandy General Reevaluation Report and Environmental Impact
 Statement - Atlantic Coast of New York - East Rockaway Inlet to Rockaway Inlet and Jamaica
 Bay
 Project Title: _____

Consultant Name: **Moffatt & Nichol**

Consultant Contact: **M. Kluijver**

Item #	Description	Quantity	Unit	Unit Price \$	Total \$	Assumption / Basis
Beachfill-Renourishment Operation						
Items						
1	Beachfill-Reach 1	-	CY	\$ 12.88	\$ -	estimate for a single renourishment operation
2	Beachfill-Reach 2	-	CY	\$ 12.88	\$ -	renourishment operations occur in 4-year cycles
3	Beachfill-Reach 3	541,000	CY	\$ 12.88	\$ 6,968,080	advance fill - 4-year cycle
4	Beachfill-Reach 4	149,000	CY	\$ 12.88	\$ 1,919,120	advance fill - 4-year cycle
5	Beachfill-Reach 5	505,000	CY	\$ 12.88	\$ 6,504,400	advance fill - 4-year cycle
6	Beachfill-Reach 6a	11,000	CY	\$ 12.88	\$ 141,680	advance fill - 4-year cycle
	SUBTOTAL	1,206,000	CY		\$ 15,533,000	

General						
Items						
1	Mob/Demob	1	EA	\$ 3,300,000.00	\$ 3,300,000	large hopper dredge
	SUBTOTAL				\$ 3,300,000	

TOTAL		\$ 18,833,000
CONTINGENCY 30.47%		\$ 5,738,000
Escalation 2Q 2016 to 2Q 2018	3.31%	\$ 812,000
GRAND TOTAL CONSTRUCTION COST		\$ 25,383,000

**CSRM ALTERNATIVES
INTERMEDIATE SEA LEVEL CHANGE SCENARIO
ALTERNATIVE 3N XL DUNE**

Contract No.: W912DS-09-0009
 Task Order No.: 26

**Alternative 3n - XL
 Feasibility Estimate**

Discipline: Annualized Cost Sheet: 1 OF 7
 Prepared by: R. Hampson Date: 5/1/2015
 Updated: S. Jessup Date: 7/11/2018
M. Kluijver Date: 7/12/2018

Project Title: Integrated Hurricane Sandy General Reevaluation Report and Environmental Impact Statement -
 Atlantic Coast of New York - East Rockaway Inlet to Rockaway Inlet and Jamaica Bay

Consultant Name: **Moffatt & Nichol** Consultant Contact: **M. Kluijver**

Item #	Description	Quantity	Unit	Unit Price \$	Total \$	Assumption / Basis
Annualized Costs						
Items						
1	Total Investment	1	LS	\$ 5,581,000.00	\$ 5,581,000	
2	Renourishment	1	LS	\$ 7,243,000.00	\$ 7,243,000	
3	Major Rehab	1	LS	\$ 332,000.00	\$ 332,000	
4	Groin Maintenance	1	LS	\$ 218,000.00	\$ 218,000	
5	Monitoring	1	LS	\$ 403,000.00	\$ 403,000	
6	SLR Adaption	1	LS	\$ 377,000.00	\$ 377,000	
	SUBTOTAL				\$ 14,154,000	

Total Annual Cost \$ 14,154,000

Contract No.: W912DS-09-0009
 Task Order No.: 26

**Alternative 3n - XL
 Feasibility Estimate**

Discipline: First Costs Sheet: 2 OF 7
 Prepared by: R. Hampson Date: 5/1/2015
 Updated: S. Jessup Date: 7/11/2018
M. Kluijver Date: 7/12/2018

Integrated Hurricane Sandy General Reevaluation Report and Environmental Impact Statement -
 Project Title: Atlantic Coast of New York - East Rockaway Inlet to Rockaway Inlet and Jamaica Bay

Consultant Name: **Moffatt & Nichol** Consultant Contact: **M. Kluijver**

Item #	Description	Quantity	Unit	Unit Price \$	Total \$	Assumption / Basis
Construction Costs						
WBS	Items					
17	Mob/Demob	1	LS	\$ 6,600,000.00	\$ 6,600,000	
17	Beachfill	1	LS	\$ 52,885,000.00	\$ 52,885,000	
2	Access Ramps	8	EA	\$ 825,000.00	\$ 6,600,000	Demo & Rebuild 8 Concrete Access Ramps
10	Mob/Demob	1	LS	\$ 2,500,000.00	\$ 2,500,000	
10	New Groins in Reach 3 & 4	1	LS	\$ 21,345,000.00	\$ 21,345,000	build 12 new groins
10	New Groin in Reach 6	1	LS	\$ 2,483,000.00	\$ 2,483,000	build 1 new groin
10	Groin Extensions in Reach 6	1	LS	\$ 8,032,000.00	\$ 8,032,000	extend 5 groins
	SUBTOTAL				\$ 100,445,000	
	CONTINGENCY 22.84%				\$ 22,942,000	
	SUBTOTAL				\$ 123,387,000	

Lands & Damages						
WBS	Items					
01	Lands & Damages	1	LS	\$ -	\$ -	
	CONTINGENCY 20%				\$ -	
	SUBTOTAL				\$ -	

Planning, Engineering & Design						
WBS	Items					
30	Planning, Engineering & Design	1	LS	10.00%	\$ 10,045,000	
	CONTINGENCY 15.25%				\$ 1,532,000	
	SUBTOTAL				\$ 11,577,000	

Construction Management						
WBS	Items					
30	Construction Management	1	LS	6.50%	\$ 6,529,000	
	CONTINGENCY 15.25%				\$ 996,000	
	SUBTOTAL				\$ 7,525,000	

First Cost		\$ 142,489,000
Escalation 2Q 2016 to 2Q 2018	3.31%	\$ 4,710,000
Interest During Construction		\$ 3,461,000
Total Investment Cost		\$ 150,660,000

Annualized Total Investment Cost **\$ 5,581,000**

Interest Rate 2.750%
 Life 50
 Capital Recovery Factor 0.03704
 Construction Period in months 21.22
 IDC Factor 0.023512491

Contract No.: W912DS-09-0009
 Task Order No.: 26

**Alternative 3n - XL
 Feasibility Estimate**

Discipline: Ren. Costs Sheet: 3 OF 7
 Prepared by: R. Hampson Date: 5/1/2015
 Updated: S. Jessup Date: 7/11/2018
M. Kluijver Date: 7/12/2018

Project Title: Integrated Hurricane Sandy General Reevaluation Report and Environmental Impact Statement -
 Atlantic Coast of New York - East Rockaway Inlet to Rockaway Inlet and Jamaica Bay

Consultant Name: **Moffatt & Nichol** Consultant Contact: M. Kluijver

Item #	Description	Quantity	Unit	Unit Price \$	Total \$	Assumption / Basis
Construction Costs						
WBS	Items					
17	Mob/Demob	1	LS	\$ 3,300,000.00	\$ 3,300,000	
17	Beachfill	1	LS	\$ 16,770,000.00	\$ 16,770,000	
	SUBTOTAL				\$ 20,070,000	
	CONTINGENCY 30.47%				\$ 6,115,000	
	SUBTOTAL				\$ 26,185,000	

Lands & Damages						
WBS	Items					
01	Lands & Damages	1	LS	\$ -	\$ -	
	CONTINGENCY 20%				\$ -	
	SUBTOTAL				\$ -	

Planning, Engineering & Design						
WBS	Items					
30	Planning, Engineering & Design	1	LS	10.00%	\$ 2,007,000	
	CONTINGENCY 15.25%				\$ 306,000	
	SUBTOTAL				\$ 2,313,000	

Construction Management						
WBS	Items					
30	Construction Management	1	LS	7.96%	\$ 1,598,000	
	CONTINGENCY 15.25%				\$ 244,000	
	SUBTOTAL				\$ 1,842,000	

First Cost		\$ 30,340,000
Escalation 2Q 2016 to 2Q 2018	3.31%	\$ 1,003,000
Interest During Construction		\$ -
Total Renourishment Cost		\$ 31,343,000

Annualized TotalRenourishment Cost **\$ 7,243,000** from amortization file

Interest Rate 2.750%
 Life 50
 Capital Recovery Factor 0.03704
 Present Value Factor 5.61125

Contract No.: W912DS-09-0009
 Task Order No.: 26

**Alternative 3n - XL
 Feasibility Estimate**

Discipline: Ren. Costs Sheet: 3 OF 7
 Prepared by: R. Hampson Date: 5/1/2015
 Updated: S. Jessup Date: 7/11/2018
M. Kluijver Date: 7/12/2018

Project Title: Integrated Hurricane Sandy General Reevaluation Report and Environmental Impact Statement -
 Atlantic Coast of New York - East Rockaway Inlet to Rockaway Inlet and Jamaica Bay

Consultant Name: Moffatt & Nichol Consultant Contact: M. Kluijver

Item #	Description	Quantity	Unit	Unit Price \$	Total \$	Assumption / Basis
Construction Costs						
WBS	Items					
17	Mob/Demob	-	EA	\$ 3,300,000.00	\$ -	
17	Beachfill	578,000	CY	\$ 12.88	\$ 7,445,000	
17	Dune Grass Planting	73	AC	\$ 20,000.00	\$ 1,460,000	32,000 LF of dune grass planting
17	Access Ramps	8	EA	\$ 825,000.00	\$ 6,600,000	Demo & Rebuild 8 Concrete Access Ramps
	SUBTOTAL				\$ 15,505,000	
	CONTINGENCY 30.47%				\$ 4,724,000	
	SUBTOTAL				\$ 20,229,000	

Lands & Damages						
WBS	Items					
01	Lands & Damages	1	LS	\$ -	\$ -	
	CONTINGENCY 20%				\$ -	
	SUBTOTAL				\$ -	

Planning, Engineering & Design						
WBS	Items					
30	Planning, Engineering & Design	1	LS	10.00%	\$ 1,551,000	
	CONTINGENCY 15.25%				\$ 237,000	
	SUBTOTAL				\$ 1,788,000	

Construction Management						
WBS	Items					
30	Construction Management	1	LS	8.20%	\$ 1,271,000	
	CONTINGENCY 15.25%				\$ 194,000	
	SUBTOTAL				\$ 1,465,000	

First Cost		\$ 23,482,000
Escalation 2Q 2016 to 2Q 2018	3.31%	\$ 776,000
Interest During Construction		\$ -
Total Renourishment Cost		\$ 24,258,000

Annualized TotalRenourishment Cost **\$ 377,000**

Interest Rate 2.750%
 Life 50
 Capital Recovery Factor 0.03704
 Present Value Factor 5.61125

Contract No.: W912DS-09-0009
 Task Order No.: 26

**Alternative 3n - XL
 Feasibility Estimate**

Discipline: Beachfill-Initial Sheet: 4 OF 7
 Prepared by: R. Hampson Date: 5/1/2015
 Updated: S. Jessup Date: 7/11/2018
M. Kluijver Date: 7/12/2018

Integrated Hurricane Sandy General Reevaluation Report and Environmental Impact
 Statement - Atlantic Coast of New York - East Rockaway Inlet to Rockaway Inlet and Jamaica
 Project Title: Bay

Consultant Name: **Moffatt & Nichol**

Consultant Contact: **M. Kluijver**

Item #	Description	Quantity	Unit	Unit Price \$	Total \$	Assumption / Basis
Beachfill - Initial Construction						
Items						
1	Beachfill-Reach 1	-	CY	\$ 12.88	\$ -	
2	Beachfill-Reach 2	-	CY	\$ 12.88	\$ -	
3	Beachfill-Reach 3	1,044,000	CY	\$ 12.88	\$ 13,446,720	design + advance fill
4	Beachfill-Reach 4	827,000	CY	\$ 12.88	\$ 10,651,760	design + advance fill
5	Beachfill-Reach 5	1,424,000	CY	\$ 12.88	\$ 18,341,120	design + advance fill
6	Beachfill-Reach 6a	621,000	CY	\$ 12.88	\$ 7,998,480	design + advance fill
7	Beachfill-Reach 6b	58,000	CY	\$ 12.88	\$ 747,040	design + advance fill
8	Dune Grass Planting	85	AC	\$ 20,000.00	\$ 1,700,000	32,000 LF of dune grass planting
	SUBTOTAL		CY		\$ 52,885,000	

General						
Items						
1	Mob/Demob	2	EA	\$ 3,300,000.00	\$ 6,600,000	30" Cutter Head Dredge
	SUBTOTAL				\$ 6,600,000	

TOTAL		\$ 59,485,000
CONTINGENCY 22.84%		\$ 13,586,374
Escalation 2Q 2016 to 2Q 2018	3.31%	\$ 2,415,000
GRAND TOTAL CONSTRUCTION COST		\$ 75,486,374

Contract No.: W912DS-09-0009
 Task Order No.: 26

**Alternative 3n - XL
 Feasibility Estimate**

Discipline: Groins Sheet: 5 OF 7
 Prepared by: R. Hampson Date: 5/1/2015
 Updated: S. Jessup Date: 7/11/2018
M. Kluijver Date: 7/12/2018

Integrated Hurricane Sandy General Reevaluation Report and Environmental Impact
 Statement - Atlantic Coast of New York - East Rockaway Inlet to Rockaway Inlet and Jamaica

Project Title: Bay

Consultant Name: **Moffatt & Nichol**

Consultant Contact:

M. Kluijver

Item #	Description	Quantity	Unit	Unit Price \$	Total \$	Assumption / Basis
New Groins in Reach 3 & 4						
Items						
1	Armor Stone (4-8 TON)	66,839	TON	\$ 193.30	\$ 12,919,882	12 groins @ a total of 4087 ft
2	Underlayer Stone (500-1500 lbs)	21,784	TON	\$ 104.68	\$ 2,280,391	
3	Core Stone (30-130 lbs)	13,368	TON	\$ 92.87	\$ 1,241,458	
4	Bedding Stone (30-130 lbs)	34,162	CY	\$ 92.87	\$ 3,172,616	
5	Geotextile Filter Fabric	38,123	SY	\$ 23.68	\$ 902,746	
6	Excavation - Sand	114,368	CY	\$ 7.24	\$ 828,025	
	SUBTOTAL				\$ 21,345,000	<i>\$4,311 per LF of groin</i>

New Groin in Reach 6a						
Items						
1	Armor Stone (3-10 TON)	7,774	TON	\$ 193.30	\$ 1,502,714	1 groin @ 526 ft
2	Underlayer Stone (500-1500 lbs)	2,751	TON	\$ 104.68	\$ 287,954	
3	Core Stone (30-130 lbs)	1,674	TON	\$ 92.87	\$ 155,502	
4	Bedding Stone (30-130 lbs)	3,767	CY	\$ 92.87	\$ 349,878	
5	Geotextile Filter Fabric	4,485	SY	\$ 23.68	\$ 106,205	
6	Excavation - Sand	11,123	CY	\$ 7.24	\$ 80,529	
	SUBTOTAL				\$ 2,483,000	<i>\$4,152 per LF of groin</i>

Groin Extensions in Reach 6a						
Items						
1	Armor Stone (10 TON)	28,652	TON	\$ 193.30	\$ 5,538,432	5 groin extensions @ a total of 800'
2	Underlayer & Core Stone (500-1500 lbs)	6,032	TON	\$ 104.68	\$ 631,430	
3	Core Stone (30-130 lbs)	3,828	TON	\$ 92.87	\$ 355,506	
4	Bedding Stone (30-130 lbs)	12,064	CY	\$ 92.87	\$ 1,120,384	
5	Geotextile Filter Fabric	10,904	SY	\$ 23.68	\$ 258,207	
6	Excavation - Sand	17,748	CY	\$ 7.24	\$ 128,496	
	SUBTOTAL				\$ 8,032,000	<i>\$6,924 per LF of groin</i>

General						
Items						
1	Mob/Demob	1	EA	\$ 2,500,000.00	\$ 2,500,000	
	SUBTOTAL				\$ 2,500,000	

TOTAL	\$	34,360,000
CONTINGENCY 22.84%	\$	7,847,824
Escalation 2Q 2016 to 2Q 2018	3.31%	\$ 1,395,000
GRAND TOTAL CONSTRUCTION COST	\$	43,602,824

Contract No.: W912DS-09-0009
 Task Order No.: 26

**Alternative 3n - XL
 Feasibility Estimate**

Discipline: Beachfill-Ren Sheet: 6 OF 7
 Prepared by: R. Hampson Date: 5/1/2015
 Updated: S. Jessup Date: 7/11/2018
M. Kluijver Date: 7/12/2018

Integrated Hurricane Sandy General Reevaluation Report and Environmental Impact
 Statement - Atlantic Coast of New York - East Rockaway Inlet to Rockaway Inlet and Jamaica
 Bay
 Project Title: _____

Consultant Name: **Moffatt & Nichol**

Consultant Contact: _____

M. Kluijver

Item #	Description	Quantity	Unit	Unit Price \$	Total \$	Assumption / Basis
Beachfill-Renourishment Operation						
Items						
1	Beachfill-Reach 1	-	CY	\$ 12.88	\$ -	estimate for a single renourishment operation
2	Beachfill-Reach 2	-	CY	\$ 12.88	\$ -	renourishment operations occur in 4-year cycles
3	Beachfill-Reach 3	608,000	CY	\$ 12.88	\$ 7,831,040	advance fill - 4-year cycle
4	Beachfill-Reach 4	149,000	CY	\$ 12.88	\$ 1,919,120	advance fill - 4-year cycle
5	Beachfill-Reach 5	534,000	CY	\$ 12.88	\$ 6,877,920	advance fill - 4-year cycle
6	Beachfill-Reach 6a	11,000	CY	\$ 12.88	\$ 141,680	advance fill - 4-year cycle
	SUBTOTAL	1,302,000	CY		\$ 16,770,000	

General						
Items						
1	Mob/Demob	1	EA	\$ 3,300,000.00	\$ 3,300,000	large hopper dredge
	SUBTOTAL				\$ 3,300,000	

TOTAL		\$ 20,070,000
CONTINGENCY 30.47%		\$ 6,115,000
Escalation 2Q 2016 to 2Q 2018	3.31%	\$ 866,000
GRAND TOTAL CONSTRUCTION COST		\$ 27,051,000

Contract No.: W912DS-09-0009
 Task Order No.: 26

**Alternative 3n - XL
 Feasibility Estimate**

Discipline: Structural Sheet: 7 OF 7
 Prepared by: R. Hampson Date: 5/1/2015
 Updated: S. Jessup Date: 7/11/2018
M. Kluijver Date: 7/12/2018

Integrated Hurricane Sandy General Reevaluation Report and Environmental Impact
 Statement - Atlantic Coast of New York - East Rockaway Inlet to Rockaway Inlet and Jamaica

Project Title: Bay

Consultant Name: Moffatt & Nichol

Consultant Contact:

M. Kluijver

Item #	Description	Quantity	Unit	Unit Price \$	Total \$	Assumption / Basis
Boardwalk Access Ramps						
Items						
1	24" Steel Pipe Pile	342	LF	\$ 135.00	\$ 46,170	9 piles @ 24x1/2" WT (38 ft long)
2	Precast Concrete Pile Cap	46	CY	\$ 1,500.00	\$ 69,000	9 caps @ 5.1 cy each
3	Cast in Place Concrete Plug	6	CY	\$ 500.00	\$ 3,000	9 plugs
4	Cast in Place Concrete Deck	18	CY	\$ 1,000.00	\$ 17,500	9 @ 4'6" x 10' x 14"
5	Precast Concrete Deck	102	CY	\$ 1,000.00	\$ 102,000	278' x 10' x 14"
6	RPL Decking	2,780	SF	\$ 50.00	\$ 139,000	Furnish and Install
7	Handrail	556	LF	\$ 150.00	\$ 83,400	Furnish and Install
SUBTOTAL					\$ 460,000	

Demolition						
Items						
1	Access Ramps	2,780	SF	\$ 35.00	\$ 97,300	Demo and Dispose of Access Ramp
SUBTOTAL					\$ 97,000	

General						
Items						
1	Mob/Demob	0.125	EA	\$ 1,000,000.00	\$ 125,000	
SUBTOTAL					\$ 125,000	

SUBTOTAL	\$ 682,000
GENERAL CONDITIONS 10%	\$ 68,000
SUBTOTAL (ALL ITEMS)	\$ 750,000
G. C. OVERHEAD & PROFIT 10%	\$ 75,000
TOTAL	\$ 825,000
CONTINGENCY 22.84%	\$ 188,000
Escalation 2Q 2016 to 2Q 2018 3.31%	\$ 33,000
GRAND TOTAL CONSTRUCTION COST	\$ 1,046,000

**CSRM ALTERNATIVES
INTERMEDIATE SEA LEVEL CHANGE SCENARIO
ALTERNATIVE 3N BURRIED SEAWALL**

Contract No.: W912DS-09-0009
 Task Order No.: 26

**Alternative 3n - Buried Seawall
 Feasibility Estimate**

Discipline: Annualized Cost Sheet: 1 OF 7
 Prepared by: R. Hampson Date: 4/20/2015
 Updated: S. Jessup Date: 7/11/2018
M. Kluijver Date: 7/12/2018

Project Title: Integrated Hurricane Sandy General Reevaluation Report and Environmental Impact Statement -
 Atlantic Coast of New York - East Rockaway Inlet to Rockaway Inlet and Jamaica Bay

Consultant Name: Moffatt & Nichol Consultant Contact: M. Kluijver

Item #	Description	Quantity	Unit	Unit Price \$	Total \$	Assumption / Basis
Annualized Costs						
Items						
1	Total Investment	1	LS	\$ 5,898,000.00	\$ 5,898,000	
2	Renourishment	1	LS	\$ 6,364,000.00	\$ 6,364,000	
3	Major Rehab	1	LS	\$ 332,000.00	\$ 332,000	
4	Groin & Seawall Maintenance	1	LS	\$ 325,000.00	\$ 325,000	
5	Monitoring	1	LS	\$ 403,000.00	\$ 403,000	
6	SLR Adaption	1	LS	\$ 1,020,000.00	\$ 1,020,000	
	SUBTOTAL				\$ 14,342,000	

Total Annual Cost

\$ 14,342,000

Contract No.: W912DS-09-0009
 Task Order No.: 26

**Alternative 3n - Buried Seawall
 Feasibility Estimate**

Discipline: First Costs Sheet: 2 OF 7
 Prepared by: R. Hampson Date: 4/20/2015
 Updated: S. Jessup Date: 7/11/2018
M. Kluijver Date: 7/12/2018

Project Title: Integrated Hurricane Sandy General Reevaluation Report and Environmental Impact Statement -
 Atlantic Coast of New York - East Rockaway Inlet to Rockaway Inlet and Jamaica Bay

Consultant Name: Moffatt & Nichol Consultant Contact: M. Kluijver

Item #	Description	Quantity	Unit	Unit Price \$	Total \$	Assumption / Basis
Construction Costs						
WBS	Items					
17	Mob/Demob	1	LS	\$ 3,300,000.00	\$ 3,300,000	
17	Beachfill	1	LS	\$ 17,444,000.00	\$ 17,444,000	
10	Mob/Demob - Groins	1	LS	\$ 2,500,000.00	\$ 2,500,000	
10	New Groins in Reach 3 & 4	1	LS	\$ 17,620,000.00	\$ 17,620,000	build 12 new groins
10	New Groin in Reach 6	1	LS	\$ 2,184,000.00	\$ 2,184,000	build 1 new groin
10	Groin Extensions in Reach 6	1	LS	\$ 5,540,000.00	\$ 5,540,000	extend 5 groins
10	Mob/Demob - Seawall	1	LS	\$ 2,600,000.00	\$ 2,600,000	
10	Buried Seawall	1	LS	\$ 53,674,000.00	\$ 53,674,000	32,000 lf of buried seawall
	SUBTOTAL				\$ 104,862,000	
	CONTINGENCY 24.56%				\$ 25,754,000	
	SUBTOTAL				\$ 130,616,000	

Lands & Damages						
WBS	Items					
01	Lands & Damages	1	LS	\$ -	\$ -	
	CONTINGENCY 20%				\$ -	
	SUBTOTAL				\$ -	

Planning, Engineering & Design						
WBS	Items					
30	Planning, Engineering & Design	1	LS	10.00%	\$ 10,486,000	
	CONTINGENCY 15.25%				\$ 1,599,000	
	SUBTOTAL				\$ 12,085,000	

Construction Management						
WBS	Items					
30	Construction Management	1	LS	6.46%	\$ 6,774,000	
	CONTINGENCY 15.25%				\$ 1,033,000	
	SUBTOTAL				\$ 7,807,000	

First Cost \$ 150,508,000
 Escalation 2Q 2016 to 2Q 2018 3.31% \$ 4,975,000
 Interest During Construction \$ 3,753,000
Total Investment Cost \$ 159,236,000

Annualized Total Investment Cost \$ 5,898,000

Interest Rate 2.750%
 Life 50
 Capital Recovery Factor 0.03704
 Construction Period in months 21.75
 IDC Factor 0.024138631

Contract No.: W912DS-09-0009
 Task Order No.: 26

**Alternative 3n - Buried Seawall
 Feasibility Estimate**

Discipline: Ren. Costs Sheet: 3 OF 7
 Prepared by: R. Hampson Date: 4/20/2015
 Updated: S. Jessup Date: 7/11/2018
M. Kluijver Date: 7/12/2018

Project Title: Integrated Hurricane Sandy General Reevaluation Report and Environmental Impact Statement -
 Atlantic Coast of New York - East Rockaway Inlet to Rockaway Inlet and Jamaica Bay

Consultant Name: Moffatt & Nichol Consultant Contact: M. Kluijver

Item #	Description	Quantity	Unit	Unit Price \$	Total \$	Assumption / Basis
Construction Costs						
WBS	Items					
17	Mob/Demob	1	LS	\$ 3,300,000.00	\$ 3,300,000	
17	Beachfill	1	LS	\$ 14,310,000.00	\$ 14,310,000	
	SUBTOTAL				\$ 17,610,000	
	CONTINGENCY 30.47%				\$ 5,366,000	
	SUBTOTAL				\$ 22,976,000	

Lands & Damages						
WBS	Items					
01	Lands & Damages	1	LS	\$ -	\$ -	
	CONTINGENCY 20%				\$ -	
	SUBTOTAL				\$ -	

Planning, Engineering & Design						
WBS	Items					
30	Planning, Engineering & Design	1	LS	10.00%	\$ 1,761,000	
	CONTINGENCY 15.25%				\$ 269,000	
	SUBTOTAL				\$ 2,030,000	

Construction Management						
WBS	Items					
30	Construction Management	1	LS	8.08%	\$ 1,423,000	
	CONTINGENCY 15.25%				\$ 217,000	
	SUBTOTAL				\$ 1,640,000	

First Cost		\$ 26,646,000
Escalation 2Q 2016 to 2Q 2018	3.31%	\$ 881,000
Interest During Construction		\$ -
Total Renourishment Cost		\$ 27,527,000

Annualized TotalRenourishment Cost **\$ 6,364,000** from amortization file

Interest Rate 2.750%
 Life 50
 Capital Recovery Factor 0.03704
 Present Value Factor 5.61125

Contract No.: W912DS-09-0009
 Task Order No.: 26

**Alternative 3n - Buried Seawall
 Feasibility Estimate**

Discipline: First Costs Sheet: 2 OF 7
 Prepared by: R. Hampson Date: 4/20/2015
 Updated: S. Jessup Date: 7/11/2018
M. Kluijver Date: 7/12/2018

Project Title: Integrated Hurricane Sandy General Reevaluation Report and Environmental Impact Statement -
 Atlantic Coast of New York - East Rockaway Inlet to Rockaway Inlet and Jamaica Bay

Consultant Name: Moffatt & Nichol Consultant Contact: M. Kluijver

Item #	Description	Quantity	Unit	Unit Price \$	Total \$	Assumption / Basis
Construction Costs						
WBS	Items					
10	Mob/Demob	1	EA	\$ 1,700,000.00	\$ 1,700,000	
10	Armor Stone (1.5 TON)	125,760	TON	\$ 124.71	\$ 15,683,530	
10	Core Stone	19,200	TON	\$ 87.47	\$ 1,679,424	
10	Geotextile	35,520	SY	\$ 7.72	\$ 274,214	
10	Excavation/Placement - Sand	301,760	CY	\$ 7.66	\$ 2,311,482	
17	Beachfill - Dune	1,106,000	CY	\$ 12.88	\$ 14,245,280	
17	Dune Grass Planting	73	AC	\$ 20,000.00	\$ 1,460,000	32,000 LF of dune grass planting
10	Access Ramps	8	EA	\$ 825,000.00	\$ 6,600,000	
	SUBTOTAL				\$ 43,954,000	
	CONTINGENCY 24.56%				\$ 10,795,000	
	SUBTOTAL				\$ 54,749,000	

Lands & Damages						
WBS	Items					
01	Lands & Damages	1	LS	\$ -	\$ -	
	CONTINGENCY 20%				\$ -	
	SUBTOTAL				\$ -	

Planning, Engineering & Design						
WBS	Items					
30	Planning, Engineering & Design	1	LS	10.00%	\$ 4,395,000	
	CONTINGENCY 15.25%				\$ 670,000	
	SUBTOTAL				\$ 5,065,000	

Construction Management						
WBS	Items					
30	Construction Management	1	LS	7.25%	\$ 3,187,000	
	CONTINGENCY 15.25%				\$ 486,000	
	SUBTOTAL				\$ 3,673,000	

First Cost		\$ 63,487,000
Escalation 2Q 2016 to 2Q 2018	3.31%	\$ 2,099,000
Interest During Construction		\$ -
Total Adaption Cost		\$ 65,586,000

Annualized Total Investment Cost **\$ 1,020,000** Construction in Year 32

Interest Rate 2.750%
 Life 50
 Capital Recovery Factor 0.03704
 Construction Period in months 3.7
 IDC Factor 0.003097769

Contract No.: W912DS-09-0009
 Task Order No.: 26

**Alternative 3n - Buried Seawall
 Feasibility Estimate**

Discipline: Beachfill-Initial Sheet: 4 OF 7
 Prepared by: R. Hampson Date: 4/20/2015
 Updated: S. Jessup Date: 7/11/2018
M. Kluijver Date: 7/12/2018

Integrated Hurricane Sandy General Reevaluation Report and Environmental Impact
 Statement - Atlantic Coast of New York - East Rockaway Inlet to Rockaway Inlet and Jamaica

Project Title: Bay

Consultant Name: **Moffatt & Nichol**

Consultant Contact:

M. Kluijver

Item #	Description	Quantity	Unit	Unit Price \$	Total \$	Assumption / Basis
Beachfill - Initial Construction						
Items						
1	Beachfill-Reach 1	-	CY	\$ 12.88	\$ -	
2	Beachfill-Reach 2	-	CY	\$ 12.88	\$ -	
3	Beachfill-Reach 3	356,000	CY	\$ 12.88	\$ 4,585,280	design + advance fill
4	Beachfill-Reach 4	294,000	CY	\$ 12.88	\$ 3,786,720	design + advance fill
5	Beachfill-Reach 5	321,000	CY	\$ 12.88	\$ 4,134,480	design + advance fill
6	Beachfill-Reach 6a	250,000	CY	\$ 12.88	\$ 3,220,000	design + advance fill
7	Beachfill-Reach 6b	20,000	CY	\$ 12.88	\$ 257,600	design + advance fill
8	Dune Grass Planting	73	AC	\$ 20,000.00	\$ 1,460,000	32,000 LF of dune grass planting
	SUBTOTAL		CY		\$ 17,444,000	

General						
Items						
1	Mob/Demob	1	EA	\$ 3,300,000.00	\$ 3,300,000	30" Cutter Head Dredge
	SUBTOTAL				\$ 3,300,000	

TOTAL		\$ 20,744,000
CONTINGENCY 24.56%		\$ 5,094,726
Escalation 2Q 2016 to 2Q 2018	3.31%	\$ 854,000
GRAND TOTAL CONSTRUCTION COST		\$ 26,692,726

Contract No.: W912DS-09-0009
 Task Order No.: 26

**Buried Seawall
 Feasibility Estimate**

Discipline: Buried Seawall Sheet: 5 OF 7
 Prepared by: R. Hampson Date: 3/24/2015
 Updated: S. Jessup Date: 7/11/2018
M. Kluijver Date: 7/12/2018

Integrated Hurricane Sandy General Reevaluation Report and Environmental Impact
 Statement - Atlantic Coast of New York - East Rockaway Inlet to Rockaway Inlet and Jamaica
 Bay
 Project Title: _____

Consultant Name: **Moffatt & Nichol** Consultant Contact: **M. Kluijver**

Item #	Description	Quantity	Unit	Unit Price \$	Total \$	Assumption / Basis
Buried Seawall						
Items						
1	Armor Stone (1.5 TON)	272,960	TON	\$ 124.71	\$ 34,040,842	
2	Core Stone	202,560	TON	\$ 87.47	\$ 17,717,923	
3	Geotextile	155,520	SY	\$ 7.72	\$ 1,200,614	
4	Excavation - Sand	186,560	CY	\$ 3.83	\$ 714,525	
	SUBTOTAL				\$ 53,674,000	

General						
Items						
1	Mob/Demob	2	EA	\$ 1,300,000.00	\$ 2,600,000	
	SUBTOTAL				\$ 2,600,000	

TOTAL		\$ 56,274,000
CONTINGENCY 24.56%		\$ 13,820,894
Escalation 2Q 2016 to 2Q 2018	3.31%	\$ 2,317,000
GRAND TOTAL CONSTRUCTION COST		\$ 72,411,894

Contract No.: W912DS-09-0009
 Task Order No.: 26

**Alternative 3n - Buried Seawall
 Feasibility Estimate**

Discipline: Groins Sheet: 6 OF 7
 Prepared by: R. Hampson Date: 4/20/2015
 Updated: S. Jessup Date: 7/11/2018
M. Kluijver Date: 7/12/2018

Integrated Hurricane Sandy General Reevaluation Report and Environmental Impact
 Statement - Atlantic Coast of New York - East Rockaway Inlet to Rockaway Inlet and Jamaica
 Bay

Project Title:

Consultant Name: **Moffatt & Nichol**

Consultant Contact:

M. Kluijver

Item #	Description	Quantity	Unit	Unit Price \$	Total \$	Assumption / Basis
New Groins in Reach 3 & 4						
Items						
1	Armor Stone (4-8 TON)	55,175	TON	\$ 193.30	\$ 10,665,231	12 groins @ a total of 4087 ft
2	Underlayer Stone (500-1500 lbs)	17,983	TON	\$ 104.68	\$ 1,882,440	
3	Core Stone (30-130 lbs)	11,035	TON	\$ 92.87	\$ 1,024,811	
4	Bedding Stone (30-130 lbs)	28,200	CY	\$ 92.87	\$ 2,618,962	
5	Geotextile Filter Fabric	31,470	SY	\$ 23.68	\$ 745,207	
6	Excavation - Sand	94,410	CY	\$ 7.24	\$ 683,526	
	SUBTOTAL				\$ 17,620,000	<i>\$4,311 per LF of groin</i>

New Groin in Reach 6a						
Items						
1	Armor Stone (3-10 TON)	6,838	TON	\$ 193.30	\$ 1,321,785	1 groin @ 526 ft
2	Underlayer Stone (500-1500 lbs)	2,420	TON	\$ 104.68	\$ 253,284	
3	Core Stone (30-130 lbs)	1,473	TON	\$ 92.87	\$ 136,779	
4	Bedding Stone (30-130 lbs)	3,314	CY	\$ 92.87	\$ 307,753	
5	Geotextile Filter Fabric	3,945	SY	\$ 23.68	\$ 93,418	
6	Excavation - Sand	9,784	CY	\$ 7.24	\$ 70,833	
	SUBTOTAL				\$ 2,184,000	<i>\$4,152 per LF of groin</i>

Groin Extensions in Reach 6a						
Items						
1	Armor Stone (10 TON)	19,760	TON	\$ 193.30	\$ 3,819,608	5 groin extensions @ a total of 800'
2	Underlayer & Core Stone (500-1500 lbs)	4,160	TON	\$ 104.68	\$ 435,469	
3	Core Stone (30-130 lbs)	2,640	TON	\$ 92.87	\$ 245,177	
4	Bedding Stone (30-130 lbs)	8,320	CY	\$ 92.87	\$ 772,678	
5	Geotextile Filter Fabric	7,520	SY	\$ 23.68	\$ 178,074	
6	Excavation - Sand	12,240	CY	\$ 7.24	\$ 88,618	
	SUBTOTAL				\$ 5,540,000	<i>\$6,925 per LF of groin</i>

General						
Items						
1	Mob/Demob	1	EA	\$ 2,500,000.00	\$ 2,500,000	
	SUBTOTAL				\$ 2,500,000	

TOTAL		\$ 27,844,000
CONTINGENCY 24.56%		\$ 7,089,082
Escalation 2Q 2016 to 2Q 2018	3.31%	\$ 1,155,000
GRAND TOTAL CONSTRUCTION COST		\$ 36,088,082

Contract No.: W912DS-09-0009
 Task Order No.: 26

**Alternative 3n - Buried Seawall
 Feasibility Estimate**

Discipline: Beachfill-Ren Sheet: 7 OF 7
 Prepared by: R. Hampson Date: 4/20/2015
 Updated: S. Jessup Date: 7/11/2018
M. Kluijver Date: 7/12/2018

Integrated Hurricane Sandy General Reevaluation Report and Environmental Impact
 Statement - Atlantic Coast of New York - East Rockaway Inlet to Rockaway Inlet and Jamaica
 Bay
 Project Title: _____

Consultant Name: **Moffatt & Nichol** Consultant Contact: **M. Kluijver**

Item #	Description	Quantity	Unit	Unit Price \$	Total \$	Assumption / Basis
Beachfill-Renourishment Operation						
Items						
1	Beachfill-Reach 1	-	CY	\$ 12.88	\$ -	estimate for a single renourishment operation
2	Beachfill-Reach 2	-	CY	\$ 12.88	\$ -	renourishment operations occur in 4-year cycles
3	Beachfill-Reach 3	475,000	CY	\$ 12.88	\$ 6,118,000	advance fill - 4-year cycle
4	Beachfill-Reach 4	149,000	CY	\$ 12.88	\$ 1,919,120	advance fill - 4-year cycle
5	Beachfill-Reach 5	476,000	CY	\$ 12.88	\$ 6,130,880	advance fill - 4-year cycle
6	Beachfill-Reach 6a	11,000	CY	\$ 12.88	\$ 141,680	advance fill - 4-year cycle
	SUBTOTAL	1,111,000	CY		\$ 14,310,000	

General						
Items						
1	Mob/Demob	1	EA	\$ 3,300,000.00	\$ 3,300,000	large hopper dredge
	SUBTOTAL				\$ 3,300,000	

TOTAL		\$ 17,610,000
CONTINGENCY 30.47%		\$ 5,366,000
Escalation 2Q 2016 to 2Q 2018	3.31%	\$ 760,000
GRAND TOTAL CONSTRUCTION COST		\$ 23,736,000

Contract No.: W912DS-09-0009

Alternative 3n - Composite Seawall

Discipline: Annualized Cost Sheet: 1 OF 8

Task Order No.: 26

Feasibility Estimate

Prepared by: R. Hampson Date: 4/20/2015

Project Title: East Rockaway to Rockaway Inlet Reformulation Study

Updated: S. Jessup Date: 7/11/2018

Consultant Name: Moffatt & Nichol

Consultant Contact: R. Hampson

Item #	Description	Quantity	Unit	Unit Price \$	Total \$	Assumption / Basis
Annualized Costs						
Items						
1	Total Investment	1	LS	\$ 8,436,000.00	\$ 8,436,000	
2	Renourishment	1	LS	\$ 6,364,000.00	\$ 6,364,000	
3	Major Rehab	1	LS	\$ 332,000.00	\$ 332,000	
4	Groin & Seawall Maintenance	1	LS	\$ 433,000.00	\$ 433,000	
5	Monitoring	1	LS	\$ 408,000.00	\$ 403,000	
6	SLR Adaption	1	LS	\$ 1,453,000.00	\$ 1,453,000	
	SUBTOTAL				\$ 17,421,000	

Total Annual Cost

\$ 17,421,000

Contract No.: W912DS-09-0009
 Task Order No.: 26

**Alternative 3n - Composite Seawall
 Feasibility Estimate**

Discipline: First Costs Sheet: 2 OF 8
 Prepared by: R. Hampson Date: 4/20/2015
 Updated: S. Jessup Date: 7/11/2018
M. Kluijver Date: 7/12/2018

Project Title: Integrated Hurricane Sandy General Reevaluation Report and Environmental Impact Statement -
 Atlantic Coast of New York - East Rockaway Inlet to Rockaway Inlet and Jamaica Bay

Consultant Name: Moffatt & Nichol Consultant Contact: M. Kluijver

Item #	Description	Quantity	Unit	Unit Price \$	Total \$	Assumption / Basis
Construction Costs						
WBS	Items					
17	Mob/Demob	1	LS	\$ 3,300,000.00	\$ 3,300,000	
17	Beachfill	1	LS	\$ 17,444,000.00	\$ 17,444,000	
2	Boardwalk Access Ramps	8	LS	\$ 333,000.00	\$ 2,664,000	
10	Mob/Demob - Groin	1	LS	\$ 2,500,000.00	\$ 2,500,000	
10	New Groins in Reach 3 & 4	1	LS	\$ 17,620,000.00	\$ 17,620,000	build 12 new groins
10	New Groin in Reach 6	1	LS	\$ 2,184,000.00	\$ 2,184,000	build 1 new groin
10	Groin Extensions in Reach 6	1	LS	\$ 5,540,000.00	\$ 5,540,000	extend 5 groins
10	Mob/Demob - Composite Wall	1	LS	\$ 3,400,000.00	\$ 3,400,000	
10	Composite Seawall	1	LS	\$ 93,786,000.00	\$ 93,786,000	32,000 lf of composite seawall
	SUBTOTAL				\$ 148,438,000	
	CONTINGENCY 25.51%				\$ 37,867,000	
	SUBTOTAL				\$ 186,305,000	

Lands & Damages						
WBS	Items					
01	Lands & Damages	1	LS	\$ -	\$ -	
	CONTINGENCY 20%				\$ -	
	SUBTOTAL				\$ -	

Planning, Engineering & Design						
WBS	Items					
30	Planning, Engineering & Design	1	LS	10.00%	\$ 14,844,000	
	CONTINGENCY 15.25%				\$ 2,264,000	
	SUBTOTAL				\$ 17,108,000	

Construction Management						
WBS	Items					
30	Construction Management	1	LS	6.14%	\$ 9,114,000	
	CONTINGENCY 15.25%				\$ 1,390,000	
	SUBTOTAL				\$ 10,504,000	

First Cost		\$ 213,917,000
Escalation 2Q 2016 to 2Q 2018	3.31%	\$ 7,071,000
Interest During Construction		\$ 6,761,000
Total Investment Cost		\$ 227,749,000

Annualized Total Investment Cost		\$ 8,436,000
Interest Rate	2.750%	
Life	50	
Capital Recovery Factor	0.03704	
Construction Period in months	27.19	
IDC Factor	0.030594915	

**CSRM ALTERNATIVES
INTERMEDIATE SEA LEVEL CHANGE SCENARIO
ALTERNATIVE 3N COMPOSITE SEAWALL**

Contract No.: W912DS-09-0009
 Task Order No.: 26

**Alternative 3n - Composite Seawall
 Feasibility Estimate**

Discipline: Ren. Costs Sheet: 3 OF 8
 Prepared by: R. Hampson Date: 4/20/2015
 Updated: S. Jessup Date: 7/11/2018
M. Kluijver Date: 7/12/2018

Project Title: Integrated Hurricane Sandy General Reevaluation Report and Environmental Impact Statement -
 Atlantic Coast of New York - East Rockaway Inlet to Rockaway Inlet and Jamaica Bay

Consultant Name: Moffatt & Nichol Consultant Contact: M. Kluijver

Item #	Description	Quantity	Unit	Unit Price \$	Total \$	Assumption / Basis
Construction Costs						
WBS	Items					
17	Mob/Demob	1	LS	\$ 3,300,000.00	\$ 3,300,000	
17	Beachfill	1	LS	\$ 14,310,000.00	\$ 14,310,000	
	SUBTOTAL				\$ 17,610,000	
	CONTINGENCY 30.47%				\$ 5,366,000	
	SUBTOTAL				\$ 22,976,000	

Lands & Damages						
WBS	Items					
01	Lands & Damages	1	LS	\$ -	\$ -	
	CONTINGENCY 20%				\$ -	
	SUBTOTAL				\$ -	

Planning, Engineering & Design						
WBS	Items					
30	Planning, Engineering & Design	1	LS	10.00%	\$ 1,761,000	
	CONTINGENCY 15.25%				\$ 269,000	
	SUBTOTAL				\$ 2,030,000	

Construction Management						
WBS	Items					
30	Construction Management	1	LS	8.08%	\$ 1,423,000	
	CONTINGENCY 15.25%				\$ 217,000	
	SUBTOTAL				\$ 1,640,000	

First Cost		\$ 26,646,000
Escalation 2Q 2016 to 2Q 2018	3.31%	\$ 881,000
Interest During Construction		\$ -
Total Renourishment Cost		\$ 27,527,000

Annualized TotalRenourishment Cost **\$ 6,364,000** from amortization file

Interest Rate 2.750%
 Life 50
 Capital Recovery Factor 0.03704
 Present Value Factor 5.61125

Contract No.: W912DS-09-0009
 Task Order No.: 26

**Alternative 3n - Composite Seawall
 Feasibility Estimate**

Discipline: First Costs Sheet: 2 OF 8
 Prepared by: R. Hampson Date: 4/20/2015
 Updated: S. Jessup Date: 7/11/2018
M. Kluijver Date: 7/12/2018

Integrated Hurricane Sandy General Reevaluation Report and Environmental Impact Statement -
 Project Title: Atlantic Coast of New York - East Rockaway Inlet to Rockaway Inlet and Jamaica Bay

Consultant Name: **Moffatt & Nichol** Consultant Contact: M. Kluijver

Item #	Description	Quantity	Unit	Unit Price \$	Total \$	Assumption / Basis
Construction Costs						
WBS	Items					
10	Mob/Demob - Composite Wall	1	EA	\$ 1,700,000.00	\$ 1,700,000	
10	Armor Stone (3 TON)	189,760	TON	\$ 124.29	\$ 23,585,270	
10	Core Stone	28,800	TON	\$ 86.15	\$ 2,481,120	
10	Geotextile	35,520	SY	\$ 9.18	\$ 326,074	
10	Excavation - Sand	445,760	CY	\$ 7.46	\$ 3,325,370	
10	Concrete Cap	7,680	CY	\$ 820.91	\$ 6,304,589	
17	Beachfill-Dune	1,288,490	CY	\$ 12.88	\$ 16,595,751	
17	Dune Grass Planting	73	AC	\$ 20,000.00	\$ 1,460,000	32,000 LF of dune grass planting
10	Access Ramps	8	EA	\$ 825,000.00	\$ 6,600,000	
	SUBTOTAL				\$ 62,378,000	
	CONTINGENCY 25.51%				\$ 15,913,000	
	SUBTOTAL				\$ 78,291,000	

Lands & Damages						
WBS	Items					
01	Lands & Damages	1	LS	\$ -	\$ -	
	CONTINGENCY 20%				\$ -	
	SUBTOTAL				\$ -	

Planning, Engineering & Design						
WBS	Items					
30	Planning, Engineering & Design	1	LS	10.00%	\$ 6,238,000	
	CONTINGENCY 15.25%				\$ 951,000	
	SUBTOTAL				\$ 7,189,000	

Construction Management						
WBS	Items					
30	Construction Management	1	LS	6.93%	\$ 4,323,000	
	CONTINGENCY 15.25%				\$ 659,000	
	SUBTOTAL				\$ 4,982,000	

First Cost		\$ 90,462,000
Escalation 2Q 2016 to 2Q 2018	3.31%	\$ 2,990,000
Interest During Construction		\$ -
Total Renourishment Cost		\$ 93,452,000

Annualized Total Investment Cost **\$ 1,453,000** Construction in Year 32

Interest Rate 2.750%
 Life 50
 Capital Recovery Factor 0.03704
 Construction Period in months 12
 IDC Factor 0.012700947

Contract No.: W912DS-09-0009
 Task Order No.: 26

**Alternative 3n - Composite Seawall
 Feasibility Estimate**

Discipline: Beachfill-Initial Sheet: 4 OF 8
 Prepared by: R. Hampson Date: 4/20/2015
 Updated: S. Jessup Date: 7/11/2018
M. Kluijver Date: 7/12/2018

Integrated Hurricane Sandy General Reevaluation Report and Environmental Impact
 Statement - Atlantic Coast of New York - East Rockaway Inlet to Rockaway Inlet and Jamaica
 Project Title: Bay

Consultant Name: **Moffatt & Nichol**

Consultant Contact:

M. Kluijver

Item #	Description	Quantity	Unit	Unit Price \$	Total \$	Assumption / Basis
Beachfill - Initial Construction						
Items						
1	Beachfill-Reach 1	-	CY	\$ 12.88	\$ -	
2	Beachfill-Reach 2	-	CY	\$ 12.88	\$ -	
3	Beachfill-Reach 3	356,000	CY	\$ 12.88	\$ 4,585,280	design + advance fill
4	Beachfill-Reach 4	294,000	CY	\$ 12.88	\$ 3,786,720	design + advance fill
5	Beachfill-Reach 5	321,000	CY	\$ 12.88	\$ 4,134,480	design + advance fill
6	Beachfill-Reach 6a	250,000	CY	\$ 12.88	\$ 3,220,000	design + advance fill
7	Beachfill-Reach 6b	20,000	CY	\$ 12.88	\$ 257,600	design + advance fill
8	Dune Grass Planting	73	AC	\$ 20,000.00	\$ 1,460,000	32,000 LF of dune grass planting
	SUBTOTAL		CY		\$ 17,444,000	

General						
Items						
1	Mob/Demob	1	EA	\$ 3,300,000.00	\$ 3,300,000	30" Cutter Head Dredge
	SUBTOTAL				\$ 3,300,000	

TOTAL		\$ 20,744,000
CONTINGENCY 25.51%		\$ 5,291,794
Escalation 2Q 2016 to 2Q 2018	3.31%	\$ 861,000
GRAND TOTAL CONSTRUCTION COST		\$ 26,896,794

Contract No.: W912DS-09-0009
 Task Order No.: 26

**Composite Seawall
 Feasibility Estimate**

Discipline: Composite Seawall Sheet: 5 OF 8
 Prepared by: R. Hampson Date: 3/24/2015
 Updated: S. Jessup Date: 7/11/2018
M. Kluijver Date: 7/12/2018

Integrated Hurricane Sandy General Reevaluation Report and Environmental Impact
 Statement - Atlantic Coast of New York - East Rockaway Inlet to Rockaway Inlet and Jamaica

Project Title: Bay

Consultant Name: **Moffatt & Nichol**

Consultant Contact: **M. Kluijver**

Item #	Description	Quantity	Unit	Unit Price \$	Total \$	Assumption / Basis
Composite Seawall						
Items						
1	Armor Stone (3 TON)	348,160	TON	\$ 124.29	\$ 43,272,806	
2	Core Stone	135,360	TON	\$ 86.15	\$ 11,661,264	
3	Geotextile	151,040	SY	\$ 9.18	\$ 1,386,547	
4	Excavation - Sand	312,960	CY	\$ 3.73	\$ 1,167,341	
5	Concrete Cap	11,520	CY	\$ 820.91	\$ 9,456,883	
6	AZ 12-770	7,040	TON	\$ 3,462.40	\$ 24,375,296	
7	Splash - Armor Stone	14,940	TON	\$ 110.00	\$ 1,643,400	
8	Splash - Bedding Stone	6,360	TON	\$ 80.00	\$ 508,800	
9	Splash - Geotextile	10,020	SY	\$ 9.18	\$ 91,984	
10	Splash - Fill	4,440	CY	\$ 50.00	\$ 222,000	
	SUBTOTAL				\$ 93,786,000	

General						
Items						
1	Mob/Demob	2	EA	\$ 1,700,000.00	\$ 3,400,000	
	SUBTOTAL				\$ 3,400,000	

TOTAL \$ 97,186,000
 CONTINGENCY 25.51% \$ 24,792,149
 Escalation 2Q 2016 to 2Q 2018 3.31% \$ 4,032,000
GRAND TOTAL CONSTRUCTION COST \$ 126,010,149

Contract No.: W912DS-09-0009
 Task Order No.: 26

**Alternative 3n - Composite Seawall
 Feasibility Estimate**

Discipline: Groins Sheet: 6 OF 8
 Prepared by: R. Hampson Date: 4/20/2015
 Updated: S. Jessup Date: 7/11/2018
M. Kluijver Date: 7/12/2018

Integrated Hurricane Sandy General Reevaluation Report and Environmental Impact
 Statement - Atlantic Coast of New York - East Rockaway Inlet to Rockaway Inlet and Jamaica

Project Title: Bay

Consultant Name: **Moffatt & Nichol**

Consultant Contact: M. Kluijver

Item #	Description	Quantity	Unit	Unit Price \$	Total \$	Assumption / Basis
New Groins in Reach 3 & 4						
Items						
1	Armor Stone (4-8 TON)	55,175	TON	\$ 193.30	\$ 10,665,231	12 groins @ a total of 4087 ft
2	Underlayer Stone (500-1500 lbs)	17,983	TON	\$ 104.68	\$ 1,882,440	
3	Core Stone (30-130 lbs)	11,035	TON	\$ 92.87	\$ 1,024,811	
4	Bedding Stone (30-130 lbs)	28,200	CY	\$ 92.87	\$ 2,618,962	
5	Geotextile Filter Fabric	31,470	SY	\$ 23.68	\$ 745,207	
6	Excavation - Sand	94,410	CY	\$ 7.24	\$ 683,526	
	SUBTOTAL				\$ 17,620,000	<i>\$4,311 per LF of groin</i>

New Groin in Reach 6a						
Items						
1	Armor Stone (3-10 TON)	6,838	TON	\$ 193.30	\$ 1,321,785	1 groin @ 526 ft
2	Underlayer Stone (500-1500 lbs)	2,420	TON	\$ 104.68	\$ 253,284	
3	Core Stone (30-130 lbs)	1,473	TON	\$ 92.87	\$ 136,779	
4	Bedding Stone (30-130 lbs)	3,314	CY	\$ 92.87	\$ 307,753	
5	Geotextile Filter Fabric	3,945	SY	\$ 23.68	\$ 93,418	
6	Excavation - Sand	9,784	CY	\$ 7.24	\$ 70,833	
	SUBTOTAL				\$ 2,184,000	<i>\$4,152 per LF of groin</i>

Groin Extensions in Reach 6a						
Items						
1	Armor Stone (10 TON)	19,760	TON	\$ 193.30	\$ 3,819,608	5 groin extensions @ a total of 800'
2	Underlayer & Core Stone (500-1500 lbs)	4,160	TON	\$ 104.68	\$ 435,469	
3	Core Stone (30-130 lbs)	2,640	TON	\$ 92.87	\$ 245,177	
4	Bedding Stone (30-130 lbs)	8,320	CY	\$ 92.87	\$ 772,678	
5	Geotextile Filter Fabric	7,520	SY	\$ 23.68	\$ 178,074	
6	Excavation - Sand	12,240	CY	\$ 7.24	\$ 88,618	
	SUBTOTAL				\$ 5,540,000	<i>\$6,925 per LF of groin</i>

General						
Items						
1	Mob/Demob	1	EA	\$ 2,500,000.00	\$ 2,500,000	
	SUBTOTAL				\$ 2,500,000	

TOTAL		\$ 27,844,000
CONTINGENCY 25.51%		\$ 7,103,004
Escalation 2Q 2016 to 2Q 2018	3.31%	\$ 1,155,000
GRAND TOTAL CONSTRUCTION COST		\$ 36,102,004

Contract No.: W912DS-09-0009
 Task Order No.: 26

**Alternative 3n - Composite Seawall
 Feasibility Estimate**

Discipline: Beachfill-Ren Sheet: 7 OF 8
 Prepared by: R. Hampson Date: 4/20/2015
 Updated: S. Jessup Date: 7/11/2018
M. Kluijver Date: 7/12/2018

Integrated Hurricane Sandy General Reevaluation Report and Environmental Impact
 Statement - Atlantic Coast of New York - East Rockaway Inlet to Rockaway Inlet and Jamaica
 Project Title: Bay

Consultant Name: Moffatt & Nichol Consultant Contact: M. Kluijver

Item #	Description	Quantity	Unit	Unit Price \$	Total \$	Assumption / Basis
Beachfill-Renourishment Operation						
Items						
1	Beachfill-Reach 1	-	CY	\$ 12.88	\$ -	estimate for a single renourishment operation
2	Beachfill-Reach 2	-	CY	\$ 12.88	\$ -	renourishment operations occur in 4-year cycles
3	Beachfill-Reach 3	475,000	CY	\$ 12.88	\$ 6,118,000	advance fill - 4-year cycle
4	Beachfill-Reach 4	149,000	CY	\$ 12.88	\$ 1,919,120	advance fill - 4-year cycle
5	Beachfill-Reach 5	476,000	CY	\$ 12.88	\$ 6,130,880	advance fill - 4-year cycle
6	Beachfill-Reach 6a	11,000	CY	\$ 12.88	\$ 141,680	advance fill - 4-year cycle
	SUBTOTAL	1,111,000	CY		\$ 14,310,000	

General						
Items						
1	Mob/Demob	1	EA	\$ 3,300,000.00	\$ 3,300,000	large hopper dredge
	SUBTOTAL				\$ 3,300,000	

TOTAL		\$ 17,610,000
CONTINGENCY 30.47%		\$ 5,366,000
Escalation 2Q 2016 to 2Q 2018	3.31%	\$ 760,000
GRAND TOTAL CONSTRUCTION COST		\$ 23,736,000

Contract No.: W912DS-09-0009
 Task Order No.: 26

**Alternative 3n - Composite Seawall
 Feasibility Estimate**

Discipline: Structural Sheet: 8 OF 8
 Prepared by: R. Hampson Date: 5/1/2015
 Updated: S. Jessup Date: 7/11/2018
M. Kluijver Date: 7/12/2018

Integrated Hurricane Sandy General Reevaluation Report and Environmental Impact
 Statement - Atlantic Coast of New York - East Rockaway Inlet to Rockaway Inlet and Jamaica

Project Title: Bay

Consultant Name: Moffatt & Nichol

Consultant Contact:

M. Kluijver

Item #	Description	Quantity	Unit	Unit Price \$	Total \$	Assumption / Basis
Boardwalk Access Ramps						
Items						
1	24" Steel Pipe Pile	114	LF	\$ 135.00	\$ 15,390	3 piles @ 24x1/2" WT (38 ft long)
2	Precast Concrete Pile Cap	15	CY	\$ 1,500.00	\$ 22,500	3 caps @ 5.1 cy each
3	Cast in Place Concrete Plug	2	CY	\$ 500.00	\$ 1,000	3 plugs
4	Cast in Place Concrete Deck	6	CY	\$ 1,000.00	\$ 6,000	3 @ 4'6" x 10' x 14"
5	Precast Concrete Deck	25	CY	\$ 1,000.00	\$ 25,000	70' x 10' x 14"
6	RPL Decking	695	SF	\$ 50.00	\$ 34,750	Furnish and Install
7	Handrail	139	LF	\$ 150.00	\$ 20,850	Furnish and Install
SUBTOTAL					\$ 125,000	

Demolition						
Items						
1	Access Ramps	700	SF	\$ 35.00	\$ 24,500	Demo and Dispose of Access Ramp
SUBTOTAL					\$ 25,000	

General						
Items						
1	Mob/Demob	0.125	EA	\$ 1,000,000.00	\$ 125,000	
SUBTOTAL					\$ 125,000	

SUBTOTAL	\$ 275,000
GENERAL CONDITIONS 10%	\$ 28,000
SUBTOTAL (ALL ITEMS)	\$ 303,000
G. C. OVERHEAD & PROFIT 10%	\$ 30,000
TOTAL	\$ 333,000
CONTINGENCY 25.51%	\$ 85,000
Escalation 2Q 2016 to 2Q 2018 3.31%	\$ 14,000
GRAND TOTAL CONSTRUCTION COST	\$ 432,000

Contract No.: W912DS-09-0009
 Task Order No.: 26

**Summary - Annualized Costs - Int SLR
 Feasibility Estimate**

Discipline: Annualized Cost Sheet: 1 OF 1
 Prepared by: R. Hampson Date: 6/17/2015
 Updated: M. Kluijver Date: 7/12/2018

Project Title: Integrated Hurricane Sandy General Reevaluation Report and Environmental Impact Statement -
 Atlantic Coast of New York - East Rockaway Inlet to Rockaway Inlet and Jamaica Bay

Consultant Name: Moffatt & Nichol Consultant Contact: M. Kluijver

Item #	Description	Medium +16'	Large +18'	XL +20'	Buried Seawall	Composite Seawall	
Annualized Costs - 4 year Cycle							
Items							
1	Total Investment	\$2,679,000	\$3,616,000	\$5,581,000	\$5,898,000	\$8,436,000	
2	Renourishment	\$6,364,000	\$6,801,000	\$7,243,000	\$6,364,000	\$6,364,000	
3	Major Rehab	\$332,000	\$332,000	\$332,000	\$332,000	\$332,000	
4	Groin & Seawall Maintenance	\$176,000	\$195,000	\$218,000	\$325,000	\$433,000	
5	Monitoring	\$403,000	\$403,000	\$403,000	\$403,000	\$403,000	
6	SLR Adaption	\$210,000	\$373,000	\$377,000	\$1,020,000	\$1,453,000	
	Total	\$10,164,000	\$11,720,000	\$14,154,000	\$14,342,000	\$17,421,000	
	IDC	\$1,307,000	\$2,129,000	\$3,461,000	\$3,753,000	\$6,761,000	

**ATTACHMENT D
CSRM ALTERNATIVES
HIGH SEA LEVEL
CHANGE SCREENING
LEVEL COST ESTIMATES**

**CSRM ALTERNATIVES
HIGH SEA LEVEL CHANGE SCENARIO
ALTERNATIVE 3N MEDIUM DUNE**

Contract No.: W912DS-09-0009
 Task Order No.: 26

**Alternative 3n - Medium
 Feasibility Estimate**

Discipline: Annualized Cost Sheet: 1 OF 6
 Prepared by: R. Hampson Date: 4/20/2015
 Updated: S. Jessup Date: 7/11/2018
M. Kluijver Date: 7/12/2018

Integrated Hurricane Sandy General Reevaluation Report and Environmental Impact Statement -
 Project Title: Atlantic Coast of New York - East Rockaway Inlet to Rockaway Inlet and Jamaica Bay

Consultant Name: Moffatt & Nichol Consultant Contact: M. Kluijver

Item #	Description	Quantity	Unit	Unit Price \$	Total \$	Assumption / Basis
Annualized Costs						
Items						
1	Total Investment	1	LS	\$ 2,679,000.00	\$ 2,679,000	
2	Renourishment	1	LS	\$ 7,666,000.00	\$ 7,666,000	
3	Major Rehab	1	LS	\$ 332,000.00	\$ 332,000	
4	Groin Maintenance	1	LS	\$ 176,000.00	\$ 176,000	
5	Monitoring	1	LS	\$ 403,000.00	\$ 403,000	
6	SLR Adaption Costs	1	LS	\$ 564,000.00	\$ 564,000	
	SUBTOTAL				\$ 11,820,000	

Total Annual Cost \$ 11,820,000

Contract No.: W912DS-09-0009
 Task Order No.: 26

**Alternative 3n - Medium
 Feasibility Estimate**

Discipline: First Costs Sheet: 2 OF 6
 Prepared by: R. Hampson Date: 4/20/2015
 Updated: S. Jessup Date: 7/11/2018
M. Kluijver Date: 7/12/2018

Project Title: Integrated Hurricane Sandy General Reevaluation Report and Environmental Impact Statement -
 Atlantic Coast of New York - East Rockaway Inlet to Rockaway Inlet and Jamaica Bay

Consultant Name: Moffatt & Nichol Consultant Contact: M. Kluijver

Item #	Description	Quantity	Unit	Unit Price \$	Total \$	Assumption / Basis
Construction Costs						
WBS	Items					
17	Mob/Demob	1	LS	\$ 3,300,000.00	\$ 3,300,000	
17	Beachfill	1	LS	\$ 17,204,000.00	\$ 17,204,000	
10	Mob/Demob	1	LS	\$ 2,500,000.00	\$ 2,500,000	
10	New Groins in Reach 3 & 4	1	LS	\$ 17,620,000.00	\$ 17,620,000	build 12 new groins
10	New Groin in Reach 6	1	LS	\$ 2,184,000.00	\$ 2,184,000	build 1 new groin
10	Groin Extensions in Reach 6	1	LS	\$ 5,540,000.00	\$ 5,540,000	extend 5 groins
	SUBTOTAL				\$ 48,348,000	
	CONTINGENCY 22.41%				\$ 10,835,000	
	SUBTOTAL				\$ 59,183,000	

Lands & Damages						
WBS	Items					
01	Lands & Damages	1	LS	\$ -	\$ -	
	CONTINGENCY 20%				\$ -	
	SUBTOTAL				\$ -	

Planning, Engineering & Design						
WBS	Items					
30	Planning, Engineering & Design	1	LS	10.00%	\$ 4,835,000	
	CONTINGENCY 15.25%				\$ 737,000	
	SUBTOTAL				\$ 5,572,000	

Construction Management						
WBS	Items					
30	Construction Management	1	LS	7.16%	\$ 3,462,000	
	CONTINGENCY 15.25%				\$ 528,000	
	SUBTOTAL				\$ 3,990,000	

First Cost		\$ 68,745,000
Escalation 2Q 2016 to 2Q 2018	3.31%	\$ 2,272,000
Interest During Construction		\$ 1,307,000
Total Investment Cost		\$ 72,324,000

Annualized Total Investment Cost \$ **2,679,000**

Interest Rate 2.750%
 Life 50
 Capital Recovery Factor 0.03704
 Construction Period in months 16.88
 IDC Factor 0.018404314

Contract No.: W912DS-09-0009
 Task Order No.: 26

**Alternative 3n - Medium
 Feasibility Estimate**

Discipline: Ren. Costs Sheet: 3 OF 6
 Prepared by: R. Hampson Date: 4/20/2015
 Updated: S. Jessup Date: 7/11/2018
M. Kluijver Date: 7/12/2018

Project Title: Integrated Hurricane Sandy General Reevaluation Report and Environmental Impact Statement -
 Atlantic Coast of New York - East Rockaway Inlet to Rockaway Inlet and Jamaica Bay

Consultant Name: Moffatt & Nichol

Consultant Contact: M. Kluijver

Item #	Description	Quantity	Unit	Unit Price \$	Total \$	Assumption / Basis
Construction Costs						
WBS	Items					
17	Mob/Demob	1	LS	\$ 3,300,000.00	\$ 3,300,000	
17	Beachfill	1	LS	\$ 17,955,000.00	\$ 17,955,000	
	SUBTOTAL				\$ 21,255,000	
	CONTINGENCY 30.47%				\$ 6,476,000	
	SUBTOTAL				\$ 27,731,000	

Lands & Damages						
WBS	Items					
01	Lands & Damages	1	LS	\$ -	\$ -	
	CONTINGENCY 20%				\$ -	
	SUBTOTAL				\$ -	

Planning, Engineering & Design						
WBS	Items					
30	Planning, Engineering & Design	1	LS	10.00%	\$ 2,126,000	
	CONTINGENCY 15.25%				\$ 324,000	
	SUBTOTAL				\$ 2,450,000	

Construction Management						
WBS	Items					
30	Construction Management	1	LS	7.91%	\$ 1,681,000	
	CONTINGENCY 15.25%				\$ 256,000	
	SUBTOTAL				\$ 1,937,000	

First Cost		\$ 32,118,000
Escalation 2Q 2016 to 2Q 2018	3.31%	\$ 1,062,000
Interest During Construction		\$ -
Total Renourishment Cost		\$ 33,180,000

Annualized TotalRenourishment Cost **\$ 7,666,000** from ammoritization file

Interest Rate 2.750%
 Life 50
 Capital Recovery Factor 0.03704
 Present Value Factor 5.61125

Contract No.: W912DS-09-0009
 Task Order No.: 26

**Alternative 3n - Large
 Feasibility Estimate**

Discipline: Adaption Costs Sheet: 3 OF 6
 Prepared by: R. Hampson Date: 4/20/2015
 Updated: S. Jessup Date: 7/11/2018
M. Kluijver Date: 7/12/2018

Project Title: Integrated Hurricane Sandy General Reevaluation Report and Environmental Impact Statement -
 Atlantic Coast of New York - East Rockaway Inlet to Rockaway Inlet and Jamaica Bay

Consultant Name: Moffatt & Nichol Consultant Contact: M. Kluijver

Item #	Description	Quantity	Unit	Unit Price \$	Total \$	Assumption / Basis
Construction Costs						
WBS	Items					
17	Mob/Demob	-	EA	\$ 3,300,000.00	\$ -	
17	Beachfill	553,000	CY	\$ 12.88	\$ 7,123,000	
17	Dune Grass Planting	73	AC	\$ 20,000.00	\$ 1,460,000	32,000 LF of dune grass planting
17	Access Ramps	-	EA	\$ 825,000.00	\$ -	Demo & Rebuild 8 Concrete Access Ramps
	SUBTOTAL				\$ 8,583,000	
	CONTINGENCY 30.47%				\$ 2,615,000	
	SUBTOTAL				\$ 11,198,000	

Lands & Damages						
WBS	Items					
01	Lands & Damages	1	LS	\$ -	\$ -	
	CONTINGENCY 20%				\$ -	
	SUBTOTAL				\$ -	

Planning, Engineering & Design						
WBS	Items					
30	Planning, Engineering & Design	1	LS	10.00%	\$ 858,000	
	CONTINGENCY 15.25%				\$ 131,000	
	SUBTOTAL				\$ 989,000	

Construction Management						
WBS	Items					
30	Construction Management	1	LS	8.74%	\$ 750,000	
	CONTINGENCY 15.25%				\$ 114,000	
	SUBTOTAL				\$ 864,000	

First Cost		\$	13,051,000
Escalation 2Q 2016 to 2Q 2018	3.31%	\$	431,000
Interest During Construction		\$	-
Total Adaption Cost		\$	13,482,000

Annualized Adaption Cost **\$ 564,000** from amortization

Interest Rate 2.750%
 Life 50
 Capital Recovery Factor 0.03704
 Present Value Factor 5.61125

Contract No.: W912DS-09-0009
 Task Order No.: 26

**Alternative 3n - Medium
 Feasibility Estimate**

Discipline: Beachfill-Initial Sheet: 4 OF 6
 Prepared by: R. Hampson Date: 4/20/2015
 Updated: S. Jessup Date: 7/11/2018
M. Kluijver Date: 7/12/2018

Integrated Hurricane Sandy General Reevaluation Report and Environmental Impact
 Statement - Atlantic Coast of New York - East Rockaway Inlet to Rockaway Inlet and Jamaica

Project Title: Bay
 Consultant Name: Moffatt & Nichol Consultant Contact: M. Kluijver

Item #	Description	Quantity	Unit	Unit Price \$	Total \$	Assumption / Basis
Beachfill - Initial Construction						
Items						
1	Beachfill-Reach 1	-	CY	\$ 12.88	\$ -	
2	Beachfill-Reach 2	-	CY	\$ 12.88	\$ -	
3	Beachfill-Reach 3	356,000	CY	\$ 12.88	\$ 4,585,280	design + advance fill
4	Beachfill-Reach 4	294,000	CY	\$ 12.88	\$ 3,786,720	design + advance fill
5	Beachfill-Reach 5	321,000	CY	\$ 12.88	\$ 4,134,480	design + advance fill
6	Beachfill-Reach 6a	250,000	CY	\$ 12.88	\$ 3,220,000	design + advance fill
7	Beachfill-Reach 6b	20,000	CY	\$ 12.88	\$ 257,600	design + advance fill
8	Dune Grass Planting	61	AC	\$ 20,000.00	\$ 1,220,000	32,000 LF of dune grass planting
	SUBTOTAL		CY		\$ 17,204,000	

General						
Items						
1	Mob/Demob	1	EA	\$ 3,300,000.00	\$ 3,300,000	30" Cutter Head Dredge
	SUBTOTAL				\$ 3,300,000	

TOTAL		\$ 20,504,000
CONTINGENCY 22.41%		\$ 4,594,946
Escalation 2Q 2016 to 2Q 2018	3.31%	\$ 830,000
GRAND TOTAL CONSTRUCTION COST		\$ 25,928,946

Contract No.: W912DS-09-0009
 Task Order No.: 26

**Alternative 3n - Medium
 Feasibility Estimate**

Discipline: Groins Sheet: 5 OF 6
 Prepared by: R. Hampson Date: 4/20/2015
 Updated: S. Jessup Date: 7/11/2018
M. Kluijver Date: 7/12/2018

Integrated Hurricane Sandy General Reevaluation Report and Environmental Impact
 Statement - Atlantic Coast of New York - East Rockaway Inlet to Rockaway Inlet and Jamaica

Project Title: Bay
 Consultant Name: Moffatt & Nichol Consultant Contact: M. Kluijver

Item #	Description	Quantity	Unit	Unit Price \$	Total \$	Assumption / Basis
New Groins in Reach 3 & 4						
Items						
1	Armor Stone (4-8 TON)	55,175	TON	\$ 193.30	\$ 10,665,231	12 groins @ a total of 4087 ft
2	Underlayer Stone (500-1500 lbs)	17,983	TON	\$ 104.68	\$ 1,882,440	
3	Core Stone (30-130 lbs)	11,035	TON	\$ 92.87	\$ 1,024,811	
4	Bedding Stone (30-130 lbs)	28,200	CY	\$ 92.87	\$ 2,618,962	
5	Geotextile Filter Fabric	31,470	SY	\$ 23.68	\$ 745,207	
6	Excavation - Sand	94,410	CY	\$ 7.24	\$ 683,526	
	SUBTOTAL				\$ 17,620,000	<i>\$4,311 per LF of groin</i>

New Groin in Reach 6a						
Items						
1	Armor Stone (3-10 TON)	6,838	TON	\$ 193.30	\$ 1,321,785	1 groin @ 526 ft
2	Underlayer Stone (500-1500 lbs)	2,420	TON	\$ 104.68	\$ 253,284	
3	Core Stone (30-130 lbs)	1,473	TON	\$ 92.87	\$ 136,779	
4	Bedding Stone (30-130 lbs)	3,314	CY	\$ 92.87	\$ 307,753	
5	Geotextile Filter Fabric	3,945	SY	\$ 23.68	\$ 93,418	
6	Excavation - Sand	9,784	CY	\$ 7.24	\$ 70,833	
	SUBTOTAL				\$ 2,184,000	<i>\$4,152 per LF of groin</i>

Groin Extensions in Reach 6a						
Items						
1	Armor Stone (10 TON)	19,760	TON	\$ 193.30	\$ 3,819,608	5 groin extensions @ a total of 800'
2	Underlayer & Core Stone (500-1500 lbs)	4,160	TON	\$ 104.68	\$ 435,469	
3	Core Stone (30-130 lbs)	2,640	TON	\$ 92.87	\$ 245,177	
4	Bedding Stone (30-130 lbs)	8,320	CY	\$ 92.87	\$ 772,678	
5	Geotextile Filter Fabric	7,520	SY	\$ 23.68	\$ 178,074	
6	Excavation - Sand	12,240	CY	\$ 7.24	\$ 88,618	
	SUBTOTAL				\$ 5,540,000	<i>\$6,925 per LF of groin</i>

General						
Items						
1	Mob/Demob	1	EA	\$ 2,500,000.00	\$ 2,500,000	
	SUBTOTAL				\$ 2,500,000	

TOTAL		\$ 27,844,000
CONTINGENCY 22.41%		\$ 6,239,840
Escalation 2Q 2016 to 2Q 2018	3.31%	\$ 1,127,000
GRAND TOTAL CONSTRUCTION COST		\$ 35,210,840

Contract No.: W912DS-09-0009
 Task Order No.: 26

**Alternative 3n - Medium
 Feasibility Estimate**

Discipline: Beachfill-Ren Sheet: 6 OF 6
 Prepared by: R. Hampson Date: 4/20/2015
 Updated: S. Jessup Date: 7/11/2018
M. Kluijver Date: 7/12/2018

Integrated Hurricane Sandy General Reevaluation Report and Environmental Impact
 Statement - Atlantic Coast of New York - East Rockaway Inlet to Rockaway Inlet and Jamaica

Project Title: Bay

Consultant Name: Moffatt & Nichol

Consultant Contact: M. Kluijver

Item #	Description	Quantity	Unit	Unit Price \$	Total \$	Assumption / Basis
Beachfill-Renourishment Operation						
Items						
1	Beachfill-Reach 1	-	CY	\$ 12.88	\$ -	estimate for a single renourishment operation
2	Beachfill-Reach 2	-	CY	\$ 12.88	\$ -	renourishment operations occur in 4-year cycles
3	Beachfill-Reach 3	572,000	CY	\$ 12.88	\$ 7,367,360	advance fill - 4-year cycle
4	Beachfill-Reach 4	200,000	CY	\$ 12.88	\$ 2,576,000	advance fill - 4-year cycle
5	Beachfill-Reach 5	576,000	CY	\$ 12.88	\$ 7,418,880	advance fill - 4-year cycle
6	Beachfill-Reach 6a	46,000	CY	\$ 12.88	\$ 592,480	advance fill - 4-year cycle
	SUBTOTAL	1,394,000	CY		\$ 17,955,000	

General						
Items						
1	Mob/Demob	1	EA	\$ 3,300,000.00	\$ 3,300,000	large hopper dredge
	SUBTOTAL				\$ 3,300,000	

TOTAL		\$ 21,255,000
CONTINGENCY 30.47%		\$ 6,476,000
Escalation 2Q 2016 to 2Q 2018	3.31%	\$ 917,000
GRAND TOTAL CONSTRUCTION COST		\$ 28,648,000

**CSRM ALTERNATIVES
HIGH SEA LEVEL CHANGE SCENARIO
ALTERNATIVE 3N LARGE DUNE**

Contract No.: W912DS-09-0009
 Task Order No.: 26

**Alternative 3n - Large
 Feasibility Estimate**

Discipline: Annualized Cost Sheet: 1 OF 6
 Prepared by: R. Hampson Date: 4/20/2015
 Updated: S. Jessup Date: 7/11/2018
M. Kluijver Date: 7/12/2018

Project Title: Integrated Hurricane Sandy General Reevaluation Report and Environmental Impact Statement -
 Atlantic Coast of New York - East Rockaway Inlet to Rockaway Inlet and Jamaica Bay

Consultant Name: Moffatt & Nichol Consultant Contact: M. Kluijver

Item #	Description	Quantity	Unit	Unit Price \$	Total \$	Assumption / Basis
Annualized Costs						
Items						
1	Total Investment	1	LS	\$ 3,616,000.00	\$ 3,616,000	
2	Renourishment	1	LS	\$ 8,108,000.00	\$ 8,108,000	
3	Major Rehab	1	LS	\$ 332,000.00	\$ 332,000	
4	Groin Maintenance	1	LS	\$ 195,000.00	\$ 195,000	
5	Monitoring	1	LS	\$ 403,000.00	\$ 403,000	
6	SLR Adaption - Access	1	LS	\$ 849,000.00	\$ 849,000	
	SUBTOTAL				\$ 13,503,000	

Total Annual Cost

\$ 13,503,000

Contract No.: W912DS-09-0009
 Task Order No.: 26

**Alternative 3n - Large
 Feasibility Estimate**

Discipline: First Costs Sheet: 2 OF 6
 Prepared by: R. Hampson Date: 4/20/2015
 Updated: S. Jessup Date: 7/11/2018
M. Kluijver Date: 7/12/2018

Project Title: Integrated Hurricane Sandy General Reevaluation Report and Environmental Impact Statement -
 Atlantic Coast of New York - East Rockaway Inlet to Rockaway Inlet and Jamaica Bay

Consultant Name: Moffatt & Nichol Consultant Contact: M. Kluijver

Item #	Description	Quantity	Unit	Unit Price \$	Total \$	Assumption / Basis
Construction Costs						
WBS	Items					
17	Mob/Demob	1	LS	\$ 3,300,000.00	\$ 3,300,000	
17	Beachfill	1	LS	\$ 31,110,000.00	\$ 31,110,000	
10	Mob/Demob	1	LS	\$ 2,500,000.00	\$ 2,500,000	
10	New Groins in Reach 3 & 4	1	LS	\$ 19,483,000.00	\$ 19,483,000	build 12 new groins
10	New Groin in Reach 6	1	LS	\$ 2,333,000.00	\$ 2,333,000	build 1 new groin
10	Groin Extensions in Reach 6	1	LS	\$ 6,786,000.00	\$ 6,786,000	extend 5 groins
	SUBTOTAL				\$ 65,512,000	
	CONTINGENCY 21.64%				\$ 14,177,000	
	SUBTOTAL				\$ 79,689,000	

Lands & Damages						
WBS	Items					
01	Lands & Damages	1	LS	\$ -	\$ -	
	CONTINGENCY 20%				\$ -	
	SUBTOTAL				\$ -	

Planning, Engineering & Design						
WBS	Items					
30	Planning, Engineering & Design	1	LS	10.00%	\$ 6,551,000	
	CONTINGENCY 15.25%				\$ 999,000	
	SUBTOTAL				\$ 7,550,000	

Construction Management						
WBS	Items					
30	Construction Management	1	LS	6.89%	\$ 4,514,000	
	CONTINGENCY 15.25%				\$ 688,000	
	SUBTOTAL				\$ 5,202,000	

First Cost		\$ 92,441,000
Escalation 2Q 2016 to 2Q 2018	3.31%	\$ 3,056,000
Interest During Construction		\$ 2,129,000
Total Investment Cost		\$ 97,626,000

Annualized Total Investment Cost \$ **3,616,000**

Interest Rate 2.750%
 Life 50
 Capital Recovery Factor 0.03704
 Construction Period in months 20.19
 IDC Factor 0.022297107

\$ 34,410,000
\$ 31,102,000

Contract No.: W912DS-09-0009
 Task Order No.: 26

**Alternative 3n - Large
 Feasibility Estimate**

Discipline: Ren. Costs Sheet: 3 OF 6
 Prepared by: R. Hampson Date: 4/20/2015
 Updated: S. Jessup Date: 7/11/2018
M. Kluijver Date: 7/12/2018

Project Title: Integrated Hurricane Sandy General Reevaluation Report and Environmental Impact Statement -
 Atlantic Coast of New York - East Rockaway Inlet to Rockaway Inlet and Jamaica Bay

Consultant Name: Moffatt & Nichol

Consultant Contact: M. Kluijver

Item #	Description	Quantity	Unit	Unit Price \$	Total \$	Assumption / Basis
Construction Costs						
WBS	Items					
17	Mob/Demob	1	LS	\$ 3,300,000.00	\$ 3,300,000	
17	Beachfill	1	LS	\$ 19,191,000.00	\$ 19,191,000	
	SUBTOTAL				\$ 22,491,000	
	CONTINGENCY 30.47%				\$ 6,853,000	
	SUBTOTAL				\$ 29,344,000	

Lands & Damages						
WBS	Items					
01	Lands & Damages	1	LS	\$ -	\$ -	
	CONTINGENCY 20%				\$ -	
	SUBTOTAL				\$ -	

Planning, Engineering & Design						
WBS	Items					
30	Planning, Engineering & Design	1	LS	10.00%	\$ 2,249,000	
	CONTINGENCY 15.25%				\$ 343,000	
	SUBTOTAL				\$ 2,592,000	

Construction Management						
WBS	Items					
30	Construction Management	1	LS	7.86%	\$ 1,768,000	
	CONTINGENCY 15.25%				\$ 270,000	
	SUBTOTAL				\$ 2,038,000	

First Cost		\$	33,974,000
Escalation 2Q 2016 to 2Q 2018	3.31%	\$	1,123,000
Interest During Construction		\$	-
Total Renourishment Cost		\$	35,097,000

Annualized TotalRenourishment Cost **\$ 8,108,000** from ammoritization file

Interest Rate 2.750%
 Life 50
 Capital Recovery Factor 0.03704
 Present Value Factor 5.61125

Contract No.: W912DS-09-0009
 Task Order No.: 26

**Alternative 3n - Large
 Feasibility Estimate**

Discipline: Adaption Costs Sheet: 3 OF 6
 Prepared by: R. Hampson Date: 4/20/2015
 Updated: S. Jessup Date: 7/11/2018
M. Kluijver Date: 7/12/2018

Project Title: Integrated Hurricane Sandy General Reevaluation Report and Environmental Impact Statement -
 Atlantic Coast of New York - East Rockaway Inlet to Rockaway Inlet and Jamaica Bay

Consultant Name: Moffatt & Nichol Consultant Contact: M. Kluijver

Item #	Description	Quantity	Unit	Unit Price \$	Total \$	Assumption / Basis
Construction Costs						
WBS	Items					
17	Mob/Demob	-	EA	\$ 3,300,000.00	\$ -	
17	Beachfill	566,000	CY	\$ 12.88	\$ 7,290,000	
17	Dune Grass Planting	73	AC	\$ 20,000.00	\$ 1,460,000	32,000 LF of dune grass planting
17	Access Ramps	8	EA	\$ 825,000.00	\$ 6,600,000	Demo & Rebuild 8 Concrete Access Ramps
	SUBTOTAL				\$ 15,350,000	
	CONTINGENCY 30.47%				\$ 4,677,000	
	SUBTOTAL				\$ 20,027,000	

Lands & Damages						
WBS	Items					
01	Lands & Damages	1	LS	\$ -	\$ -	
	CONTINGENCY 20%				\$ -	
	SUBTOTAL				\$ -	

Planning, Engineering & Design						
WBS	Items					
30	Planning, Engineering & Design	1	LS	10.00%	\$ 1,535,000	
	CONTINGENCY 15.25%				\$ 234,000	
	SUBTOTAL				\$ 1,769,000	

Construction Management						
WBS	Items					
30	Construction Management	1	LS	8.21%	\$ 1,260,000	
	CONTINGENCY 15.25%				\$ 192,000	
	SUBTOTAL				\$ 1,452,000	

First Cost		\$	23,248,000
Escalation 2Q 2016 to 2Q 2018	3.31%	\$	768,000
Interest During Construction		\$	-
Total Adaption Cost		\$	24,016,000

Annualized Adaption Cost **\$ 849,000** from amortization

Interest Rate 2.750%
 Life 50
 Capital Recovery Factor 0.03704
 Present Value Factor 5.61125

Contract No.: W912DS-09-0009
 Task Order No.: 26

**Alternative 3n - Large
 Feasibility Estimate**

Discipline: Beachfill-Initial Sheet: 4 OF 6
 Prepared by: R. Hampson Date: 4/20/2015
 Updated: S. Jessup Date: 7/11/2018
M. Kluijver Date: 7/12/2018

Integrated Hurricane Sandy General Reevaluation Report and Environmental Impact
 Statement - Atlantic Coast of New York - East Rockaway Inlet to Rockaway Inlet and Jamaica

Project Title: Bay

Consultant Name: Moffatt & Nichol

Consultant Contact: M. Kluijver

Item #	Description	Quantity	Unit	Unit Price \$	Total \$	Assumption / Basis
Beachfill - Initial Construction						
Items						
1	Beachfill-Reach 1	-	CY	\$ 12.88	\$ -	
2	Beachfill-Reach 2	-	CY	\$ 12.88	\$ -	
3	Beachfill-Reach 3	611,000	CY	\$ 12.88	\$ 7,869,680	design + advance fill
4	Beachfill-Reach 4	478,000	CY	\$ 12.88	\$ 6,156,640	design + advance fill
5	Beachfill-Reach 5	758,000	CY	\$ 12.88	\$ 9,763,040	design + advance fill
6	Beachfill-Reach 6a	417,000	CY	\$ 12.88	\$ 5,370,960	design + advance fill
7	Beachfill-Reach 6b	38,000	CY	\$ 12.88	\$ 489,440	design + advance fill
8	Dune Grass Planting	73	AC	\$ 20,000.00	\$ 1,460,000	32,000 LF of dune grass planting
	SUBTOTAL		CY		\$ 31,110,000	

General						
Items						
1	Mob/Demob	1	EA	\$ 3,300,000.00	\$ 3,300,000	30" Cutter Head Dredge
	SUBTOTAL				\$ 3,300,000	

TOTAL		\$ 34,410,000
CONTINGENCY 21.64%		\$ 7,446,324
Escalation 2Q 2016 to 2Q 2018	3.31%	\$ 1,384,000
GRAND TOTAL CONSTRUCTION COST		\$ 43,240,324

Contract No.: W912DS-09-0009
 Task Order No.: 26

**Alternative 3n - Large
 Feasibility Estimate**

Discipline: Groins Sheet: 5 OF 6
 Prepared by: R. Hampson Date: 4/20/2015
 Updated: S. Jessup Date: 7/11/2018
M. Kluijver Date: 7/12/2018

Integrated Hurricane Sandy General Reevaluation Report and Environmental Impact
 Statement - Atlantic Coast of New York - East Rockaway Inlet to Rockaway Inlet and Jamaica

Project Title: Bay

Consultant Name: Moffatt & Nichol

Consultant Contact: M. Kluijver

Item #	Description	Quantity	Unit	Unit Price \$	Total \$	Assumption / Basis
New Groins in Reach 3 & 4						
Items						
1	Armor Stone (4-8 TON)	61,007	TON	\$ 193.30	\$ 11,792,556	12 groins @ a total of 4519 ft
2	Underlayer Stone (500-1500 lbs)	19,884	TON	\$ 104.68	\$ 2,081,415	
3	Core Stone (30-130 lbs)	12,201	TON	\$ 92.87	\$ 1,133,135	
4	Bedding Stone (30-130 lbs)	31,181	CY	\$ 92.87	\$ 2,895,789	
5	Geotextile Filter Fabric	34,796	SY	\$ 23.68	\$ 823,976	
6	Excavation - Sand	104,389	CY	\$ 7.24	\$ 755,776	
	SUBTOTAL				\$ 19,483,000	<i>\$4,311 per LF of groin</i>

New Groin in Reach 6a						
Items						
1	Armor Stone (3-10 TON)	7,306	TON	\$ 193.30	\$ 1,412,250	1 groin @ 562 ft
2	Underlayer Stone (500-1500 lbs)	2,585	TON	\$ 104.68	\$ 270,619	
3	Core Stone (30-130 lbs)	1,574	TON	\$ 92.87	\$ 146,140	
4	Bedding Stone (30-130 lbs)	3,541	CY	\$ 92.87	\$ 328,816	
5	Geotextile Filter Fabric	4,215	SY	\$ 23.68	\$ 99,811	
6	Excavation - Sand	10,453	CY	\$ 7.24	\$ 75,681	
	SUBTOTAL				\$ 2,333,000	<i>\$4,151 per LF of groin</i>

Groin Extensions in Reach 6a						
Items						
1	Armor Stone (10 TON)	24,206	TON	\$ 193.30	\$ 4,679,020	5 groin extensions @ a total of 980'
2	Underlayer & Core Stone (500-1500 lbs)	5,096	TON	\$ 104.68	\$ 533,449	
3	Core Stone (30-130 lbs)	3,234	TON	\$ 92.87	\$ 300,342	
4	Bedding Stone (30-130 lbs)	10,192	CY	\$ 92.87	\$ 946,531	
5	Geotextile Filter Fabric	9,212	SY	\$ 23.68	\$ 218,140	
6	Excavation - Sand	14,994	CY	\$ 7.24	\$ 108,557	
	SUBTOTAL				\$ 6,786,000	<i>\$6,924 per LF of groin</i>

General						
Items						
1	Mob/Demob	1	EA	\$ 2,500,000.00	\$ 2,500,000	
	SUBTOTAL				\$ 2,500,000	

TOTAL	\$	31,102,000
CONTINGENCY 21.64%	\$	6,730,473
Escalation 2Q 2016 to 2Q 2018	3.31%	\$ 1,251,000
GRAND TOTAL CONSTRUCTION COST	\$	39,083,473

Contract No.: W912DS-09-0009
 Task Order No.: 26

**Alternative 3n - Large
 Feasibility Estimate**

Discipline: Beachfill-Ren Sheet: 6 OF 6
 Prepared by: R. Hampson Date: 4/20/2015
 Updated: S. Jessup Date: 7/11/2018
M. Kluijver Date: 7/12/2018

Integrated Hurricane Sandy General Reevaluation Report and Environmental Impact
 Statement - Atlantic Coast of New York - East Rockaway Inlet to Rockaway Inlet and Jamaica

Project Title: Bay
 Consultant Name: Moffatt & Nichol Consultant Contact: M. Kluijver

Item #	Description	Quantity	Unit	Unit Price \$	Total \$	Assumption / Basis
Beachfill-Renourishment Operation						
Items						
1	Beachfill-Reach 1	-	CY	\$ 12.88	\$ -	estimate for a single renourishment operation
2	Beachfill-Reach 2	-	CY	\$ 12.88	\$ -	renourishment operations occur in 4-year cycles
3	Beachfill-Reach 3	639,000	CY	\$ 12.88	\$ 8,230,320	advance fill - 4-year cycle
4	Beachfill-Reach 4	200,000	CY	\$ 12.88	\$ 2,576,000	advance fill - 4-year cycle
5	Beachfill-Reach 5	605,000	CY	\$ 12.88	\$ 7,792,400	advance fill - 4-year cycle
6	Beachfill-Reach 6a	46,000	CY	\$ 12.88	\$ 592,480	advance fill - 4-year cycle
	SUBTOTAL	1,490,000	CY		\$ 19,191,000	

General						
Items						
1	Mob/Demob	1	EA	\$ 3,300,000.00	\$ 3,300,000	large hopper dredge
	SUBTOTAL				\$ 3,300,000	

TOTAL	\$ 22,491,000
CONTINGENCY 30.47%	\$ 6,853,000
Escalation 2Q 2016 to 2Q 2018	3.31% \$ 970,000
GRAND TOTAL CONSTRUCTION COST	\$ 30,314,000

**CSRM ALTERNATIVES
HIGH SEA LEVEL CHANGE SCENARIO
ALTERNATIVE 3N XL DUNE**

Contract No.: W912DS-09-0009
 Task Order No.: 26

Alternative 3n - XL
Feasibility Estimate

Discipline: Annualized Cost Sheet: 1 OF 7
 Prepared by: R. Hampson Date: 5/1/2015
 Updated: S. Jessup Date: 7/11/2018
M. Kluijver Date: 7/12/2018

Project Title: Integrated Hurricane Sandy General Reevaluation Report and Environmental Impact Statement - Atlantic Coast of New York - East Rockaway Inlet to Rockaway Inlet and Jamaica Bay

Consultant Name: Moffatt & Nichol

Consultant Contact: M. Kluijver

Item #	Description	Quantity	Unit	Unit Price \$	Total \$	Assumption / Basis
Annualized Costs						
Items						
1	Total Investment	1	LS	\$ 5,581,000.00	\$ 5,581,000	
2	Renourishment	1	LS	\$ 8,544,000.00	\$ 8,544,000	
3	Major Rehab	1	LS	\$ 332,000.00	\$ 332,000	
4	Groin Maintenance	1	LS	\$ 218,000.00	\$ 218,000	
5	Monitoring	1	LS	\$ 403,000.00	\$ 403,000	
6	SLR Adaption	1	LS	\$ 859,000.00	\$ 859,000	
	SUBTOTAL				\$ 15,937,000	

Total Annual Cost

\$ 15,937,000

Contract No.: W912DS-09-0009
 Task Order No.: 26

**Alternative 3n - XL
 Feasibility Estimate**

Discipline: First Costs Sheet: 2 OF 7
 Prepared by: R. Hampson Date: 5/1/2015
 Updated: S. Jessup Date: 7/11/2018
M. Kluijver Date: 7/12/2018

Project Title: Integrated Hurricane Sandy General Reevaluation Report and Environmental Impact Statement -
 Atlantic Coast of New York - East Rockaway Inlet to Rockaway Inlet and Jamaica Bay

Consultant Name: Moffatt & Nichol Consultant Contact: M. Kluijver

Item #	Description	Quantity	Unit	Unit Price \$	Total \$	Assumption / Basis
Construction Costs						
WBS	Items					
17	Mob/Demob	1	LS	\$ 6,600,000.00	\$ 6,600,000	
17	Beachfill	1	LS	\$ 52,885,000.00	\$ 52,885,000	
2	Access Ramps	8	LS	\$ 825,000.00	\$ 6,600,000	Demo & Rebuild 8 Concrete Access Ramps
10	Mob/Demob	1	LS	\$ 2,500,000.00	\$ 2,500,000	
10	New Groins in Reach 3 & 4	1	LS	\$ 21,345,000.00	\$ 21,345,000	build 12 new groins
10	New Groin in Reach 6	1	LS	\$ 2,483,000.00	\$ 2,483,000	build 1 new groin
10	Groin Extensions in Reach 6	1	LS	\$ 8,032,000.00	\$ 8,032,000	extend 5 groins
	SUBTOTAL				\$ 100,445,000	
	CONTINGENCY 22.84%				\$ 22,942,000	
	SUBTOTAL				\$ 123,387,000	

Lands & Damages						
WBS	Items					
01	Lands & Damages	1	LS	\$ -	\$ -	
	CONTINGENCY 20%				\$ -	
	SUBTOTAL				\$ -	

Planning, Engineering & Design						
WBS	Items					
30	Planning, Engineering & Design	1	LS	10.00%	\$ 10,045,000	
	CONTINGENCY 15.25%				\$ 1,532,000	
	SUBTOTAL				\$ 11,577,000	

Construction Management						
WBS	Items					
30	Construction Management	1	LS	6.50%	\$ 6,529,000	
	CONTINGENCY 15.25%				\$ 996,000	
	SUBTOTAL				\$ 7,525,000	

First Cost		\$ 142,489,000
Escalation 2Q 2016 to 2Q 2018	3.31%	\$ 4,710,000
Interest During Construction		\$ 3,461,000
Total Investment Cost		\$ 150,660,000
Annualized Total Investment Cost		\$ 5,581,000

Interest Rate 2.750%
 Life 50
 Capital Recovery Factor 0.03704
 Construction Period in months 21.22
 IDC Factor 0.023512491

Contract No.: W912DS-09-0009
 Task Order No.: 26

Alternative 3n - XL
Feasibility Estimate

Discipline: Ren. Costs Sheet: 3 OF 7
 Prepared by: R. Hampson Date: 5/1/2015
 Updated: S. Jessup Date: 7/11/2018
M. Kluijver Date: 7/12/2018

Project Title: Integrated Hurricane Sandy General Reevaluation Report and Environmental Impact Statement - Atlantic Coast of New York - East Rockaway Inlet to Rockaway Inlet and Jamaica Bay

Consultant Name: Moffatt & Nichol Consultant Contact: M. Kluijver

Item #	Description	Quantity	Unit	Unit Price \$	Total \$	Assumption / Basis
Construction Costs						
WBS	Items					
17	Mob/Demob	1	LS	\$ 3,300,000.00	\$ 3,300,000	
17	Beachfill	1	LS	\$ 20,415,000.00	\$ 20,415,000	
	SUBTOTAL				\$ 23,715,000	
	CONTINGENCY 30.47%				\$ 7,226,000	
	SUBTOTAL				\$ 30,941,000	

Lands & Damages						
WBS	Items					
01	Lands & Damages	1	LS	\$ -	\$ -	
	CONTINGENCY 20%				\$ -	
	SUBTOTAL				\$ -	

Planning, Engineering & Design						
WBS	Items					
30	Planning, Engineering & Design	1	LS	10.00%	\$ 2,372,000	
	CONTINGENCY 15.25%				\$ 362,000	
	SUBTOTAL				\$ 2,734,000	

Construction Management						
WBS	Items					
30	Construction Management	1	LS	7.81%	\$ 1,852,000	
	CONTINGENCY 15.25%				\$ 282,000	
	SUBTOTAL				\$ 2,134,000	

First Cost		\$ 35,809,000
Escalation 2Q 2016 to 2Q 2018	3.31%	\$ 1,184,000
Interest During Construction		\$ -
Total Renourishment Cost		\$ 36,993,000

Annualized TotalRenourishment Cost **\$ 8,544,000** from amortization file

Interest Rate 2.750%
 Life 50
 Capital Recovery Factor 0.03704
 Present Value Factor 5.61125

Contract No.: W912DS-09-0009
 Task Order No.: 26

**Alternative 3n - XL
 Feasibility Estimate**

Discipline: Beachfill-Initial Sheet: 4 OF 7
 Prepared by: R. Hampson Date: 5/1/2015
 Updated: S. Jessup Date: 7/11/2018
M. Kluijver Date: 7/12/2018

Integrated Hurricane Sandy General Reevaluation Report and Environmental Impact
 Statement - Atlantic Coast of New York - East Rockaway Inlet to Rockaway Inlet and Jamaica

Project Title: Bay
 Consultant Name: Moffatt & Nichol Consultant Contact: M. Kluijver

Item #	Description	Quantity	Unit	Unit Price \$	Total \$	Assumption / Basis
Beachfill - Initial Construction						
Items						
1	Beachfill-Reach 1	-	CY	\$ 12.88	\$ -	
2	Beachfill-Reach 2	-	CY	\$ 12.88	\$ -	
3	Beachfill-Reach 3	1,044,000	CY	\$ 12.88	\$ 13,446,720	design + advance fill
4	Beachfill-Reach 4	827,000	CY	\$ 12.88	\$ 10,651,760	design + advance fill
5	Beachfill-Reach 5	1,424,000	CY	\$ 12.88	\$ 18,341,120	design + advance fill
6	Beachfill-Reach 6a	621,000	CY	\$ 12.88	\$ 7,998,480	design + advance fill
7	Beachfill-Reach 6b	58,000	CY	\$ 12.88	\$ 747,040	design + advance fill
8	Dune Grass Planting	85	AC	\$ 20,000.00	\$ 1,700,000	32,000 LF of dune grass planting
	SUBTOTAL		CY		\$ 52,885,000	

General						
Items						
1	Mob/Demob	2	EA	\$ 3,300,000.00	\$ 6,600,000	30" Cutter Head Dredge
	SUBTOTAL				\$ 6,600,000	

TOTAL		\$ 59,485,000
CONTINGENCY 22.84%		\$ 13,586,374
Escalation 2Q 2016 to 2Q 2018	3.31%	\$ 2,415,000
GRAND TOTAL CONSTRUCTION COST		\$ 75,486,374

Contract No.: W912DS-09-0009
 Task Order No.: 26

**Alternative 3n - XL
 Feasibility Estimate**

Discipline: Groins Sheet: 5 OF 7
 Prepared by: R. Hampson Date: 5/1/2015
 Updated: S. Jessup Date: 7/11/2018
M. Kluijver Date: 7/12/2018

Integrated Hurricane Sandy General Reevaluation Report and Environmental Impact
 Statement - Atlantic Coast of New York - East Rockaway Inlet to Rockaway Inlet and Jamaica

Project Title: Bay

Consultant Name: Moffatt & Nichol

Consultant Contact: M. Kluijver

Item #	Description	Quantity	Unit	Unit Price \$	Total \$	Assumption / Basis
New Groins in Reach 3 & 4						
Items						
1	Armor Stone (4-8 TON)	66,839	TON	\$ 193.30	\$ 12,919,882	12 groins @ a total of 4087 ft
2	Underlayer Stone (500-1500 lbs)	21,784	TON	\$ 104.68	\$ 2,280,391	
3	Core Stone (30-130 lbs)	13,368	TON	\$ 92.87	\$ 1,241,458	
4	Bedding Stone (30-130 lbs)	34,162	CY	\$ 92.87	\$ 3,172,616	
5	Geotextile Filter Fabric	38,123	SY	\$ 23.68	\$ 902,746	
6	Excavation - Sand	114,368	CY	\$ 7.24	\$ 828,025	
	SUBTOTAL				\$ 21,345,000	<i>\$4,311 per LF of groin</i>

New Groin in Reach 6a						
Items						
1	Armor Stone (3-10 TON)	7,774	TON	\$ 193.30	\$ 1,502,714	1 groin @ 526 ft
2	Underlayer Stone (500-1500 lbs)	2,751	TON	\$ 104.68	\$ 287,954	
3	Core Stone (30-130 lbs)	1,674	TON	\$ 92.87	\$ 155,502	
4	Bedding Stone (30-130 lbs)	3,767	CY	\$ 92.87	\$ 349,878	
5	Geotextile Filter Fabric	4,485	SY	\$ 23.68	\$ 106,205	
6	Excavation - Sand	11,123	CY	\$ 7.24	\$ 80,529	
	SUBTOTAL				\$ 2,483,000	<i>\$4,152 per LF of groin</i>

Groin Extensions in Reach 6a						
Items						
1	Armor Stone (10 TON)	28,652	TON	\$ 193.30	\$ 5,538,432	5 groin extensions @ a total of 800'
2	Underlayer & Core Stone (500-1500 lbs)	6,032	TON	\$ 104.68	\$ 631,430	
3	Core Stone (30-130 lbs)	3,828	TON	\$ 92.87	\$ 355,506	
4	Bedding Stone (30-130 lbs)	12,064	CY	\$ 92.87	\$ 1,120,384	
5	Geotextile Filter Fabric	10,904	SY	\$ 23.68	\$ 258,207	
6	Excavation - Sand	17,748	CY	\$ 7.24	\$ 128,496	
	SUBTOTAL				\$ 8,032,000	<i>\$6,924 per LF of groin</i>

General						
Items						
1	Mob/Demob	1	EA	\$ 2,500,000.00	\$ 2,500,000	
	SUBTOTAL				\$ 2,500,000	

TOTAL		\$ 34,360,000
CONTINGENCY 22.84%		\$ 7,847,824
Escalation 2Q 2016 to 2Q 2018	3.31%	\$ 1,395,000
GRAND TOTAL CONSTRUCTION COST		\$ 43,602,824

Contract No.: W912DS-09-0009
 Task Order No.: 26

**Alternative 3n - XL
 Feasibility Estimate**

Discipline: Beachfill-Ren Sheet: 6 OF 7
 Prepared by: R. Hampson Date: 5/1/2015
 Updated: S. Jessup Date: 7/11/2018
M. Kluijver Date: 7/12/2018

Integrated Hurricane Sandy General Reevaluation Report and Environmental Impact
 Statement - Atlantic Coast of New York - East Rockaway Inlet to Rockaway Inlet and Jamaica

Project Title: Bay

Consultant Name: Moffatt & Nichol

Consultant Contact: M. Kluijver

Item #	Description	Quantity	Unit	Unit Price \$	Total \$	Assumption / Basis
Beachfill-Renourishment Operation						
Items						
1	Beachfill-Reach 1	-	CY	\$ 12.88	\$ -	estimate for a single renourishment operation
2	Beachfill-Reach 2	-	CY	\$ 12.88	\$ -	renourishment operations occur in 4-year cycles
3	Beachfill-Reach 3	705,000	CY	\$ 12.88	\$ 9,080,400	advance fill - 4-year cycle
4	Beachfill-Reach 4	200,000	CY	\$ 12.88	\$ 2,576,000	advance fill - 4-year cycle
5	Beachfill-Reach 5	634,000	CY	\$ 12.88	\$ 8,165,920	advance fill - 4-year cycle
6	Beachfill-Reach 6a	46,000	CY	\$ 12.88	\$ 592,480	advance fill - 4-year cycle
	SUBTOTAL	1,585,000	CY		\$ 20,415,000	

General						
Items						
1	Mob/Demob	1	EA	\$ 3,300,000.00	\$ 3,300,000	large hopper dredge
	SUBTOTAL				\$ 3,300,000	

TOTAL \$ 23,715,000
 CONTINGENCY 30.47% \$ 7,226,000
 Escalation 2Q 2016 to 2Q 2018 3.31% \$ 1,023,000
GRAND TOTAL CONSTRUCTION COST \$ 31,964,000

Contract No.: W912DS-09-0009
 Task Order No.: 26

**Alternative 3n - XL
 Feasibility Estimate**

Discipline: Structural Sheet: 7 OF 7
 Prepared by: R. Hampson Date: 5/1/2015
 Updated: S. Jessup Date: 7/11/2018
M. Kluijver Date: 7/12/2018

Integrated Hurricane Sandy General Reevaluation Report and Environmental Impact
 Statement - Atlantic Coast of New York - East Rockaway Inlet to Rockaway Inlet and Jamaica

Project Title: Bay
 Consultant Name: Moffatt & Nichol Consultant Contact: M. Kluijver

Item #	Description	Quantity	Unit	Unit Price \$	Total \$	Assumption / Basis
Boardwalk Access Ramps						
Items						
1	24" Steel Pipe Pile	342	LF	\$ 135.00	\$ 46,170	9 piles @ 24x1/2" WT (38 ft long)
2	Precast Concrete Pile Cap	46	CY	\$ 1,500.00	\$ 69,000	9 caps @ 5.1 cy each
3	Cast in Place Concrete Plug	6	CY	\$ 500.00	\$ 3,000	9 plugs
4	Cast in Place Concrete Deck	18	CY	\$ 1,000.00	\$ 17,500	9 @ 4'6" x 10' x 14"
5	Precast Concrete Deck	102	CY	\$ 1,000.00	\$ 102,000	278' x 10' x 14"
6	RPL Decking	2,780	SF	\$ 50.00	\$ 139,000	Furnish and Install
7	Handrail	556	LF	\$ 150.00	\$ 83,400	Furnish and Install
SUBTOTAL					\$ 460,000	

Demolition						
Items						
1	Access Ramps	2,780	SF	\$ 35.00	\$ 97,300	Demo and Dispose of Access Ramp
SUBTOTAL					\$ 97,000	

General						
Items						
1	Mob/Demob	0.125	EA	\$ 1,000,000.00	\$ 125,000	
SUBTOTAL					\$ 125,000	

SUBTOTAL	\$ 682,000
GENERAL CONDITIONS 10%	\$ 68,000
SUBTOTAL (ALL ITEMS)	\$ 750,000
G. C. OVERHEAD & PROFIT 10%	\$ 75,000
TOTAL	\$ 825,000
CONTINGENCY 22.84%	\$ 188,000
Escalation 2Q 2016 to 2Q 2018 3.31%	\$ 33,000
GRAND TOTAL CONSTRUCTION COST	\$ 1,046,000

**ATTACHMENT C
CSRM ALTERNATIVES
HIGH SEA LEVEL CHANGE SCENARIO
ALTERNATIVE 3N BURIED SEAWALL**

Contract No.: W912DS-09-0009
 Task Order No.: 26

**Alternative 3n - Buried Seawall
 Feasibility Estimate**

Discipline: Annualized Cost Sheet: 1 OF 7
 Prepared by: R. Hampson Date: 4/20/2015
 Updated: S. Jessup Date: 7/11/2018
M. Kluijver Date: 7/12/2018

Project Title: Integrated Hurricane Sandy General Reevaluation Report and Environmental Impact Statement -
 Atlantic Coast of New York - East Rockaway Inlet to Rockaway Inlet and Jamaica Bay

Consultant Name: Moffatt & Nichol Consultant Contact: M. Kluijver

Item #	Description	Quantity	Unit	Unit Price \$	Total \$	Assumption / Basis
Annualized Costs						
Items						
1	Total Investment	1	LS	\$ 5,898,000.00	\$ 5,898,000	
2	Renourishment	1	LS	\$ 7,666,000.00	\$ 7,666,000	
3	Major Rehab	1	LS	\$ 332,000.00	\$ 332,000	
4	Groin & Seawall Maintenance	1	LS	\$ 151,000.00	\$ 151,000	
5	Monitoring	1	LS	\$ 403,000.00	\$ 403,000	
6	SLR Adaption	1	LS	\$ 2,197,000.00	\$ 2,197,000	
	SUBTOTAL				\$ 16,647,000	

Total Annual Cost

\$ 16,647,000

Contract No.: W912DS-09-0009
 Task Order No.: 26

**Alternative 3n - Buried Seawall
 Feasibility Estimate**

Discipline: First Costs Sheet: 2 OF 7
 Prepared by: R. Hampson Date: 4/20/2015
 Updated: S. Jessup Date: 7/11/2018
M. Kluijver Date: 7/12/2018

Project Title: Integrated Hurricane Sandy General Reevaluation Report and Environmental Impact Statement -
 Atlantic Coast of New York - East Rockaway Inlet to Rockaway Inlet and Jamaica Bay

Consultant Name: Moffatt & Nichol Consultant Contact: M. Kluijver

Item #	Description	Quantity	Unit	Unit Price \$	Total \$	Assumption / Basis
Construction Costs						
WBS	Items					
17	Mob/Demob	1	LS	\$ 3,300,000.00	\$ 3,300,000	
17	Beachfill	1	LS	\$ 17,444,000.00	\$ 17,444,000	
10	Mob/Demob - Groins	1	LS	\$ 2,500,000.00	\$ 2,500,000	
10	New Groins in Reach 3 & 4	1	LS	\$ 17,620,000.00	\$ 17,620,000	build 12 new groins
10	New Groin in Reach 6	1	LS	\$ 2,184,000.00	\$ 2,184,000	build 1 new groin
10	Groin Extensions in Reach 6	1	LS	\$ 5,540,000.00	\$ 5,540,000	extend 5 groins
10	Mob/Demob - Seawall	1	LS	\$ 2,600,000.00	\$ 2,600,000	
10	Buried Seawall	1	LS	\$ 53,674,000.00	\$ 53,674,000	32,000 lf of buried seawall
	SUBTOTAL				\$ 104,862,000	
	CONTINGENCY 24.56%				\$ 25,754,000	
	SUBTOTAL				\$ 130,616,000	

Lands & Damages						
WBS	Items					
01	Lands & Damages	1	LS	\$ -	\$ -	
	CONTINGENCY 20%				\$ -	
	SUBTOTAL				\$ -	

Planning, Engineering & Design						
WBS	Items					
30	Planning, Engineering & Design	1	LS	10.00%	\$ 10,486,000	
	CONTINGENCY 15.25%				\$ 1,599,000	
	SUBTOTAL				\$ 12,085,000	

Construction Management						
WBS	Items					
30	Construction Management	1	LS	6.46%	\$ 6,774,000	
	CONTINGENCY 15.25%				\$ 1,033,000	
	SUBTOTAL				\$ 7,807,000	

First Cost		\$ 150,508,000
Escalation 2Q 2016 to 2Q 2018	3.31%	\$ 4,975,000
Interest During Construction		\$ 3,753,000
Total Investment Cost		\$ 159,236,000
Annualized Total Investment Cost		\$ 5,898,000

Interest Rate 2.750%
 Life 50
 Capital Recovery Factor 0.03704
 Construction Period in months 21.75
 IDC Factor 0.024138631

Contract No.: W912DS-09-0009
 Task Order No.: 26

**Alternative 3n - Buried Seawall
 Feasibility Estimate**

Discipline: Ren. Costs Sheet: 3 OF 7
 Prepared by: R. Hampson Date: 4/20/2015
 Updated: S. Jessup Date: 7/11/2018
M. Kluijver Date: 7/12/2018

Project Title: Integrated Hurricane Sandy General Reevaluation Report and Environmental Impact Statement -
 Atlantic Coast of New York - East Rockaway Inlet to Rockaway Inlet and Jamaica Bay

Consultant Name: Moffatt & Nichol Consultant Contact: M. Kluijver

Item #	Description	Quantity	Unit	Unit Price \$	Total \$	Assumption / Basis
Construction Costs						
WBS	Items					
17	Mob/Demob	1	LS	\$ 3,300,000.00	\$ 3,300,000	
17	Beachfill	1	LS	\$ 17,955,000.00	\$ 17,955,000	
	SUBTOTAL				\$ 21,255,000	
	CONTINGENCY 30.47%				\$ 6,476,000	
	SUBTOTAL				\$ 27,731,000	

Lands & Damages						
WBS	Items					
01	Lands & Damages	1	LS	\$ -	\$ -	
	CONTINGENCY 20%				\$ -	
	SUBTOTAL				\$ -	

Planning, Engineering & Design						
WBS	Items					
30	Planning, Engineering & Design	1	LS	10.00%	\$ 2,126,000	
	CONTINGENCY 15.25%				\$ 324,000	
	SUBTOTAL				\$ 2,450,000	

Construction Management						
WBS	Items					
30	Construction Management	1	LS	7.91%	\$ 1,681,000	
	CONTINGENCY 15.25%				\$ 256,000	
	SUBTOTAL				\$ 1,937,000	

First Cost		\$ 32,118,000
Escalation 2Q 2016 to 2Q 2018	3.31%	\$ 1,062,000
Interest During Construction		\$ -
Total Renourishment Cost		\$ 33,180,000

Annualized TotalRenourishment Cost **\$ 7,666,000** from amortization file

Interest Rate 2.750%
 Life 50
 Capital Recovery Factor 0.03704
 Present Value Factor 5.61125

Contract No.: W912DS-09-0009
 Task Order No.: 26

**Alternative 3n - Buried Seawall
 Feasibility Estimate**

Discipline: First Costs Sheet: 2 OF 7
 Prepared by: R. Hampson Date: 4/20/2015
 Updated: S. Jessup Date: 7/11/2018
M. Kluijver Date: 7/12/2018

Project Title: Integrated Hurricane Sandy General Reevaluation Report and Environmental Impact Statement -
 Atlantic Coast of New York - East Rockaway Inlet to Rockaway Inlet and Jamaica Bay

Consultant Name: Moffatt & Nichol Consultant Contact: M. Kluijver

Item #	Description	Quantity	Unit	Unit Price \$	Total \$	Assumption / Basis
Construction Costs						
WBS	Items					
10	Mob/Demob	1	EA	\$ 1,700,000.00	\$ 1,700,000	
10	Armor Stone (1.5 TON)	211,520	TON	\$ 124.71	\$ 26,378,659	
10	Core Stone	31,680	TON	\$ 87.47	\$ 2,771,050	
10	Geotextile	35,520	SY	\$ 7.72	\$ 274,214	
10	Excavation - Sand	444,480	CY	\$ 3.83	\$ 1,702,358	
17	Beachfill-Dune	1,106,000	CY	\$ 12.88	\$ 14,245,280	
17	Dune Grass Planting	73	AC	\$ 20,000.00	\$ 1,460,000	32,000 LF of dune grass planting
10	Access Ramps	8	EA	\$ 825,000.00	\$ 6,600,000	
	SUBTOTAL				\$ 55,132,000	
	CONTINGENCY 24.56%				\$ 13,540,000	
	SUBTOTAL				\$ 68,672,000	

Lands & Damages						
WBS	Items					
01	Lands & Damages	1	LS	\$ -	\$ -	
	CONTINGENCY 20%				\$ -	
	SUBTOTAL				\$ -	

Planning, Engineering & Design						
WBS	Items					
30	Planning, Engineering & Design	1	LS	10.00%	\$ 5,513,000	
	CONTINGENCY 15.25%				\$ 841,000	
	SUBTOTAL				\$ 6,354,000	

Construction Management						
WBS	Items					
30	Construction Management	1	LS	7.04%	\$ 3,881,000	
	CONTINGENCY 15.25%				\$ 592,000	
	SUBTOTAL				\$ 4,473,000	

First Cost		\$ 79,499,000
Escalation 2Q 2016 to 2Q 2018	3.31%	\$ 2,628,000
Interest During Construction		\$ -
Total Adaption Cost		\$ 82,127,000

Annualized Total Investment Cost **\$ 2,197,000** Construction in Year 12

Interest Rate 2.750%
 Life 50
 Capital Recovery Factor 0.03704
 Construction Period in months 3.7
 IDC Factor 0.003097769

Contract No.: W912DS-09-0009
 Task Order No.: 26

**Alternative 3n - Buried Seawall
 Feasibility Estimate**

Discipline: Beachfill-Initial Sheet: 4 OF 7
 Prepared by: R. Hampson Date: 4/20/2015
 Updated: S. Jessup Date: 7/11/2018
M. Kluijver Date: 7/12/2018

Integrated Hurricane Sandy General Reevaluation Report and Environmental Impact
 Statement - Atlantic Coast of New York - East Rockaway Inlet to Rockaway Inlet and Jamaica
 Project Title: Bay

Consultant Name: Moffatt & Nichol Consultant Contact: M. Kluijver

Item #	Description	Quantity	Unit	Unit Price \$	Total \$	Assumption / Basis
Beachfill - Initial Construction						
Items						
1	Beachfill-Reach 1	-	CY	\$ 12.88	\$ -	
2	Beachfill-Reach 2	-	CY	\$ 12.88	\$ -	
3	Beachfill-Reach 3	356,000	CY	\$ 12.88	\$ 4,585,280	design + advance fill
4	Beachfill-Reach 4	294,000	CY	\$ 12.88	\$ 3,786,720	design + advance fill
5	Beachfill-Reach 5	321,000	CY	\$ 12.88	\$ 4,134,480	design + advance fill
6	Beachfill-Reach 6a	250,000	CY	\$ 12.88	\$ 3,220,000	design + advance fill
7	Beachfill-Reach 6b	20,000	CY	\$ 12.88	\$ 257,600	design + advance fill
8	Dune Grass Planting	73	AC	\$ 20,000.00	\$ 1,460,000	32,000 LF of dune grass planting
	SUBTOTAL		CY		\$ 17,444,000	

General						
Items						
1	Mob/Demob	1	EA	\$ 3,300,000.00	\$ 3,300,000	30" Cutter Head Dredge
	SUBTOTAL				\$ 3,300,000	

TOTAL	\$ 20,744,000
CONTINGENCY 24.56%	\$ 5,094,726
Escalation 2Q 2016 to 2Q 2018 3.31%	\$ 854,000
GRAND TOTAL CONSTRUCTION COST	\$ 26,692,726

Contract No.: W912DS-09-0009
 Task Order No.: 26

**Buried Seawall
 Feasibility Estimate**

Discipline: Buried Seawall Sheet: 5 OF 7
 Prepared by: R. Hampson Date: 3/24/2015
 Updated: S. Jessup Date: 7/11/2018
M. Kluijver Date: 7/12/2018

Integrated Hurricane Sandy General Reevaluation Report and Environmental Impact
 Statement - Atlantic Coast of New York - East Rockaway Inlet to Rockaway Inlet and Jamaica

Project Title: Bay
 Consultant Name: Moffatt & Nichol Consultant Contact: M. Kluijver

Item #	Description	Quantity	Unit	Unit Price \$	Total \$	Assumption / Basis
Buried Seawall						
Items						
1	Armor Stone (1.5 TON)	272,960	TON	\$ 124.71	\$ 34,040,842	
2	Core Stone	202,560	TON	\$ 87.47	\$ 17,717,923	
3	Geotextile	155,520	SY	\$ 7.72	\$ 1,200,614	
4	Excavation - Sand	186,560	CY	\$ 3.83	\$ 714,525	
	SUBTOTAL				\$ 53,674,000	

General						
Items						
1	Mob/Demob	2	EA	\$ 1,300,000.00	\$ 2,600,000	
	SUBTOTAL				\$ 2,600,000	

TOTAL		\$ 56,274,000
CONTINGENCY 24.56%		\$ 13,820,894
Escalation 2Q 2016 to 2Q 2018	3.31%	\$ 2,317,000
GRAND TOTAL CONSTRUCTION COST		\$ 72,411,894

Contract No.: W912DS-09-0009
 Task Order No.: 26

**Alternative 3n - Buried Seawall
 Feasibility Estimate**

Discipline: Groins Sheet: 6 OF 7
 Prepared by: R. Hampson Date: 4/20/2015
 Updated: S. Jessup Date: 7/11/2018
M. Kluijver Date: 7/12/2018

Integrated Hurricane Sandy General Reevaluation Report and Environmental Impact
 Statement - Atlantic Coast of New York - East Rockaway Inlet to Rockaway Inlet and Jamaica

Project Title: Bay
 Consultant Name: Moffatt & Nichol Consultant Contact: M. Kluijver

Item #	Description	Quantity	Unit	Unit Price \$	Total \$	Assumption / Basis
New Groins in Reach 3 & 4						
Items						
1	Armor Stone (4-8 TON)	55,175	TON	\$ 193.30	\$ 10,665,231	12 groins @ a total of 4087 ft
2	Underlayer Stone (500-1500 lbs)	17,983	TON	\$ 104.68	\$ 1,882,440	
3	Core Stone (30-130 lbs)	11,035	TON	\$ 92.87	\$ 1,024,811	
4	Bedding Stone (30-130 lbs)	28,200	CY	\$ 92.87	\$ 2,618,962	
5	Geotextile Filter Fabric	31,470	SY	\$ 23.68	\$ 745,207	
6	Excavation - Sand	94,410	CY	\$ 7.24	\$ 683,526	
	SUBTOTAL				\$ 17,620,000	\$4,311 per LF of groin

New Groin in Reach 6a						
Items						
1	Armor Stone (3-10 TON)	6,838	TON	\$ 193.30	\$ 1,321,785	1 groin @ 526 ft
2	Underlayer Stone (500-1500 lbs)	2,420	TON	\$ 104.68	\$ 253,284	
3	Core Stone (30-130 lbs)	1,473	TON	\$ 92.87	\$ 136,779	
4	Bedding Stone (30-130 lbs)	3,314	CY	\$ 92.87	\$ 307,753	
5	Geotextile Filter Fabric	3,945	SY	\$ 23.68	\$ 93,418	
6	Excavation - Sand	9,784	CY	\$ 7.24	\$ 70,833	
	SUBTOTAL				\$ 2,184,000	\$4,152 per LF of groin

Groin Extensions in Reach 6a						
Items						
1	Armor Stone (10 TON)	19,760	TON	\$ 193.30	\$ 3,819,608	5 groin extensions @ a total of 800'
2	Underlayer & Core Stone (500-1500 lbs)	4,160	TON	\$ 104.68	\$ 435,469	
3	Core Stone (30-130 lbs)	2,640	TON	\$ 92.87	\$ 245,177	
4	Bedding Stone (30-130 lbs)	8,320	CY	\$ 92.87	\$ 772,678	
5	Geotextile Filter Fabric	7,520	SY	\$ 23.68	\$ 178,074	
6	Excavation - Sand	12,240	CY	\$ 7.24	\$ 88,618	
	SUBTOTAL				\$ 5,540,000	\$6,925 per LF of groin

General						
Items						
1	Mob/Demob	1	EA	\$ 2,500,000.00	\$ 2,500,000	
	SUBTOTAL				\$ 2,500,000	

TOTAL		\$ 27,844,000
CONTINGENCY 24.56%		\$ 7,089,082
Escalation 2Q 2016 to 2Q 2018	3.31%	\$ 1,155,000
GRAND TOTAL CONSTRUCTION COST		\$ 36,088,082

Contract No.: W912DS-09-0009
 Task Order No.: 26

**Alternative 3n - Buried Seawall
 Feasibility Estimate**

Discipline: Beachfill-Ren Sheet: 7 OF 7
 Prepared by: R. Hampson Date: 4/20/2015
 Updated: S. Jessup Date: 7/11/2018
M. Kluijver Date: 7/12/2018

Integrated Hurricane Sandy General Reevaluation Report and Environmental Impact
 Statement - Atlantic Coast of New York - East Rockaway Inlet to Rockaway Inlet and Jamaica

Project Title: Bay

Consultant Name: Moffatt & Nichol

Consultant Contact: M. Kluijver

Item #	Description	Quantity	Unit	Unit Price \$	Total \$	Assumption / Basis
Beachfill-Renourishment Operation						
Items						
1	Beachfill-Reach 1	-	CY	\$ 12.88	\$ -	estimate for a single renourishment operation
2	Beachfill-Reach 2	-	CY	\$ 12.88	\$ -	renourishment operations occur in 4-year cycles
3	Beachfill-Reach 3	572,000	CY	\$ 12.88	\$ 7,367,360	advance fill - 4-year cycle
4	Beachfill-Reach 4	200,000	CY	\$ 12.88	\$ 2,576,000	advance fill - 4-year cycle
5	Beachfill-Reach 5	576,000	CY	\$ 12.88	\$ 7,418,880	advance fill - 4-year cycle
6	Beachfill-Reach 6a	46,000	CY	\$ 12.88	\$ 592,480	advance fill - 4-year cycle
	SUBTOTAL	1,394,000	CY		\$ 17,955,000	

General						
Items						
1	Mob/Demob	1	EA	\$ 3,300,000.00	\$ 3,300,000	large hopper dredge
	SUBTOTAL				\$ 3,300,000	

TOTAL		\$ 21,255,000
CONTINGENCY 30.47%		\$ 6,476,000
Escalation 2Q 2016 to 2Q 2018	3.31%	\$ 917,000
GRAND TOTAL CONSTRUCTION COST		\$ 28,648,000

**ATTACHMENT D
CSRM ALTERNATIVES
HIGH SEA LEVEL CHANGE SCENARIO
ALTERNATIVE 3N COMPOSITE SEAWALL**

Contract No.: W912DS-09-0009
 Task Order No.: 26

**Alternative 3n - Composite Seawall
 Feasibility Estimate**

Discipline: Annualized Cost Sheet: 1 OF 8
 Prepared by: R. Hampson Date: 4/20/2015
 Updated: S. Jessup Date: 7/11/2018
M. Kluijver Date: 7/12/2018

Integrated Hurricane Sandy General Reevaluation Report and Environmental Impact Statement -
 Project Title: Atlantic Coast of New York - East Rockaway Inlet to Rockaway Inlet and Jamaica Bay

Consultant Name: Moffatt & Nichol Consultant Contact: M. Kluijver

Item #	Description	Quantity	Unit	Unit Price \$	Total \$	Assumption / Basis
Annualized Costs						
Items						
1	Total Investment	1	LS	\$ 8,436,000.00	\$ 8,436,000	
2	Renourishment	1	LS	\$ 7,666,000.00	\$ 7,666,000	
3	Major Rehab	1	LS	\$ 332,000.00	\$ 332,000	
4	Groin & Seawall Maintenance	1	LS	\$ 14,000.00	\$ 14,000	
5	Monitoring	1	LS	\$ 403,000.00	\$ 403,000	
6	Seawall Adaption	1	LS	\$ 2,288,000.00	\$ 2,288,000	
	SUBTOTAL				\$ 19,139,000	

Total Annual Cost

\$ 19,139,000

Contract No.: W912DS-09-0009
 Task Order No.: 26

**Alternative 3n - Composite Seawall
 Feasibility Estimate**

Discipline: First Costs Sheet: 2 OF 8
 Prepared by: R. Hampson Date: 4/20/2015
 Updated: S. Jessup Date: 7/11/2018
M. Kluijver Date: 7/12/2018

Project Title: Integrated Hurricane Sandy General Reevaluation Report and Environmental Impact Statement -
 Atlantic Coast of New York - East Rockaway Inlet to Rockaway Inlet and Jamaica Bay

Consultant Name: Moffatt & Nichol Consultant Contact: M. Kluijver

Item #	Description	Quantity	Unit	Unit Price \$	Total \$	Assumption / Basis
Construction Costs						
WBS	Items					
17	Mob/Demob	1	LS	\$ 3,300,000.00	\$ 3,300,000	
17	Beachfill	1	LS	\$ 17,444,000.00	\$ 17,444,000	
2	Boardwalk Access Ramps	8	LS	\$ 333,000.00	\$ 2,664,000	
10	Mob/Demob - Groin	1	LS	\$ 2,500,000.00	\$ 2,500,000	
10	New Groins in Reach 3 & 4	1	LS	\$ 17,620,000.00	\$ 17,620,000	build 12 new groins
10	New Groin in Reach 6	1	LS	\$ 2,184,000.00	\$ 2,184,000	build 1 new groin
10	Groin Extensions in Reach 6	1	LS	\$ 5,540,000.00	\$ 5,540,000	extend 5 groins
10	Mob/Demob - Composite Wall	1	LS	\$ 3,400,000.00	\$ 3,400,000	
10	Composite Seawall	1	LS	\$ 93,786,000.00	\$ 93,786,000	32,000 lf of composite seawall
	SUBTOTAL				\$ 148,438,000	
	CONTINGENCY 25.51%				\$ 37,867,000	
	SUBTOTAL				\$ 186,305,000	

Lands & Damages						
WBS	Items					
01	Lands & Damages	1	LS	\$ -	\$ -	
	CONTINGENCY 20%				\$ -	
	SUBTOTAL				\$ -	

Planning, Engineering & Design						
WBS	Items					
30	Planning, Engineering & Design	1	LS	10.00%	\$ 14,844,000	
	CONTINGENCY 15.25%				\$ 2,264,000	
	SUBTOTAL				\$ 17,108,000	

Construction Management						
WBS	Items					
30	Construction Management	1	LS	6.14%	\$ 9,114,000	
	CONTINGENCY 15.25%				\$ 1,390,000	
	SUBTOTAL				\$ 10,504,000	

First Cost		\$ 213,917,000
Escalation 2Q 2016 to 2Q 2018	3.31%	\$ 7,071,000
Interest During Construction		\$ 6,761,000
Total Investment Cost		\$ 227,749,000

Annualized Total Investment Cost		\$ 8,436,000
Interest Rate	2.750%	
Life	50	
Capital Recovery Factor	0.03704	
Construction Period in months	27.19	
IDC Factor	0.030594915	

Contract No.: W912DS-09-0009
 Task Order No.: 26

**Alternative 3n - Composite Seawall
 Feasibility Estimate**

Discipline: Ren. Costs Sheet: 3 OF 8
 Prepared by: R. Hampson Date: 4/20/2015
 Updated: S. Jessup Date: 7/11/2018
M. Kluijver Date: 7/12/2018

Project Title: Integrated Hurricane Sandy General Reevaluation Report and Environmental Impact Statement - Atlantic Coast of New York - East Rockaway Inlet to Rockaway Inlet and Jamaica Bay
 Consultant Name: Moffatt & Nichol Consultant Contact: M. Kluijver

Item #	Description	Quantity	Unit	Unit Price \$	Total \$	Assumption / Basis
Construction Costs						
WBS	Items					
17	Mob/Demob	1	LS	\$ 3,300,000.00	\$ 3,300,000	
17	Beachfill	1	LS	\$ 17,955,000.00	\$ 17,955,000	
	SUBTOTAL				\$ 21,255,000	
	CONTINGENCY 30.47%				\$ 6,476,000	
	SUBTOTAL				\$ 27,731,000	

Lands & Damages						
WBS	Items					
01	Lands & Damages	1	LS	\$ -	\$ -	
	CONTINGENCY 20%				\$ -	
	SUBTOTAL				\$ -	

Planning, Engineering & Design						
WBS	Items					
30	Planning, Engineering & Design	1	LS	10.00%	\$ 2,126,000	
	CONTINGENCY 15.25%				\$ 324,000	
	SUBTOTAL				\$ 2,450,000	

Construction Management						
WBS	Items					
30	Construction Management	1	LS	7.91%	\$ 1,681,000	
	CONTINGENCY 15.25%				\$ 256,000	
	SUBTOTAL				\$ 1,937,000	

First Cost		\$ 32,118,000
Escalation 2Q 2016 to 2Q 2018	3.31%	\$ 1,062,000
Interest During Construction		\$ -
Total Renourishment Cost		\$ 33,180,000

Annualized TotalRenourishment Cost **\$ 7,666,000** from amortization file

Interest Rate 2.750%
 Life 50
 Capital Recovery Factor 0.03704
 Present Value Factor 5.61125

Contract No.: W912DS-09-0009
 Task Order No.: 26

**Alternative 3n - Composite Seawall
 Feasibility Estimate**

Discipline: First Costs Sheet: 2 OF 8
 Prepared by: R. Hampson Date: 4/20/2015
 Updated: S. Jessup Date: 7/11/2018
M. Kluijver Date: 7/12/2018

Project Title: Integrated Hurricane Sandy General Reevaluation Report and Environmental Impact Statement -
 Atlantic Coast of New York - East Rockaway Inlet to Rockaway Inlet and Jamaica Bay

Consultant Name: Moffatt & Nichol Consultant Contact: M. Kluijver

Item #	Description	Quantity	Unit	Unit Price \$	Total \$	Assumption / Basis
Construction Costs						
WBS	Items					
10	Mob/Demob - Composite Wall	2	EA	\$ 1,700,000.00	\$ 3,400,000	
10	Armor Stone (3 TON)	168,960	TON	\$ 124.29	\$ 21,000,038	
10	Core Stone	24,000	TON	\$ 86.15	\$ 2,067,600	
10	Geotextile	35,520	SY	\$ 9.18	\$ 326,074	
10	Excavation - Sand	444,480	CY	\$ 3.73	\$ 1,657,910	
10	Concrete Cap	4,800	CY	\$ 820.91	\$ 3,940,368	
17	Beachfill-Dune	1,288,490	CY	\$ 12.88	\$ 16,595,751	
17	Dune Grass Planting	73	AC	\$ 20,000.00	\$ 1,460,000	32,000 LF of dune grass planting
10	Access Ramps	8	EA	\$ 825,000.00	\$ 6,600,000	
	SUBTOTAL				\$ 57,048,000	
	CONTINGENCY 25.51%				\$ 14,553,000	
	SUBTOTAL				\$ 71,601,000	

Lands & Damages						
WBS	Items					
01	Lands & Damages	1	LS	\$ -	\$ -	
	CONTINGENCY 20%				\$ -	
	SUBTOTAL				\$ -	

Planning, Engineering & Design						
WBS	Items					
30	Planning, Engineering & Design	1	LS	10.00%	\$ 5,705,000	
	CONTINGENCY 15.25%				\$ 870,000	
	SUBTOTAL				\$ 6,575,000	

Construction Management						
WBS	Items					
30	Construction Management	1	LS	7.01%	\$ 3,999,000	
	CONTINGENCY 15.25%				\$ 610,000	
	SUBTOTAL				\$ 4,609,000	

First Cost		\$ 82,785,000
Escalation 2Q 2016 to 2Q 2018	3.31%	\$ 2,737,000
Interest During Construction		\$ -
Total Adaption Cost		\$ 85,522,000

Annualized Total Investment Cost **\$ 2,288,000** Construction in Year 12

Interest Rate 2.750%
 Life 50
 Capital Recovery Factor 0.03704
 Construction Period in months 12
 IDC Factor 0.012700947

Contract No.: W912DS-09-0009
 Task Order No.: 26

**Alternative 3n - Composite Seawall
 Feasibility Estimate**

Discipline: Beachfill-Initial Sheet: 4 OF 8
 Prepared by: R. Hampson Date: 4/20/2015
 Updated: S. Jessup Date: 7/11/2018
M. Kluijver Date: 7/12/2018

Integrated Hurricane Sandy General Reevaluation Report and Environmental Impact
 Statement - Atlantic Coast of New York - East Rockaway Inlet to Rockaway Inlet and Jamaica

Project Title: Bay

Consultant Name: Moffatt & Nichol

Consultant Contact: M. Kluijver

Item #	Description	Quantity	Unit	Unit Price \$	Total \$	Assumption / Basis
Beachfill - Initial Construction						
Items						
1	Beachfill-Reach 1	-	CY	\$ 12.88	\$ -	
2	Beachfill-Reach 2	-	CY	\$ 12.88	\$ -	
3	Beachfill-Reach 3	356,000	CY	\$ 12.88	\$ 4,585,280	design + advance fill
4	Beachfill-Reach 4	294,000	CY	\$ 12.88	\$ 3,786,720	design + advance fill
5	Beachfill-Reach 5	321,000	CY	\$ 12.88	\$ 4,134,480	design + advance fill
6	Beachfill-Reach 6a	250,000	CY	\$ 12.88	\$ 3,220,000	design + advance fill
7	Beachfill-Reach 6b	20,000	CY	\$ 12.88	\$ 257,600	design + advance fill
8	Dune Grass Planting	73	AC	\$ 20,000.00	\$ 1,460,000	32,000 LF of dune grass planting
	SUBTOTAL		CY		\$ 17,444,000	

General						
Items						
1	Mob/Demob	1	EA	\$ 3,300,000.00	\$ 3,300,000	30" Cutter Head Dredge
	SUBTOTAL				\$ 3,300,000	

TOTAL		\$ 20,744,000
CONTINGENCY 25.51%		\$ 5,291,794
Escalation 2Q 2016 to 2Q 2018	3.31%	\$ 861,000
GRAND TOTAL CONSTRUCTION COST		\$ 26,896,794

Contract No.: W912DS-09-0009
 Task Order No.: 26

**Composite Seawall
 Feasibility Estimate**

Discipline: Composite Seawall Sheet: 5 OF 8
 Prepared by: R. Hampson Date: 3/24/2015
 Updated: S. Jessup Date: 7/11/2018
M. Kluijver Date: 7/12/2018

Integrated Hurricane Sandy General Reevaluation Report and Environmental Impact
 Statement - Atlantic Coast of New York - East Rockaway Inlet to Rockaway Inlet and Jamaica

Project Title: Bay

Consultant Name: Moffatt & Nichol

Consultant Contact: M. Kluijver

Item #	Description	Quantity	Unit	Unit Price \$	Total \$	Assumption / Basis
Composite Seawall						
Items						
1	Armor Stone (3 TON)	348,160	TON	\$ 124.29	\$ 43,272,806	
2	Core Stone	135,360	TON	\$ 86.15	\$ 11,661,264	
3	Geotextile	151,040	SY	\$ 9.18	\$ 1,386,547	
4	Excavation - Sand	312,960	CY	\$ 3.73	\$ 1,167,341	
5	Concrete Cap	11,520	CY	\$ 820.91	\$ 9,456,883	
6	AZ 12-770	7,040	TON	\$ 3,462.40	\$ 24,375,296	
7	Splash - Armor Stone	14,940	TON	\$ 110.00	\$ 1,643,400	
8	Splash - Bedding Stone	6,360	TON	\$ 80.00	\$ 508,800	
9	Splash - Geotextile	10,020	SY	\$ 9.18	\$ 91,984	
10	Splash - Fill	4,440	CY	\$ 50.00	\$ 222,000	
	SUBTOTAL				\$ 93,786,000	

General						
Items						
1	Mob/Demob	2	EA	\$ 1,700,000.00	\$ 3,400,000	
	SUBTOTAL				\$ 3,400,000	

TOTAL		\$ 97,186,000
CONTINGENCY 25.51%		\$ 24,792,149
Escalation 2Q 2016 to 2Q 2018	3.31%	\$ 4,032,000
GRAND TOTAL CONSTRUCTION COST		\$ 126,010,149

Contract No.: W912DS-09-0009
 Task Order No.: 26

**Alternative 3n - Composite Seawall
 Feasibility Estimate**

Discipline: Groins Sheet: 6 OF 8
 Prepared by: R. Hampson Date: 4/20/2015
 Updated: S. Jessup Date: 7/11/2018
M. Kluijver Date: 7/12/2018

Integrated Hurricane Sandy General Reevaluation Report and Environmental Impact
 Statement - Atlantic Coast of New York - East Rockaway Inlet to Rockaway Inlet and Jamaica

Project Title: Bay

Consultant Name: Moffatt & Nichol

Consultant Contact: M. Kluijver

Item #	Description	Quantity	Unit	Unit Price \$	Total \$	Assumption / Basis
New Groins in Reach 3 & 4						
Items						
1	Armor Stone (4-8 TON)	55,175	TON	\$ 193.30	\$ 10,665,231	12 groins @ a total of 4087 ft
2	Underlayer Stone (500-1500 lbs)	17,983	TON	\$ 104.68	\$ 1,882,440	
3	Core Stone (30-130 lbs)	11,035	TON	\$ 92.87	\$ 1,024,811	
4	Bedding Stone (30-130 lbs)	28,200	CY	\$ 92.87	\$ 2,618,962	
5	Geotextile Filter Fabric	31,470	SY	\$ 23.68	\$ 745,207	
6	Excavation - Sand	94,410	CY	\$ 7.24	\$ 683,526	
	SUBTOTAL				\$ 17,620,000	\$4,311 per LF of groin

New Groin in Reach 6a						
Items						
1	Armor Stone (3-10 TON)	6,838	TON	\$ 193.30	\$ 1,321,785	1 groin @ 526 ft
2	Underlayer Stone (500-1500 lbs)	2,420	TON	\$ 104.68	\$ 253,284	
3	Core Stone (30-130 lbs)	1,473	TON	\$ 92.87	\$ 136,779	
4	Bedding Stone (30-130 lbs)	3,314	CY	\$ 92.87	\$ 307,753	
5	Geotextile Filter Fabric	3,945	SY	\$ 23.68	\$ 93,418	
6	Excavation - Sand	9,784	CY	\$ 7.24	\$ 70,833	
	SUBTOTAL				\$ 2,184,000	\$4,152 per LF of groin

Groin Extensions in Reach 6a						
Items						
1	Armor Stone (10 TON)	19,760	TON	\$ 193.30	\$ 3,819,608	5 groin extensions @ a total of 800'
2	Underlayer & Core Stone (500-1500 lbs)	4,160	TON	\$ 104.68	\$ 435,469	
3	Core Stone (30-130 lbs)	2,640	TON	\$ 92.87	\$ 245,177	
4	Bedding Stone (30-130 lbs)	8,320	CY	\$ 92.87	\$ 772,678	
5	Geotextile Filter Fabric	7,520	SY	\$ 23.68	\$ 178,074	
6	Excavation - Sand	12,240	CY	\$ 7.24	\$ 88,618	
	SUBTOTAL				\$ 5,540,000	\$6,925 per LF of groin

General						
Items						
1	Mob/Demob	1	EA	\$ 2,500,000.00	\$ 2,500,000	
	SUBTOTAL				\$ 2,500,000	

TOTAL	\$ 27,844,000
CONTINGENCY 25.51%	\$ 7,103,004
Escalation 2Q 2016 to 2Q 2018	3.31% \$ 1,155,000
GRAND TOTAL CONSTRUCTION COST	\$ 36,102,004

Contract No.: W912DS-09-0009
 Task Order No.: 26

**Alternative 3n - Composite Seawall
 Feasibility Estimate**

Discipline: Beachfill-Ren Sheet: 7 OF 8
 Prepared by: R. Hampson Date: 4/20/2015
 Updated: S. Jessup Date: 7/11/2018
M. Kluijver Date: 7/12/2018

Integrated Hurricane Sandy General Reevaluation Report and Environmental Impact
 Statement - Atlantic Coast of New York - East Rockaway Inlet to Rockaway Inlet and Jamaica

Project Title: Bay

Consultant Name: Moffatt & Nichol

Consultant Contact: M. Kluijver

Item #	Description	Quantity	Unit	Unit Price \$	Total \$	Assumption / Basis
Beachfill-Renourishment Operation						
Items						
1	Beachfill-Reach 1	-	CY	\$ 12.88	\$ -	estimate for a single renourishment operation
2	Beachfill-Reach 2	-	CY	\$ 12.88	\$ -	renourishment operations occur in 4-year cycles
3	Beachfill-Reach 3	572,000	CY	\$ 12.88	\$ 7,367,360	advance fill - 4-year cycle
4	Beachfill-Reach 4	200,000	CY	\$ 12.88	\$ 2,576,000	advance fill - 4-year cycle
5	Beachfill-Reach 5	576,000	CY	\$ 12.88	\$ 7,418,880	advance fill - 4-year cycle
6	Beachfill-Reach 6a	46,000	CY	\$ 12.88	\$ 592,480	advance fill - 4-year cycle
	SUBTOTAL	1,394,000	CY		\$ 17,955,000	

General						
Items						
1	Mob/Demob	1	EA	\$ 3,300,000.00	\$ 3,300,000	large hopper dredge
	SUBTOTAL				\$ 3,300,000	

TOTAL		\$ 21,255,000
CONTINGENCY 30.47%		\$ 6,476,000
Escalation 2Q 2016 to 2Q 2018	3.31%	\$ 917,000
GRAND TOTAL CONSTRUCTION COST		\$ 28,648,000

Contract No.: W912DS-09-0009
 Task Order No.: 26

**Alternative 3n - Composite Seawall
 Feasibility Estimate**

Discipline: Structural Sheet: 8 OF 8
 Prepared by: R. Hampson Date: 5/1/2015
 Updated: S. Jessup Date: 7/11/2018
M. Kluijver Date: 7/12/2018

Integrated Hurricane Sandy General Reevaluation Report and Environmental Impact
 Statement - Atlantic Coast of New York - East Rockaway Inlet to Rockaway Inlet and Jamaica

Project Title: Bay

Consultant Name: Moffatt & Nichol

Consultant Contact: M. Kluijver

Item #	Description	Quantity	Unit	Unit Price \$	Total \$	Assumption / Basis
Boardwalk Access Ramps						
Items						
1	24" Steel Pipe Pile	114	LF	\$ 135.00	\$ 15,390	3 piles @ 24x1/2" WT (38 ft long)
2	Precast Concrete Pile Cap	15	CY	\$ 1,500.00	\$ 22,500	3 caps @ 5.1 cy each
3	Cast in Place Concrete Plug	2	CY	\$ 500.00	\$ 1,000	3 plugs
4	Cast in Place Concrete Deck	6	CY	\$ 1,000.00	\$ 6,000	3 @ 4'6" x 10' x 14"
5	Precast Concrete Deck	25	CY	\$ 1,000.00	\$ 25,000	70' x 10' x 14"
6	RPL Decking	695	SF	\$ 50.00	\$ 34,750	Furnish and Install
7	Handrail	139	LF	\$ 150.00	\$ 20,850	Furnish and Install
SUBTOTAL					\$ 125,000	

Demolition						
Items						
1	Access Ramps	700	SF	\$ 35.00	\$ 24,500	Demo and Dispose of Access Ramp
SUBTOTAL					\$ 25,000	

General						
Items						
1	Mob/Demob	0.125	EA	\$ 1,000,000.00	\$ 125,000	
SUBTOTAL					\$ 125,000	

SUBTOTAL	\$ 275,000
GENERAL CONDITIONS 10%	\$ 28,000
SUBTOTAL (ALL ITEMS)	\$ 303,000
G. C. OVERHEAD & PROFIT 10%	\$ 30,000
TOTAL	\$ 333,000
CONTINGENCY 25.51%	\$ 85,000
Escalation 2Q 2016 to 2Q 2018 3.31%	\$ 14,000
GRAND TOTAL CONSTRUCTION COST	\$ 432,000

Contract No.: W912DS-09-0009
 Task Order No.: 26

**Summary - Annualized Cost - High SLR
 Feasibility Estimate**

Discipline: Annualized Cost Sheet: 1 OF 1
 Prepared by: R. Hampson Date: 6/17/2015

Project Title: Integrated Hurricane Sandy General Reevaluation Report and Environmental Impact Statement -
 Atlantic Coast of New York - East Rockaway Inlet to Rockaway Inlet and Jamaica Bay

Consultant Name: Moffatt & Nichol

Consultant Contact: M. Kluijver

Item #	Description	Medium +16'	Large +18'	XL +20'	Buried Seawall	Composite Seawall	
Annualized Costs - 4 year Cycle							
Items							
1	Total Investment	\$2,679,000	\$3,616,000	\$5,581,000	\$5,898,000	\$8,436,000	
2	Renourishment	\$7,666,000	\$8,108,000	\$8,544,000	\$7,666,000	\$7,666,000	
3	Major Rehab	\$332,000	\$332,000	\$332,000	\$332,000	\$332,000	
4	Groin & Seawall Maintenance	\$176,000	\$195,000	\$218,000	\$151,000	\$14,000	
5	Monitoring	\$403,000	\$403,000	\$403,000	\$403,000	\$403,000	
6	SLR Adaption	\$564,000	\$849,000	\$859,000	\$2,197,000	\$2,288,000	
	Total	\$11,820,000	\$13,503,000	\$15,937,000	\$16,647,000	\$19,139,000	
	IDC	\$1,307,000	\$2,129,000	\$3,461,000	\$3,753,000	\$6,761,000	