South Shore of Staten Island, NY

Coastal Storm Risk Management

Phase 1

Fort Wadsworth to Oakwood Beach

August 2015

US Army Corps of Engineers
New York District
BUILDING STRONG

Staten Island Feasibility Study

- Phase 1 (Fort Wadsworth to Oakwood Beach)
- Sandy Impacts
- Alternatives assessed
- Proposed Plan Optimization & Details
- Sponsor responsibilities
- Next Steps; Schedule

Coastal Storm Risk Management

- Disaster Relief Appropriations Act of 2013; Public Law 113-2; provides construction authority and Federal funding

- PL 113-2 objectives: demonstrate project is economically justified, technically feasible, environmentally acceptable

- Evaluate feasibility of Federal participation in implementing solutions to problems and opportunities associated with storm damage and erosion control in study area

Non-Federal Project Partners

- Project Sponsor is New York State Department of Environmental Conservation (NYSDEC)

- NYSDEC in cooperation with the City of New York:
  - NYC Mayor's Office, NYCDEP, NYCDPR, NYCDOT

- NPS properties (Miller Field + Great Kills)

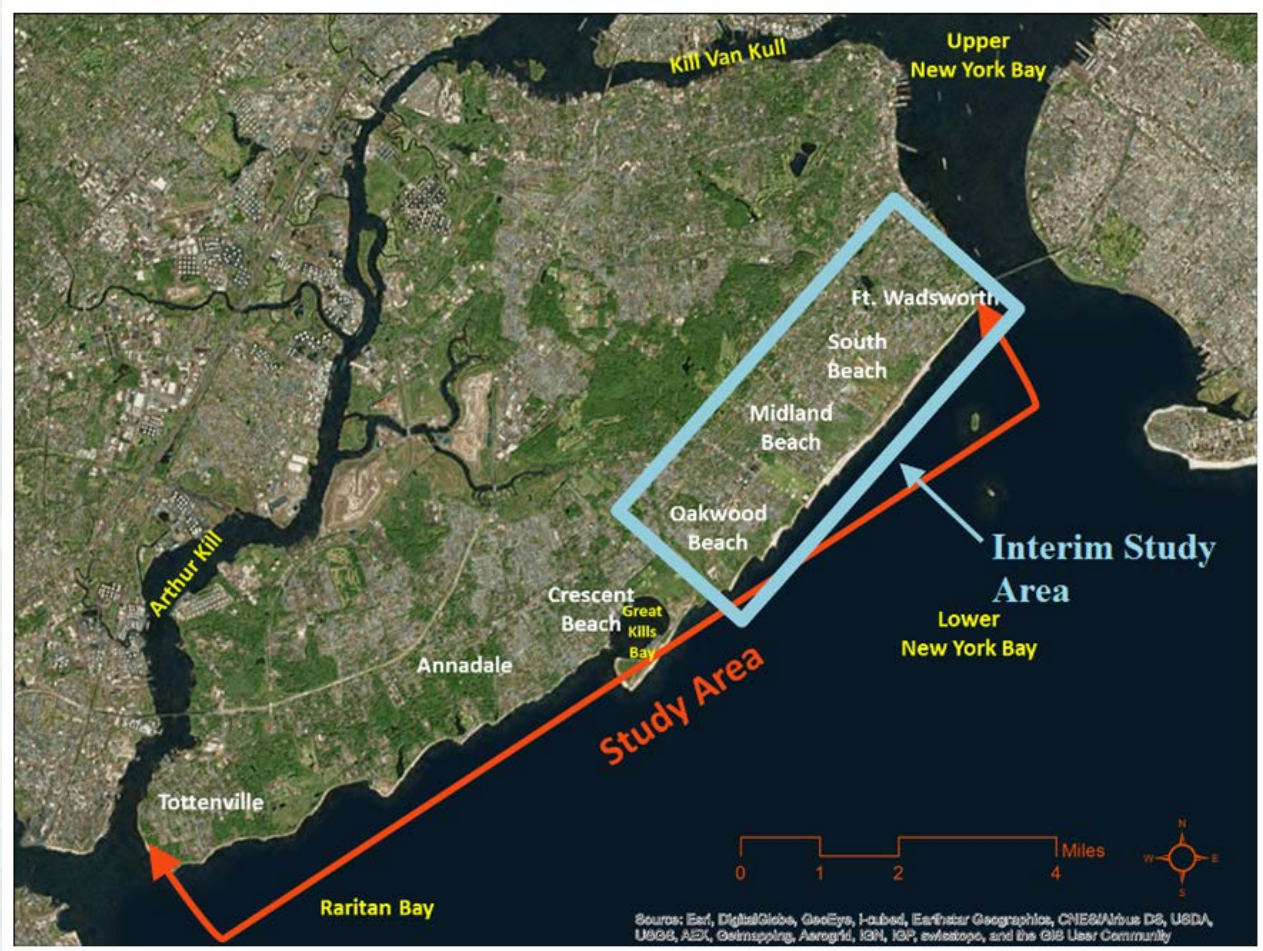
- 100% Federal cost to complete feasibility study

- Construction to be cost-shared in accordance with Project Partnership Agreement, once executed
  - 65% Federal
  - 35% non-Federal

Study Area Phase 1 + Phase 2

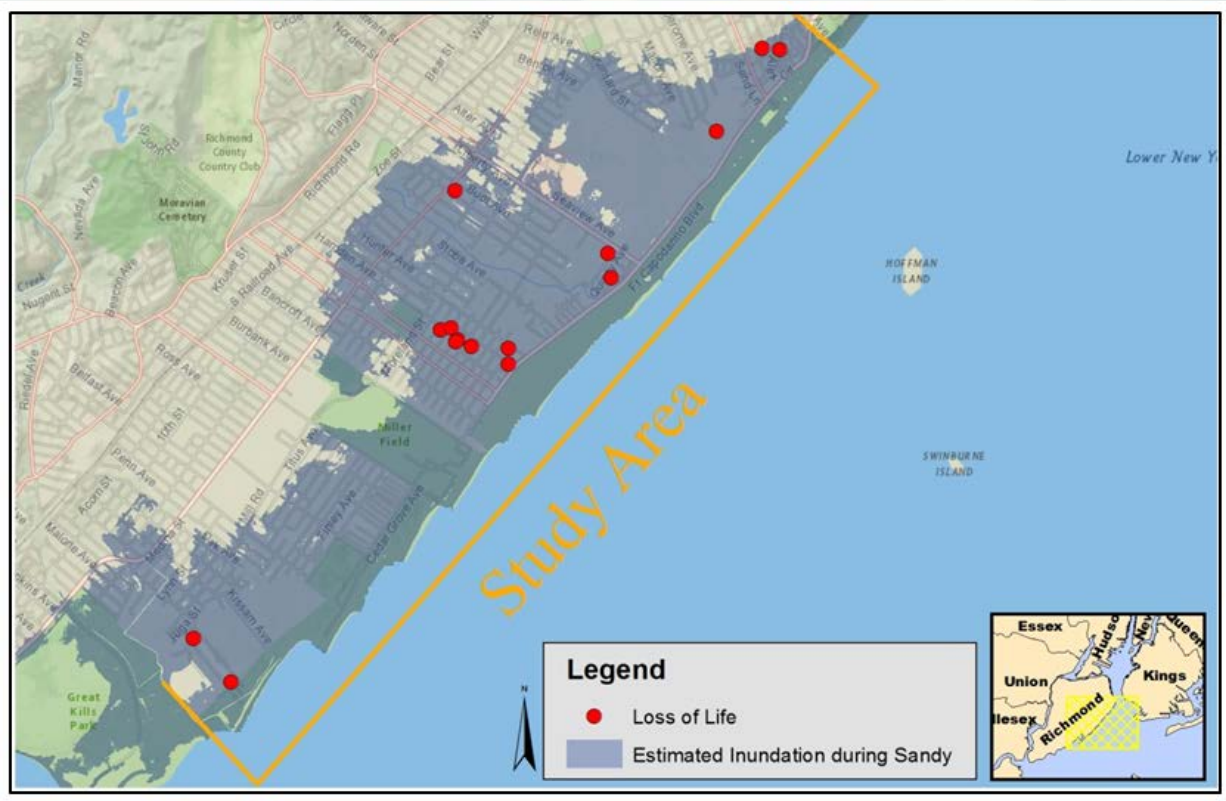
Phase 1 = Fort Wadsworth to Oakwood Beach

Phase 2 = Great Kills to Tottenville (separate action)



Hurricane Sandy

- Hurricane Sandy generated record storm surges
- Several deaths in area, with thousands of buildings damaged or destroyed

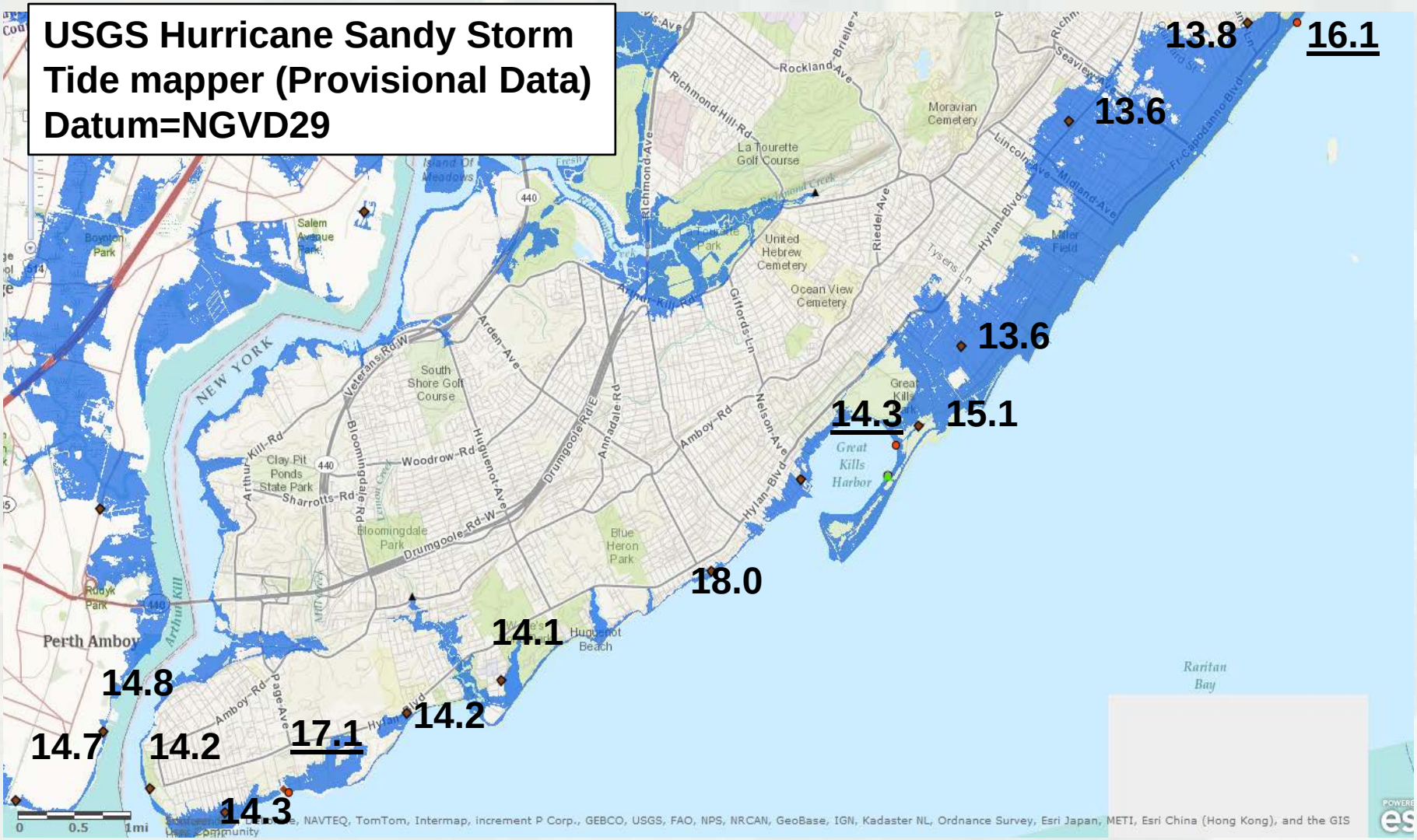


Hurricane Sandy

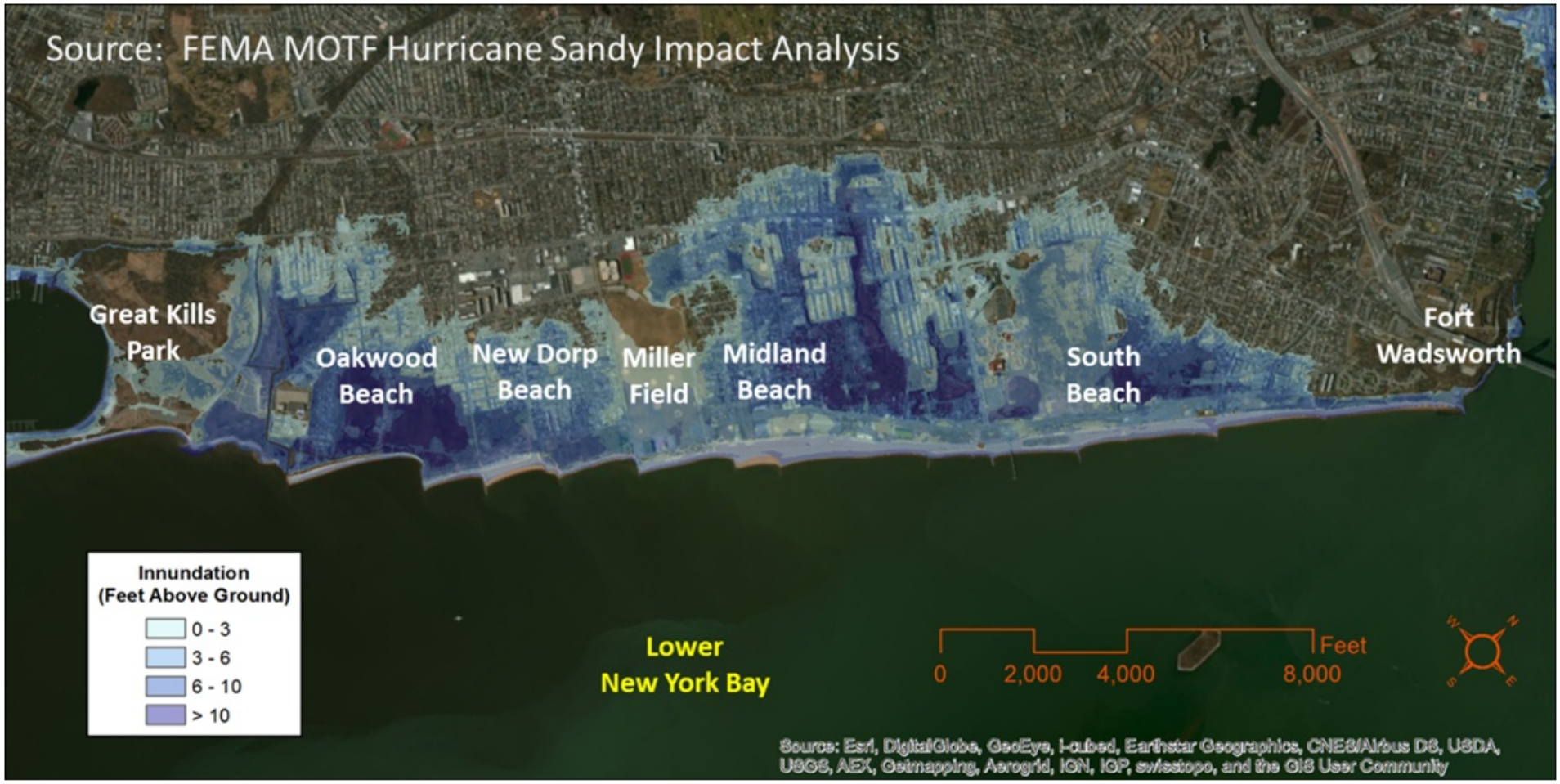
Hurricane Sandy

Hurricane Sandy

Hurricane Sandy Impacts



Hurricane Sandy Inundation



Without-project Future Conditions

Without-project future conditions

- Continued flooding during severe future storm events
- Continued wave impacts to unprotected shoreline
- Continued development and fill of low-lying storage areas
- Without-project damages estimated over $34 million annually based on 50-year period of analysis (coastal inundation and interior flood damages)

Sea Level Change

- Storm tide inundation expected to increase over time, resulting in increase of 0.7 ft over 50-year period of analysis

Preliminary Alternatives

Alternatives designed to provide same level of coastal storm risk management; Analyzed to determine highest net benefits

- No Action
- Non-Structural – floodproofing, buyouts
- Alternative #1 - beach fill, seawall, floodwall, levee
- Alternatives #2 & #3 – variations of Father Capodanno road raising, buried seawall/armored levee, floodwall, levee
- Alternative #4 – buried seawall/armored levee, floodwall, levee

Comparison of Preliminary Alternatives

No Action or Non-structural

- Excessive costs

Alternative #1

- High beach fill quantity required (over 3.2 million CY)
- May disrupt present balance and stability of existing beach front
- Difficult to maintain design shoreline; substantial future nourishments; may not maintain design dimensions when exposed to multiple design storm events

Alternatives #2/3

- Raising Father Capodanno has significant impacts

Alternative #4 – PROPOSED PLAN (buried seawall/armored levee)

- **Lowest estimated cost and greatest net benefits**
- **Withstand multiple storms**

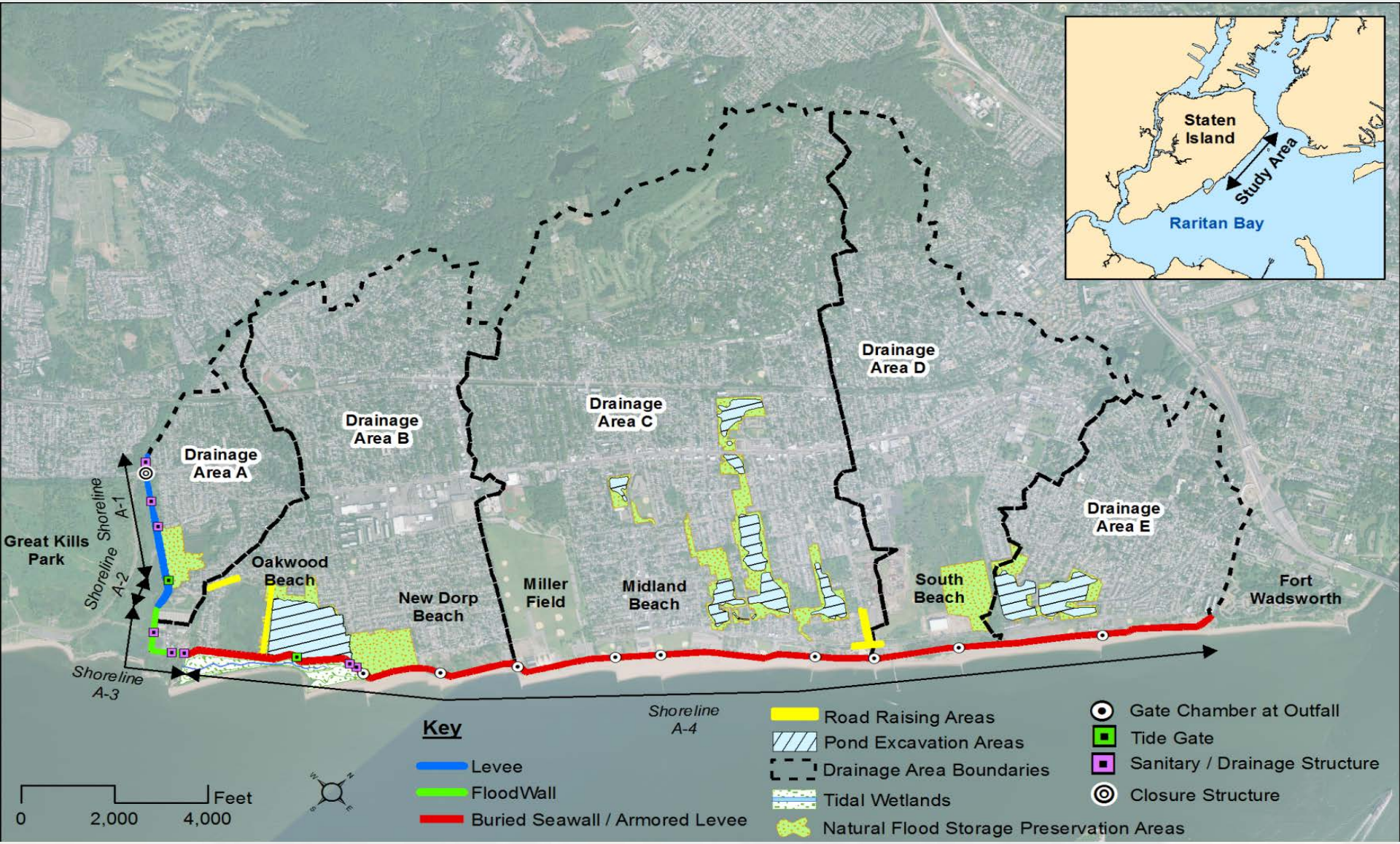
Optimization of the Proposed Plan

- **Alternative #4 buried seawall/armored levee is proposed plan**
- Various stillwater design levels analyzed for optimization
- +15.6 ft. stillwater design provides maximum net benefits

Table 23 – Economic Comparison of Stillwater Designs				
Scenario	**13.3 ft. NGVD 1929 Stillwater Design**	**14.3 ft. NGVD 1929 Stillwater Design**	**15.6 ft. NGVD 1929 Stillwater Design**	**16.6 ft. NGVD 1929 Stillwater Design**
Annual Benefits	$22,098,000	$24,972,000	$27,732,000	$29,252,000
Annual Costs	$17,690,400	$19,005,400	$21,551,400	$23,603,400
Net Benefits	$4,407,600	$5,966,600	$6,180,600	$5,648,600
BCR	**1.2**	**1.3**	**1.3**	**1.2**
Selected as NED Plan			✓	

Rounded to the nearest thousand, 3.375% Discount Rate

Proposed Plan Layout



Oakwood Beach Area

Hylan Blvd (near Buffalo St)

to

Oakwood Beach Treatment Plant

Road Closure gate @ Hylan Blvd + Levee + Tide Gate + Acquisition/Preservation of open space

Levee
(Hylan Blvd to Oakwood Treatment Plant)

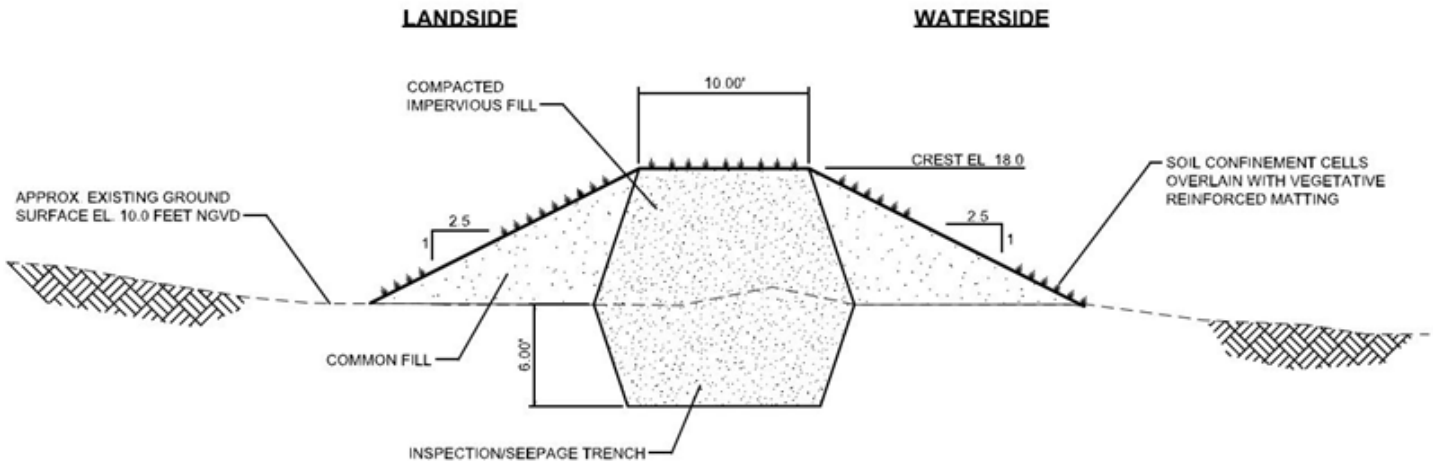


Figure 27 – Levee Typical Section (Reach A-1)

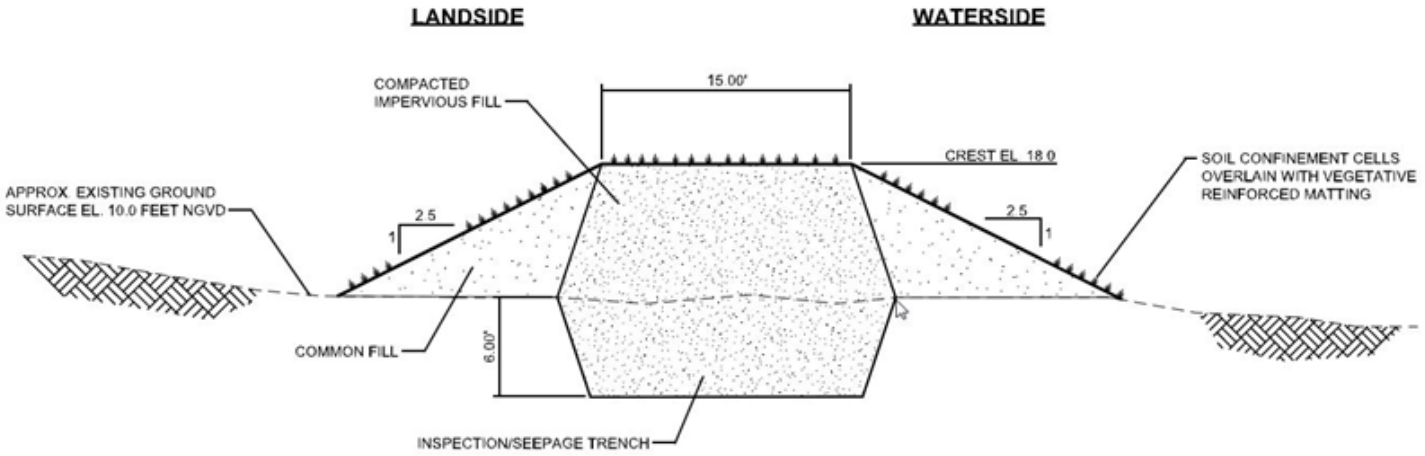


Figure 28 -Levee Typical Section (Reach A-2)

Tide Gate (Oakwood Creek)

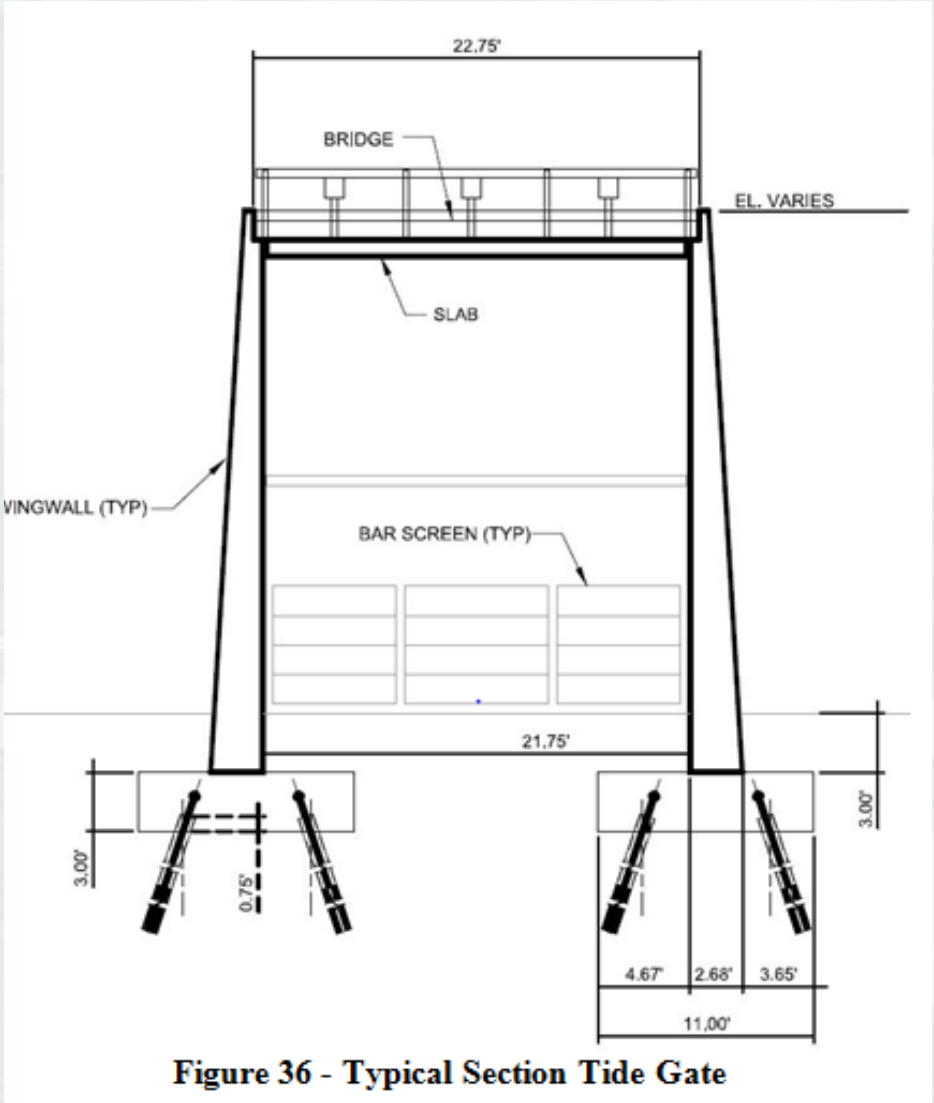


Figure 36 - Typical Section Tide Gate

Acquisition/Preservation of open space

Oakwood Beach & New Dorp Beach Areas

Oakwood Beach Treatment Plant

thru

Miller Field

Floodwall + Buried Seawall + Outfall chambers + Tidal Wetlands + Tide Gate + Remove Oakwood Tide Gate + Road Raisings + Acquisition/Preservation/Excavation of open space

Floodwall around Oakwood Treatment Plant

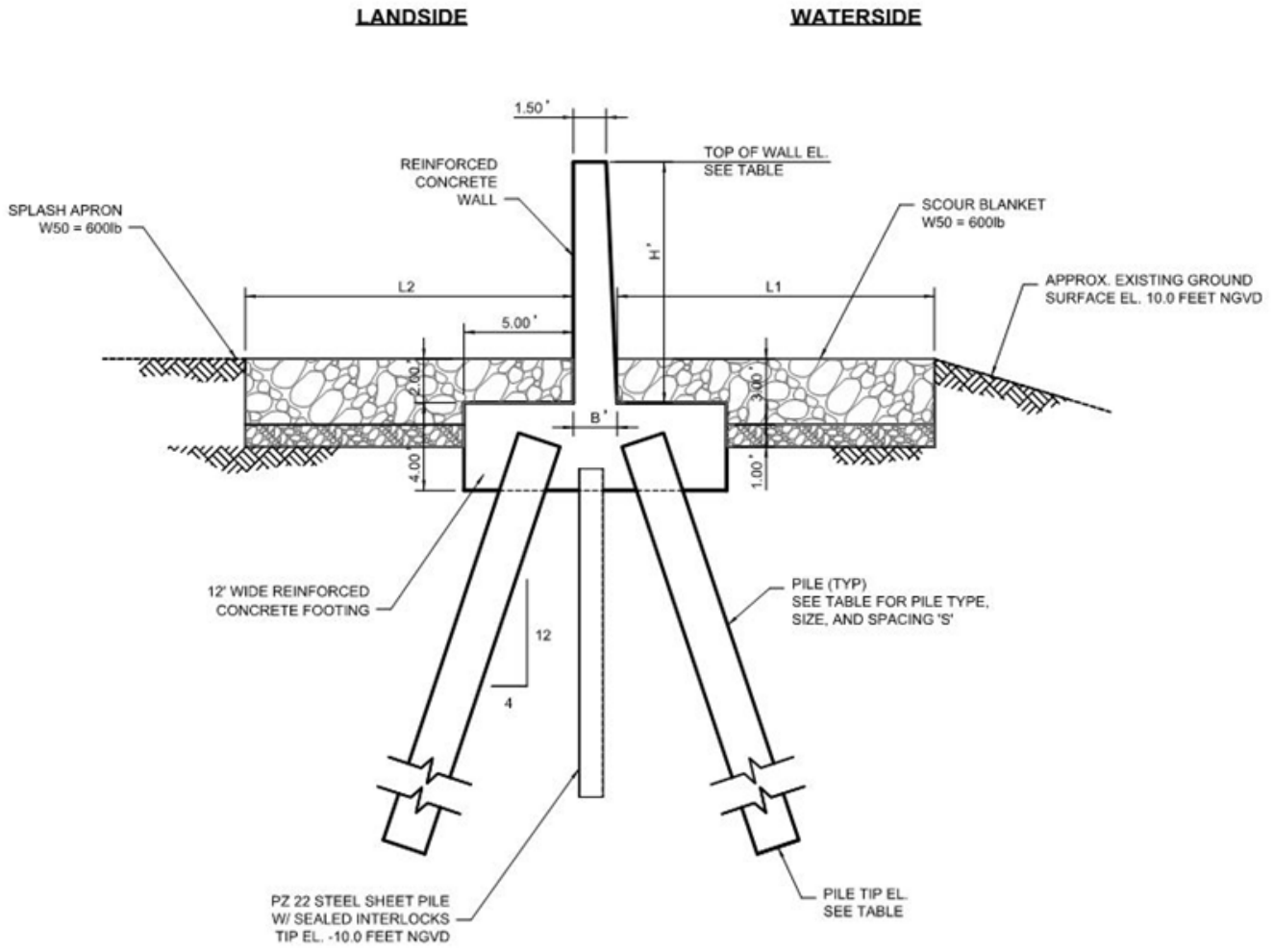


Figure 29 – Floodwall Typical Section (Reach A-3)

Buried Seawall
(Oakwood Beach thru Miller Field)

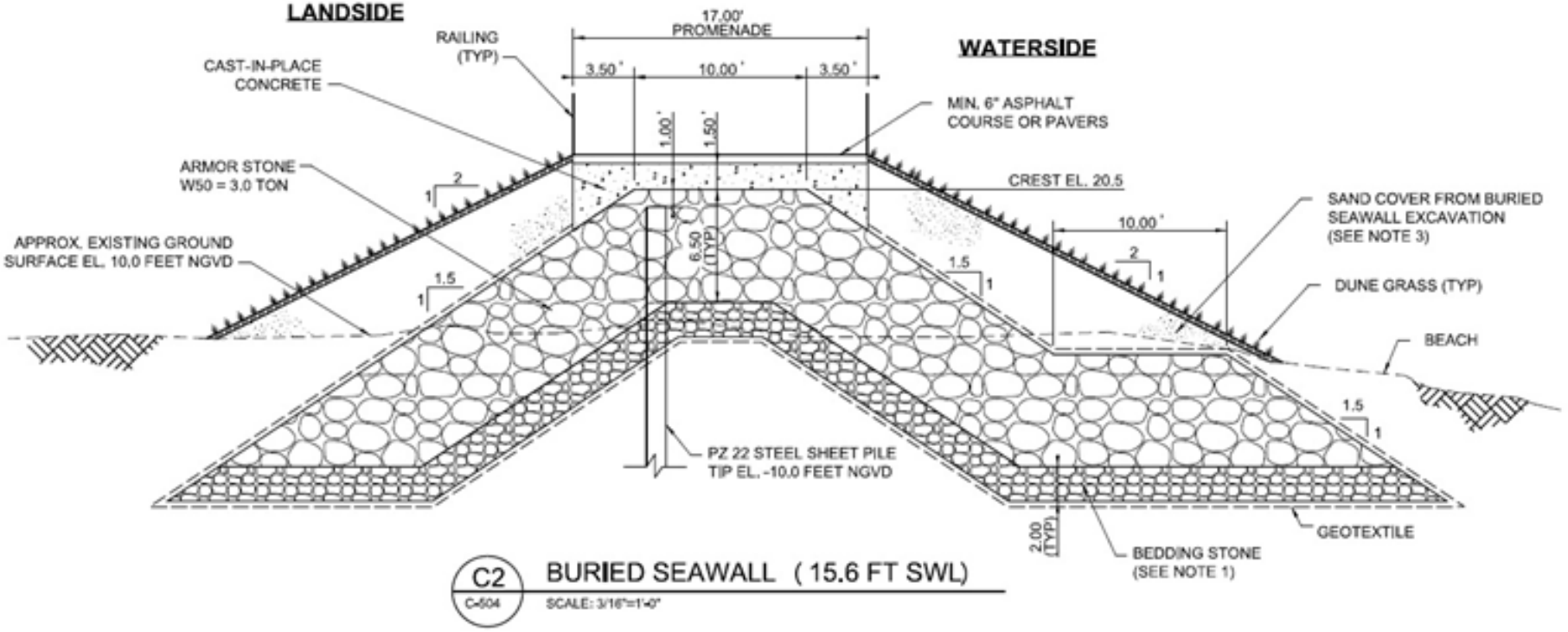


Figure 31 – Buried Seawall Typical Section (Reach A-4)

Gate Chambers for existing outfalls

Tysens Lane, Ebbits Street and New Dorp Lane
Sewer Outfalls

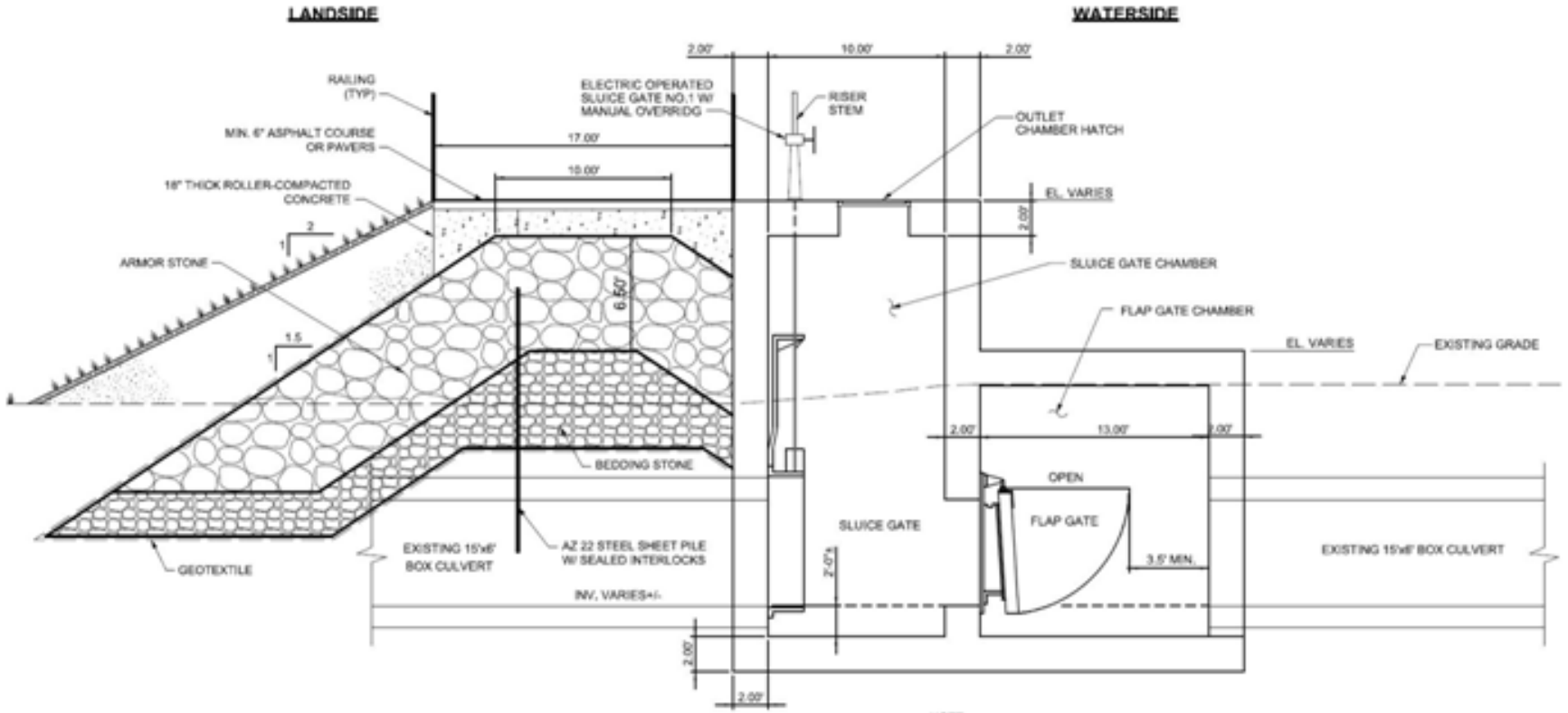


Figure 35 - Typical Section Gate Chamber

Tidal Wetlands fronting Buried Seawall in Oakwood Beach area

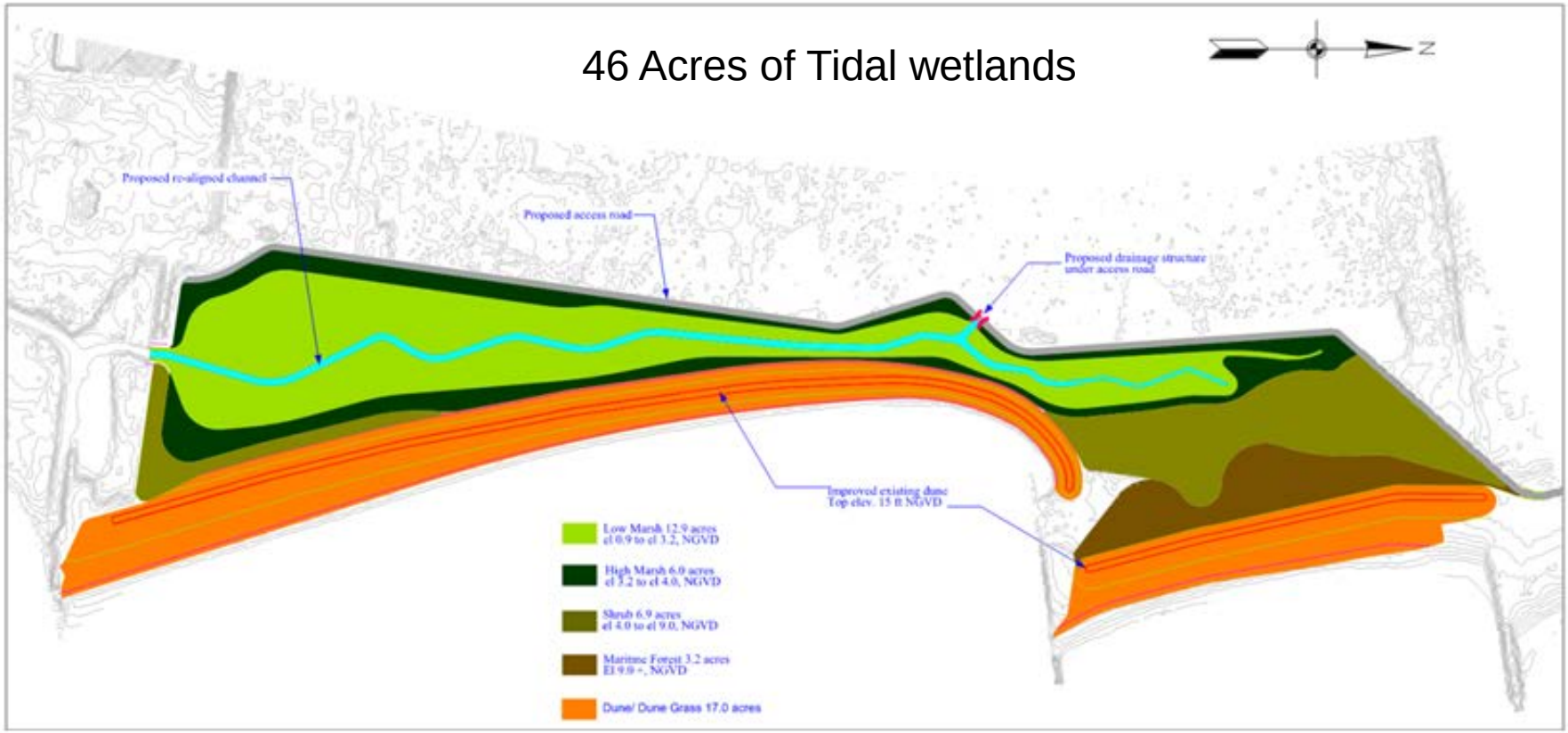


Figure 30 – Tidal Wetlands

Tide Gate (Oakwood Creek)
+ Removal of existing Oakwood Beach tide gate/levee

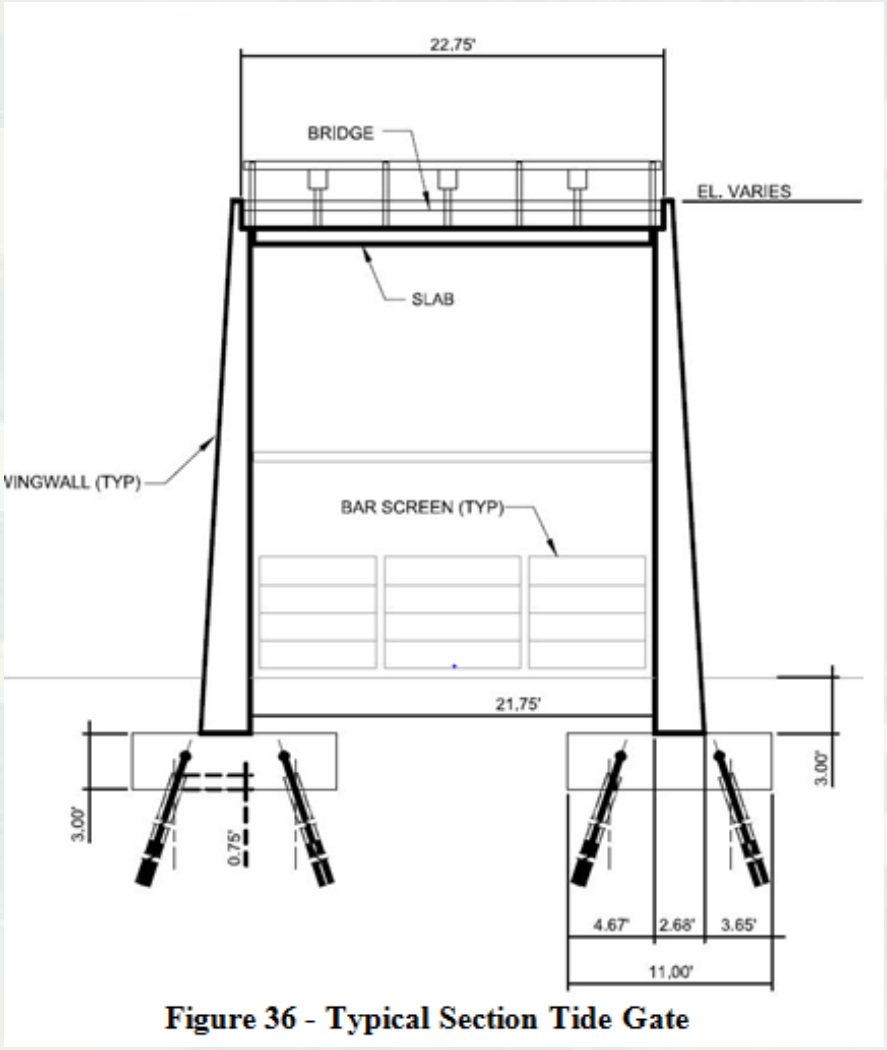
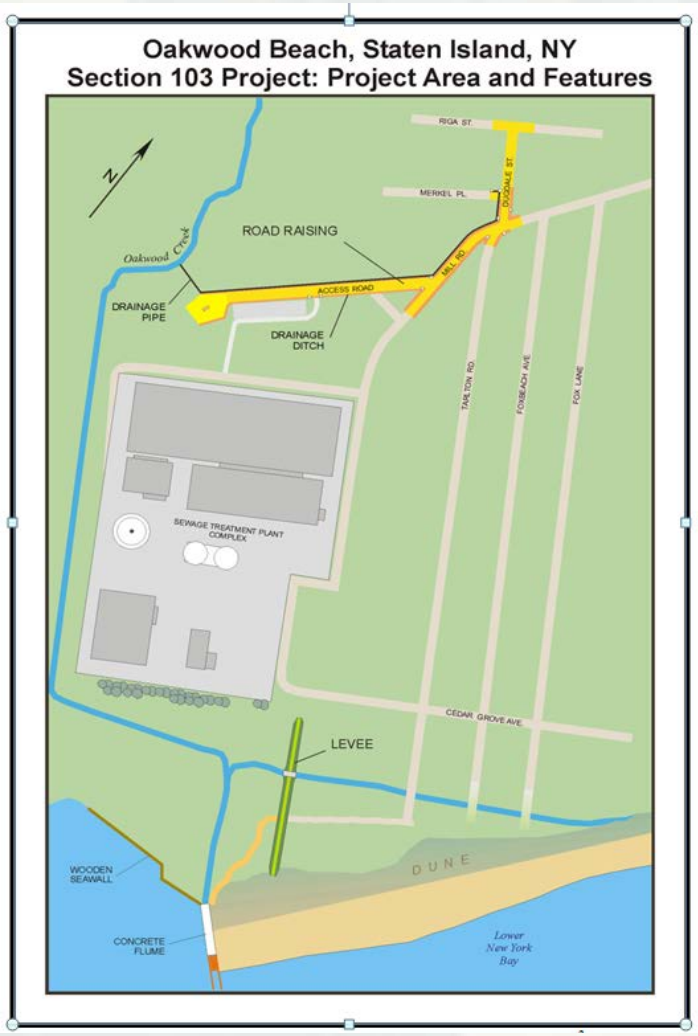


Figure 36 - Typical Section Tide Gate



Road Raisings

- Mill Road
  - Average raise height of + 1 ft.
- Kissam Ave
  - Average raise height of + 3 ft.

Acquisition/Preservation/Excavation of open space

Midland Beach & South Beach Areas

Midland Beach (promenade area)

to

Seaview Avenue

Buried Seawall (replaces existing promenade) + Outfall chambers + Road Raisings + Acquisition/Preservation/Excavation of open space

Buried Seawall
(replaces existing promenade)

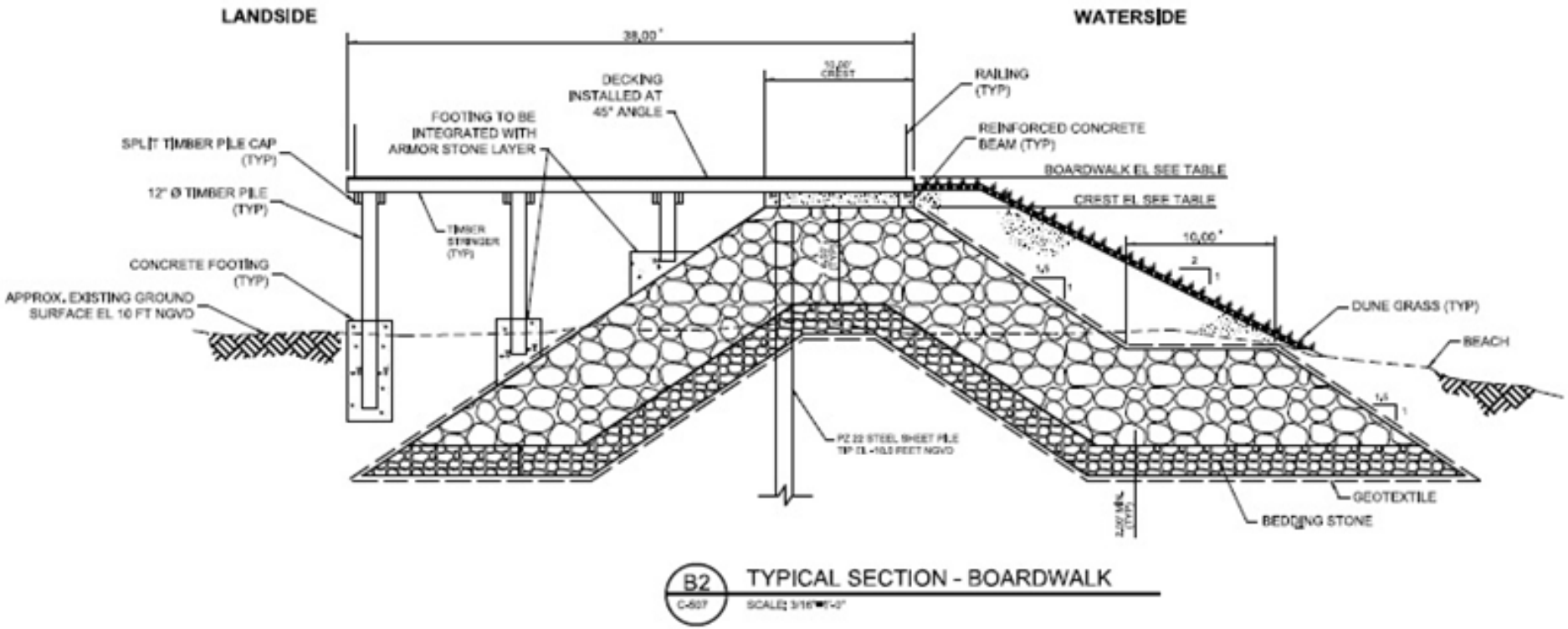


Figure 32 – Boardwalk Typical Section (Reach A-4)

US Army Corps of Engineers
New York District

Project Renderings

NEW YORK STATE OF OPPORTUNITY Department of Environmental Conservation

Existing Promenade
Midland Beach Area looking North

Buried Seawall with new Boardwalk
Midland Beach Area looking North

Gate Chambers for existing outfalls

Greely Ave, Midland Ave, Naughton Ave and Seaview Ave
Sewer Outfalls

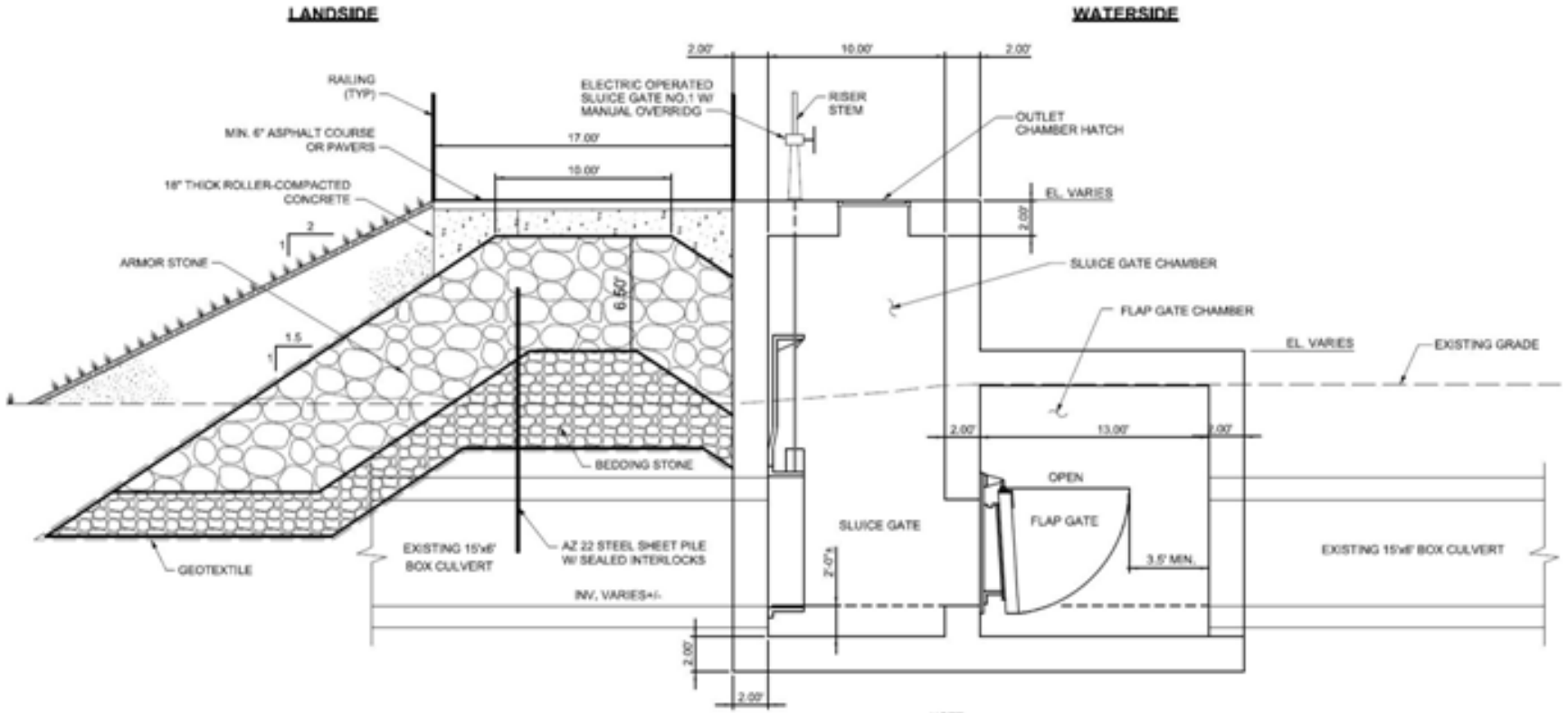


Figure 35 - Typical Section Gate Chamber

Road Raisings

- Seaview Ave
  - Average raise height of + 1 ft.

- Father Capodanno Blvd
  - Average raise height of + 1 ft.

Acquisition/Preservation/Excavation of open space

Drainage Area C - Alternative 4: 377,200 CY, Seven Ponds
(Tentatively Selected Plan)

South Beach & Fort Wadsworth Areas

Seaview Avenue (boardwalk area)

to

Fort Wadsworth

Buried Seawall (replaces existing boardwalk) + Outfall chamber + Preservation of open space

Buried Seawall (replaces existing boardwalk)
+ Outfall chambers
+ Acquisition/Preservation/Excavation of open space

Buried Seawall
(replaces existing boardwalk)

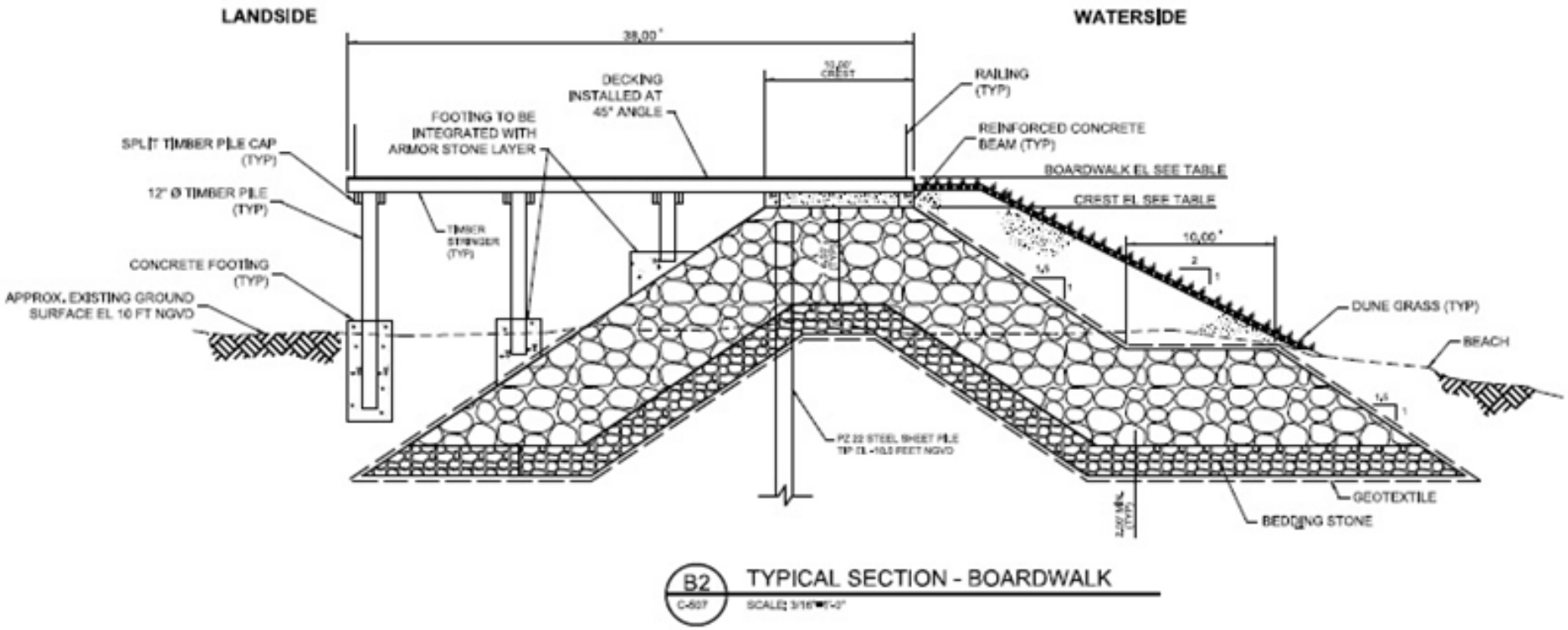


Figure 32 – Boardwalk Typical Section (Reach A-4)

US Army Corps of Engineers
New York District

Project Renderings

NEW YORK STATE OF OPPORTUNITY Department of Environmental Conservation

Existing Boardwalk
South Beach Area looking South

Buried Seawall with New Boardwalk
South Beach Area looking South

Existing Boardwalk
South Beach Area looking North

Buried Seawall with New Boardwalk
South Beach Area looking North

Gate Chambers for existing outfalls

Quintard Street, Sand Lane, Quincy Ave
Sewer Outfalls

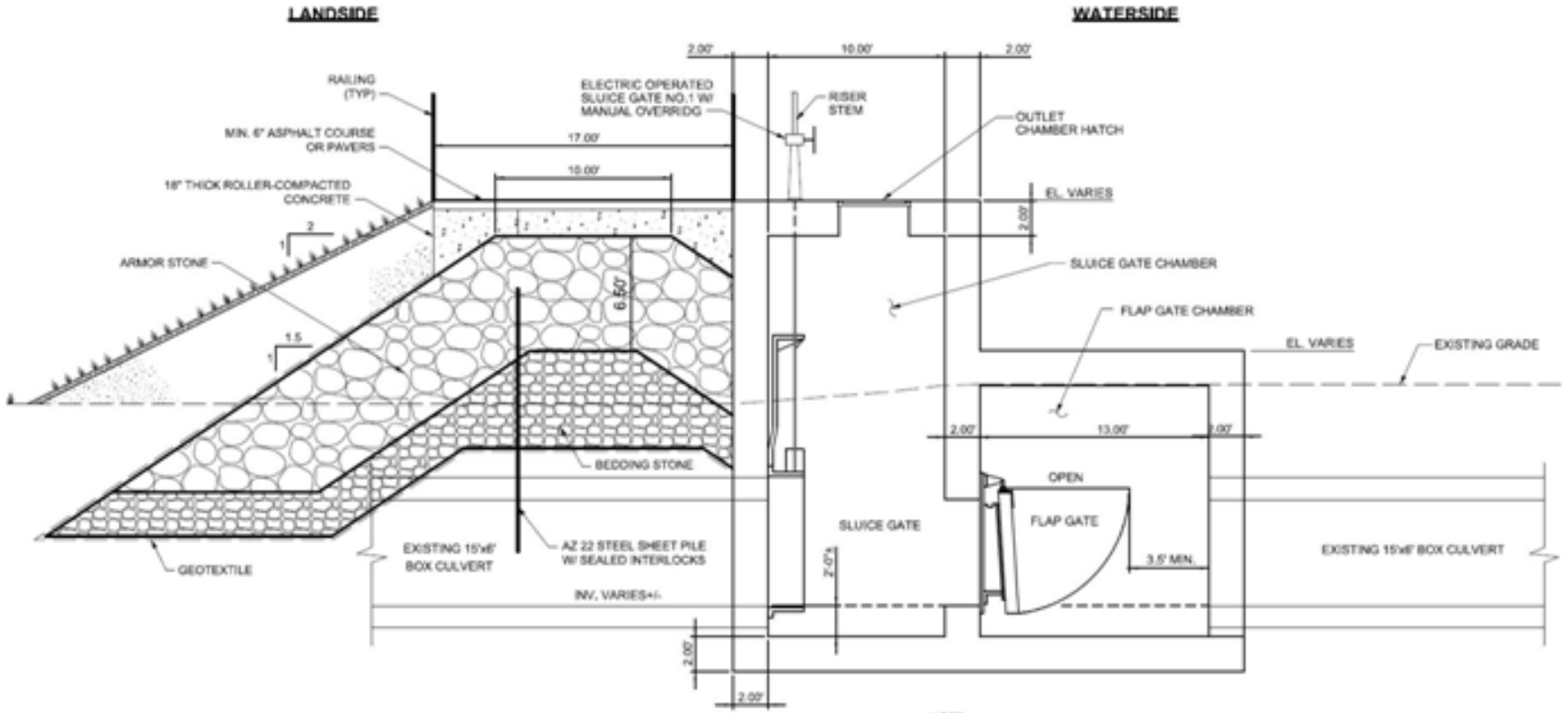


Figure 35 - Typical Section Gate Chamber

Preservation of open space

Acquisition/Preservation/Excavation of open space

Buried Seawall ties off near Fort Wadsworth

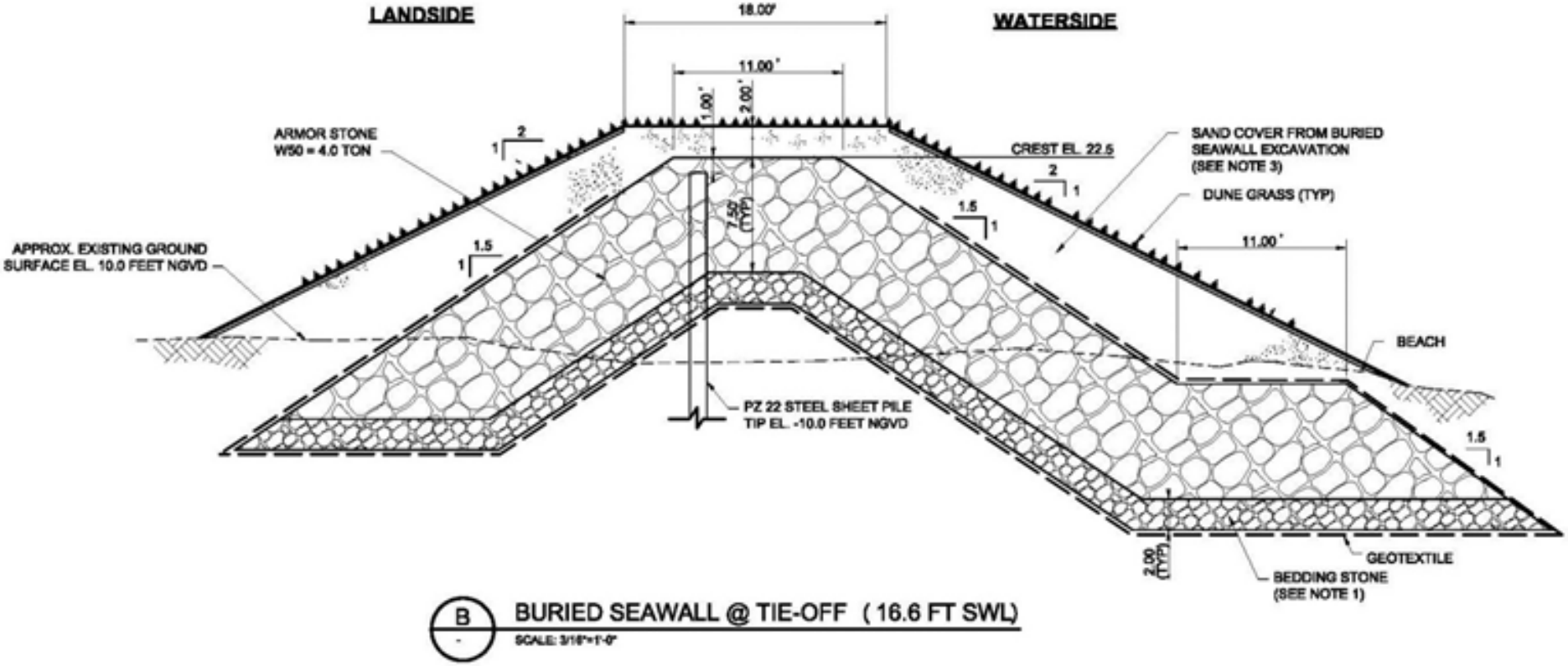
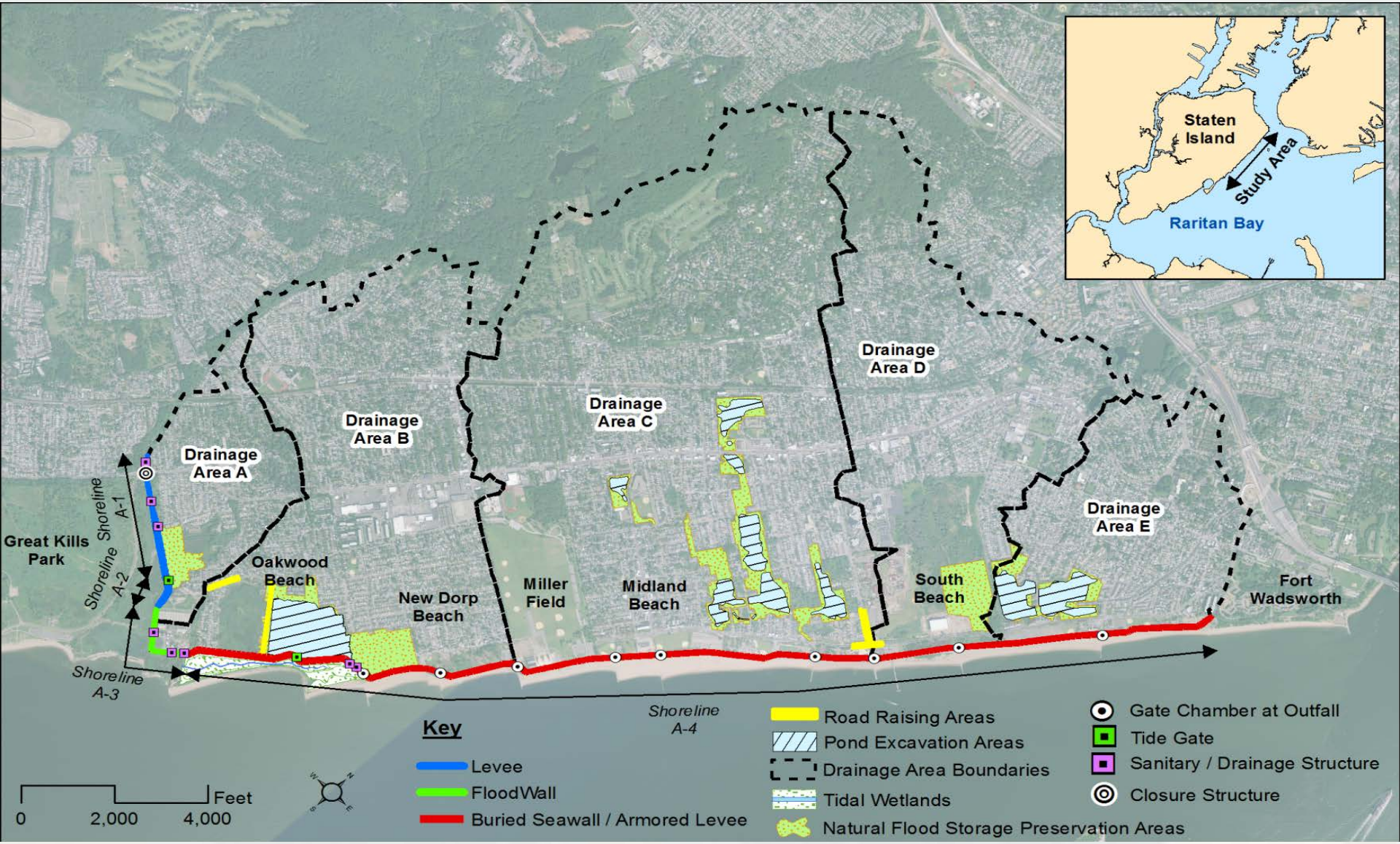


Figure 33 – Buried Seawall Section (Reach A-4)

Proposed Plan Layout



Sea level change and future adaptability

Sea level change over 50 year period

- Historic - 0.7 ft increase
- Intermediate - projected 1.1 ft increase
- High - projected 2.5 ft increase

Project adaptable in future for increased sea level change

- Add concrete parapet wall atop crest of buried seawall
- Add future cast in place concrete floodwall addition
- Add impervious backfill to increase levee

Future Adaptability of Proposed Plan

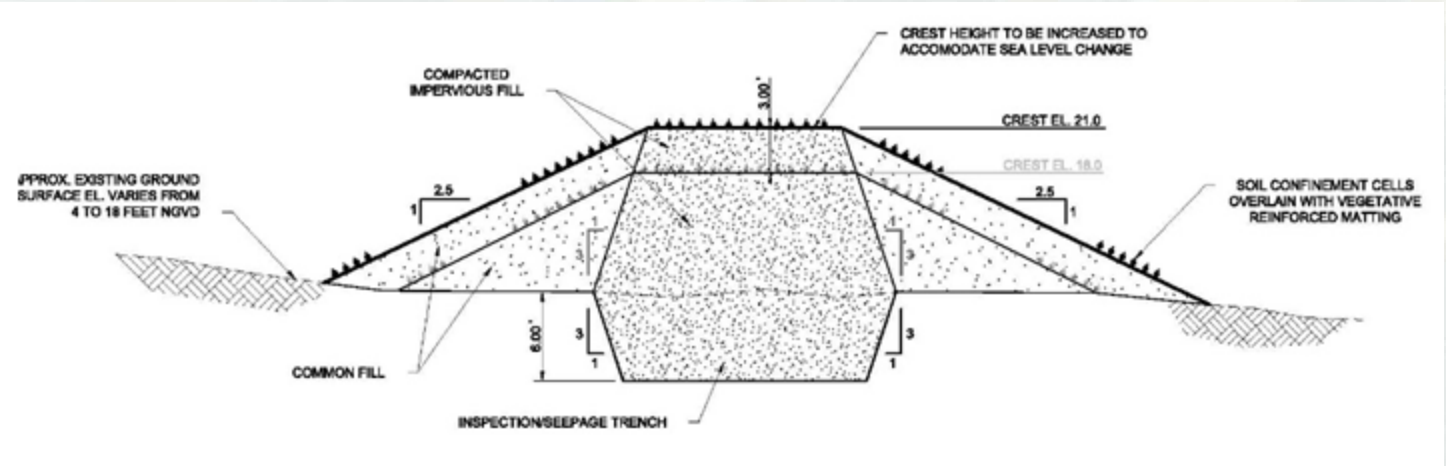


Figure 46 - Raising of Earthen Levee

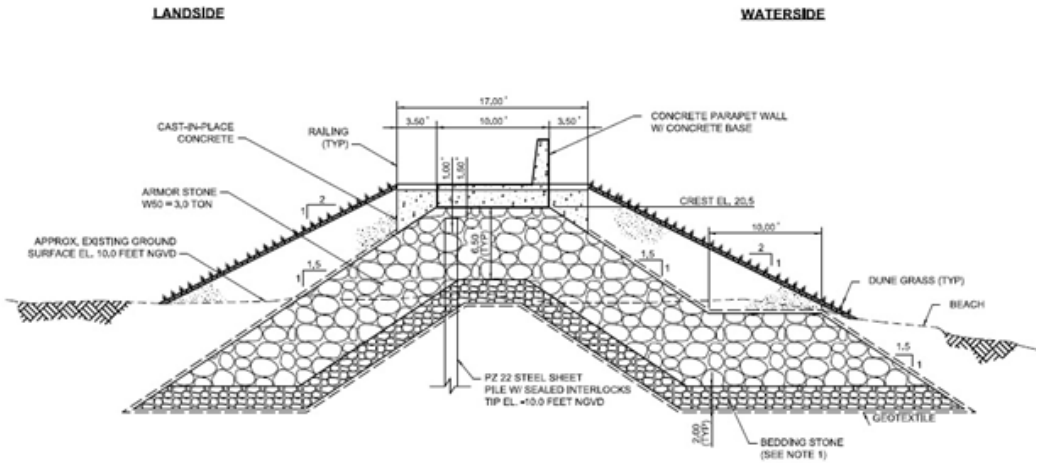


Figure 44 - Concrete Parapet Wall atop Buried Seawall

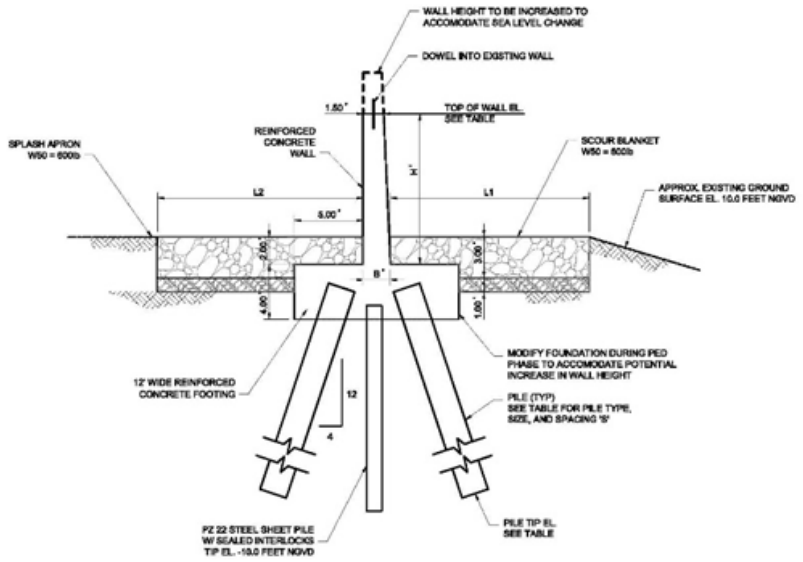


Figure 45 - Raising of Concrete Floodwall

Proposed Plan
Project Costs/Benefits and Cost-sharing

Table 36- Cost Apportionment	
Federal Project Cost (65%)	**$376,302,000**
Non-Federal Project Cost (35%)	**$202,624,000**
LERR	$91,261,000
LER	$43,854,000
Relocations	
Road Raising	$5,328,000
Boardwalk	$42,079,000
Cash Balance	$111,363,000
TOTAL	**$578,926,000**

Table 32 - Feasibility Assessment	
Annual Benefits	$27,732,000
Annual Costs	$24,011,000
Net Benefits	$3,721,000
BCR	1.2
Economically Feasible	**Yes**

Real Estate Requirements

Various Standard Estate easements are required to be obtained by the Sponsor

- Flowage Easements – excavation of ponding areas (112 acres)
- Restrictive Easements – land restricted from future development (144 acres)
- Flood Protection Levee Easements – land for construction, operation and maintenance of project (88 acres)
- Temporary Work Area Easements – land for construction staging (63 acres)
- Pipeline and Road Easements – O&M of underground drainage, access road to sewer manholes (1.2 acres)

Operation & Maintenance Sponsor Requirements

O&M Requirements (100% non-Federal responsibility)

- Estimated annual cost of $555,000
- Annual inspections, surveys and report conditions of project features (closure gate, gate chambers, tide gates, ramps, ponds, sand coverage, etc)
- Replacement of sand coverage and dune grass replanting
- Levee mowing + ponds/easement area mowing/maintenance
- Operation/testing of closure gate, tide gates, gate chambers
- Interior drainage replacements (gates, valves, etc) at end of useful project life; estimated 25th year

Proposed Plan Comparison to Hurricane Sandy

- Hurricane Sandy generated record storm surges in area
- Water levels in study area, excluding wave fluctuations, peaked at approximately 13.6 ft NGVD during Sandy
- Proposed plan designed to manage and reduce risk of storm damage due to waves, erosion, flooding for coastal storms with total stillwater elevation (tide plus storm surge) of 15.6 ft NGVD
- 2 feet higher than peak water levels experienced during Sandy

Proposed Plan comparison to Sandy

- 15.6 NGVD stillwater design height provides project crest elevations ranging between 18 and 20.5 feet NGVD
- Design storm estimated annual chance of exceedance of 0.3 % (~300 year event) under current sea level conditions
- In contrast, existing area is approximately 10 ft. NGVD, with lower spots sporadically thru area (0.1%; 10 year event)

Residual Flooding With Project in place

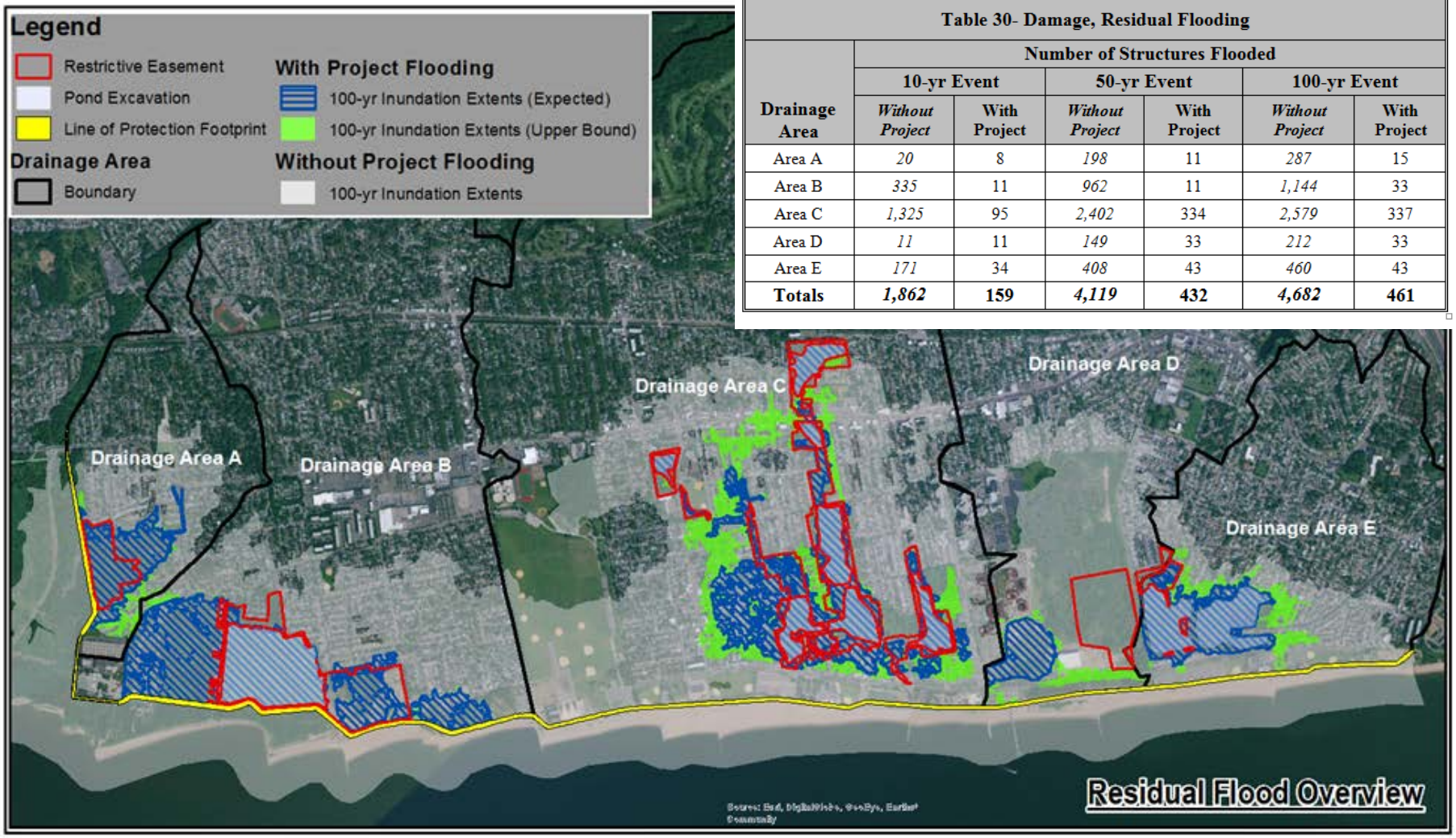


Table 30- Damage, Residual Flooding						
	Number of Structures Flooded					
	10-yr Event		50-yr Event		100-yr Event	
Drainage Area	*Without Project*	With Project	*Without Project*	With Project	*Without Project*	With Project
Area A	*20*	8	*198*	11	*287*	15
Area B	*335*	11	*962*	11	*1,144*	33
Area C	*1,325*	95	*2,402*	334	*2,579*	337
Area D	*11*	11	*149*	33	*212*	33
Area E	*171*	34	*408*	43	*460*	43
Totals	***1,862***	**159**	***4,119***	**432**	***4,682***	**461**

Figure 42 – Residual Flood Overview

Residual Flooding With Project in place

- Estimated to reduce damages by $27 million annually

- Will not eliminate all flooding
  - Lower level storm events will continue to cause low level flooding from interior run-off even with project in place
  - Low lying areas will experience ponding of water

- In rare occurrence stillwater exceeds 15.6 ft NGVD (approximately 0.3% annual chance or ~300 year storm) ocean surge could breach and/or overtop line of protection inundating area

- Residents must continue to follow NYC evacuation protocols

Project Schedule

Final Draft Report/DEIS **Released for public review** **Released for IEPR (external peer) review** **Released for Corps HQ review**	**Jun 2015**
DEIS public information meetings	**Aug 2015**
Public Review period closes	**9 Sep 2015**
Final Report/EIS submitted to Corps HQ	Dec 2015
Chief of Engineers Report submitted to ASA	May 2016
ASA approval to execute PPA agreement	Sep 2016
Start Plans/Specs for construction contracts	Sep 2016
Construction Agreement execution with NYS	Oct 2016
Real Estate acquisitions completed	Spring 2018
Advertise/Award construction contracts	Spring 2018
Construction completion	thru 2021

US Army Corps of Engineers
New York District

NEW YORK STATE OF OPPORTUNITY
Department of Environmental Conservation

US Army Corps of Engineers
New York State Department of Environmental Conservation
City of New York

PUBLIC INFORMATION MEETING

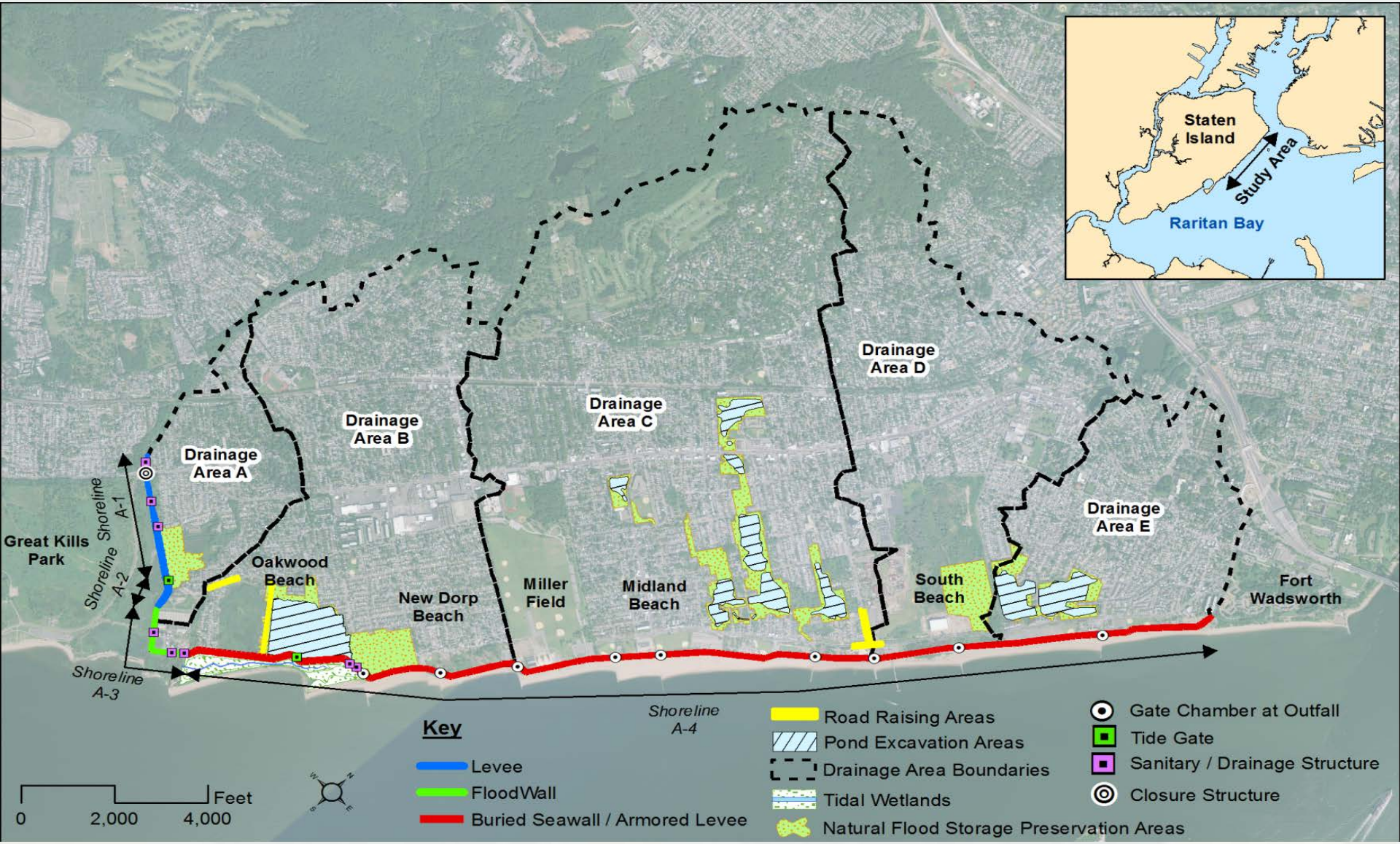
The Draft Environmental Impact Statement is open for public comment through September 9, 2015.

Please address your comments to:

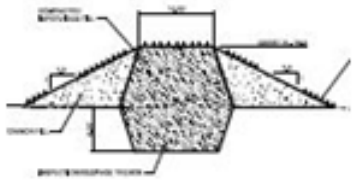
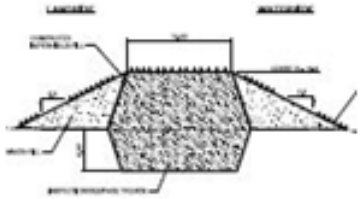
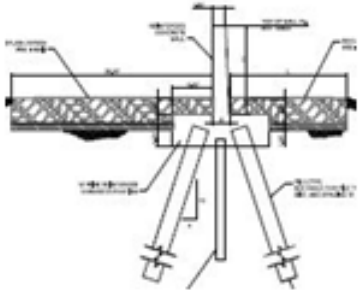
US Army Corps of Engineers – New York District
Attn: Ms. Catherine Alcoba
26 Federal Plaza, Room 2151
New York, NY 10278
catherine.j.alcoba@usace.army.mil

Public comment cards are available at this Information Meeting

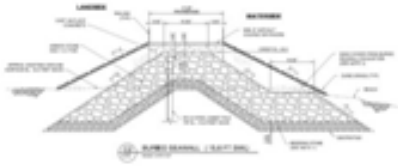
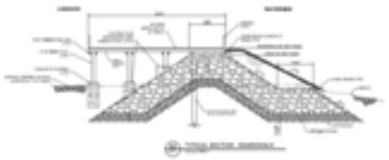
Proposed Plan Layout



Line of Protection
(Hylan Blvd to Oakwood Treatment Plant)

Table ES 2 - NED Plan Storm Risk Management Measures Line of Protection								
Reach	**Type**	**Length**	**Crest Elevation**	**Depth**	**Slope**	**Materials**	**Typical Section View**	**Features**
A-1	Levee	2,800 lf.	18 ft. NGVD 1929 or 16.9 ft. NAVD 1988	10 ft. wide at crest	2.5:1.0 (H:V)	compacted impervious fill		The compact impervious fill will extend at least 6 feet below the existing grade to prevent seepage, a closure structure will be constructed along Hylan Boulevard.
A-2	Levee	600 lf.	18 ft. NGVD 1929 or 16.9 ft. NAVD 1988	15 ft. wide at crest	2.5:1.0 (H:V)	compacted impervious fill		The compact impervious fill will extend at least 6 feet below the existing grade to prevent seepage.
A-3	Floodwall	1,800 lf.	20.5 ft. NGVD 1929 or 19.4 ft. NAVD 1988	1.5 ft. wide at crest	vertical	reinforced concrete T-Wall on piles		A vertical steel sheet pile wall will be included below the wall to prevent seepage.

Line of Protection
(Oakwood Beach to Fort Wadsworth)

Table ES 2 - NED Plan Storm Risk Management Measures								
A-4	Buried Seawall / Armored Levee/tidal wetland	9,300 lf.	20.5 ft. NGVD 1929 or 19.4 ft. NAVD 1988	10 ft. wide at crest	1.5:1.0 (H:V)	3-ton armor stone		A vertical steel sheet pile wall will be incorporated to prevent seepage. A 17 ft. wide promenade will be constructed on top of the crest of the buried seawall/armored levee. Tidal wetland will help attenuate wave energy and reduce erosion. It also provides biological habitat value.
A-4	Buried Seawall / Armored Levee	13,400 lf.	20.5 ft. NGVD 1929 or 19.4 ft. NAVD 1988	10 ft. wide at crest	1.5:1.0 (H:V)	3-ton armor stone		A vertical steel sheet pile wall will be incorporated to prevent seepage. A 38 ft. wide pile supported boardwalk will be constructed on top of the crest of the buried seawall/armored levee.

Interior Drainage
(Oakwood Beach to Fort Wadsworth)

Interior Drainage					
Interior Drainage Area	**Natural Storage**	**Excavated Pond**	**Tide Gate**	**Outlets**	**Road Raising**
Area A	17.19 acres	X	22.75 ft. by 18 ft. NGVD 1929 (or 16.9 ft. NAVD 1988) by 16 ft. (LxHxD) with 3 @ 5 ft. by 5 ft. sluice gates, wingwalls, and pre-engineered bridge	2 new sluice gate structures (2 ft. by 2ft.) & 2 intermediate pipe outlets with flap gates	X
Area B	86.41acres	1 Pond (46 acres) with 94,200 c.y. of excavation to 2.75 ft and NGVD 1929 (1.3ft. NAVD 1988)	22.75 ft. by 20.5 ft. NGVD 1929 (or 19.4 ft. NAVD 1988) by 16 ft. (LxHxD) with 3 @ 5 ft. by 5 ft. sluice gates, wingwalls, and pre-engineered bridge	New gate chambers at Ebbits St., New Dorp Ln., Tysens Ln. outfalls	1,730lf. by 30 ft. of Kissam Ave. to 7.1 ft. NGVD 1929 (6 ft. NAVD 1988). An average raising height of 3 ft. 630lf. by 60 ft. of Mill Rd. to 7.1 ft. NGVD 1929 (6 ft. NAVD 88). An average raising height of 1 ft.
Area C	120.44 acres	7 Ponds (100.51 acres), 377,200 c.y. of excavation to an invert of 2 ft. NGVD 1929 (0.9 ft. NAVD 1988)	X	New gate chambers at Greely Ave., Midland Ave., Naughton Ave., Seaview Ave. outfalls	820lf. by 90 ft. of Seaview Ave to 10 ft. NGVD 1929 (8.9 ft. NAVD 1988). An average raising height of 1 ft. 300lf. by 60 ft. of Father Capodanno Blvd. to 10 ft. NGVD 1929 (8.9 ft. NAVD 1988). An average raising height of 1 ft.
Area D	30.76 acres	X	X	New gate chamber at Quintard Street outfall	X
Area E	46.7 acres	2 Ponds (34 acres), 222,720 c.y. of excavation to an invert of 2 ft. NGVD 1929 (0.9 ft. NAVD 1988)	X	New gate chambers at Sand Lane, Quincy Ave. outfall	X