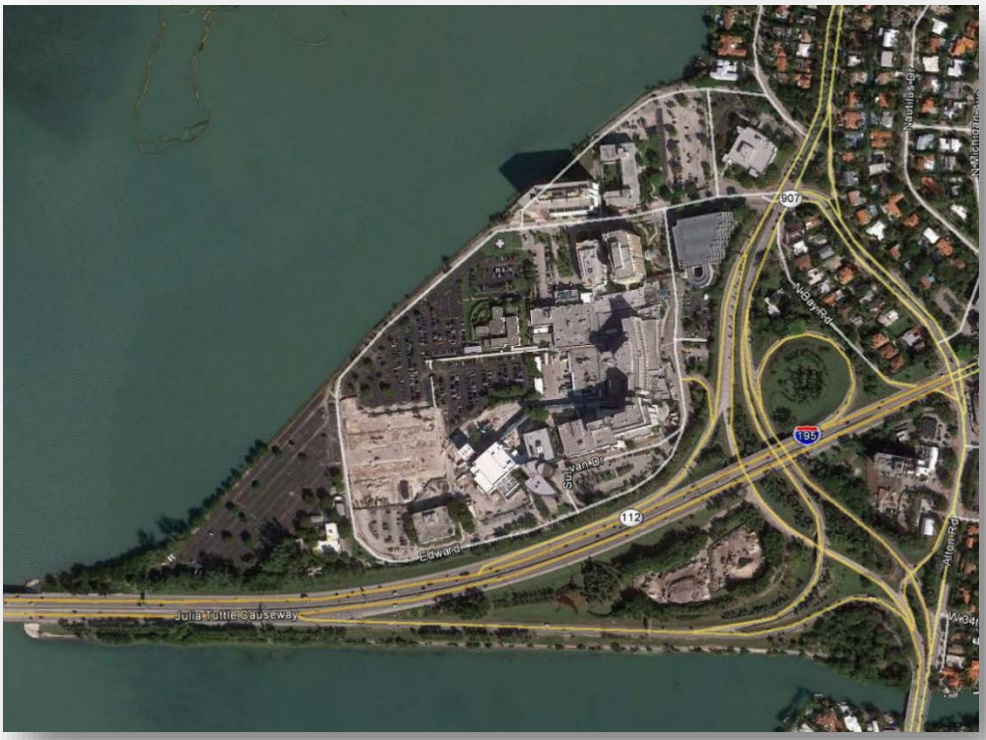
MOUNT SINAI MEDICAL CENTER, CONTINUING AUTHORITIES PROGRAM (CAP) SECTION 14, PROJECT

DRAFT INTEGRATED FEASIBILITY REPORT AND ENVIRONMENTAL ASSESSMENT



September 2016

US Army Corps of Engineers ®
Jacksonville District

USING THIS DOCUMENT

Report Reference Materials: To ease navigation through the report, prompts are provided throughout the document, alerting the reader to reference additional sections or graphics. In this report, these prompts can be identified by this blue box format.

Additionally, informational foldout REF-1 is provided at the end of the report to be used while reading the document to serve as a reference map with key points and landmarks.

Detailed tables of contents are provided by chapter in the main report, as well as an index at the end of the report.

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MOUNT SINAI MEDICAL CENTER
CAP – SECTION 14 DRAFT INTEGRATED FEASIBILITY REPORT
AND ENVIRONMENTAL ASSESSMENT
MIAMI-DADE COUNTY, FLORIDA

EXECUTIVE SUMMARY

Please refer to informational foldout REF-1 located on the back page of this report.

PURPOSE AND NEED

This study was conducted under the authority of Section 14 of the 1946 Flood Control Act, as amended - Streambank and Shoreline Erosion Protection of Public Works and Non-Profit Public Services. Section 14 is designed to implement projects to protect public facilities and facilities owned by non-profit organizations used to provide public services that are open to all on equal terms. These facilities must have been properly maintained but be in imminent threat of damage or failure by natural erosion processes on stream banks and shorelines, and are essential and important enough to merit Federal participation in their protection.

The Mount Sinai Medical Center is a major medical institution that serves not only the citizens of Miami Beach, but offers a wide array of services to hundreds of thousands of people in the greater Miami metropolitan area. The medical center is the only hospital facility on a barrier island and maintains emergency services and shelter for critically ill patients during disasters. The center is also an Essential Services facility and a disaster coordination point. The facility is unable to fully evacuate all patients during disasters and must shelter in place, as well as provide critical support to the population remaining on the island and other facilities with emergency needs.

Currently, during extreme high tide events, the bayside seawall (approximately 3,000 feet long) is overtopped by tides and waves. Overtopping and resulting inundation drives erosion and subsidence of land behind the wall threatening vulnerable facilities including a perimeter road and parking facilities which are critical to the center's operations. Continued erosion will result in failure of portions, or all, of the existing seawall. Such failure would impact the perimeter road and vulnerable parking, negatively affecting the daily operations of the medical center, limiting access to hospital facilities, and potentially causing life risk.

ALTERNATIVE PLANS AND THE RECOMMENDED PLAN

Plan Formulation

A description of the alternatives, their performance in terms of benefits and costs, and the methods used for screening are provided in the sub-sections that follow.

Management Measures

Per ER 1105-2-100 Appendix F, Section III, F-23, the option of relocating threatened facilities must be considered and compared with alternatives in CAP Section 14 analysis. In this case, relocation is not

considered a “measure” or “alternative” but a basis for cost comparison and alternative selection. Therefore, some measures that would typically be listed as “non-structural” are listed under “relocation.”

Non-Structural (NS)

NS-1: No Action

*Other measures that would typically be considered non-structural are considered under “Relocation.”

Structural (S)

S-1: Adding elevation to existing seawall (concrete lift, sandbags, stone, wood, or other material).

S-2: Revetment on waterside of existing seawall to existing elevation.

S-3: Revetment on waterside and on top of existing seawall to higher elevation.

S-4: Sheetpile (vinyl, steel, or other material) placement on waterside of existing seawall at existing elevation with.

S-5: Sheetpile (vinyl, steel, or other material) placement on waterside of existing seawall to higher elevation.

S-6: Sheetpile (vinyl, steel, or other material) placement on landside of existing seawall at existing elevation with erosion prevention measure placed on land behind seawall.

S-7: Sheetpile (vinyl, steel, or other material) placement on landside of existing seawall to higher elevation.

S-8: Erosion prevention material placed on land behind seawall.

Figure ES-1 shows a graphic depiction of structural measures.

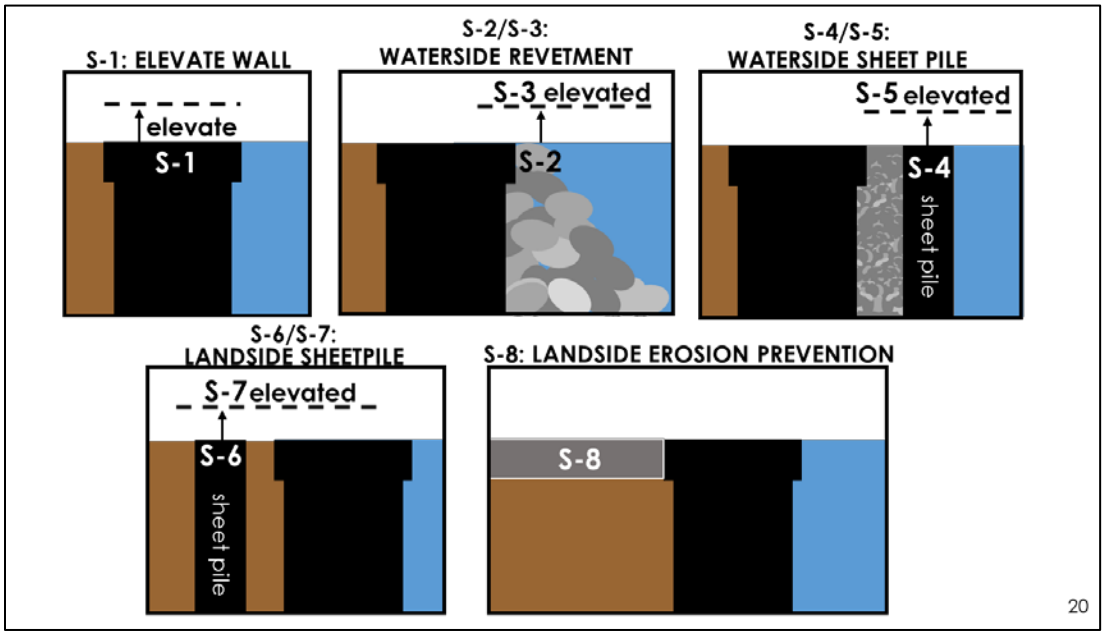

Figure ES-1: Graphic depiction of structural measures considered.

Alternative Development, Relocation, and the Recommended Plan

Adding elevation to the existing seawall (S-1), sheetpile placement on the waterside of the existing seawall to higher elevation (S-5), and No Action (NS-1) were the measures carried forward for alternative development and comparison with Relocation. No Action is maintained for comparison purposes. S-1 and S-5 were scaled and combined to formulate two alternatives; Alternative 1 and Alternative 2.

The barrier island on which the Mount Sinai Medical Center is located is very densely developed and real estate prices are some of the highest in the nation. Opportunities to relocate vulnerable facilities are limited. Relocation options considered included:

- Vertical relocation of the perimeter road on piles.
- Vertical relocation of the perimeter road on an elevated berm.
- Offsite parking within walking distance of hospital facilities.
- Offsite parking (in existing or new construction) with shuttle service to hospital facilities.
- Parking constructed onsite.

The selected relocation option consists of vertical relocation of the vulnerable portion of the perimeter road on an elevated berm. Relocation also includes relocation of vulnerable parking to a new parking garage constructed on the medical center property.

Per ER 1105-2-100 Appendix F, Section III, F-23**, the least cost alternative plan is considered to be justified if the total costs of the proposed alternative are less than the costs to relocate the threatened facility.** The costs of Alternative 1, Alternative 2, and Relocation are shown in Table ES-1. Both alternative costs are less than relocation. Alternative 2 is preferable to No Action and is the least cost alternative plan. Alternative 2 is therefore considered to be justified and is the Recommended Plan.

Table ES-1: Cost comparison.

	Item	Number of Units	Units	Cost
Relocation	parking garage	250	parking spaces	$5,500,000
	sheet pile	1000	lf	$1,345,000
	elevated road	1310	lf	$707,400
			Total =	**$7,552,400**
Alternative 1	**Item**	**Number of Units**	**Units**	**Cost**
	sheet pile	3200	lf	$4,304,000
	T-wall	300	lf	$91,500
			Total =	**$4,395,500**
Alternative 2	**Item**	**Number of Units**	**Units**	**Cost**
	sheet pile	3070	lf	$4,129,200
	1.5 ft concrete lift	130	lf	$9,800
	T-wall	300	lf	$91,500
			Total =	**$4,230,500**

The Recommended Plan (Alternative 2) includes installation of 3,070 linear feet of sheetpile (25-ft long PZC-13 steel sheetpile) driven to a depth of 16 feet. The sheetpile will be driven approximately 3 feet seaward of the existing seawall with a concrete cap elevation of 4.0 feet (NAVD88). The three foot offset is necessary for workers to reconnect any drainage system or utilities between the new and existing walls. The three foot offset will be filled with stone. At the northeast end of the driven sheetpile, a T-wall will tie-in to the sheetpile and continue landward to the 3.5 foot contour to prevent flanking of the seawall. Sheetpile will not be driven in front of the 130 foot section of seawall constructed in 1990. This section has been deemed structurally sound enough to add a 1.5 foot concrete lift to the top of the existing wall to reach an overall crest elevation of 4.0 feet NAVD88. **Figure ES-2** depicts The Recommended Plan in plan view.

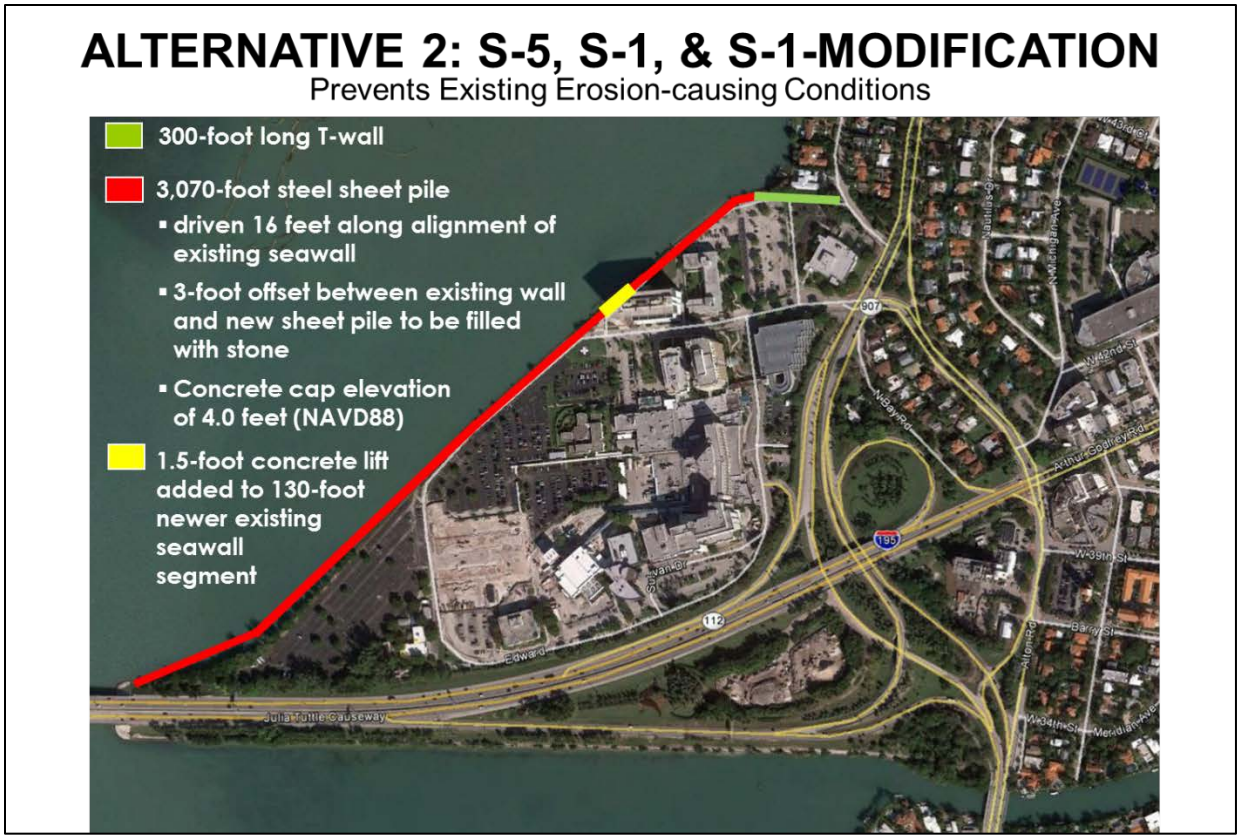

Figure ES-2: Recommended Plan.

Sea Level Change (SLC)

The project area, and Miami Beach as a whole, are vulnerable to sea level rise. However, given the emergency nature and funding constraints of the CAP Section 14 authority, future sea level rise was not a key factor for alternative development. Alternative development focused on preventing current erosion causing conditions. However, future sea level rise was considered, per guidance, in order to recommend an alternative that prevents current erosion causing conditions and is able to be adapted to future sea level change by the sponsor if necessary. The Recommended Plan will increase the current crest elevation by 1.5 feet. As sea levels rise, extreme high tide events will begin to overtop the Recommended Plan. At that time, the Recommended Plan could be adapted by the sponsor by construction of a concrete elevation lift, similar to that being done on the 130 feet of existing wall, to raise the crest elevation further. Any investigation, design, and construction of such adaptations would be the responsibility of the sponsor.

ENVIRONMENTAL CONSIDERATIONS

Environmental considerations for this project include species listed as threatened or endangered under the Endangered Species Act, as well as designated critical habitat, habitats designated as essential fish habitat under the Magnuson Stevens Fisheries Conservation and Management Act, water quality under the Clean Water Act, and historic and cultural resources protected under the National Historic Preservation Act. A detailed list of all environmental laws, regulations, and executive orders applicable to this action and compliance with those requirements is included in Section 5.10 of this report.

COST ESTIMATE AND IMPLEMENTATION

The current cost estimate for the Recommended Plan is $6,866,000. This cost is more developed than the planning level costs shown in Table ES-1. Federal costs total 65% of the Recommended Plan, or $4,462,900. Non-federal costs total 35%, or $2,367,760. The expected construction duration is 18 months.

NON-FEDERAL SPONSOR AND CONGRESSIONAL REPRESENTATION

The study was requested by the City of Miami Beach, the local non-federal sponsor, in a letter dated January 13, 2014. The project also has strong congressional support as indicated in a letter dated February 24, 2014 from Congresswoman Debbie Wasserman Schultz. The City supports the Recommended Plan to protect the medical center from further damage and prevent potential failures at the facility.

Congressional representation for the area includes the following:
Honorable Representative Debbie Wasserman Schultz

10100 Pines Boulevard
Pembroke Pines, FL 33026
(954) 437-3936
19200 West Country Club Drive, 3rd Floor
Aventura, FL 33180
(305) 936-5724

COORDINATION WITH AGENCIES AND THE PUBLIC

The proposed project shall be coordinated with the following agencies: U.S. Fish and Wildlife Service, National Marine Fisheries Service, U.S. Environmental Protection Agency, Florida State Clearinghouse, Florida State Historic Preservation Officer, Florida Fish and Wildlife Conservation Commission, and the Florida Department of Environmental Protection. The draft NEPA document, integrated within this report, will be coordinated with the public.

RISK CONSEQUENCE RATING

Without action, erosion will continue and extreme high tide events will continue to overtop the existing seawall, driving erosion and the ultimate failure of portions, or all, of the wall. Such failure will impact the perimeter road and vulnerable parking and negatively affect daily operations of the medical center, limiting access to hospital facilities, and potentially causing life risk. Furthermore, if seawall failures occurred during events necessitating activation of emergency disaster services, the center's function as an Essential Services facility and disaster coordination point could be severely impacted. These would constitute adverse impacts to facilities critical to public health, safety, security, and welfare that could occur within the next two to four years. These considerations elevate the Safety Risk Ranking in the Risk Consequence Matrix to a rank of 2 as shown in Table ES-3.

Table ES-3: Risk Consequence Matrix

SAFETY MATRIX RANKING		Consequences Category				
		Category A	Category B	Category C	Category D	Category E
Risk Level	Level A (0 to 2 years)	1	3	5	7	12
	Level B (2 to 4 years)	2	4	6	8	12
	Level C (4 to 6 years)	3	5	7	9	12
	Level D (6 to 8 years)	4	6	8	10	12
	Level E (Over 8 years)	5	7	9	11	12

This rank is based on the following: An undesirable event is anything which causes adverse consequences. In this case, the undesirable event is failure, either partial or total, of the existing seawall due to erosion. "Risk Level" is an estimate of the time, starting from the present, when an undesirable event is considered most likely to occur based on best professional judgment. Small portions of the seawall are currently failing; given this, and the poor condition of the wall in general, it is likely that failure could occur within the next 2-4 years, signifying Risk Level B.

Severity of impact from the event decreases from the highest severity in Category A to the lowest severity in Category E. Projects are assigned to the highest severity category for which one or more criteria in the category apply to the project consequences. Category A means that at least one of the following is expected if the undesirable event occurs.

- Adversely impacts transportation routes with Average Daily Traffic (ADT) over 50,000.
- Adversely impacts an affected population over 50,000.
- Adversely impacts an affected disadvantaged population over 20,000.
- Losses with an estimated relocation or replacement cost over $3,000,000.
- Adverse impacts to facilities critical to public health, safety, security, or welfare.
- Adverse impacts to facilities designated as having national cultural importance.
- Adverse impacts to facilities critical to interstate commerce.
- Loss of life is considered likely if no action is taken.

The severity of impact resulting from the failure of the existing seawall would meet four of the criteria under Category A:

1. Adversely impacts an affected population over 50,000:
   The 2014 population of Miami Beach is 92,000 residents; higher than the 50,000 population threshold. Furthermore, Miami Beach is a highly touristed area, and population increases with tourism multiple times per year.
2. Losses with an estimated relocation or replacement cost over $3,000,000:

As will be described later in this report, the estimated relocation cost of threatened facilities is greater than $3,000,000.

3. Adverse impacts to facilities critical to public health, safety, security, or welfare:
   If the existing seawall fails, the perimeter road and existing parking will be impacted. Normal operations or emergency operations of the medical facility will be impacted and several of these criteria will be met. The Mount Sinai Medical Center is the only hospital facility on the barrier island and maintains emergency services, shelter for electric and oxygen dependent persons, and care for critically ill patients during disasters. The center is also an Essential Services facility and a disaster coordination point. The primary service area of the center sees 5,000,000 annual visitors and has 125,000 permanent residents. Yearly, there are 22,000 inpatient admissions and 181,000 outpatient admissions. There are 178+ emergency care visits and 7+ births per day. The facility is unable to fully evacuate all patients during disasters and must shelter in place, as well as provide critical support to the population remaining on the island and other facilities with emergency needs. Such impacts would also constitute "adverse impacts" to facilities critical to public health, safety, security, and welfare.
4. Loss of life is considered likely if no action is taken.
   Furthermore, loss of life could be considered likely depending on the severity of the impact and timing with respect to medical service needs.

RESIDUAL RISK

Even with implementation of the Recommended Plan, residual risk remains. The Recommended Plan addresses current erosion-causing conditions driven by overtopping of the bayside seawall as an emergency repair. It is not designed to prevent erosion resulting from extreme high tide events beyond those that have been experienced or that will occur as a result of sea level rise. Residual risk remains that extreme high tide events in the future could overtop the new seawall and that the Mount Sinai property could be inundated by other current and future events, such as heavy rainfall, which the Recommended Plan is not designed to address.

1 INTRODUCTION*

Please refer to informational foldout REF-1, located on the back page of this report, throughout this report.

1.1. STUDY AUTHORITY*

This study was conducted under the authority of Section 14 of the 1946 Flood Control Act, as amended - Streambank and Shoreline Erosion Protection of Public Works and Non-Profit Public Services. Section 14 is designed to implement projects to protect public facilities and facilities owned by non-profit organizations used to provide public services that are open to all on equal terms. These facilities must have been properly maintained, but be in imminent threat of damage or failure by natural erosion processes on stream banks and shorelines, and are essential and important enough to merit Federal participation in their protection.

The Mount Sinai Medical Center is a private non-profit hospital and is considered an eligible facility for Section 14, according to ER 1105-2-100, Appendix F, page F-30. Furthermore, the center's facilities have been properly maintained, but are in imminent threat of damage by natural erosion processes on the shoreline. Additional information on this program can be found in USACE 2000, Planning Guidance Notebook, Appendix F.

The feasibility study was carried out in a manner consistent with the USACE Environmental Operating Principles (EOPs). The principles are consistent with NEPA, the Army's Environmental Strategy with its four pillars (prevention, compliance, restoration, and conservation), and other environmental statutes that govern USACE activities. Finally, the implementation framework proposed as part of the study seeks to work collaboratively; fully engaging individuals, agencies, and local groups in identifying, planning, and implementing shoreline protection efforts.

1.2. STUDY SPONSOR

The study was requested by the City of Miami Beach, the local non-federal sponsor, in a letter dated January 13, 2014. The project has strong congressional support, as indicated in a letter dated February 24, 2014 from Congresswoman Debbie Wasserman Schultz. The City supports the Recommended Plan to protect the medical center from further damage and to prevent potential failures at the facility.

Congressional representation for the area includes the following:

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1.3. LOCATION OF STUDY AREA AND VULNERABLE FACILITIES

The project vicinity is located in the City of Miami Beach, Florida, on a barrier island bordered to the east by the Atlantic Ocean and to the west by Biscayne Bay. The project area is the property of Mount Sinai Medical Center, located directly north of Julia Tuttle Causeway and extending approximately 0.57 miles along the bayside of the island. The area vulnerable to erosion is outlined in **Figure 1-1**. Within this area, vulnerable facilities include approximately 2,100 feet of the perimeter road and parking facilities (approximately 250 parking spaces) closest to Biscayne Bay.

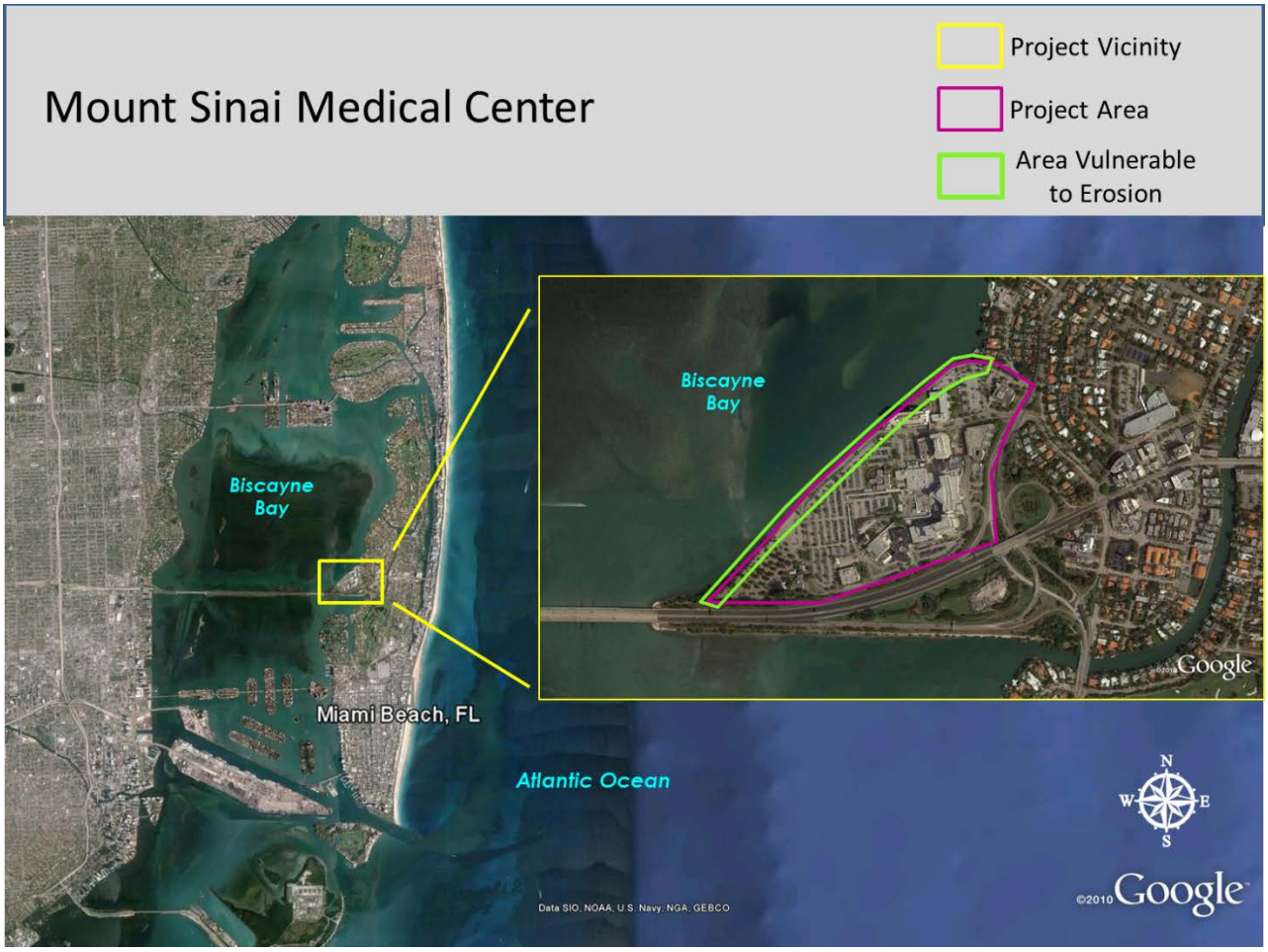

Figure 1-1: Mount Sinai vicinity and project area.

1.4. STUDY PURPOSE AND NEED

The Mount Sinai Medical Center is a major medical institution that serves not only the citizens of Miami Beach, but offers a wide array of services to hundreds of thousands of people in the greater Miami metropolitan area. There are numerous buildings of various sizes on the campus, which is bordered on the west by Biscayne Bay (Anatres Group 2014). **Figure 1-2** shows various buildings on the campus and an existing seawall bordering the property along Biscayne Bay.

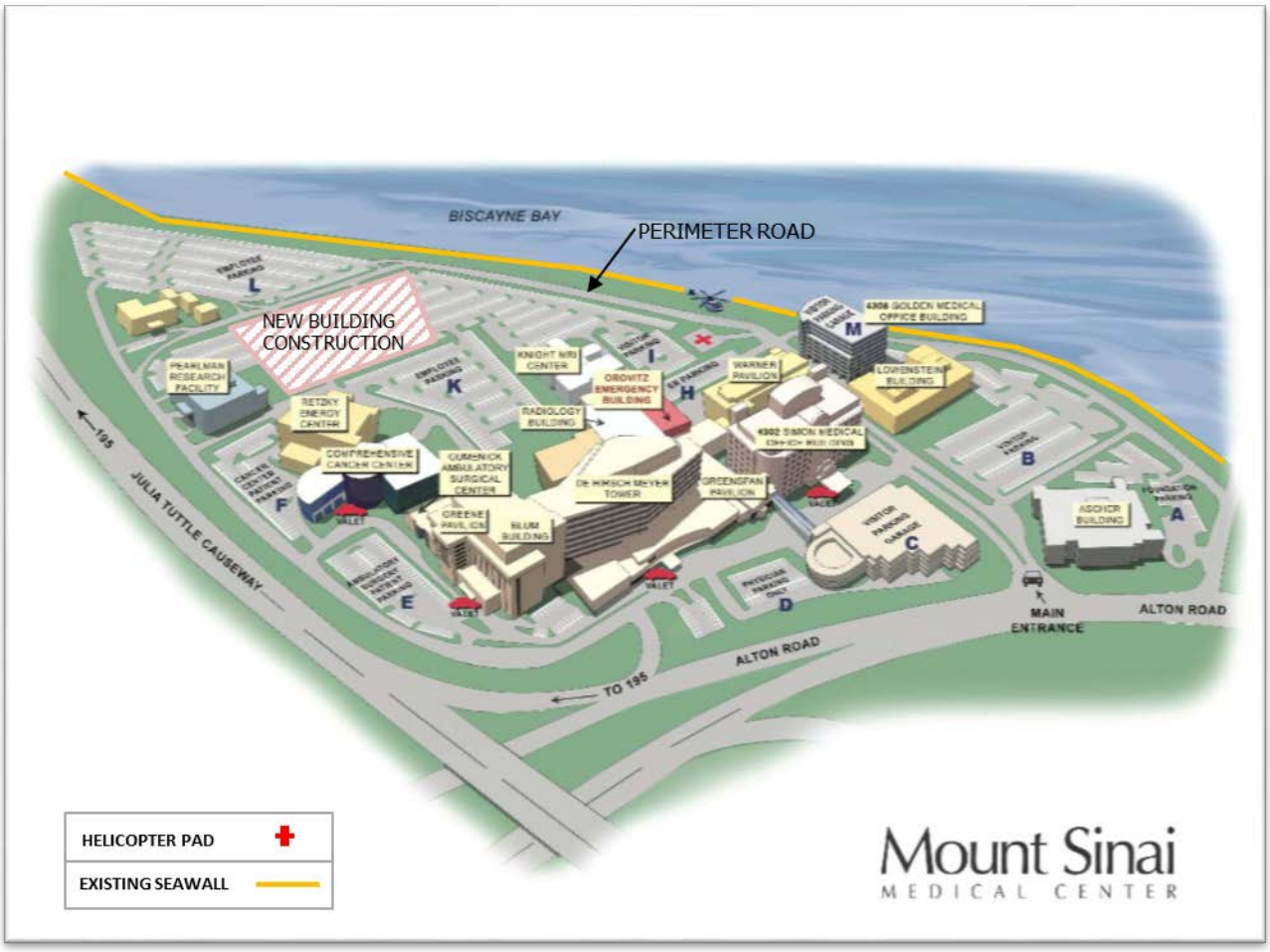

Figure 1-2: Site graphic of Mount Sinai Medical Center

The Mount Sinai Medical Center is the only hospital facility on the barrier island and maintains emergency services, shelter for electric and oxygen dependent persons, and care for critically ill patients during disasters. The center is also an Essential Services facility and a disaster coordination point. The primary service area of the center sees 5,000,000 annual visitors and has 125,000 permanent residents. Yearly, there are 22,000 inpatient admissions and 181,000 outpatient admissions. There are 178+ emergency care visits and 7+ births per day. The facility is unable to fully evacuate all patients during disasters and must shelter in place, as well as provide critical support to the population remaining on the island and other facilities with emergency needs.

Currently, during extreme high tide events, the bayside seawall, approximately 3,000 feet long, is overtopped by tides and waves (**Figure 1-3 - Figure 1-6**). Overtopping, and the resulting inundation, drives erosion (**Figure 1-4**) of land behind the wall threatening vulnerable facilities including a perimeter road and parking facilities, which are critical to the center's operations. Continued erosion will result in failure of portions, or all, of the existing seawall which is currently in a degraded state (**Figure 1-7**). Such failure would impact the perimeter road and vulnerable parking, negatively affecting daily operations of the medical center, limiting access to hospital facilities, and potentially causing a risk to life.

Figure 1-3: Biscayne Bay elevated to the top of the seawall during a July 2013 extreme high tide event. Standing water behind the wall, covering the perimeter road, resulted from overtopping of the seawall.

Figure 1-4: Segment of seawall showing waves overtopping wall and land subsidence causing potholes along perimeter road landward of seawall.

Figure 1-5: Inundation and waves breaking over the seawall carried seaweed behind the wall during an October 7, 2014 extreme high tide event.

Figure 1-6: Inundation and waves breaking over the seawall carried seaweed behind the wall during an October 7, 2014 extreme high tide event. Ponding water indicates land subsidence under the road.

Figure 1-7: Rusting rebar and cracking throughout the seawall (2014).

1.5. PRIOR STUDIES*

a. Estimates of Flood Damages to Sea Wall, Facilities and Operations at the Mount Sinai Medical Center, Miami Beach, Florida, (Anatres Group 2014). The purpose of this assessment was to provide a preliminary indication of potential damages to the Mount Sinai Medical Facility and to project potential additional risk based on sea level rise.

1.6. DECISION TO BE MADE

The decision to be made is to determine if a feasible alternative, from engineering and environmental perspectives, can be implemented to protect vulnerable facilities in place, or if relocating the vulnerable facilities would be more cost effective.

1.7. SCOPING AND ISSUES

The following environmental issues were identified as relevant to the proposed action and as appropriate for evaluation:

a. Vegetation
b. Threatened and Endangered Species
c. Scleractinian Corals
d. Fish and Wildlife Resources
e. Essential Fish Habitat
f. Coastal Barrier Resources
g. Water Quality
h. Hazardous and Toxic Materials
i. Air Quality
j. Noise
k. Historic Properties
l. Invasive Species
m. Aesthetic Resources
n. Recreation Resources

1.8. PERMITS, LICENSE, AND ENTITLEMENTS

The USACE will apply for water quality certification (WQC) under Section 401 of the Clean Water Act in the form of a Joint Coastal Permit (JCP) from the FDEP to cover the proposed action. Issuance of the permit will also constitute state concurrence that the project is consistent with the Florida Coastal Zone Management Program.

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2. EXISTING AND FUTURE WITHOUT-PROJECT CONDITIONS2.1 PHYSICAL ENVIRONMENT

2.1.1. EROSION

EXISTING CONDITIONS

The existing seawall is approximately 3,000 feet long and was constructed in multiple phases to prevent erosion of the Mount Sinai Medical Center property. The northern segment was constructed first, in 1959. The remaining portion of this northern segment is approximately 400 feet long and is in the worst condition of any segment of the existing wall (see **Figure 2-1** and **Figure 2-2**).

Figure 2-1: Northern segment of existing seawall.

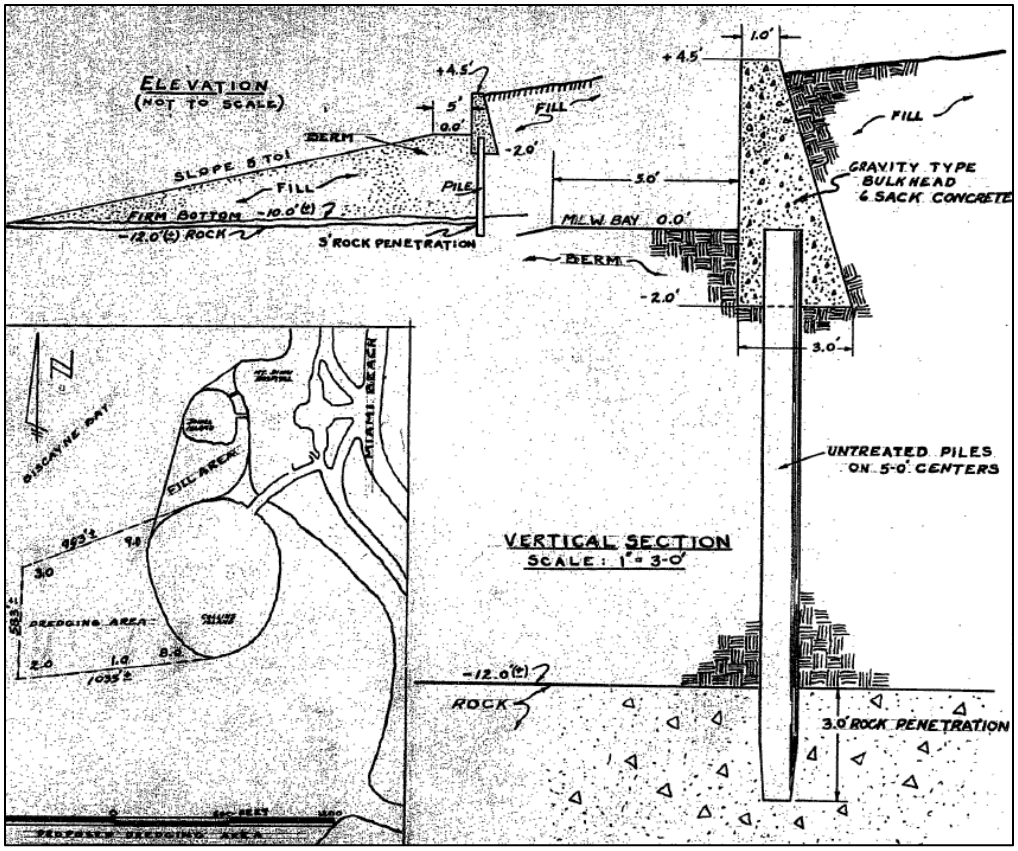

Figure 2-2: Design drawing of northern segment. Constructed circa 1959.

In 1967, dredged fill was placed adjacent to the Mount Sinai property to expand the upland. A new seawall was constructed to protect the newly created land from erosion (**Figure 2-3**). This segment is approximately 2,600 feet.

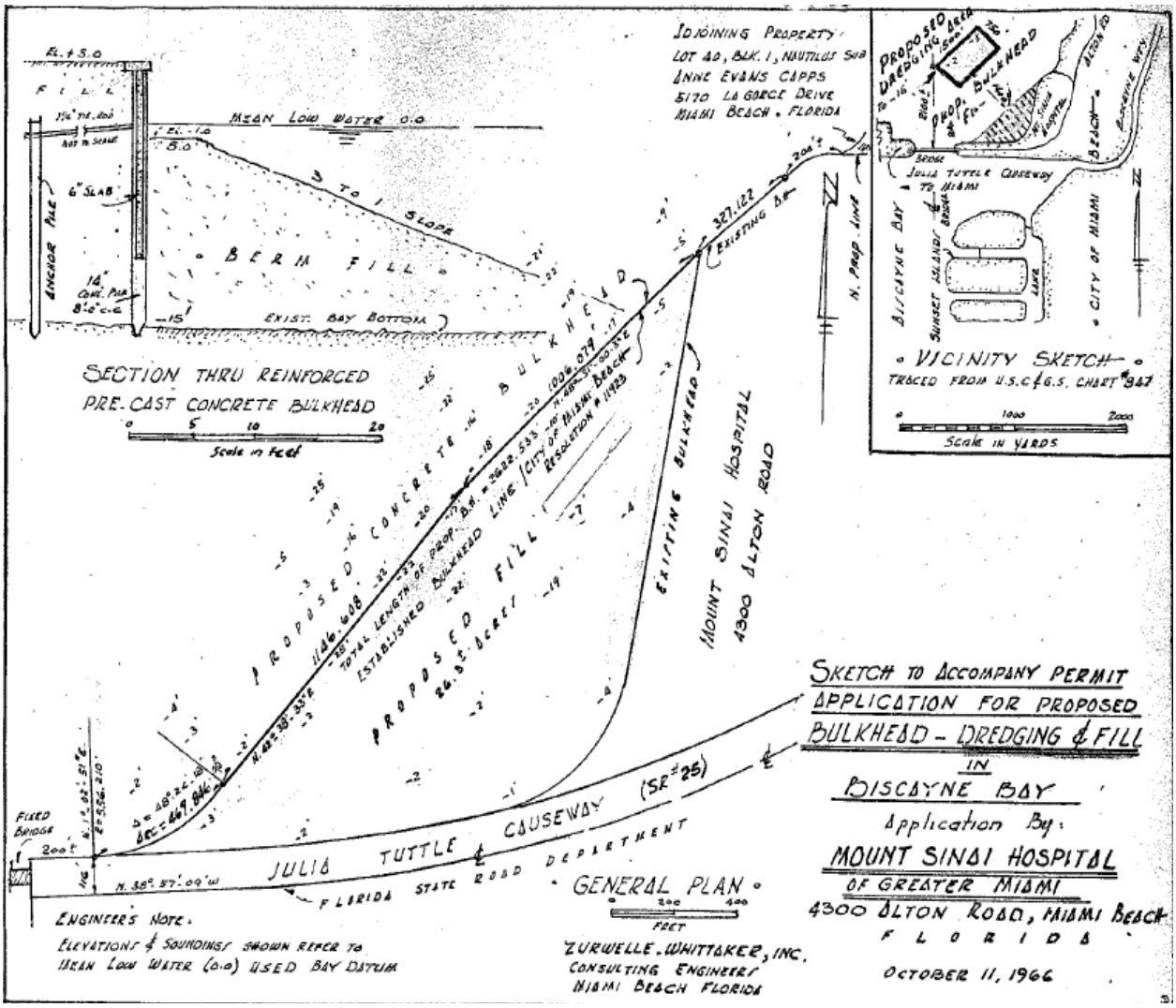

Figure 2-3: Design drawing for segment constructed in 1967.

In 2009, 130 feet of this segment of seawall was improved (**Figure 2-4**). Combined, all segments of the existing seawall total approximately 3,000 feet, with a crest elevation of approximately 2.5 feet NAVD88.

Figure 2-4: The newest segment of seawall; 130 feet constructed in 2009 and tying into the 1967 segment.

The majority of the seawall, except for the 130 feet constructed in 2009, is in a failing condition, evidenced by the cracking and spalling of concrete, exposed rusting steel reinforcement condition, crumbling and failing sections of wall in the northern segment, and land subsidence landward of the wall indicating the loss of soil through cracks and over the existing wall.

Most of the primary medical facilities and buildings are located away from the bayfront on higher ground, with the exception of the Golden and Lowenstein buildings, which were constructed in close proximity to the seawall. A two-lane paved perimeter road and parking facilities extend along most of the length of the existing seawall. A grassy area from 8 to 15 feet wide extends along much of the area between the seawall and the perimeter road and parking facilities. Some trees, and other vegetation, exist along this grassy area. There is evidence of steel tiebacks for the seawall and possibly some underground utilities in this area. Areas of scouring damage are evident at many locations adjacent to the seawall, a result of overtopping and/or wave action. In some areas gravel has been placed in the scour holes to restore surface elevations and prevent further damage.

Critical facilities vulnerable to erosion include the portion of the perimeter road which runs adjacent to the seawall, approximately 1,000 feet of the perimeter road, and parking facilities adjacent to the seawall on the north and south ends of the medical center property.

Currently, during extreme high tide events, the seawall is overtopped by elevated water levels and waves inundating the perimeter road and parking area. Overtopping is a major driver in the erosion of land behind the seawall which fronts the perimeter road and parking facilities. Overtopping allows soil to

migrate through cracks in the compromised portion of seawall and be carried over the wall as water recedes. Depth of the current seawall concrete piles are assumed to be three feet below the existing bay bottom. Although unverified, this limited depth may allow material to erode at the toe of the seawall. Given these conditions, the existing seawall is in imminent threat of damage by natural erosion processes. Loss of portions of the seawall will result in sudden, extreme erosion impacting existing critical facilities. These factors complicate and compromise hospital operations and patient health. A depiction of this erosion process is shown in **Figure 2-5** and **Figure 2-6**.

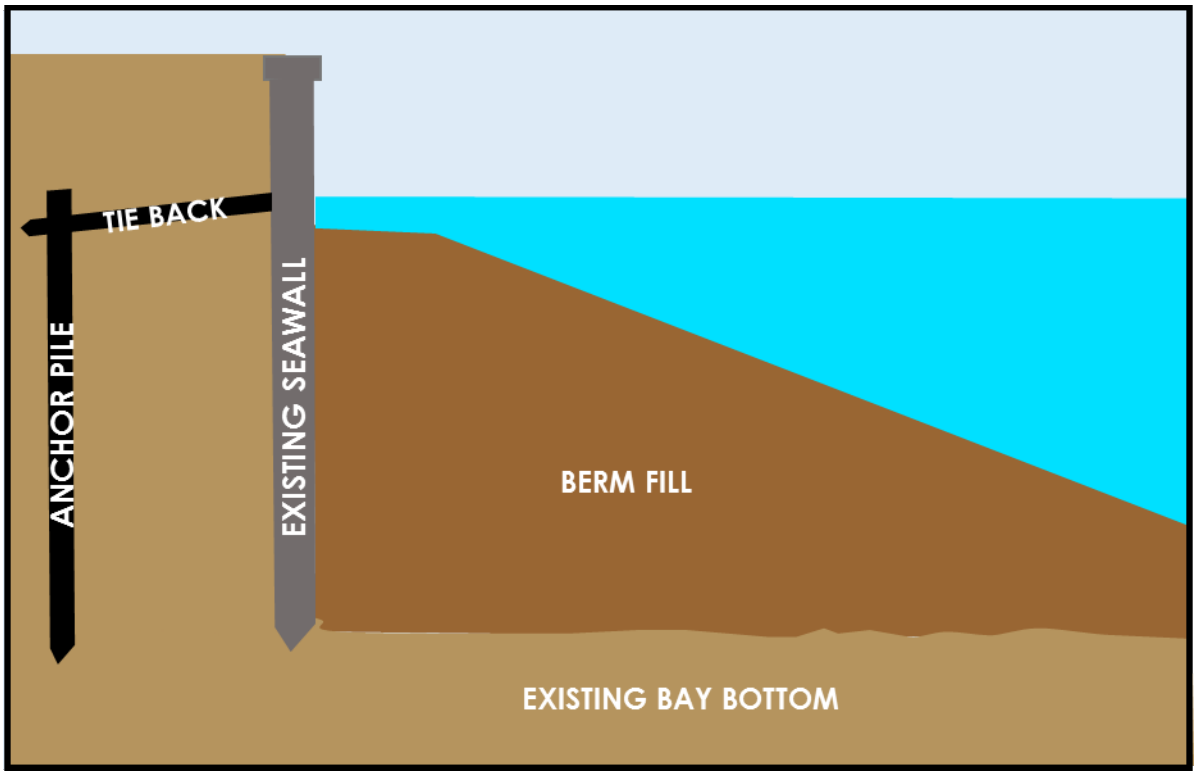

Figure 2-5: Seawall configuration for the majority of the existing seawall (1967 design).

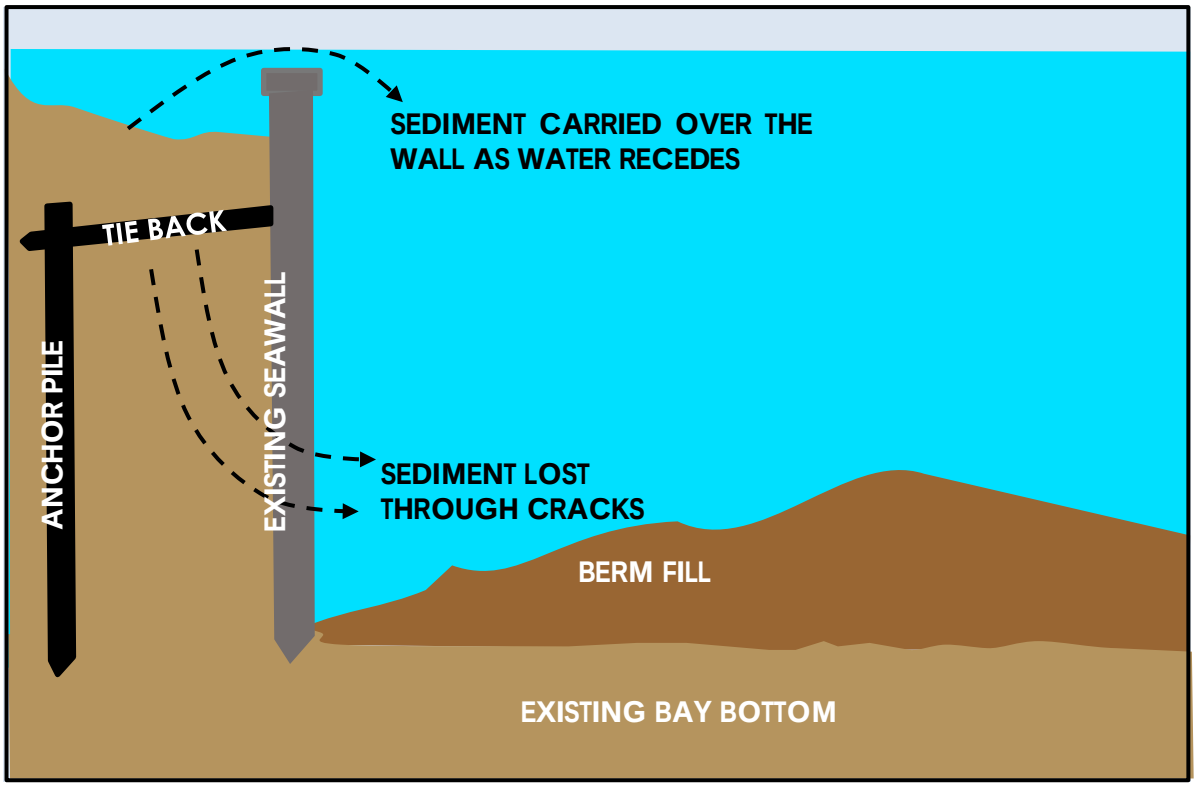

Figure 2-6: Erosion modes for the existing seawall: overtopping of the seawall crest resulting in sediment eroded over and through the existing seawall.

Erosion causes the subsidence of land behind the seawall. After extreme high tide events, standing water remains in subsided areas on the landward side of the seawall, complicating and compromising hospital operations and patient health (life risk). These complications would be exacerbated during disaster events, e.g. storms or hurricanes, where conditions would be worsened both by the natural event and by the increased use of hospital facilities as an emergency care facility and a disaster staging area.

FUTURE WITHOUT-PROJECT CONDITIONS (NO ACTION ALTERNATIVE)

Continued erosion will result in failure of portions, or all, of the existing seawall. Such failure would impact the perimeter road and vulnerable parking areas negatively affecting the daily operations of the medical center, limiting access to hospital facilities, and potentially causing a risk to life. Extreme high tide events, a major driver of erosion, occur multiple times per year and are expected to increase as sea level rises.

2.1.2. CLIMATE

EXISTING CONDITIONS

2.1.2.1. WATER LEVELS AND TIDES

All water levels and land surface elevations in this report will be referenced to North American Vertical Datum of 1988 (NAVD88), unless otherwise specified. References to other datums will be provided as necessary. The nearest tidal gage to the Mount Sinai Medical Center is Biscayne Creek, NOAA # 8723089. This is the only gage located in this area of Biscayne Bay. Other NOAA gages are located on the other side of one or more causeways; causeways restrict tidal flow and those gages are therefore not fully relevant to this project site. However NOAA # 8723089 only collected 2 years' worth of data in the early 1970's. The Virginia Key gage (8723214) has the longest period of record of all the local gages; it was installed in 1994 and remains operational today.

The highest water level on record was examined at both gages. At Biscayne Creek, the maximum level was +1.24 feet NAVD88, but this low value may be due to the relatively short (<2 year) period of record, in addition to the causeway effects. The Virginia Key gage recorded a maximum value of +2.79 feet NAVD88. This water level would overtop most of the length of the existing seawall and could lead to the level of flooding currently observed at the facility.

Anecdotal and photographic evidence provided by the medical center shows that water levels presently overtop the existing seawall by up to one foot during the annual "king tide" events, which are the most extreme high tide events, other than those that could be created by tropical and extra-tropical storms. The level of overtopping will increase over time in response to sea level rise, but at this time evidence suggests that water levels rise to approximately one foot over the existing seawall elevation.

2.1.2.2. SURGE

Surge levels are provided by FEMA's 2009 Flood Insurance Study (FIS).

Table 2-1: Surge levels, from FEMA 2009 FIS.

Return Frequency (years)	Surge Elevation (ft, NGVD29)	Surge Elevation (ft, NAVD88)
10	5.4	3.8
50	6.7	5.1
100	7.2	5.6
500	8.1	6.5

2.1.2.3. SEA LEVEL RISE

Sea levels have been rising gradually throughout the study area during the entire period of record. The longest water-level record in the Miami Beach area was measured by NOAA gage #8723170 (Figure 2-7). Recorded water levels from this gage span 50 years, extending from 1931 to 1981. During this period the average annual rate of sea level rise was 2.39 mm per year, +/- 0.43 mm/yr. Note that the gage used to establish the tidal datum used throughout this study (Biscayne Creek, station #8723089) was not used in this computation of sea level change rates due to its short period of record.

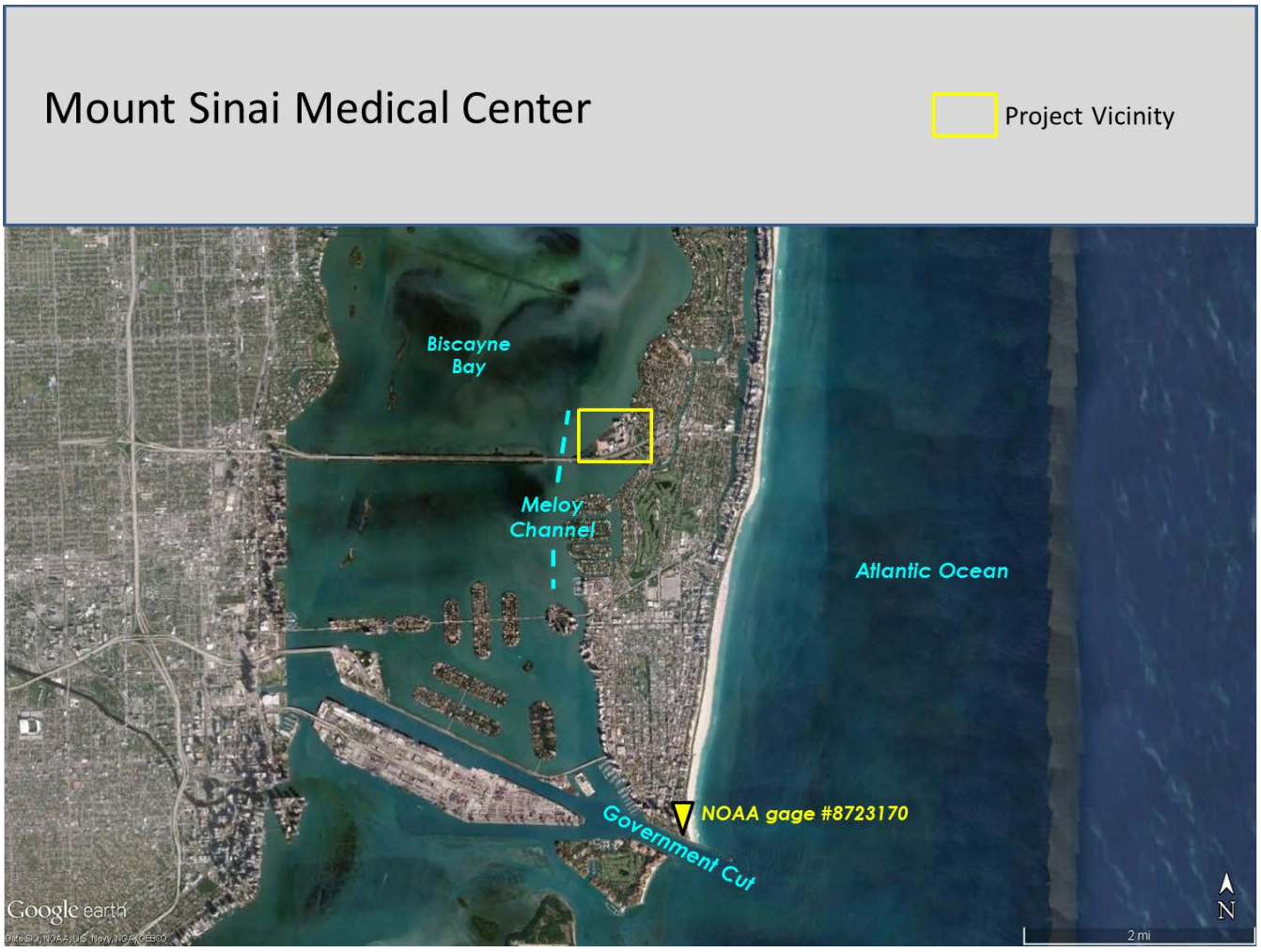

Figure 2-7: General setting.

FUTURE WITHOUT-PROJECT CONDITIONS (NO ACTION ALTERNATIVE)

Water levels and surge will continue to increase in the future as sea levels rise. It is generally accepted that sea level will continue to rise and that the rate of rise may accelerate due to climatic changes. USACE provides guidance on the calculation of sea level rise and on its application to the design process. USACE Engineering Regulation (ER) 1100-2-8162 was issued in December 2013 to establish procedures for projecting sea level rise into the future based on global sea level change rates, the local historic sea level change rate, base year of project analysis, and number of years in the period of analysis. This ER requires that three scenarios be examined, which result in low, intermediate, and high predictions of sea level rise. The low value is based on an extrapolation of the local historic sea level rise rate. The intermediate and high values are based on the National Research Council (NRC) sea level rise predictive Curves I and III, respectively. The three rates of sea level rise predicted for the project area over 100 years, from year 2018, the planned base year of construction of any Recommended Plan, are shown in **Figure 2-8**, with detail on their calculation provided in the Engineering Appendix. As shown in the figure, sea levels could rise from between 0.75 to nearly 6.5 feet over the next 100 years.

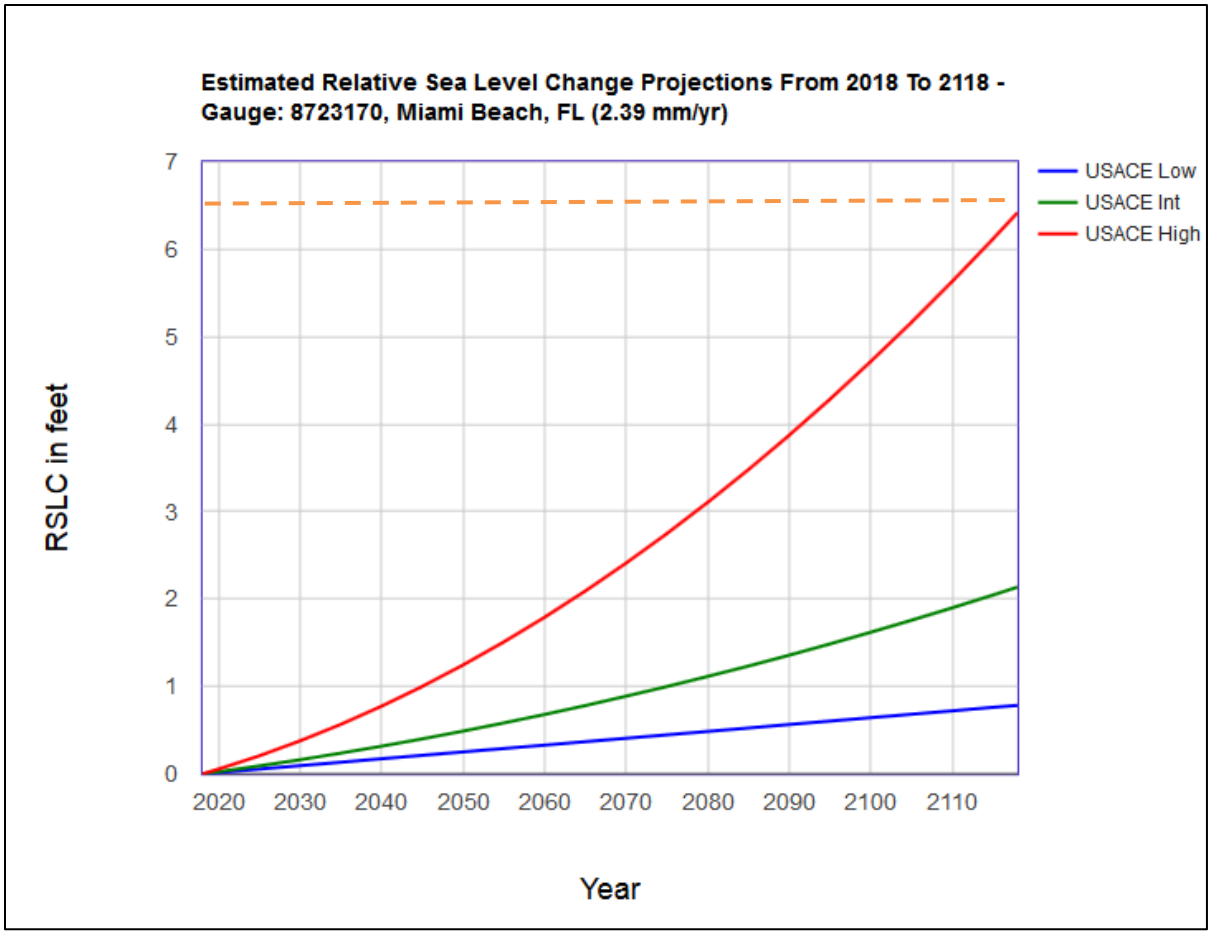

Figure 2-8: Predicted relative sea level rise in Miami Beach by the year 2118.

The project area, and Miami Beach as a whole, are vulnerable to sea level rise. However, given the emergency nature and funding constraints of the CAP Section 14 authority, future sea level rise was not a key factor for alternative development. Alternative development focused on preventing current erosion causing conditions. However, future sea level rise was considered, per guidance, in order to recommend an alternative that prevents current erosion causing conditions and is able to be adapted to future sea level change by the sponsor if necessary.

A 2014 risk assessment was completed for the Mount Sinai Medical Center by the Anatres Group. The purpose of the assessment was to provide a preliminary indication of future damages to infrastructure and operations. Future damages include damage to structures, loss of facility function, content damages, displacement, and loss of life as a result of erosion and inundation. The assessment used a combination of pre-existing materials provided by the medical center and open sources and the Federal Emergency Management Agency (FEMA) BCAR 4.8 software platform to calculate damages. All loss figures are over a 50 year time horizon and are discounted to present value using the FEMA standard 7% discount rate.

Sea Level Rise (SLR) will exacerbate erosion and inundation caused by high tide events in the future. The Anatres Group projected SLR for flood hazard data using the U.S. Army Corps of Engineers (USACE) SLR calculator (http://corpsclimate.us/ccaceslcurves.cfm) and averaged the projected increase in water surface elevations for the period 2010 to 2060. The projection uses the USACE **intermediate** SLR rate for the area.

Several damage estimates were given in the assessment: damage to the seawall and related infrastructure (including asphalt road, concrete curb, and fill), and damage to facilities and operations. The assessment found that approximately $4,000,000 in damages to the seawall and related infrastructure are possible over a 50 year time horizon if sea level rise accelerates to the USACE **intermediate** SLR scenario. In addition to these damages, an additional $296,000,000 in damages and loss of function to Mount Sinai facilities and operations was predicted to occur. Recommending an alternative that can be adapted as sea level rises will be important to reduce the risk of such potential future damages.

2.2. NATURAL ENVIRONMENT (AFFECTED ENVIRONMENT)

The Affected Environment section succinctly describes the existing environmental resources of the areas that would be affected if any of the alternatives were implemented. This section describes only those environmental resources that are relevant to the decision to be made. It does not describe the entire existing environment, but only those environmental resources that would affect, or that would be affected, by the alternatives if they were implemented. This section, in conjunction with the description of the "no-action" alternative forms the baseline conditions for determining the environmental impacts of the proposed action and reasonable alternatives.

2.3. GENERAL ENVIRONMENTAL SETTING*

EXISTING CONDITIONS

The Mount Sinai Medical Center is located to the east of the Meloy channel shown in the red dashed line in **Figure 2-9**, on the north-east side of Biscayne Bay, a shallow subtropical lagoon that extends from the City of North Miami (Miami-Dade County, Florida) south to the northern end of Key Largo, at the juncture of Miami-Dade and Monroe Counties. Biscayne Bay is bordered on the west by the mainland of peninsular Florida and on the east by both the Atlantic Ocean and a series of barrier islands consisting of sand and carbonate deposits over limestone bedrock (Hoffmeister 1974).

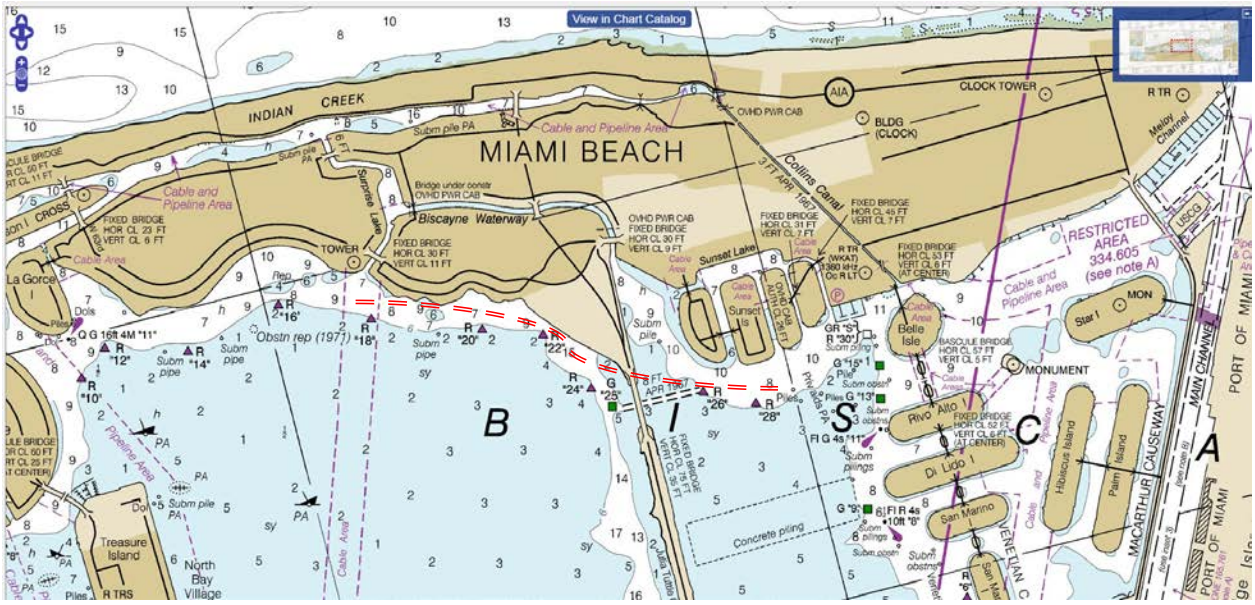

Figure 2-9: The location of Meloy channel on the backside of Miami Beach (noted with the red-dashed line).

Tides within the Miami area are semi-diurnal, having two high and two low tides each day. The mean range at Miami Beach is 2.5 feet; 3.0 feet in spring. The lowest tide is 1.4 feet below mean low water (USACE 1989). Maximum tidal current velocities through Government Cut (**Figure 2-7**) are approximately 5.5 feet per second on average tide, but occasional velocities of approximately 6.2 feet per second have been recorded during spring tide (USACE 1989).

The Biscayne Bay area, including the Mount Sinai Medical Center, is located within State of Florida Class III waters. Class III is the standard designation covering most of the open marine waters of the state. Biscayne Bay is also classified as Outstanding Florida Waters (OFW) under Section 62-302.700 of the Florida Administrative Code and is commonly referred to as the Biscayne Bay Aquatic Preserve. The OFW designation carries with it the requirement that ambient water quality cannot be degraded below its existing level.

FUTURE WITHOUT-PROJECT CONDITIONS (NO ACTION ALTERNATIVE)

The future without-project conditions are similar to the existing conditions described above. However, tide levels will increase proportionally with sea level rise.

2.3.1. VEGETATION

EXISTING CONDITIONS

2.3.1.1. SEAGRASS SURVEY

A seagrass survey was conducted by Coastal Eco-Group, Inc. (CEG) over eight days between May 2 and June 2, 2016. Seventy transects were established in 50-foot increments along the 3,500-foot length of the seawall, starting at the base of the seawall and extending waterward to a maximum distance of 400 feet (**Figure 2-9**).

The highly-used navigable waters of Meloy Channel are located within the boundaries of the survey areas between Transects 10 and 35. Due to safety concerns with diving in, and adjacent to, these waters, CEG coordinated with the USACE to discuss shortening the transect lengths in this area where the red day markers are closest to the seawall. Several of the original 400-foot length transects extended waterward of the channel red day marker. USACE approved shortening these transects for diver safety by as much as 150 feet to provide a larger buffer from vessel activity.

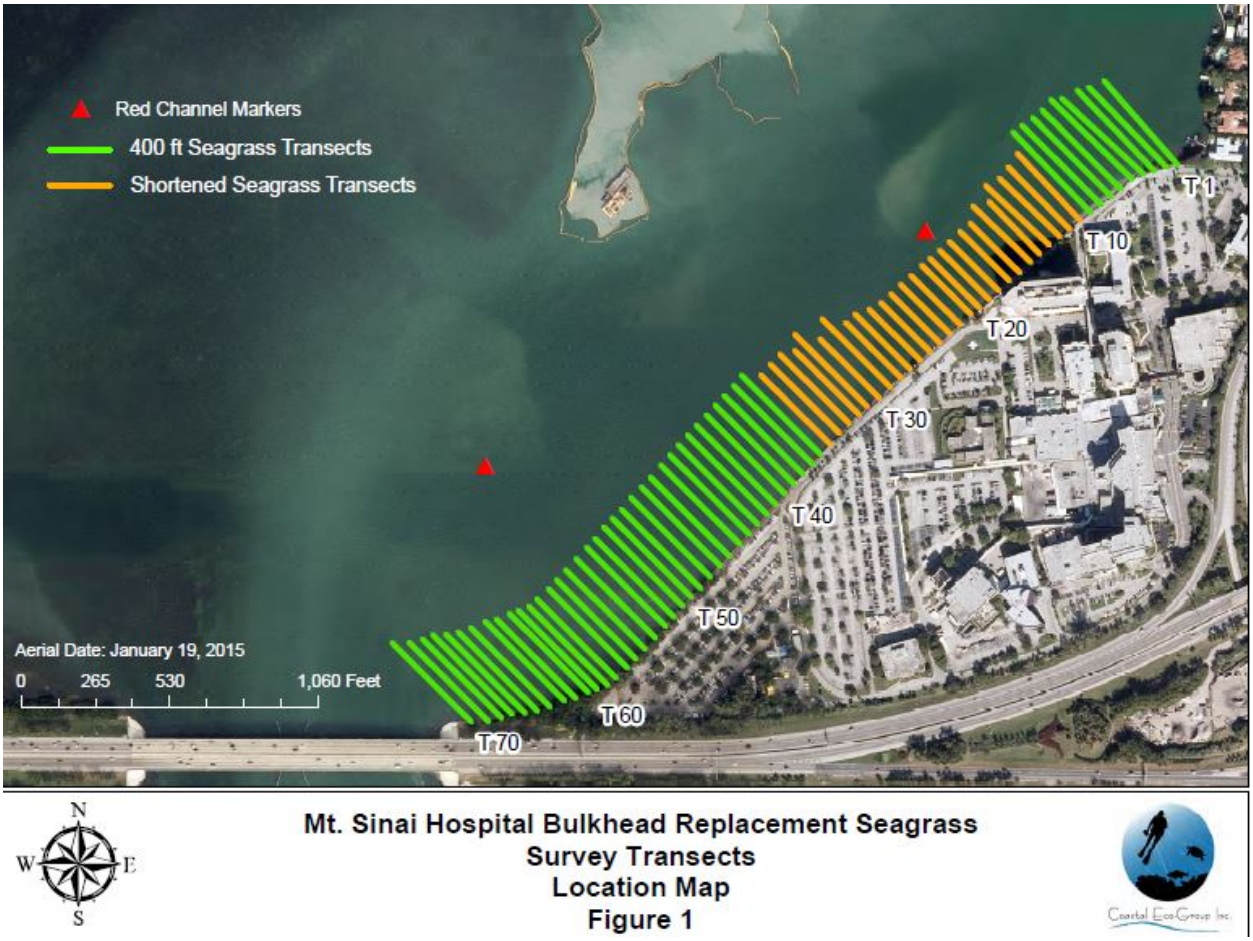

Figure 2-9: Seagrass Survey Transect Locations

A total of 17.04 acres of seagrass habitat and 9.11 acres of unvegetated bottom were mapped within the survey area (**Figure 2-10**). The seagrass bed is dominated by *Halophila decipiens*, *Halodule wrightii*, and *Syringodium filiforme*; *Thalassia testudinum* occurs in sporadic, dense patches, primarily in the northern and southern extents of the bed. A mixed species seagrass bed dominates the nearshore and increases in extent at the south end of the survey area; this mixed species bed accounts for 10.16 acres of seagrass habitat in the study area. The mixed species bed transitions to 6.75 acres of *H. decipiens* in the offshore portion of the study area. Monospecific *H. wrightii* and *T. testudium* patches only accounted for between 0.10 and 0.03 acres of the total seagrass habitat, respectively. There was a strong relationship between substrate type and distribution of the seagrass bed. Muck was the dominant substrate throughout the central segment of the survey area where seagrass was generally not present (refer to **Figure 2-10**). *Halophila johnsonii* was not observed during the survey. The nearshore bed edge ranged from 0 to 26 ft. waterward of the seawall. The area between the seawall and the seagrass bed edge was dominated by rubble; sand was the dominant substrate at the bed edge. A copy of the survey is included in Appendix D-4.

FUTURE WITHOUT-PROJECT CONDITIONS (NO ACTION ALTERNATIVE)

There will be no effect to seagrasses in Biscayne Bay in the No Action alternative.

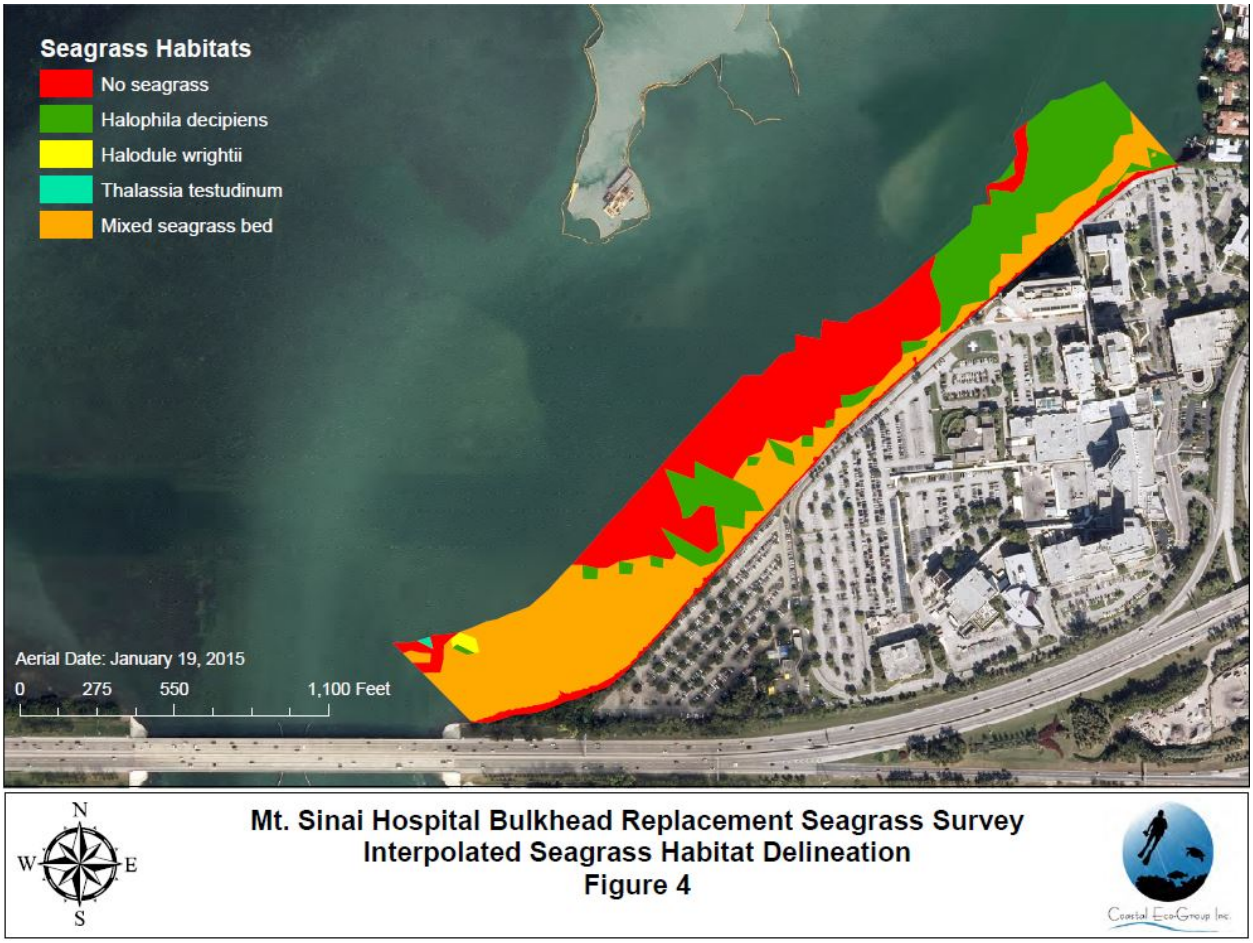

Figure 2-10: Mount Sinai Hospital seagrass survey.

2.3.1.2. TREE SURVEY

A tree survey was conducted on May 2 and 3, 2016, behind the existing seawall. The survey focused on the trees concentrated on the northern and southern sections of the property behind and adjacent to the seawall. The tree survey defined four distinct areas of trees that were identified (**Figure 2-12**).

Figure 2-11: Tree Survey at Mount Sinai Medical Center

The survey identified 11 different tree species (**Table 2-2**) and a total of 68 trees were surveyed along the seawall. Area 1, located on the northern end of the property, consisted mostly of Seagrape. Within this area many of the trees abutted the seawall and were leaning, or had fallen into the bay, due to shoreline erosion. The second area, Area No. 2, consisted of six different species: Seagrape, Black Mangrove, Washington Fan Palm, Pitch Apple, Black Olive, and Silver Buttonwood. The trees and shrubs present in this area were planned landscape plantings. The third section, Area No. 3, contained a mostly mature set of trees, including mostly Black Olive and Australian Pine, along with one Seagrape. The fourth, and last, section of trees were situated on the shore of the bay and extended out to the Julia Tuttle Causeway. The trees here were overgrown, with a lot of undergrowth and trash from the bay that had washed up on the shore and base of the trees. Area 4 had the largest tree canopy and the largest trees. Trees were found growing on both sides of the seawall.

Table 2-2: Tree survey by species.

TREE ID	COMMON NAME	SCIENTIFIC NAME	CLASSIFICATION
1	Brazilian Pepper	*Schinus terebinthifolius*	FLEPPC Category 1 invasive exotic
2	Golden Dewdrop	*Duranta erecta L.*	Non-native
3	Seagrape	*Coccoloba uvifera*	
4	Seagrape	*Coccoloba uvifera*	
5	Seagrape	*Coccoloba uvifera*	
6	Seagrape	*Coccoloba uvifera*	
7	Seagrape	*Coccoloba uvifera*	
8	Seagrape	*Coccoloba uvifera*	
9	Seagrape	*Coccoloba uvifera*	
10	Seagrape	*Coccoloba uvifera*	
11	Seagrape	*Coccoloba uvifera*	
12	Seagrape	*Coccoloba uvifera*	
13	Black Mangrove	*Avicennia germinans*	
14	Seagrape	*Coccoloba uvifera*	
15	Washington Fan Palm	*Washingtonia robusta*	Possible *Livistona spp* however both are non-native
16	Washington Fan Palm	*Washingtonia robusta*	
17	Washington Fan Palm	*Washingtonia robusta*	
18	Seagrape	*Coccoloba uvifera*	
19	Washington Fan Palm	*Washingtonia robusta*	Possible *Livistona spp* however both are non-native
20	Washington Fan Palm	*Washingtonia robusta*	
21	Seagrape	*Coccoloba uvifera*	
22	Seagrape	*Coccoloba uvifera*	
23	Seagrape	*Coccoloba uvifera*	
24	Seagrape	*Coccoloba uvifera*	
25	Pitch Apple	*Clusia rosea*	
26	Black Olive	*Terminalia buceras*	Non-native
27	Seagrape	*Coccoloba uvifera*	
28	Seagrape	*Coccoloba uvifera*	
29	Black Olive	*Terminalia buceras*	Non-native
30	Silver Buttonwood	*Conocarpus erectus var. sericeus*	

Trees and underbrush found in Area 1 (Tree Nos. 1-11), at the northern most end of the seawall, are densely packed. The seawall at this location has suffered significant damage and deterioration. Trees found in Area 2 (Tree Nos. 12-30) represent landscaping plantings that are maintained and were part of the overall facility landscaping along sidewalks and benches. Trees found in Area 3 (Tree Nos. 31-50) were mostly trees planted as part of landscaping and are spaced apart from each other. Most of these trees are approximately 10 feet from the seawall. Trees found in Area 4 (Tree Nos. 51-68) are densely packed with underbrush and debris floated in by tides and storm events. A copy of the survey is included in Appendix D-4.

FUTURE WITHOUT-PROJECT CONDITIONS (NO ACTION ALTERNATIVE)

If the existing seawall, or portions of the wall should collapse, then some vegetation may be impacted, including loss of the trees into the adjacent bay waters.

2.3.2. THREATENED AND ENDANGERED SPECIES

2.3.2.1. SEA TURTLES

EXISTING CONDITIONS

Miami-Dade County is within the normal nesting range of three species of sea turtles; the loggerhead (*Caretta caretta*), the North Atlantic distinct population segment (DPS) of green sea turtle (*Chelonia mydas*) (80 FR 15272), and the leatherback (*Dermochelys coriacea*). The leatherback sea turtle is listed as endangered under the Endangered Species Act (ESA). The loggerhead sea turtle is listed as a threatened species. The North Atlantic DPS of the green sea turtle is currently proposed as a threatened species; previously all green sea turtles found in the U.S. were listed as endangered species. There are no records of sea turtles nesting within the boundaries of the interior of northern Biscayne Bay.

The waters offshore of Miami-Dade County and Biscayne Bay are also used for foraging and shelter for the three species listed above, as well as the hawksbill sea turtle (*Eretmochelys imbricata*) and, possibly, Kemp's ridley sea turtle (*Lepidochelys kempii*), and Olive ridley sea turtle (*Lepidochelys oliveacea)* (DC&A 2001; Foley, et al 2003). There is no designated critical habitat for sea turtles within the project area.

FUTURE WITHOUT-PROJECT CONDITIONS (NO ACTION ALTERNATIVE)

The existing seawall is deteriorating and has the potential to collapse in areas, resulting in the destabilization of the shoreline where sediment and debris may impact the adjacent seagrass beds. Loss of the existing wall would also adversely affect algae growing on the structure. The green sea turtle may access this area and forage on seagrass, as well as algae growing on the wall. .

2.3.2.2. MANATEES

EXISTING CONDITIONS

The Florida manatee (*Trichechus manatus latirostris)* is a subspecies of the West Indian manatee. *Trichechus manatus* has been listed as a protected mammal in Florida since 1893. Federal law, specifically the Marine Mammal Protection Act of 1972 (MMPA) and the ESA, protects manatees. Florida provided further protection in 1978 by passing the Florida Marine Sanctuary Act, designating the state as a manatee sanctuary and providing signage and speed zones in Florida's waterways. All of Biscayne Bay is designated critical habitat under the ESA (42 FR 47840, September 22, 1977).

Within Miami-Dade County there exist both permanent and transient populations of manatees. Surveys show that during the winter months when temperatures drop, manatees from north Florida and Miami-Dade County will migrate to the Florida Power and Light (FP&L) power plant at Port Everglades (USGS 2000). During the spring months when the water warms, manatees return to the counties to the north and south to forage and reproduce. Telemetry and aerial surveys confirm manatees are present within Miami-Dade County all year (Miami-Dade County 1999a, USGS 2000). The surveys also confirm that they frequent the waters in and adjacent to the study area, and near the Miami River and Intracoastal Waterway (ICWW). All of the waters in Miami-Dade County are designated as critical habitat for the manatee under the ESA in 1976 (50 CFR 17.95(a)). Adjacent to the Mount Sinai Medical Center, manatee

slow speed zones are enforced from November 15 - April 30 and 30 MPH from May 1 - November 14 (**Figure 2-13**).

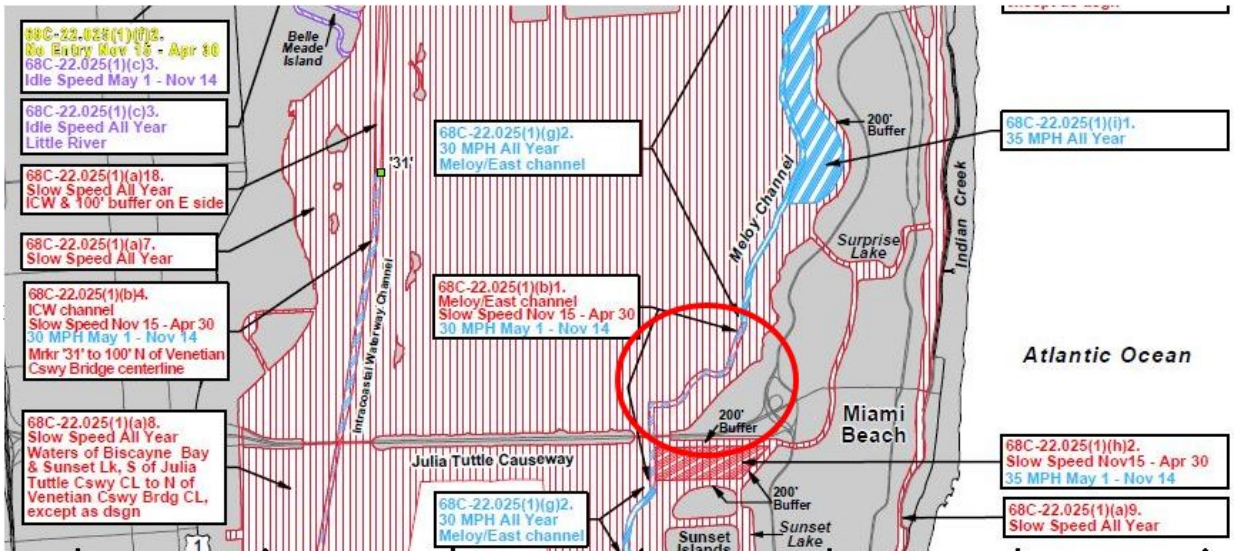

Figure 2-12: FWC Manatee Speed Zones near the Mount Sinai Center

Florida manatees have been documented feeding on seagrasses in the shallow waters west of the project area and within the recently completed Julia Tuttle seagrass restoration area (**Figure 2-14**).

Figure 134: Manatee at Julia Tuttle Restoration Site Sept 2015

FUTURE WITHOUT-PROJECT CONDITIONS (NO ACTION ALTERNATIVE)

The existing seawall is deteriorating and has the potential to collapse in areas resulting in the destabilization of the shoreline where sediment and debris may impact adjacent seagrass beds. Loss of

the existing wall may also adversely affect algae growing on the wall. The manatee forages on seagrass as well as algae and, during high tide, may be able to access this area.

2.3.2.3. JOHNSON'S SEAGRASS

EXISTING CONDITIONS

Johnson's seagrass (*H. johnsonii*) was listed as a threatened species by NMFS on September 14, 1998 (63 FR 49035) and a re-proposal to designate critical habitat pursuant to Section 4 of the ESA was published on December 2, 1998 (64 FR 64231). The final rule for critical habitat designation for *H. johnsonii* was published April 5, 2000 (65 FR 17786). *H. johnsonii* has one of the most limited geographic ranges of all seagrass species. It is only known to occur between Sebastian Inlet and northern Biscayne Bay on the east coast of Florida (Kenworthy 1997). There is designated critical habitat for *H. johnsonii* immediately adjacent to the existing seawall (**Figure 2-14**), and while *H. johnsonii* has been reported to occur in north Biscayne Bay, no *H. johnsonii* was encountered within the seagrass survey area.

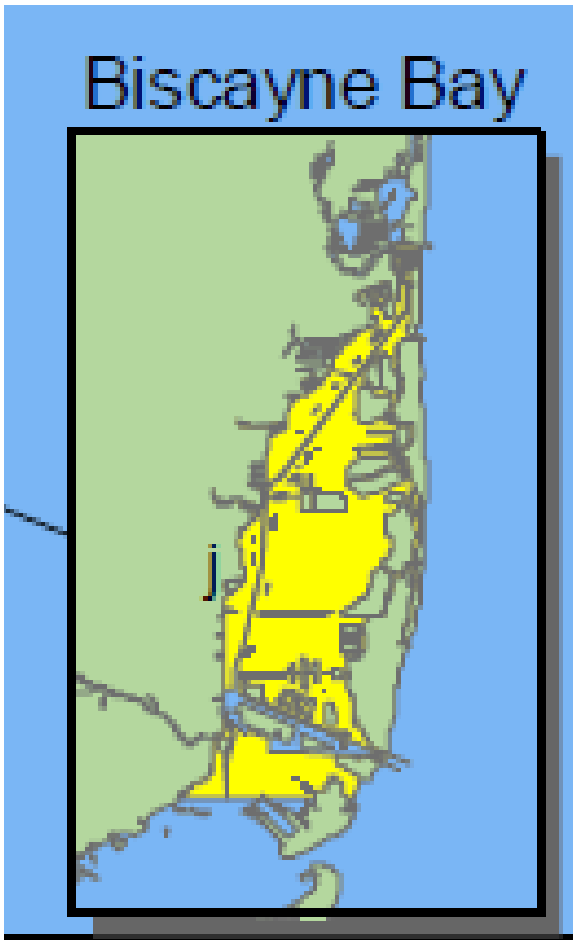

Figure 14: Designated Johnson's seagrass Critical Habitat in Biscayne Bay.

FUTURE WITHOUT-PROJECT CONDITIONS (NO ACTION ALTERNATIVE)

There will be no effect to Johnson's seagrass critical habitat in the No Action alternative.

2.3.2.4. AMERICAN CROCODILE

EXISTING CONDITIONS

The American crocodile is a state and federally listed threatened species. It is distributed along the coastal and estuarine shores of the extreme southern Florida peninsula. Crocodiles primarily nest south of the project area, from Florida Bay to Turkey Point, and on northern Key Largo. In Biscayne Bay they have been observed nesting as far north as Crandon Park, Bill Baggs State Recreation Area, and Snapper Creek (USFWS 1999; Mazzotti 2000) located more than six miles south of the project area. Nesting for the crocodile begins in March and extends until late April or early May until the eggs are laid. They build their nests in well-drained soil at sites adjacent to deep-water. Adult crocodiles feed at night on schooling fish in creeks, open water, and deep channels (FP&L 1987). Crocodiles are shy animals and prefer quiet, inland ponds, creeks, and protected coves. They also prefer natural, undisturbed areas for nesting, resting, and feeding (USFWS 1999). Documentation of American crocodiles north of Miami-Dade County has increased over the last few years, with animals being reported in Broward and Palm Beach Counties. According to FWS, the closest nest that has been documented near Mount Sinai Medical Center was on the north end of Virginia Key in 2015, approximately 6.5 miles south of the Mount Sinai Medical Center. There is no designated critical habitat for the crocodile in the project area.

FUTURE WITHOUT-PROJECT CONDITIONS (NO ACTION ALTERNATIVE)

There will be no effect to American crocodile in the No Action alternative.

2.3.2.5. SMALLTOOTH SAWFISH

EXISTING CONDITIONS

On April 1, 2003, NMFS published a final rule (68 FR 15674) listing the DPS of smalltooth sawfish found in the U.S. as an endangered species under the ESA. Smalltooth sawfish, *Pristis pectinata* were once common in Florida as detailed by the "Smalltooth Sawfish Recovery Plan" (NMFS, 2009) and are very rarely reported in southeast Florida. Their core range extends along the Everglades coast from the Ten Thousand Islands to Florida Bay, with moderate occurrences in the Florida Keys and at the mouth of the Caloosahatchee River. Outside of these areas, sawfish are rarely encountered and appear to be relatively rare (Simpfendorfer 2006). It does not appear to be a coincidence that the core range of smalltooth sawfish corresponds to the section of Florida with the smallest amount of coastal habitat modification. NMFS released the final recovery plan for the smalltooth sawfish in January 2009 (NMFS, 2009), and designated critical habitat for the species in September 2009 (74 FR 45353). There is no designated critical habitat for smalltooth sawfish in the project area. Smalltooth sawfish inhabit the shallow coastal waters of tropical seas and estuaries throughout the world. They are usually found in shallow waters, less than 32 feet (10 m), very close to shore over muddy and sandy bottoms.

FUTURE WITHOUT-PROJECT CONDITIONS (NO ACTION ALTERNATIVE)

There will be no effect to smalltooth sawfish in the No Action alternative.

2.3.2.6. SCLERACTINIAN CORALS

EXISTING CONDITIONS

A survey for scleractinian corals was conducted on May 2, 2016, along the entire 3,500 linear foot seawall, from the base of the seawall to the mean low water mark. Transects to document encrusting organisms were located vertically along the seawall from the mean low water mark to the bay bottom. Scleractinian coral data collected included coral species, size, orientation, latitude, longitude, and height on the seawall wall. The total scleractinian coral transect survey area was 70 m^2 (**Figure 2-15**, **Figure 2-16**). A total of 11 scleractinian corals ≥ 1 cm were identified along the entire seawall. Coral colonies < 10 cm were identified

as *Siderastrea siderea* or *S. siderea*. The colonies that were ≥ 10 cm included individuals of *Oculina diffusa*, *Oculina robusta*, and *S. siderea*.

The 10 transects with scleractinian corals were generally located at the center portion of the existing seawall. **Table 2-3** provides the location, species, and size data for each scleractinian coral. Of the 11 coral colonies located on the existing seawall, six (55%) exceeded 10 cm in their greatest (longest) measured dimension. The total area of wall surface covered by all 11 corals is approximately 0.11 m^2. These species are commonly identified on the reefs and hardbottom communities of southeast Florida (Jaap 1984; Porter 1987).

Table 2-3: Location, species, and size data for each scleractinian coral located on the existing seawall.

Transect	Transect Length (m)	Water Depth (m)	Scleractinian Coral Species	Coral ID	Length (cm)	Width (cm)	Height (cm)	> 10 cm	% Live	Location on transect (cm)	Orientation (R/L)	Distance from transect line (cm)
T19	1.90	0.85	*Oculina diffusa*	A	15	13	7	Yes	100	20	West	16
T28	2.00	0.94	*Siderastrea siderea*	A	2	2	0.5	No	100	0.05	East	12
T29	1.90	0.90	*Siderastrea siderea*	A	11	8	1	Yes	100	15	East	25
T30	1.80	0.80	*Oculina diffusa*	A	16	10	16	Yes	100	30	East	32
T32	1.80	0.75	*Siderastrea siderea*	A	7	6	1	No	100	4	West	25
T33	1.80	0.80	*Oculina robusta*	A	17	14	9	Yes	100	20	West	5
T33	1.80	0.80	*Siderastrea* cf. *siderea*	B	6	5	0.5	No	100	25	East	30
T34	1.90	0.85	*Siderastrea siderea*	A	12	7	1	Yes	100	14	West	4
T36	1.80	0.75	*Oculina diffusa*	A	24	16	11	Yes	100	36	West	50
T38	1.55	0.50	*Siderastrea* cf. *siderea*	A	3	3	0.5	No	100	12	West	50
T39	1.68	0.72	*Siderastrea siderea*	A	4	3	0.5	No	100	0.5	East	18

Macroalgae, empty space, turf algae, and sponge cover, when combined, made up 80 to 100% of the total cover at the encrusting transect surveys. Other functional groups identified on the 10 encrusting transects were hydroid, tunicate, anemone, fanworm, barnacle, bivalve, and limpets.

The following data were collected for all scleractinian coral colonies ≥ 1 cm in diameter within 0.5 m on either side of the transect line (1-m wide belt).

- Species, to the lowest taxonomic rank possible, including a note if the species is listed as threatened under the Endangered Species Act.
- Colony size, including length (longest axis), width (perpendicular to the longest axis), and height (in the direction of growth).
- Colony orientation (x,y,z).
- Overall health (i.e. presence of disease or bleaching).
- Percent live and dead tissue.
- General description of the original colony location (i.e. eastern Colonized Habitat shallow or segments) and depth.

All scleractinian coral colonies were documented with still digital photography. A representative landscape photograph of the encrusting organisms was also collected at each transect.

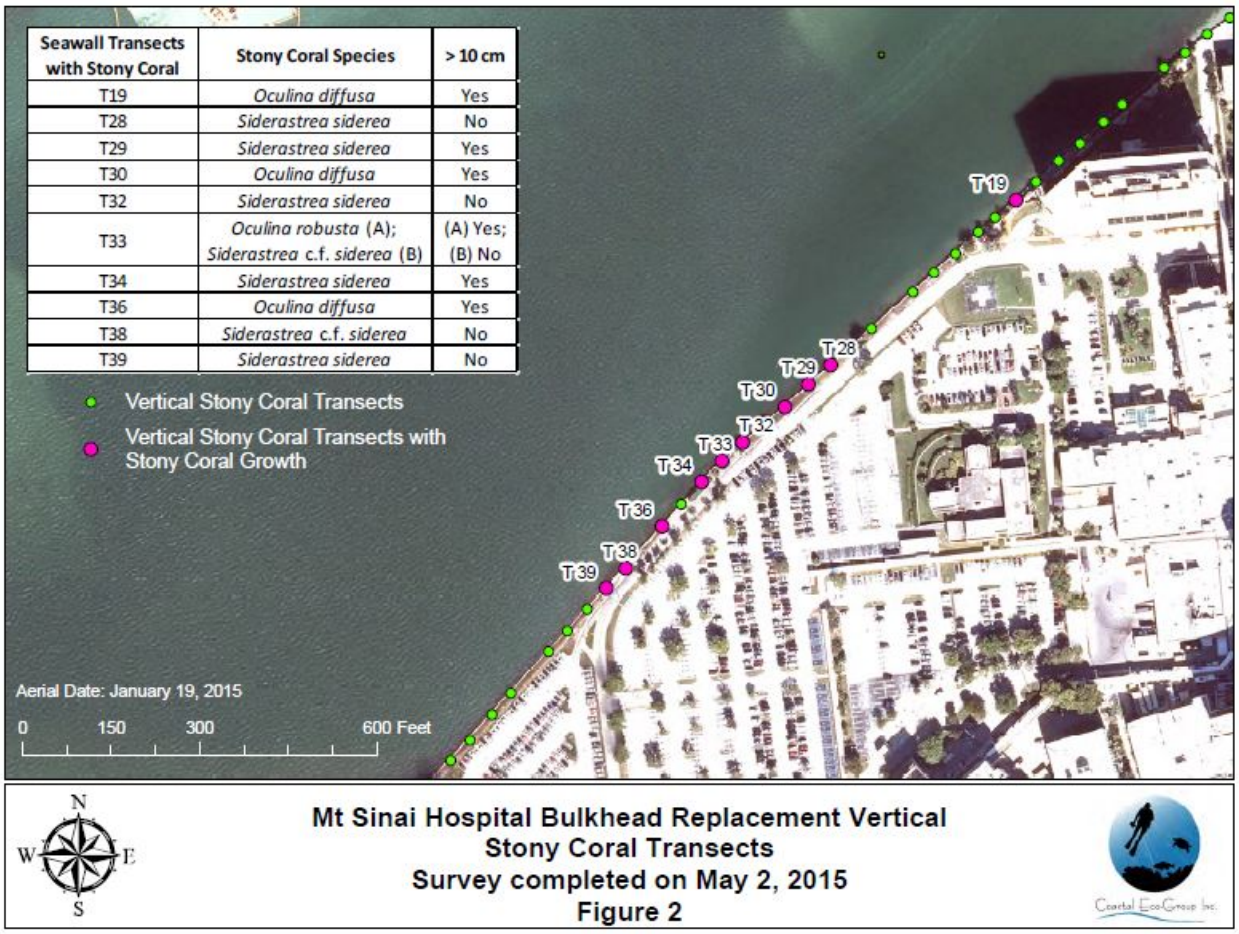

Figure 2-15: Stony coral transects.

A quantitative encrusting organism survey was conducted at 10 of the 70 transects. Macroalgae, empty space, turf algae, and sponge cover, when combined, made up 80 to 100% of the total cover at the encrusting transect surveys. Other functional groups identified on the 10 encrusting transects were hydroid, scleractinian coral, tunicate, anemone, fanworm, barnacle, bivalve, and limpets (**Figure 2-16**).

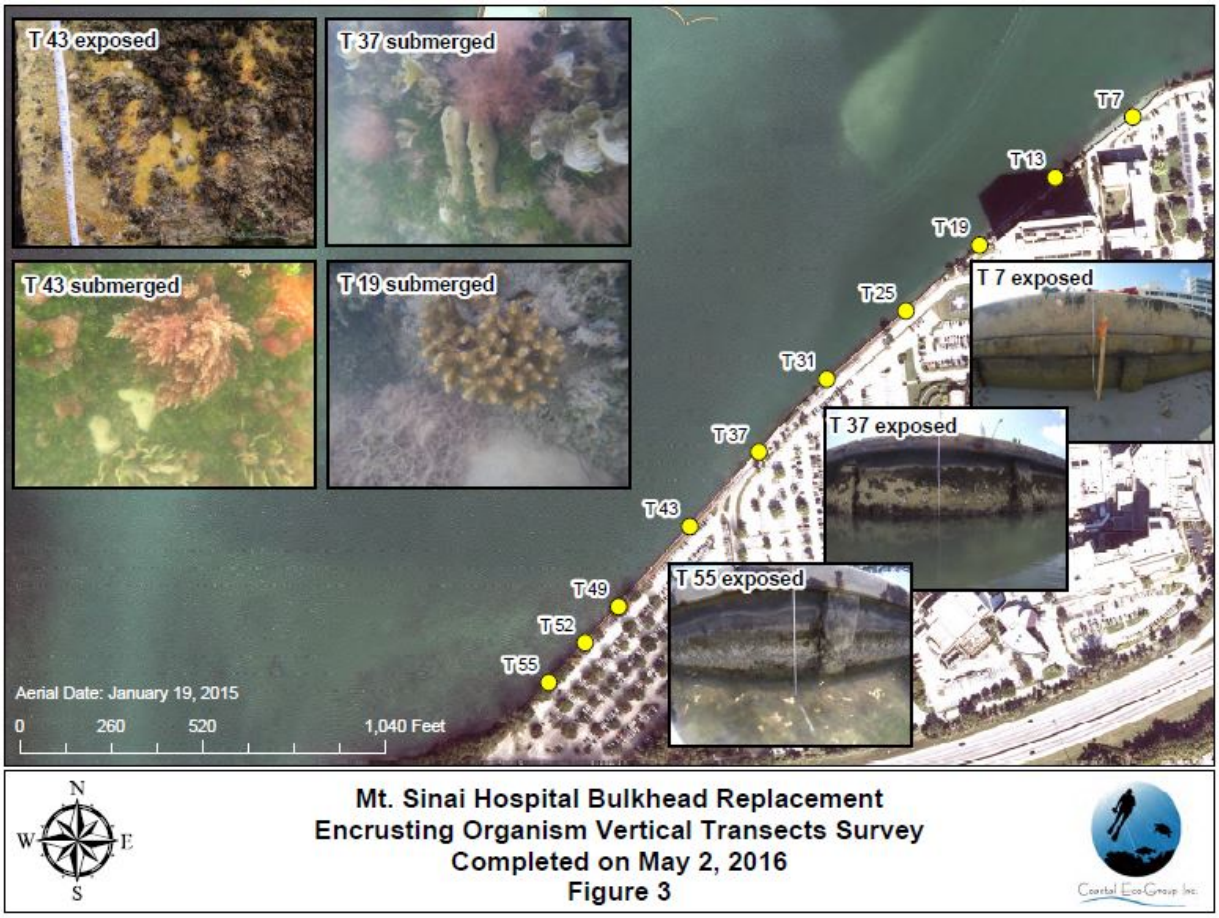

Figure 2-16: Encrusting organism transect survey

FUTURE WITHOUT-PROJECT CONDITIONS (NO ACTION ALTERNATIVE)

The existing seawall is deteriorating and has the potential to collapse in areas which may impact encrusting organisms or scleractinian corals.

2.3.3. FISH AND WILDLIFE RESOURCES

2.3.3.1. BOTTLENOSE DOLPHINS

EXISTING CONDITIONS

The National Marine Fisheries Service – Southeast Fisheries Science Center-Miami Laboratory (SEFSC) has identified numerous stocks of coastal bottlenose dolphins along the east coast of the United States. The stock of bottlenose dolphins most likely to be in the vicinity of Mount Sinai Medical facility is the Biscayne Bay stock. Incorporated by reference is the most recent stock assessment for the Biscayne Bay stock of bottlenose dolphin that was completed by NMFS in 2014 (Waring *et al*, 2014).

Based on Waring *et al (*2014), the minimum population that may be in northern Biscayne Bay; the closest vicinity to the Mount Sinai Medical facility, is 69 animals, based upon Litz's (2007) determination that 69 animals in Biscayne Bay have a northern home range (Haulover Inlet to Rickenbacker Causeway). The maximum population of animals that may be in Biscayne Bay is equal to the total number of uniquely

identified animals for the entire photo-ID study of Biscayne Bay, or 229 animals. The best population estimate for Biscayne Bay is also based on Waring *et al (*2014) - 157 animals – during a consistent survey effort put in place by SEFSC for the 2003-2007 photo-ID survey seasons.

FUTURE WITHOUT-PROJECT CONDITIONS (NO ACTION ALTERNATIVE)

There will be no effect to bottlenose dolphins in the No Action alternative.

2.3.3.2. FISHES

EXISTING CONDITIONS

Fish species are expected to be near the Mount Sinai seawall. This is a common occurrence in South Florida because fish are attracted to vertical structures. Fish species documented during surveys conducted in 2005 near bulkheads at PortMiami, located approximately three miles south of the project area, are listed in **Table 2-4**. Similar fish species are expected to be present at the Mount Sinai seawall, due to the proximity of the project to PortMiami.

Table 2-4: Fishes collected near bulkheads at 2005 Port of Miami project.

Common Name	Scientific Name	Common Name	Scientific Name
Atlantic thread herring	Opisthonema oglinum	bandtail puffer	Sphoeroides spengleri
bigeye scad	Selar crumenopthalmus	black grouper	Mycteroperca bonaci
blackwing sea robin	Prionotus rubio	bluestriped grunt	Haemulon sciurus
Cardinalfish	Astropogon spp	dwarf sand perch	Diplectrum bivittatum
Filefish	Aluterus spp	French grunt	Haemulon flavolineatum
gag grouper	Mycteroperca microlepis	gray angelfish	Pomacanthus arcuatus
gray triggerfish	Balistes capriscus	Hogfish	Lachnolaimus maximus
lane snapper	Lutjanus synagris	Lookdown	Selene vomer
mangrove snapper	Lutjanus griseus	Mojarra	Eucinostomas spp
mutton snapper	Lutjanus analis	Porkfish	Anisotremus virginicus
pygmy filefish	Monocanthus setifer	queen angelfish	Holocanthus ciliaris
red grouper	Epinephelus morio	scrawled cowfish	Lactophrys quadricornis
silver jenny	Eucinostomas gula	spotfin mojarra	Eucinostomas argenteus
Tomtate	Haemulon aurolineatum	white grunt	Haemulon plumieri
yellow jack	Caranx bartholomaei	yellowfin mojarra	Gerres cinereus

FUTURE WITHOUT-PROJECT CONDITIONS (NO ACTION ALTERNATIVE)

There will be no effect to fish in the No Action alternative.

2.3.3.3. MIGRATORY BIRDS

Migratory birds may fly through southeast Florida and may attempt to rest on the seawall or use the vegetation adjacent to this structure at Mount Sinai Medical Center.

FUTURE WITHOUT-PROJECT CONDITIONS (NO ACTION ALTERNATIVE)

The existing seawall is deteriorating and has the potential to collapse in areas, which may impact some vegetation occasionally utilized by birds.

2.3.4. ESSENTIAL FISH HABITAT

EXISTING CONDITIONS

The Magnuson-Stevens Fishery Conservation and Management Act, as amended by the Sustainable Fisheries Act of 1996 (Public Law 104-267), requires Federal agencies to consult with NMFS on activities that may adversely affect Essential Fish Habitat (EFH). This report with integrated EA is prepared in consistence with guidance provided by the NMFS Southeast Regional Office to USACE, Jacksonville District regarding coordinating EFH consultation requirements with NEPA (NMFS 1999a). EFH is defined as "those waters and substrate necessary to fish for spawning, breeding, or growth to maturity" (SAFMC 1998).

The South Atlantic Fishery Management Council (SAFMC) designated corals, seagrasses, and unconsolidated sediments as EFH. Sand habitats are EFH for cobia (*Rachycentron canadum*), black seabass (*Centropristis striata*), king mackerel (*Scomberomorus cavalla*), Spanish mackerel (*S. maculates*), spiny lobster, and pink shrimp (*Farfantepenaeus duorarum*). Coral and seagrass benefit fishery resources by providing food or shelter (SAFMC 1983). SAFMC also designated corals and seagrasses as a Habitat Area of Particular Concern (HAPC), which is a subset of EFH that is either rare, particularly susceptible to human-induced degradation, especially important ecologically, or located in an environmentally stressed area. In light of their designation as EFH-HAPC's and Executive Order 13089, NMFS applies greater scrutiny to projects affecting corals and seagrasses, as they are HAPCs, to ensure practicable measures to avoid and minimize adverse effects to these habitats are fully explored.

FUTURE WITHOUT-PROJECT CONDITIONS (NO ACTION ALTERNATIVE)

There may be an effect to Essential Fish Habitat if no action is taken. The existing seawall is deteriorating and has the potential to collapse in areas, resulting in erosion where sediment and debris may impact adjacent seagrass beds as well as encrusting organisms and scleractinian corals.

2.3.5. INVASIVE SPECIES

Florida has the second highest incidence of invasive species in the US. Three invasive marine animal species have been identified in the "Southern Florida" HUC code (30902) in the offshore areas per the USGS Non-Indigenous Aquatic Species Database (http://nas.er.usgs.gov/queries/default.aspx). Although this database does not list species in specific bays and estuaries in Florida, it is highly likely that the invasive species reported in offshore waters may also be inside of bay systems adjacent to offshore waters. With that potential, the following invasive species have been documented offshore of Miami-Dade County, and thus the potential exists for them to be found within Biscayne Bay.

- Lionfish – *Pterois volitans/miles*

The lionfish has been confirmed within the boundaries of Biscayne Bay with documented sightings within a few hundred feet of CGB Miami Beach (**Figure 2-18**).

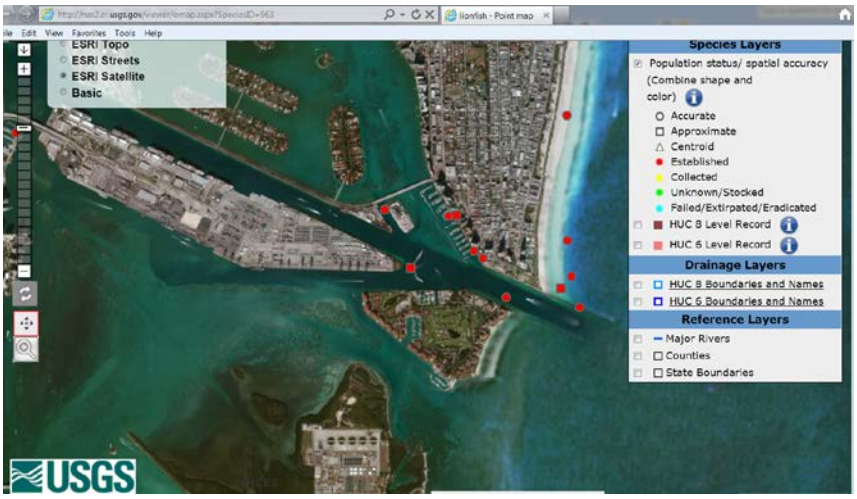

Figure 2-17 Reports of lionfish in SE Florida

- Asian Tiger Shrimp – *Penaeus monodon*

  Although the Asian tiger shrimp has not be reported in the database from Miami-Dade County, it is very likely to be present as it has been reported south in Monroe County and north in Broward and Palm Beach Counties (**Figure 2-19**).

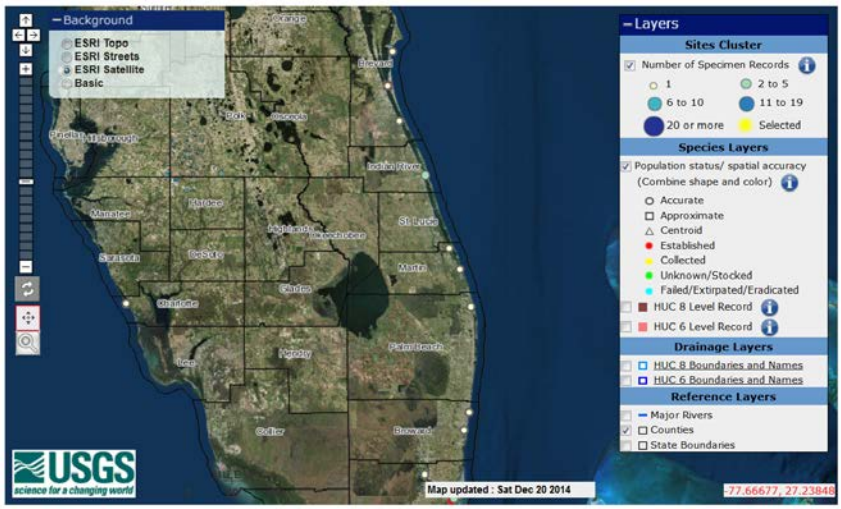

Figure 2-18 Reports of Asian Tiger Shrimp in SE Florida

- Fairy Basslet - *Gramma loreto*

  Although the fairy basslet has not been reported in the database from Miami-Dade County, it is very likely to be present as it has been reported south in Monroe County and north in Broward and Palm Beach Counties (**Figure 2-20**).

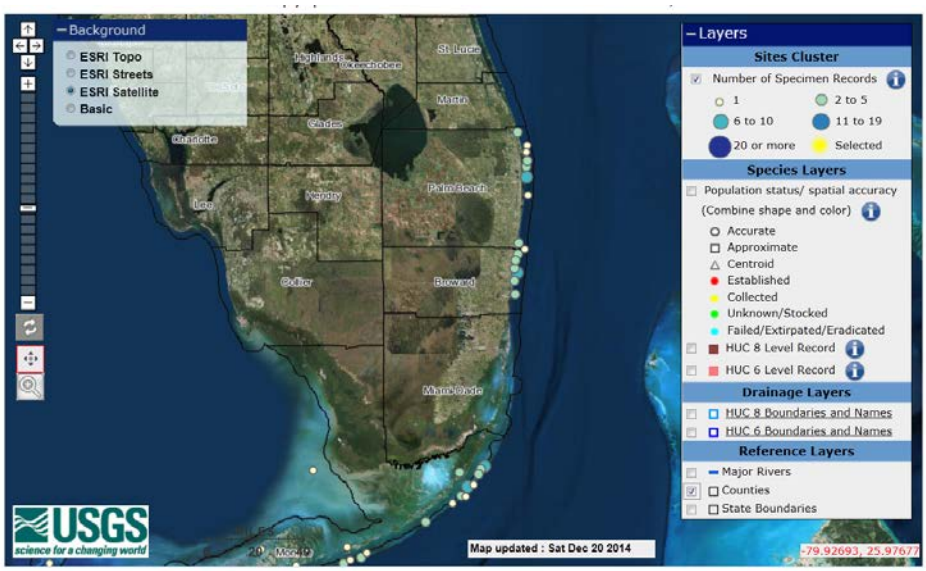

Figure 2-19 Reports of Fairy Basslet in SE Florida

FUTURE WITHOUT-PROJECT CONDITIONS (NO ACTION ALTERNATIVE)

There will be no effect to invasive species in the No Action alternative.

2.3.6. COASTAL BARRIER RESOURCES

There are no designated Coastal Barrier Resource Act Units located in the project area that would be affected by this project.

2.3.7. AIR QUALITY

Air quality within the project area is good due to the presence of either on or offshore breezes. Miami-Dade County is in attainment with the Florida State Air Quality Implementation Plan for all parameters, except for the air pollutant ozone. The County is in attainment for all EPA designated air quality parameters.

FUTURE WITHOUT-PROJECT CONDITIONS (NO ACTION ALTERNATIVE)

There will be no effect to air quality in the No Action alternative.

2.3.8. WATER QUALITY

The Mount Sinai Medical Center is located within the Biscayne Bay Aquatic Preserve. The preserve, which includes all of the waters of Biscayne Bay south to Biscayne National Park, was established in 1980 under Ch. 18-18, F.A.C. and is considered to be State-Owned Submerged Land under the jurisdictional authority of FDEP. All aquatic preserves in Florida are designated OFW. New construction, or other marine activities, cannot result in a degradation of water quality outside of specially designated mixing zones (Miami-Dade County 1999).

Turbidity is the major limiting factor in coastal water quality in South Florida. Turbidity is measured in Nephelometric Turbidity Units (NTU), which is a measure of light-scatter by particulates within the water. This measurement does not address the characteristics of the suspended material that create turbid conditions. According to Dompe and Haynes (1993), the two major sources of turbidity in coastal areas

are very fine organic particulate matter and sand-sized sediments that become re-suspended around the seabed from local waves and currents. Florida state guidelines set to minimize turbidity impacts from beach restoration activities confine turbidity values to less than 29 NTU above ambient levels outside the turbidity mixing zone for Class III waters.

Turbidity values are generally lowest in the summer months and highest in the winter months, corresponding with winter storm events and the rainy season, and are higher closer to shore (Gilliam et al. 2008; Dompe and Haynes, 1993; Coastal Planning & Engineering [CPE], 1989). Moreover, higher turbidity levels can generally be expected around inlet areas, and especially in estuarine areas, where nutrient and entrained sediment levels are higher. Although some colloidal material will remain suspended in the water column upon disturbance, high turbidity episodes usually return to background conditions within several days to several weeks, depending on the duration of the perturbation (storm event or other) and on the amount of suspended fines.

FUTURE WITHOUT-PROJECT CONDITIONS (NO ACTION ALTERNATIVE)

The existing seawall is deteriorating and has the potential to collapse in areas resulting in erosion where sediment may impact local water quality.

2.3.9. NOISE

Ambient noise is comprised of sounds from natural and manmade sources. Natural sounds include wind, rain, thunder, water movement such as surf, and wildlife. Sound levels from these sources are typically low, but can be pronounced during violent weather events. Sounds from natural sources are generally not considered undesirable. Ambient background noise in urbanized areas typically varies from 60 to 70 dBA, but can be higher; suburban neighborhoods experience ambient noise levels of approximately 45 to 50 dBA (USEPA 1974). In urbanized areas such as the location of the Mount Sinai hospital, noise sources may include emergency vehicles, i.e. ambulance, as well as helicopters landing at the hospital, in addition to recreational vessels transiting through Meloy channel.

Underwater ambient noise is comprised of sounds produced by a number of natural and anthropogenic sources. Natural noise sources can include wind, waves, precipitation, and biological sources such as shrimp, fish, and cetaceans. These sources produce sound in a wide variety of frequency ranges (Urick 1983; Richardson et al. 1995) and can vary over both long (days to years) and short (seconds to hours) time scales. In shallow waters, precipitation may contribute up to 35 dB to the existing sound level, and increases in wind speed of 5 to 10 knots can cause a 5 dB increase in ambient ocean noise between 20 Hz and 100 kilohertz (kHz) (Urick 1983). High noise levels may also occur in nearshore areas during heavy surf, which may increase low frequency (200 Hz – 2 kHz) underwater noise levels by 20 dB or more within 200 yards of the surf zone (Wilson et al. 1985).

The underwater acoustic environment adjacent to the Mount Sinai Hospital is likely to be dominated by noise from day-to-day vessel transits past the seawall by recreational vessels transiting Meloy Channel. During the proposed action, normal vessel transits are expected to continue, and noise contributions from these sources would remain at current levels.

FUTURE WITHOUT-PROJECT CONDITIONS (NO ACTION ALTERNATIVE)

There will be no effect as a result of noise in the No Action alternative.

2.3.10. CULTURAL RESOURCES

EXISTING CONDITIONS

The earliest widely accepted date of occupation by the aboriginal inhabitants of Florida dates from around 12,000 years ago (Milanich 1994). This cultural period, called the Paleo-Indian period, lasted until about 10,000 YBP (years before present). Sea level was lower and the continental shelves were exposed in an area almost twice the width of the current size of the state. Few Paleo-Indian archeological sites are recorded in South Florida.

During the Archaic period (ca. 10,000 YBP - ca. 2500 YBP), a wider range of resources was exploited and may have led to a more sedentary existence. Sea level rose to its present position. Few Archaic period archeological sites, such as the Cutler Ridge site (~9300 YBP) in Miami, are recorded in South Florida. Known sites are clustered along the Atlantic coast and inland waterways.

Regional cultural traditions within Miami-Dade County, known as the Glades culture; historically known as the Tequesta, developed from the Archaic period in South Florida around 2500 YBP. The Glades culture sequence (ca. 2500 YBP-A.D. 1513) produced a large number of sites, predominantly along the coasts, but also in the interior wetlands. Glades site types include shell and earth middens and low sand mounds.

During the early historic period, beginning with the first Spanish colonial period (A.D. 1513-1763), the Tequesta were the main tribal group that controlled southern Florida with a central village located on the Miami River. Their population was decimated by European-introduced diseases, warfare, enslavement, and migration out of Florida.

Present day coastal Miami-Dade County was virtually ignored by New World explorers like Ponce de Leon until the mid-seventeenth century when it became an important passage way for New World shipping. Many Spanish fleet ships wrecked in the vicinity. The *HMS Fowey*, a British war ship, sank in Biscayne Bay in 1748 on a reef now known as Fowey Rocks.

The Seminole and Miccosukee tribes migrated into this region of Florida in the 18th and 19th centuries from Georgia and Alabama to escape relocation attempts by the U.S. Army. American settlement in South Florida began in earnest in the late 19th century after Florida became a U.S. Territory in 1821. Settlers began moving into the Miami area by the 1830s. Fort Dade was constructed near Miami to protect settlers.

The city of Miami emerged in the late nineteenth century from Henry Flagler's Florida East Coast Railway that was constructed through the area. The Port of Miami boomed in the 1920s. In the 1940s, Miami served as a prominent training area for the U.S. Navy during World War II. By the 1950s, the population of the region had exploded and today Miami-Dade County's industry includes shipping, agriculture, commercial and sport fishing, and tourism.

The Miami-Dade property appraiser's records indicate that construction of the hospital complex begun in 1958. No impacts to the hospital buildings are anticipated. The northern section of the seawall was constructed circa May 1959, and the remaining extent (2,600 feet) of the seawall was constructed circa March 1967. The seawall was constructed following standardized construction design plans, and does not embody distinctive characteristics of a type, period, or method of construction. Consultation in accordance with Section 106 of the National Historic Preservation Act of 1966, as amended, and its

implementing regulations in 36 CFR Part 800: Protection of Historic Properties, will be coordinated with the Florida State Historic Preservation Office regarding the project. No recorded submerged or terrestrial archaeological sites exist along the seawall. The entire project footprint has been previously disturbed by construction.

FUTURE WITHOUT-PROJECT CONDITIONS (NO ACTION ALTERNATIVE)

There will be no effect to listed historic properties in the No Action alternative.

2.3.11. AESTHETIC AND RECREATION RESOURCES

Mount Sinai Hospital is located in the northeastern portion of Biscayne Bay adjacent to Meloy Channel. This area has high aesthetic value, with recreational and commercial vessels utilizing the Intracoastal Waterway and Meloy Channel.

Miami-Dade County is a heavily populated county on Florida's Atlantic Coast, which receives a tremendous volume of tourists, particularly during the winter months. Those beaches that can be accessed by the general public are heavily used year round. In the recent past, new developments have been required to build public beach access to allow the general public to utilize beaches which are in front of private condominiums. Additionally, a boardwalk has been built along Miami-Dade beaches allowing visitors greater access to beaches along the county.

Miami Beach has public access and receives heavy use by swimmers and sunbathers. Adjacent to these beaches are many condominiums and hotels used by long term and short-term visitors and residents of the area. Other water related activities within the project area include on-shore and offshore fishing, snorkeling, scuba diving, windsurfing, and recreational boating. Most of the boating activity in the area originates from either Bakers Haulover Inlet or Government Cut. Both offshore fishing and diving utilize the natural and artificial reefs located within and adjacent to the project area. Commercial enterprises along the beach rent beach chairs, cushions, umbrellas, and jet skis. Food vendors can also be found along the beach areas. The revenue generated by beachgoers supports a strong Miami Beach business district in the project vicinity.

The project will have a negligible effect on aesthetics because the project site has an existing facility. Construction will obscure the view of the waterway; however this will be temporary and therefore negligible to the public interest.

FUTURE WITHOUT-PROJECT CONDITIONS (NO ACTION ALTERNATIVE)

Effects to aesthetics could be negative in the project area if the existing seawall, or portions of it, collapse. Collapse would result in steel and concrete debris in the water, as well as eroded land.

2.3.12. HAZARDOUS AND TOXIC MATERIALS

There are no known hazardous or toxic materials within the project area.

FUTURE WITHOUT-PROJECT CONDITIONS (NO ACTION ALTERNATIVE)

No changes to the status of hazardous and toxic materials are expected in the future without project condition.

3. PLAN FORMULATION

3.1. PROBLEMS AND OPPORTUNITIES*

A problem is an existing undesirable condition to be changed. An opportunity is a chance to create a future condition that is desirable.

The purpose of this feasibility study is to develop an implementable and acceptable plan to change the future condition and address specific problems and opportunities in the study area. Problems and opportunities have been identified by the Project Delivery Team (PDT) in several ways, including coordination with the sponsor, site visits, and reports completed by private contractors.

3.1.1. PROBLEMS

Existing problems in the study area include:

- **Infrastructure is vulnerable to erosion. Further erosion will impact infrastructure key to hospital and emergency operation functions.**
  An existing seawall was constructed in several phases to prevent erosion of land. The existing seawall has been repaired in various locations, but the majority of the wall is in imminent threat of damage by natural erosion processes. Loss of portions of the seawall will result in sudden, extreme erosion impacting existing infrastructure.
- **The primary driver for current erosion problems is overtopping of the wall during extreme high tide events.**
  Overtopping allows material to migrate through cracks in the existing compromised seawall and be carried over the wall as the water recedes. Erosion also contributes to subsidence of land behind the wall. After extreme high tide events, standing water remains in subsided areas complicating and compromising hospital operations and patient health (life risk.) These complications would be exacerbated during disaster events (storms, hurricanes, etc.) where conditions would be worsened both by the natural event and by the increased use of hospital facilities as an emergency care facility and a disaster staging area.

3.1.2. OPPORTUNITIES

Opportunities are positive conditions in the study area that may result from implementation of a Federal project. Opportunities exist to:

- **Protect critical infrastructure vulnerable to erosion and maintain hospital and emergency operation functions.**
  Alternatives exist to prevent erosion and to protect critical infrastructure in place that may be more cost effective than relocating infrastructure. Critical infrastructure vulnerable to erosion includes the perimeter road and parking on the north and south ends of the hospital's waterfront.
- **Prevent current erosion drivers.**
  Such an alternative would prevent current erosion problems. It would not be designed to prevent all inundation of hospital property, but only the overtopping that occurs along the seawall and contributes to the overall erosion problem. Such an alternative would also include proper depth, or toe; protection to prevent erosion at the seabed from impacting critical infrastructure.

3.2 CONSTRAINTS

3.2.1 PLANNING CONSTRAINTS

A constraint limits the extent of the planning process. It is a statement of things or situations the alternative plans should avoid. Constraints are designed to avoid undesirable changes between the without and with-project future conditions. The planning constraints relative to this study are:

- **Maintain consistency with Federal laws.**
- **Maintain footprint of existing perimeter road.**
  A significant constraint is the need to maintain the configuration of the existing perimeter road, which encircles the mid-hospital property and traverses a significant portion of waterfront as shown in REF-1. Maintaining this configuration is essential for day-to-day hospital operations, as well as the hospital's function as a disaster staging area.
- **Maintain amount of existing parking.**
  All existing parking is necessary to medical center operations. The Mount Sinai Medical Center is the only hospital facility on the barrier island and maintains emergency services, shelter for electric and oxygen dependent persons, and care for critically ill patients during disasters. The center is also an Essential Services facility and a disaster coordination point. The primary service area of the center sees 5,000,000 annual visitors and has 125,000 permanent residents. Yearly, there are 22,000 inpatient admissions and 181,000 outpatient admissions. All parking facilities available on the hospital property are currently necessary to provide these services. Parking facilities on the bayside of the hospital property sit atop land abutted by a failing seawall and at risk of imminent damage. Loss of these facilities would negatively affect hospital operations, life safety, and the ability to provide essential public services.
- **Avoid or minimize impacts to future hospital operations.**
  This constraint would lead toward alternatives that would not impact hospital operations, especially emergency and disaster-related operations.

OBJECTIVES PLANNING OBJECTIVES

The following study objectives have been developed based on problems, opportunities, goals, and Federal and state objectives and regulations.

- **Protect the hospital's perimeter road and parking from erosion caused by current conditions.**
  Any alternative will be designed to prevent current erosion-causing conditions and, due to the emergency nature of the work, is not intended to specifically provide protection against future sea level rise. However, alternatives can be formulated to be adapted to future sea level rise.
- **Avoid or minimize environmental impacts.**
  If impacts cannot be avoided or minimized, they should be mitigated.
- **Avoid or minimize impacts to hospital operations during any alternative implementation.**

3.3.2. FEDERAL ENVIRONMENTAL OBJECTIVES

USACE strives to balance the environmental and development needs of the nation in full compliance with the National Environmental Policy Act (NEPA) and other authorities provided by Congress and the

Executive Branch. Therefore, significant environmental resources and values that would likely be impacted, favorably as well as adversely, by an alternative under consideration are identified early in the planning process. All plans are formulated to avoid, to the fullest extent practicable, any adverse impact on significant resources. Significant adverse impacts that cannot be avoided are mitigated as required by Section 906(d) of WRDA 1986.

This report is an integrated feasibility study and environmental assessment. As with a separate NEPA document, it discusses and documents the environmental effects of the recommended plan and summarizes compliance with Federal statutes and regulations.

3.4 SUMMARY OF MANAGEMENT MEASURES AND RELOCATION

Management measures are specific structural or nonstructural actions that would take place at geographical locations within the project areas.

Management measures were selected to accomplish at least one of the planning objectives. Both structural (S) and nonstructural (NS) measures were identified.

Structural measures modify the behavior of damage drivers. In this case, structural measures would modify the drivers causing erosion. Nonstructural measures are those that modify the damage susceptibility of infrastructure. Typically, this would include measures such as flood proofing, elevating, or relocation of infrastructure. Per ER 1105-2-100 Appendix F, Section III, F-23, the option of relocating threatened facilities must be considered and compared with alternatives in CAP Section 14 analysis. In this case, relocation is not considered a "measure" or "alternative" but a basis for cost comparison and alternative selection. Therefore, some measures that would typically be listed as "non-structural" are listed under "relocation."

3.4.1 NON-STRUCTURAL (NS)

NS-1: No Action
*Other measures that would typically be considered non-structural are considered under "Relocation."

3.4.2 STRUCTURAL (S)

S-1: Adding elevation to the existing seawall (concrete "lift" achieved by adding concrete, sandbags, stone, wood, or other material).
S-2: Revetment on waterside of the existing seawall to existing elevation.
S-3: Revetment on waterside and on top of the existing seawall to higher elevation.
S-4: Sheetpile (vinyl, steel, or other material) placement on the waterside of the existing seawall to existing elevation.
S-5: Sheetpile (vinyl, steel, or other material) placement on the waterside of the existing seawall to higher elevation.
S-6: Sheetpile (vinyl, steel, or other material) placement on landside of existing seawall to existing elevation with an erosion prevention measure placed on the land behind seawall.
S-7: Sheetpile (vinyl, steel, or other material) placement on the landside of the existing seawall to higher elevation.
S-8: Erosion prevention material placed on the land behind the seawall.

Figure 3-1 shows a graphic depiction of structural measures.

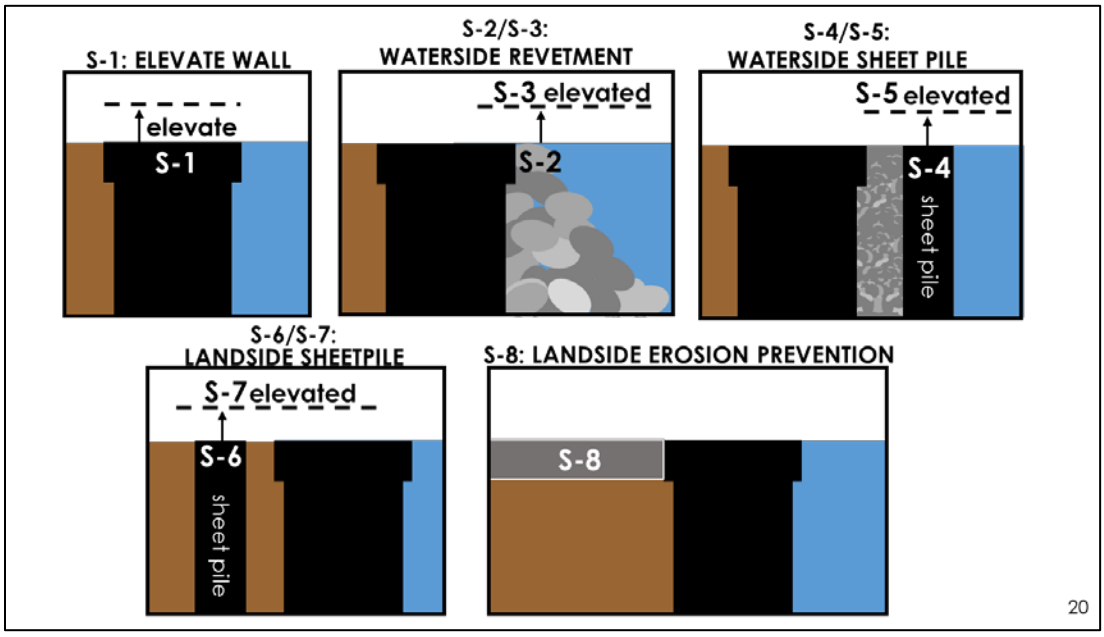

Figure 3-1: Graphic depiction of structural measures considered.

3.4.3 PRELIMINARY SCREENING

Table 3-1 shows the preliminary screening of the management measures against the study objectives and constraints. Each measure is rated as to how well it meets objectives and avoids constraints on a scale of zero to two. The average of the ratings is then taken, and if a measure scores a minimum ranking of seven, it meets at least half of the project goals and is carried forward. If a measure is ranked less than seven, it is screened out.

The management measures were evaluated and rated in Table 3-1 for their potential to accomplish objectives given constraints: 0 = does not meet criteria, 1 = partially meets criteria, and 2 = fully meets criteria. If the total rating equals a number greater than 6, the measure partially meets, at least, half of the objectives given constraints and is carried forward for further analysis. If the total rating is equal to or less than 6, the measure is not considered further. The final total rating should not be inferred to be a ranking of measures against one another. A measure's rating is only an indication of how likely it is to meet objectives given constraints and therefore carried forward or not. S-6 was screened out as a result of this first screening.

Table 3-1: Management measure initial screening.

	Measures	Planning Objectives			Planning Constraints			Local Constraints		
		Protect Critical Infrastructure Vulnerable to Erosion	Avoid or Minimize Environmental Impacts	Avoid or Minimize Impacts to Hospital Operations During Any Alternative Implementation.	Consistent with Federal Laws	Maintain Footprint of Existing Perimeter Road	Maintain Existing Parking	Avoid, or Minimize, Impacts to Future Hospital Operations	Total	Measure Carried Forward (Yes/No)
	Nonstructural Measures (NS)									
NS-1	No-Action	Continued potential for significant impacts to infrastructure.	Potential loss of environmental rescources as existing seawall fails, causing erosion and covering of seafloor resources with soil and debris.	No impact for implementation.	Consistent with federal law.	Loss of footpring of existing perimeter road as existing seawall fails.	Existing parking will be reduced as existing seawall fails.	Hospital operations will be impacted during exteme high tide events and will be impacted as existing seawall fails.		
		0	1	2	2	0	0	0	5	No-Action carried forward for baseline comparison.
	Structural Measures (S)									
S-1	Adding elevation to existing seawall (concrete lift, sandbags, stone, wood, or other material)	Would likely be least costly but requires dependence on structural integrity of existing seawall to support weight of added elevation. Does not alleviate erosion of fill through or under the existing seawall.	Potential loss of environmental rescources as existing seawall fails, causing erosion and covering of seafloor resources with soil and debris.	Could be fastest alternative to implement.	Consistent with federal law.	Maintains footprint of existing perimeter road until erosion through or under the existing seawall causes seawall failure or the seawall collapses under added weight.	Maintains existing parking until erosion through or under the existing seawall causes seawall failure or the seawall collapses under added weight. This would cause a loss of fill behind the seawall impacting existing parking.	Could minimize impacts to operations. However, as erosion continues through and under existing seawall operations would be affected as existing seawall fails.		
		0	1	1	2	1	1	1	7	Yes
S-2	Revetment on waterside of existing seawall to existing elevation.	Could support existing seawall and prevent failure. Would not prevent loss of material over existing seawall. Structure would need to be designed to be completely submerged during extreme high tide events.	Slope of waterside face would impact a large footprint of the seabed, impacting seagrass and other resoucres.	Construction would likely involve stone placement and have some impact on operations.	Consistent with federal law.	Would not prevent extreme high tide events from inundating property. Structure may prevent most inundation induced erosion but some erosion could still occur landward of seawall, impacting the perimeter road.	Would not prevent extreme high tide events from inundating property. Structure may prevent most inundation induced erosion but some erosion could still occur landward of seawall, impacting existing parking.	Would not prevent extreme high tide events from inundating property. Structure may prevent most inundation induced erosion but some erosion could still occur landward of seawall, impacting operations.		
		1	0	1	2	1	1	1	7	Yes
S-3	Revetment on waterside and on top of existing seawall to higher elevation.	Could support existing seawall and prevent failure. However, design still relies on existing seawall to partially support rock placed on top of it.	Slope of waterside face would impact a large footprint of the seabed, impacting seagrass and other resoucres.	Construction would likely involve stone placement and have some impact on operations.	Consistent with federal law.	If existing seawall fails under added weight, erosion could still impact existing perimeter road.	If existing seawall fails under added weight, erosion could still impact existing parking.	If existing seawall fails under added weight, significant impacts to operations could occur as structure is modified/repaired.		
		1	0	1	2	1	1	1	7	Yes
S-4	Sheetpile (vinyl, steel, or other material) placement on waterside of existing seawall at existing elevation.	Could prevent all current erosion problems. However, structure and materials would need to be designed to be completely submerged during extreme high tide events.	Relatively small footprint due to vertical construction minimizing potential environmental impacts.	Construction would likely require both land and water access for pile driving and have some impact on operations.	Consistent with federal law.	Should maintain footprint of existing perimeter road depending. However, structure would not prevent overtopping of seawall and any related issues.	Should maintain footprint of existing parking. However, structure would not prevent overtopping of seawall and any related issues.	Since measure would be inundated during extreme high tide events, future maintenance may be required impacting operations.		
		2	2	1	2	1	1	1	10	Yes
S-5	Sheetpile (vinyl, steel, or other material) placement on waterside of existing seawall to higher elevation.	Would prevent all current erosion problems.C24	Relatively small footprint due to vertical construction minimizing potential environmental impacts.	Construction would likely require both land and water access for pile driving and have some impact on operations.	Consistent with federal law.	Maintains footprint of existing perimeter road.	Maintains existing parking.	All current erosion problems are addressed and maintenance should be minimal, minimizing impacts to operations.		
		2	2	1	2	2	2	2	13	Yes
S-6	Sheetpile (vinyl, steel, or other material) placement on landside of existing seawall at existing elevation..	Could prevent all current erosion problems. However, structure and materials would need to be designed to be completely submerged during extreme high tide events.	Driving sheetpile on landside of existing seawall raises serious concerns with existing seawall failure. Failure of wall may cause collapse and burial of environmental resources.	Construction behind wall could be complicated without complete as-builts of existing wall. Any tiebacks of existing wall would be severed as new sheetpile is driven. Impacts to hospital operations could be lengthy depending on complexity of construction.	Consistent with federal law.	Should maintain footprint of existing perimeter road depending on how far landward piles must be driven. However, structure would not prevent overtopping of seawall and any related issues.	Should maintain footprint of existing parking depending on how far landward piles must be driven. However, structure would not prevent overtopping of seawall and any related issues.	Without as-builts of the existing seawall, it is unknown what impacts to operations could be as a result of impacting existing drainage or utilities behind wall.		
		1	0	0	2	1	1	1	6	No
S-7	Sheetpile (vinyl, steel, or other material) placement on landside of existing seawall to higher elevation.	Would prevent all current erosion problems.	Driving sheetpile on landside of existing seawall raises serious concerns with existing seawall failure. Failure of wall may cause collapse and burial of environmental resources.	Construction behind wall could be complicated without complete as-builts of existing wall. Any tiebacks of existing wall would be severed as new sheetpile is driven. Impacts to hospital operations could be lengthy depending on complexity of construction.	Consistent with federal law.	Should maintain footprint of existing perimeter road depending on how far landward piles must be driven.	Maintains existing parking.	Without as-builts of the existing seawall, it is unknown what impacts to operations could be as a result of impacting existing drainage or utilities behind wall.		
		2	0	0	2	1	2	1	8	Yes
S-8	Erosion prevention measure (fabric, rip-rap, or other material) constructed on land behind existing seawall.	Would prevent erosion of surface soil. Would not prevent loss of material through/under existing seawall. Would need to be designed to be completely submerged during extreme high tide events.	Would be no environmental impacts to sea floor. Potential environmental impacts to resources along top of seawall.	Construction footprint would span area between perimeter road and existing seawall top and have some impact on operations.	Consistent with federal law.	Should maintain footprint of existing perimeter road depending on erosion prevention measure placed behind seawall.	Would not prevent eventual collapse of portions, or all, of existing wall. Existing parking will be reduced as existing seawall fails.	Since measure would be inundated during extreme high tide events, future maintenance may be required impacting operations.		
		1	1	1	2	1	0	1	7	Yes

Measure carried forward for further analysis
Measure eliminated
2 - Fully meets objective/avoids constraint
1 - Partially meets objective/avoids constraint
0 - Does not meet objective/avoids constraint

3.4.4 SECONDARY SCREENING

The remaining measures were discussed in detail by the Project Development Team (PDT) to evaluate their merit for further consideration, as described in the following paragraphs.

NS-1: No Action

The No Action measure would consist of no participation by the Federal government in an alternative to protect vulnerable facilities. Under this measure, erosion would continue and extreme high tide events would continue to inundate the existing seawall, driving , and ultimately the failure of portions, or all, of the wall. Such failure would impact the perimeter road and vulnerable parking, negatively affecting the daily operations of the medical center, limiting access to hospital facilities, and potentially causing life risk. Furthermore, if failures occurred during extreme events necessitating activation of emergency disaster services, the center's function as an Essential Services facility and disaster coordination point could be severely impacted.

S-1: Adding elevation to the existing seawall (concrete lift, sandbags, stone, wood, or other material.)

As described in Table 3-1, this measure is likely the least costly and easiest to implement. However, due to visible deterioration, and existing sections where the seawall is failing, the structure cannot reliably support the additional weight of materials used to increase the seawall height. Furthermore, the measure would not prevent the erosion of material through the existing wall, and is unlikely to reduce the risk of failure. However, there is one span of the existing seawall where this measure could be implemented. The 130 ft. section of seawall in front of the Golden Medical office building (see **Figure** 1-2) was newly constructed in 1990 to an elevation equivalent to the remaining wall. This newer section can support increased height. This measure will be carried forward for the 130 ft. newly constructed seawall section.

S-2: Revetment on the **waterside** of the existing seawall to existing elevation.

This measure would be constructed of stone, likely granite or limestone. The footprint of a revetment would be significantly larger than a measure constructed vertically. The revetment footprint would cover a larger area of the seafloor, likely impacting more environmental resources than a measure such as sheetpile. Due to these reasons, this measure was screened out.

S-3: Revetment on the **waterside** and on top of the existing seawall to higher elevation.

Considerations are similar to S-2. While this measure would have added erosion prevention due to its higher crest elevation, the potential negative environmental impacts compared to other measures, such as sheetpile, led to screening it out.

S-4: Sheetpile (vinyl, steel, or other material) placement on **waterside** of existing seawall at existing elevation.

Depending on the material used, this measure could be cost prohibitive within the CAP project limit. The amount of construction that can be land based rather than water based will have a significant impact on cost. Sheetpile provides benefits over other measures due to its limited, or negligible, environmental impact, depending on the location of resources. This measure would not address erosion due to overtopping and would need to be combined with an erosion prevention structure (S-8) to prevent the erosion of land behind the seawall. Additionally, the measure would need to be constructed with the

intent of being periodically submerged during extreme high tide events, likely increasing cost and the necessity for O&M. Due to these factors, the measure was screened out.

S-5: Sheetpile (vinyl, steel, or other material) placement on the **waterside** of the existing seawall to higher elevation.

Depending on the material used, this measure could be cost prohibitive within the CAP project limit. The amount of construction that can be land based rather than water based will have a significant impact on cost. Given the likely minimal cost increase to add elevation to the sheetpile, this measure is preferable to S-4 since it would not require an erosion prevention measure behind the wall and would prevent inundation of the structure, as well as erosion resulting from material being carried back over the wall as inundation waters recede. Given the effectiveness of the measure and minimal, or no, environmental impact, this measure is preferable to others and was carried forward.

S-7: Sheetpile (vinyl, steel, or other material) placement on the **landside** of the existing seawall to higher elevation.

This measure could minimize or eliminate environmental impacts to seafloor resources. Depending on the material used, this measure could be cost prohibitive within the CAP per project limit. The amount of construction that can be land based rather than water based will have a significant impact on cost. This measure would prevent inundation of the structure as well as erosion resulting from material being carried back over the wall as inundation waters recede. However driving piles on the landside of the existing seawall may have construction complications related to tiebacks and/or service lines buried behind the existing wall. Such features would need to be located prior to construction and removed/relocated. Due to these factors, this measure was eliminated.

S-8: Erosion prevention material on the land behind the seawall.

This measure would involve placement of small size rip-rap, fabric, or some other form of prevention material on the land behind the existing seawall. In order to fully address erosion issues, the measure would need to be used in combination with S-2 or S-4. This measure also has the potential to add weight, depending on the material used, to the landward side of the existing seawall. Additional load on the land behind the wall could increase likelihood of failure of portions of the existing wall. Using this measure in combination with others could complicate construction when the S-5 measure would address all erosion-causing conditions without added complication. Due to this consideration, this measure was eliminated.

Table 3-2 summarizes the secondary screening.

Table 3-2: Secondary screening of managment measures. NS-1 (No Action) is carried forward for baseline comparison.

Measure		Discussion	Carry Forward?
S-1	Add elevation to existing seawall.	Only applicable for 130 ft of newer existing wall.	Yes
S-2	Waterside revetment to existing elevation.	Large env. impact footprint. Footprint extends approx. 18' from wall. Seagrass begins 6' from wall. Does not fully address erosion.	No
S-3	Waterside revetment to higher elevation.	Large env. impact footprint compared to S-5. Footprint extends approx. 18' from wall. Seagrass begins 6' from wall.	No
S-4	Waterside sheet pile to existing elevation.	Does not fully address erosion and must be constructed to be submerged.	No
S-5	Waterside sheet pile to higher elevation.	Fully addresses erosion with likely minimal cost increase to S-4.	Yes
S-7	Landside sheet pile to higher elevation.	Potential construction complications: existing seawall tiebacks and service lines would need to be removed and relocated.	No
S-8	Erosion prevention material on land behind seawall.	Must be used in combination with S-2 or S-4 to fully address erosion resulting in added complication compared to increasing elevation. Added load on land behind seawall may cause seawall impacts/collapse.	No

3.4.5 MEASURES CARRIED FORWARD

Adding elevation to the existing seawall (S-1), sheetpile placement on the waterside of the existing seawall to higher crest elevation (S-5), and No Action (NS-1), were the measures carried forward for alternative development and comparison with Relocation.

3.4.6 RELOCATION

3.4.6.1 RELOCATION OF PERIMETER ROAD

The barrier island on which the Mount Sinai Medical Center is located is very densely developed. Real estate prices nearby are some of the highest in the nation. Opportunities to relocate the perimeter road do not exist. Onsite relocation would require the demolition of patient care buildings or operations infrastructure. Offsite relocation would be subject to costly real estate limitations, but also unfeasible due to the need to maintain the perimeter road in its current location and configuration which encircles the mid-hospital property and traverses a significant portion of waterfront. The current road configuration provides first responders with quick, efficient access to the emergency room and helipad, and provides correct dimensions for fire rescue apparatus. The current configuration along the seawall serves to separate pedestrian and vehicular traffic, which provides for a safer environment for pedestrians and minimizes traffic congestion. Due to these factors, vertical relocation of the perimeter road is the only relocation measure available. Vertical relocation options considered include:

- Vertical relocation of the perimeter road on piles.
- Vertical relocation of the perimeter road on an elevated berm.

Vertically relocating the perimeter road on an elevated berm is more economical than elevating the road on piles. Therefore, vertical relocation on piles was screened out. Only the section of road adjacent to Biscayne Bay would require elevation (approximately 1,000 feet), with appropriate transitions to/from existing grade. Given the proximity of the road to the existing seawall in this section, elevating the road on a berm would create an additional load on the existing wall. Therefore some form of support would need to be constructed on the waterside of the existing seawall, to prevent the wall from collapse during or after construction.

3.4.6.2 RELOCATION OF VULNERABLE PARKING

All existing parking is essential, not only to provide services to the public for normal and emergency operations, but also for employee parking. The Mount Sinai Medical Center is the only hospital facility on the barrier island and maintains emergency services, shelter for electric and oxygen dependent persons, and care for critically ill patients during disasters. The center is also an Essential Services facility and a disaster coordination point. The primary service area of the center sees 5,000,000 annual visitors and has 125,000 permanent residents. Yearly, there are 22,000 inpatient admissions and 181,000 outpatient admissions. The hospital sees approximately 55,000 annual emergency room visits and has 3,700 employees. Approximately 75% of patients come from outside of the city so there is a large influx of vehicles, currently using 93% of the facility's parking capacity. Construction of new facilities (**Figure 1-2**) will remove a significant portion of the current surface parking lot, while at the same time increasing patient volume, and perhaps increasing the need for additional employees, thereby creating a deficit in available parking. To meet this demand, the hospital will be constructing their own onsite parking garage.

Parking relocation options considered:

- Offsite parking within walking distance of hospital facilities.
- Offsite parking, in existing or new construction, with shuttle service to hospital facilities.
- Parking constructed onsite.

The hospital evaluated the potential to develop offsite parking and found that the cost of procuring additional land would likely be prohibitive if it existed. Miami Dade County Property Appraiser lists the median price of vacant land as $234 per square foot ($20-million for 300 square feet). However, there is not any properly zoned vacant commercial land near Mount Sinai that is available to purchase.

Offsite parking with shuttle service was also assessed by the hospital. The closest parking garages are between 1 and 3 miles from the hospital with daily rates ranging from $8 - $20. Based on these rates, the cost to park 250 employees would range from $520,000-$1,250,000 annually, assuming that the necessary parking volume was available. Additional shuttle operational costs would be at least $300,000 a year. These costs were deemed prohibitive.

Based on these factors, it was determined that any vulnerable parking would be relocated to a new parking garage located on hospital property.

3.4.6.3 RELOCATION PLAN

The Relocation plan therefore consists of vertical relocation of the perimeter road adjacent to Biscayne Bay with constructed support for the portion of the existing seawall adjacent to the elevated road. Relocation also includes the relocation of vulnerable parking to a new parking garage constructed on the medical center property.

3.5. ALTERNATIVE DEVELOPMENT

Adding elevation to the existing seawall (S-1), sheetpile placement on the waterside of the existing seawall to higher elevation (S-5), and No Action (NS-1), were the measures carried forward for alternative development and comparison with Relocation. No Action is maintained for comparison purposes. S-1 and S-5 were scaled and combined to formulate Alternative 1 and Alternative 2.

3.5.1. DESIGN ELEVATION DETERMINATION (STRUCTURE CREST AND VERTICAL ROAD RELOCATION)

A key design factor of Alternatives 1 and 2 is the crest elevation necessary to prevent current erosion-causing conditions. This same elevation will be used as the height to which the vulnerable portion of the perimeter road should be vertically relocated. The Engineering Appendix provides full details on determination of the design crest elevation. In summary:

- Height of existing seawall is approximately 2.5 feet (NAVD88)
- Extreme high tide events overtop the seawall by approximately 1 foot; gage measured still water level.
- An additional 0.5 feet should be added to prevent overtopping by waves along the bayside.
- Therefore a crest elevation increase of 1.5 feet should be added to the existing wall.
- This results in a design crest elevation of 4 feet (NAVD88).
- This increase is designed to prevent existing erosion-causing conditions, and does not account for future sea level rise.

3.5.2. ALTERNATIVE 1

Alternative 1 includes the S-5 steel sheet pile driven on the waterside of the entire alignment of the existing seawall to an elevation of 4.0 feet NAVD88. The total length of the new sheetpile would be 3,200 feet, driven to a depth of 16 feet, with a 3 foot offset between it and the existing wall. The three foot offset is necessary for workers to reconnect any drainage system or utilities between the new and existing walls. The three foot offset will be filled with stone. At the northeast end of the driven sheetpile, a modification to S-1, adding elevation, will be added; a T-wall will tie-in and continue landward to the 3.5 foot contour to prevent flanking of the seawall. **Figure 3-2** depicts Alternative 1 in plan view. Construction is expected to take 266 calendar days.

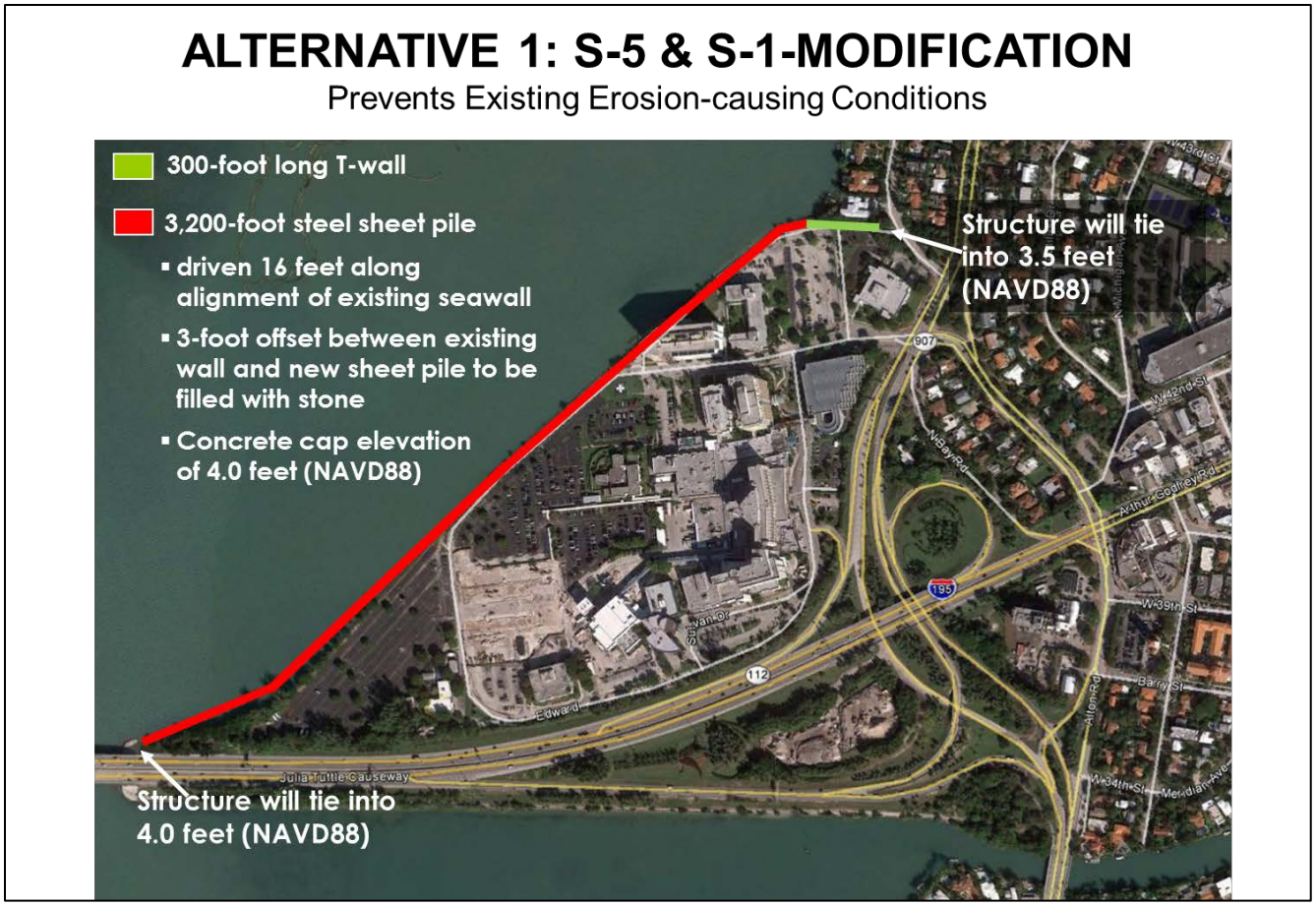

Figure 3-2: Alternative 1.

3.5.3. ALTERNATIVE 2

Alternative 2 is very similar to Alternative 1. However, it was determined that the 130 foot section of seawall constructed in 1990 was in an acceptable condition to support the weight of added concrete to increase its elevation. Therefore Alternative 2 will not drive sheetpile seaward of the section of existing seawall and instead will add a 1.5 foot concrete lift on top of the existing seawall. **Figure 3-3** depicts Alternative 2 in plan view. Construction will take less than the 266 days required for Alternative 1.

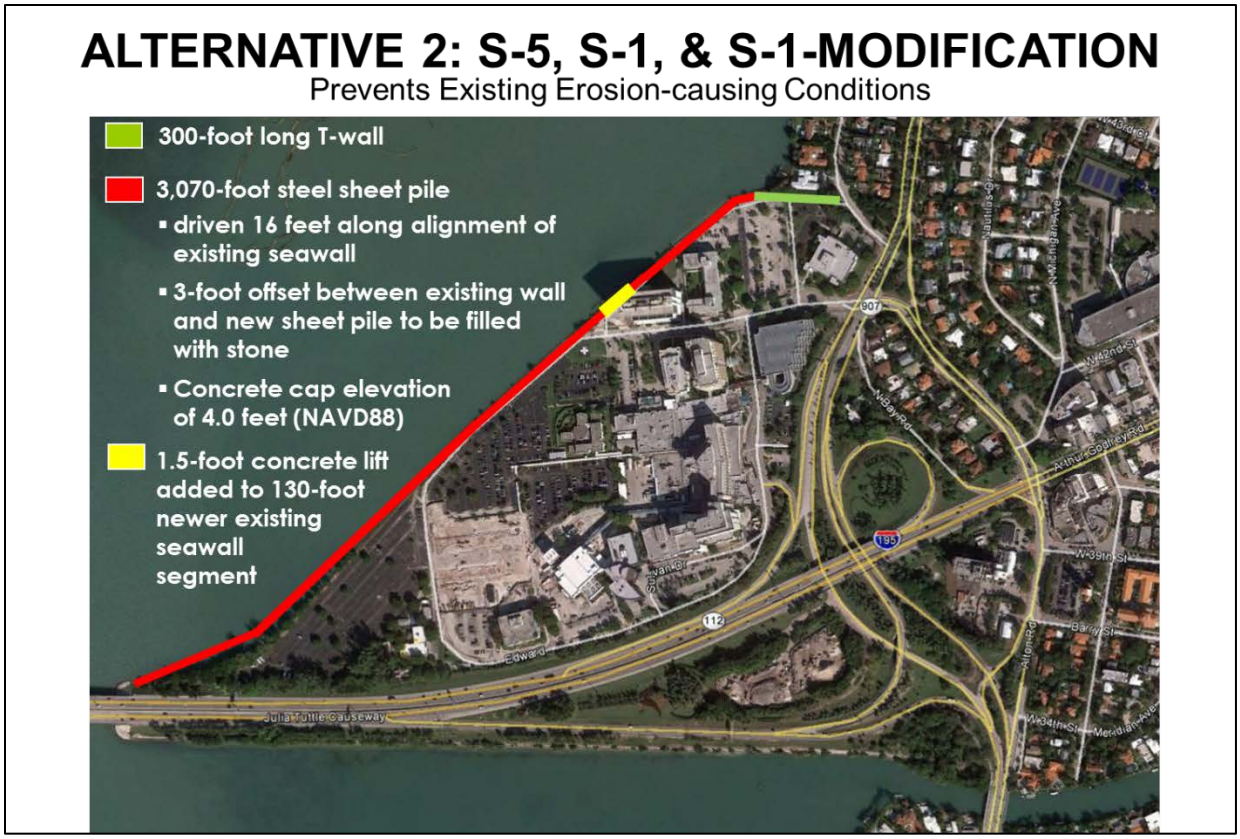

Figure 3-3: Alternative 2.

Per ER 1105-2-100 Appendix F, Section III, F-23**, the least cost alternative plan is considered to be justified if the total costs of the proposed alternative are less than the costs to relocate the threatened facility.**

3.6. ENVIRONMENTAL EFFECTS OF ALTERNATIVES

This section is the scientific and analytic basis for the comparisons of the alternatives: No Action, Alternative 1, and Alternative 2. The following includes anticipated changes to the existing environment including direct, indirect, and cumulative effects.

3.6.1. GENERAL ENVIRONMENTAL EFFECTS

Due to contracting laws requiring open competition, USACE cannot limit which construction methodology may be used for the seawall construction. For the seawall construction, either vibratory or impact hammers will be used, and the impact assessment for pile driving associated with seawall construction is based on impact hammer driven piles, as these tend to result in the greatest pressure being released into the water. The vibratory pile driver or hammer would generate a lower level of sound or vibration through a series of lower impact blows. For the purposes of impact analysis, the construction timeframe is assumed to be 266 calendar days.

3.6.2. VEGETATION

3.6.2.1. ALTERNATIVE 1

USACE has determined that Alternative 1 would result in minor impacts, less than 0.05 acres, to seagrass beds. Although this project would be constructed in accordance with Section 14 of the 1946 Flood Control Act, as amended - Streambank and Shoreline Erosion Protection of Public Works and Non-Profit Public Services, its construction will also be consistent with Nationwide Permit 3 (NWP), 33 CFR 320.4, and 40 CFR Part 230. Activities authorized by this NWP may result in the loss of small amounts of wetlands. Seagrass beds are considered to be a type of saltwater wetlands (NOAA 2004). USACE would require, and thus would be compliant with General Condition 23 of Nationwide Permits, that the proposed work avoid and minimize impacts to seagrass beds. Also in accordance with this condition, compensatory mitigation at a minimum one-for-one ratio will be required for all wetland (seagrass) losses resulting from the proposed work that exceed 0.10 acres. Additional seagrass surveys within the project footprint would be performed before and after construction, and this information would be coordinated with the appropriate regulatory agencies. The project was assumed to be constructed from the shoreside for cost engineering purposes, however, if a contractor proposes to construct from the waterside, temporary impacts to seagrasses adjacent to the seawall may occur when the legs from a spud barge are placed on the bottom. These impacts are assumed to be temporary in nature and discountable in size as the spudding down will not change the bottom elevation in a manner that would prevent recolonization of seagrasses into the footprints of the spud feet.

Trees and underbrush found in Area 1 (Tree Nos. 1-11) at the northern most end of the seawall, are densely packed and will likely be removed during demolition and reconstruction activities. The seawall at this location has suffered significant damage and deterioration. Trees found in Area 2 (Tree Nos. 12-30) represent landscaping plantings that are maintained and were part of the overall facility landscaping along sidewalks and benches. As such, landscape materials abut the seawall; consequently, any demolition and reconstruction efforts will destroy most of such plantings. Trees found in Area 3 (Tree Nos. 31-50) were mostly trees planted as part of landscaping and are spaced apart from each other. Most of these trees are approximately 10 feet from the seawall and, depending on demolition and construction methods, may be saved. However, this will not be known until project design is completed. Trees found in Area 4 (Tree Nos. 51-68) are densely packed with underbrush and debris floated in by tides and storm events, and will likely be removed during demolition and reconstruction activities.

3.6.2.2. ALTERNATIVE 2

Effects would be similar to Alternative 1. However, as previously stated, the 130 foot section of seawall constructed in 1990 is in good enough condition to support the weight of added concrete to increase its elevation. Therefore, no sheet pile would be placed adjacent to this section of the wall.

3.6.3. THREATENED AND ENDANGERED SPECIES

3.6.3.1. SEA TURTLES

3.6.3.1.1. Alternative 1

Sea turtles may be affected by being temporarily unable to use the site due to potential avoidance of construction activities and related noise, and physical exclusion from areas contained by turbidity curtains (if utilized), but these effects are insignificant and temporary. Disturbance from construction activities and related noise will be intermittent and only occur during the day for part of the construction period;

turbidity curtains will only enclose small areas at any one time in the project area, will be removed upon project completion, and will not appreciably interfere with use of the area by listed species. Additional avoidance and minimization measures include adhering to the NMFS' "Sea Turtle and Smalltooth Sawfish Construction Conditions." Although seagrass and other soft bottom habitats will be impacted, USACE does not anticipate that the proposed project will have any adverse indirect effects on sea turtles in the vicinity of the action area. These habitats may be utilized by the species, however, loss of seagrass habitats is relatively small with respect to overall seagrass abundance throughout the area.

Replacement of the seawall will result in the temporary loss of foraging habitat that has encrusted the face of the existing structure. This impact is temporary, since the newly constructed seawall will recolonize with the same types of encrusting plants and organisms over time.

Acoustic impact criteria and thresholds were developed in cooperation with NMFS for sea turtle exposures to various sound sources. Only one criteria applicable to sound produced by pile driving exists for sea turtles. The NMFS threshold value for onset of injury to sea turtles due to both impact pile driving and vibratory pile driving is 190 dB re 1 µPa sound pressure level root mean square. This criteria was developed in cooperation with NMFS and is not based on experimental evidence of injuries caused to sea turtles by pile driving sound, but was adopted from pinniped thresholds as a precautionary measure when addressing impacts from pile driving to sea turtles. In the absence of reliable in-water density data for sea turtles, this criterion is useful for qualitatively assessing activities that impart sound to water.

Sound levels from pile driving are not expected to reach the 190 dB re 1 µPa sound pressure level root mean square threshold (**Table 3-3**).

Table 3-3: Source Levels for Pile Driving

Hammer	Pile type	RMS [dB re 1µPa at 10m]	SEL [dB re 1µPa2s at 10m]
Vibratory	24" steel pipe	163	-
	12" timber	153	-
Impact	24" steel pipe	189	179
	12" timber	170	160

Because of this, no injuries associated with the sound produced by pile driving are anticipated for any species of sea turtle; however this does not preclude behavioral effects. As a precautionary measure against possible behavioral effects, a sea turtle and manatee shutdown zone of 50 feet (15 meters) will be observed. If a sea turtle approaches or enters the shutdown zone, pile driving will cease and will not resume until the animal has moved out of the area. Based on the protective radius around the seawall construction activities, and the determination that sound levels are not expected to reach the impactive levels previously set by NMFS, USACE believes that construction of the proposed work may affect, but is not likely to adversely affect, the threatened and endangered sea turtles as defined by the ESA.

3.6.3.1.2. Alternative 2

Effects for the partial replacement of the seawall at the facility will be similar in nature to the effects for replacement of the entire seawall as described above, however, construction would not take as long.

3.6.3.2. MANATEES

3.6.3.2.1. Alternative 1

Utilization of pile driving to replace the sheet pile seawall may have an effect on manatees in the area. Both the pressure and noise associated with pile driving can impact marine mammals.

The two tables below were recreated from USN 2013 (**Table 3-4**, **Table 3-5**). They detail representative pile driving sound pressure levels measured from 24" steel pipe piles, 24" wide steel sheet piles, and 12" timber piles. Sources are indicated by footnotes in the relevant tables.

Table 3-4: Underwater sound pressure levels during vibratory installation based on in situ monitored construction activities.

Project and Location	Pile Size and Type	Water Depth	Range to Pile	RMS	Peak	Sediment
Portage Bay, WA[b]	24 inch steel Pipe	3-7m	10m	157	170	Unknown
Berth 23 Port of Oakland, CA[c]	24 inch steel sheet pile	6.1m	10m	163	177	Unknown
Berth 30 Port of Oakland, CA[c]	24 inch steel sheet pile	4.9m	10m	162	175	Unknown
Berth 35/37 Port of Oakland, CA[c]	24 inch steel sheet pile	6.1m	10m	163	177	Unknown
Port Townsend Ferry, WA[d]	12 inch timber Pile	10m	10m	153	167	Unknown
Sound levels expressed as dB re 1 µPa rms and dB re 1 µPa peak for RMS and Peak SPL measurements, respectively.						

Sources: a – Illingworth & Rodkin 2012; b- Washington Department of Transportation 2010; c- California Department of Transportation 2009; d – Washington Department of Transportation 2010a

Table 3-5: Underwater sound pressure levels during impact installation based on in situ monitored construction activities.

Project and Location	Pile Size and Type	Water Depth	RMS	Peak	SEL	Sediment
Friday Harbor Ferry Terminal, WA[a]	24-inch steel sheet pile	12.8m	170	183	180	Sandy silt / clay
		13.4m	186	205	179	
		14.3m	186	204	179	
		10m	194	210	185	Sandy silt / rock
		10m	195	215	187	
		10m	193	212	184	
Typical values, CALTRANS compendium summary table[b]	24-inch steel sheet pile	15m	194	207	178	Unknown
Berth 23 Port of Oakland[b]	24-inch steel sheet pile	12 to 14m	189	205	179	Unknown
Sound levels expressed as dB re 1 µPa rms and dB re 1 µPa peak for RMS and Peak SPL measurements, respectively.						

Sources: [a]WSDOT 2005; [b]CALTRANS 2009

USFWS has not set levels defining harassment of manatees under the MMPA. However, under the MMPA, NMFS has defined levels of harassment for marine mammals. Level A harassment is defined as "any act of pursuit, torment, or annoyance which has the potential to injure a marine mammal or marine mammal stock in the wild." Level B harassment is defined as "Any act of pursuit, torment, or annoyance which has the potential to disturb a marine mammal or marine mammal stock in the wild by causing disruption of behavioral patterns, including but not limited to migration, breathing, nursing, breeding, feeding or sheltering." Current NMFS practice regarding exposure of marine mammals to pile driving noise is that cetaceans exposed to impulsive sounds at or above 180 re 1 µPa rms are considered to have been taken by Level A (i.e., injurious) harassment.

Behavioral harassment (Level B) is considered to have occurred when marine mammals are exposed to impulsive noise from impact pile driving at or above 160 dB re 1 µPa rms, and for non-impulsive noise from vibratory pile driving at or above 120 dB re 1 µPa rms, but below injurious thresholds.

Sound levels from vibratory pile driving are not expected to reach the 180 dB re 1 µPa sound pressure level root mean square threshold; therefore based on the data from NMFS for cetaceans, no injuries to manatees from sound associated with vibratory pile driving are anticipated. However, should manatees be near the project vicinity during pile driving operations, direct impacts could include alteration of behavior and autecology. For example, daily movements and/or seasonal migrations of manatees may be impeded or altered.

As a precautionary measure against possible behavioral effects, USACE will utilize a shutdown zone which will always be a minimum of 15 meters (50 feet). For impact pile driving which generates impulsive sound, a larger 40 meter (130 foot) shutdown zone shall be implemented for marine mammals only; the standard shutdown zone will continue to be applied for all other protected species. If a protected species approaches or enters a shutdown zone during any in-water work, activity will be halted and delayed until either the animal has voluntarily left and been visually confirmed beyond the shutdown zone or 15 minutes have passed without re-detection of the animal. Based on this information, and the proposed construction techniques, it was determined that seawall construction using vibratory or impact pile driving may affect, but is not likely to adversely affect, the endangered Florida manatee and will not adversely modify designated critical habitat..

3.6.3.2.2. Alternative 2

Effects for partial replacement of the seawall at the facility will be similar in nature to the effects for replacement of the entire seawall as described above.

3.6.3.3. JOHNSON'S SEAGRASS AND DESIGNATED CRITICAL HABITAT

3.6.3.3.1. Alternative 1

There will be no affect to Johnson's seagrass critical habitat under Alternative 1. A seagrass survey was performed and Johnson's seagrass is not located within the project area. Designated critical habitat will not be impacted by replacement of the seawall.

3.6.3.3.2. Alternative 2

There will be no affect to Johnson's seagrass critical habitat under Alternative 2.

3.6.3.4. AMERICAN CROCODILE

3.6.3.4.1. Alternative 1

As with sea turtles, noise and pressure effects on crocodiles have been poorly studied. As such, in the absence of species-specific (or in this case, order-specific) data, USACE is using assumptions regarding effects on sea turtles as proxies for the American crocodile, given their common reptilian morphology and physiology, and for dolphins, given the similarity in body size between adult dolphins and crocodiles. If these comparisons are valid, direct impacts to crocodiles could include injury or death associated with physical damage from pressure-related injuries. Both the pressure and noise associated with blasting could injure crocodiles.

Sub-lethal effects could occur within the 130-foot radius, though the degree of risk is uncertain. Crocodilians are known for complex communication behaviors, sometimes involving the use of sounds transmitted below the range of frequencies audible to humans. As such, their ears may be susceptible to low-frequency noise. Damage to sensitive ear structures and tissues, though externally covered by a thick flap of skin/scale, could result. If there is any temporary or permanent hearing loss, individuals may not behave normally, but the degree to which this would affect foraging, reproductive success, and other functions is unknown.

Crocodiles may be affected by being temporarily unable to use the site due to potential avoidance of construction activities and related noise, and physical exclusion from areas contained by turbidity curtains (if utilized), but these effects are insignificant and temporary. Disturbance from construction activities and related noise will be intermittent and only occur during the day for part of the construction period; turbidity curtains will only enclose small areas at any one time in the project area, will be removed upon project completion, and will not appreciably interfere with use of the area by listed species.

Protection. USACE plans to protect crocodiles in the same manner as manatees and other listed and protected species in the action area. Based on the protective measures proposed for this project, the impacts to crocodiles associated with seawall construction should be minimal. Based on this information, and the proposed construction techniques, it was determined that the proposed work using vibratory or impact pile driving may affect, but is not likely to adversely affect the threatened American crocodile.

3.6.3.4.2. Alternative 2

Effects for the partial replacement of the seawall at the facility will be similar in nature to the effects for replacement of the entire seawall described above.

3.6.3.5. SMALLTOOTH SAWFISH

3.6.3.5.1. Alternative 1

Smalltooth sawfish may be affected by being temporarily unable to use the site due to potential avoidance of construction activities and related noise, and physical exclusion from areas contained by turbidity curtains (if utilized), but these effects are insignificant and temporary. Disturbance from construction activities and related noise will be intermittent and only occur during the day for part of the construction period; turbidity curtains will only enclose small areas at any one time in the project area, will be removed upon project completion, and will not appreciably interfere with use of the area by listed species. Additional avoidance and minimization measures include adhering to the NMFS' "Sea Turtle and Smalltooth Sawfish Construction Conditions". Although seagrass and other soft bottom habitats will be

impacted, USACE does not anticipate that the proposed project will have any adverse indirect effects on smalltooth sawfish in the vicinity of the action area. These habitats may be utilized by the species, however, loss of seagrass habitats is relatively small with respect to overall seagrass abundance throughout the area. Additionally, softbottom areas are also plentiful in and near the action area, and impacts to them would not limit resource use by sawfish, especially since the population density of individuals in the area is extremely low. Based on the construction of the seawall, the project may affect, but is not likely to adversely affect, the endangered smalltooth sawfish as defined by the ESA.

3.6.3.5.2. Alternative 2

Effects for the partial replacement of the seawall at the facility will be similar in nature to the effects for replacement of the entire seawall as described above.

3.6.3.6. SCLERACTINIAN CORALS

3.6.3.6.1. Alternative 1

The replacement of existing seawall will not affect any ESA listed coral species because no listed coral species were documented on the seawall during the 2016 survey. Therefore it was determined that there will be no effect to any listed corals species.

3.6.3.6.2. Alternative 2

Effects for the partial replacement of the seawall at the facility will be similar in nature to the effects for replacement of the entire seawall as described above.

3.6.4. FISH AND WILDLIFE RESOURCES

3.6.4.1. BOTTLENOSE DOLPHINS

3.6.4.1.1. Alternative 1

Utilization of pile driving to replace the sheet pile seawall may have an effect on bottlenose dolphins in the area. Both the pressure and noise associated with pile driving can impact marine mammals.

NMFS has defined levels of harassment for marine mammals under the MMPA. Level A harassment is defined as “any act of pursuit, torment, or annoyance which has the potential to injure a marine mammal or marine mammal stock in the wild.” Level B harassment is defined as “Any act of pursuit, torment, or annoyance which has the potential to disturb a marine mammal or marine mammal stock in the wild by causing disruption of behavioral patterns, including but not limited to migration, breathing, nursing, breeding, feeding or sheltering.” Current NMFS practice regarding exposure of marine mammals to pile driving noise is that cetaceans exposed to impulsive sounds at or above 180 re 1 µPa rms are considered to have been taken by Level A (i.e. injurious) harassment.

Behavioral harassment (Level B) is considered to have occurred when marine mammals are exposed to impulsive noise from impact pile driving at or above 160 dB re 1 µPa rms and for non-impulsive noise from vibratory pile driving at or above 120 dB re 1 µPa rms, but below injurious thresholds. **Table 3-5** details representative pile driving sound pressure levels measured from 24” steel pipe piles, 24” wide steel sheet piles, and 12” timber piles.

Sound levels from vibratory pile driving are not expected to reach the 180 dB re 1 µPa sound pressure level root mean square threshold; therefore no injuries to dolphins from sound associated with vibratory

pile driving are anticipated. However, should dolphins be near the project vicinity during pile driving operations, direct impacts could include alteration of behavior and autecology. For example, daily movements and/or the seasonal migrations of dolphins may be impeded or altered.

In attempting to assess the potential impacts of seawall replacement for bottlenose dolphins, we first assessed the total area of Biscayne Bay (428 square miles; 1,108,514,911m^2) and the area of Meloy Channel and Government Cut where sound could radiate during sheet pile driving operations is 346,464 m^2. This area represents 0.00031% of the total area of Biscayne Bay. USCG accessed the NMFS-SEFSC Photo-ID survey data from 1990-2004 covering 12 years of survey in the bay via the OBIS-Seamap database (http://seamap.env.duke.edu/) and downloaded the Google Earth overlay of the data. Based on the NOAA data, it is clear that sighting levels across throughout Biscayne Bay are not equal, and that the areas around the Port, Meloy Channel, and Government Cut have low sighting densities (1-3 dolphins per survey).

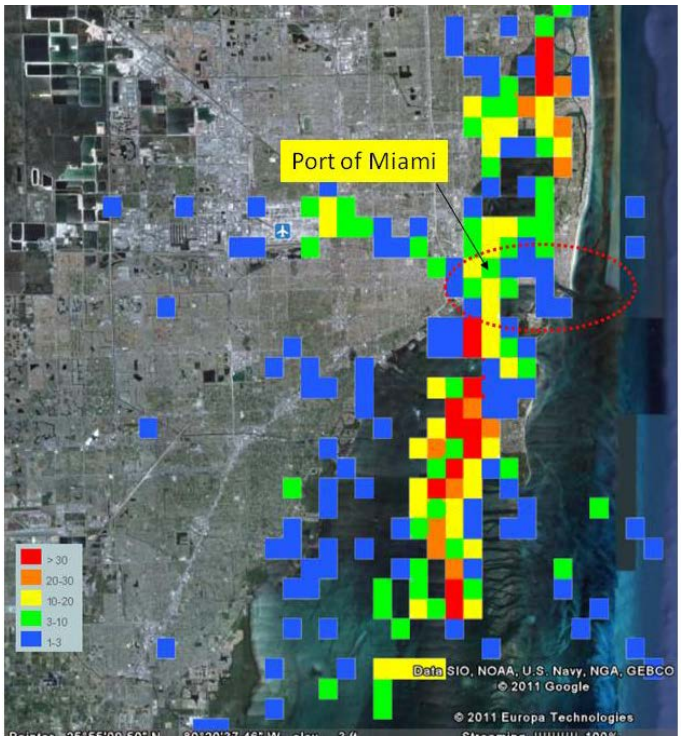

Figure 4 NOAA Southeast Fisheries Science Center, South Florida Bottlenose Dolphin Photo-identification Cooperative – Dolphin sightings

As a precautionary measure against possible behavioral effects, USACE will utilize a shutdown zone, which will always be a minimum of 15 meters (50 feet). For impact pile driving, which generates impulsive sound, a larger 40 meter (130 foot) shutdown zone shall be implemented for marine mammals only; the standard shutdown zone will continue to be applied for all other protected species. If a bottlenose dolphin approaches or enters a shutdown zone during any in-water work, activity will be halted and delayed until either the animal has voluntarily left and been visually confirmed beyond the shutdown zone or 15 minutes have passed without re-detection of the animal.

3.6.4.1.2. Alternative 2

Effects for the partial replacement of the seawall at the facility will be similar in nature to the effects for replacement of the entire seawall as described above.

3.6.4.2. FISHES

3.6.4.2.1. Alternative 1

The proposed action includes the replacement of the existing seawall and associated disturbance of the water column. Highly mobile juvenile or adult fish would be able to move quickly away from the disturbance. However, fish associated with attached macroalgae and sedentary invertebrates on the existing seawall will be displaced until the community is reestablished on the new seawall; attached macroalgae EFH are expected to quickly recolonize the seawall (<1 year). The small area of unconsolidated substrate EFH (e.g. subtidal flats) which surround the existing seawall will be minimally disturbed in the replacement of the vertical structures.

Individual fish near the seawall replacement work area may also experience sound intensities that could affect their behavior or damage their hearing ability. There is an in-depth discussion of underwater noise from pile driving and the modeling methodology in the marine mammals section. Since many fish use their swim bladders for buoyancy, they are susceptible to rapid expansion/decompression due to peak pressure waves from underwater noises (Hastings and Popper 2005). The onset of injury threshold resulting from this rapid expansion/decompression is supported by data presented on selected species in FHWG (2008). Whereas behavioral disturbance criteria for fish are not supported with data, NMFS and USFWS generally use 150 dB rms as the threshold for ESA-listed species. Criteria for behavioral impacts and onset of injury are provided in **Table 3-6**.

The criteria suggest only the most limited mortality of fish, and only when they are very close to an intense sound source (FHWG 2008). There is no population-level impact on unregulated fish anticipated from the sound intensities modeled and only minimum and temporary adverse impacts on water column EFH for all managed species inhabiting the water column. The ESA listed smalltooth sawfish may be affected by the sound intensities, but are not likely to be adversely impacted by them.

Table 3-6: Criteria for fish behavioral disturbance and onset of injury from the sound produced by vibratory and impact hammers.

Pile Type	Driving Method	Threshold	Distance (m)[1]	Area (km^2)
Steel (sheet and king piles)	Vibratory	Behavioral (all):150 dB re 1 µPa rms	73.6	0.011
	Impact (contingency)	Injury (all): 206 dB re 1 µPa rms	8.6	0.00058
		Injury (≥ 2g): 187 dB re 1 μPa^2sec SEL	21.6	0.0019
		Injury (< 2g): 183 dB re 1 μPa^2sec SEL	39.9	0.0045
		Behavioral (all):150 dB re 1 µPa rms	3,981	1.37
Polymeric fender piles	Vibratory	Behavioral (all): 150 dB re 1 µPa rms	15.8	0.001

Note: no injury criteria for fish for vibratory driving; all sound levels expressed in dB re 1 µPa rms. dB=decibel; rms=root-mean-square; µPa=microPascal; Practical spreading loss (15 log, or 4.5 dB per doubling of distance) used for calculations; [1]Sound pressure levels used for calculations are given in Tables 3-12 and 3-13.

The primary cause of injury and mortality to aquatic organisms from pile driving for seawall replacement in aquatic environments appears to be damage associated with the rupture and hemorrhage of air-filled internal organs, in particular, the swim bladder (Wright and Hopky 1998; Keevin and Hempen 1997), which, in many pelagic fishes, plays a role in buoyancy. Demersal species, such as flounder, typically do not have swim bladders and are frequently less susceptible to pressure impacts. Less information is available, but it is generally reported that there is minimal injury and mortality from pressure to mollusks, shellfish, and crustaceans, which do not have gas-filled organs similar to the swim bladder in fish (Wright and Hopky 1998). Although the structure of the swim bladder and the mechanism for adjusting gas volume vary among species, generally the process for release of gas from the swim bladder is too slow to compensate for the rapid fluctuations in hydrostatic pressure associated with the pressure shock wave associated with pile driving. This and other physiological considerations are discussed below (Hempen et al 2005):

> "The primary cause of damage in finfish exposed to a pressure shock wave appears to be the outward rupture of the swim bladder as a result of the expansive effect of the negative hydrostatic pressure associated with the reflected air-water surface wave. While the organ may tolerate the compressive portion of the shock wave, the rapid drop to negative hydrostatic gage pressure and expansion of the gas that cannot otherwise be released, causes the rupture of the organ. Vibration, expansion, and rupture of the swim bladder can also cause secondary damage and hemorrhage due to impact with other internal organs in close proximity to the swim bladder. Other organs typically exhibiting damage include the kidney, liver, spleen, and sinus venosus (a structure in the heart). Extensive tearing of tissue has been observed in species where the swim bladder is closely attached to the visceral cavity. Close attachment to the dorsal cavity wall was typically associated with extensive damage to the kidney. Species with thick-walled swim bladders and cylindrical body shape (e.g., oyster toad fish and catfish) appear to be more resistant to pressure waves than species with laterally compressed bodies such as herring and menhaden (Linton *et al.* 1985, as cited in Keevin and Hempen 1997). Smaller individuals of a species are generally more sensitive than larger fish. Early-stage larvae do not have swim bladders and are more resistant than older larvae after development of the swim bladder. The extent of injury and

mortality decreases with distance from the detonation, as the magnitude of the pressure drop declines due to dissipation of the blast impulse (*I*) and energy flux density (*Ef*) with distance. In a review of a number of studies of primarily open water blasting, Keevin and Hempen (1997) concluded that *I* was the best predictor of potential damage for shallow depths (less than 3 m), while *Ef* was the best predictor for deeper conditions."

3.6.4.2.2. Alternative 2

Effects for the partial replacement of the seawall at the facility will be similar in nature to the effects for replacement of the entire seawall as described above.

3.6.4.3. CORALS AND ASSOCIATED SPECIES

3.6.4.3.1. Alternative 1

With the replacement of the entire seawall, a total of 11 coral colonies from four different species would be impacted by the seawall replacement. The survey of the complete seawall identified six colonies equal to, or greater than, 10 cm in diameter, making them candidates for relocation. Any corals relocated off of the seawall may be offered to non-federal parties for education and research purposes and/or may be relocated to a previously permitted relocation site managed by either Miami-Dade County DERM. This will leave up to five colonies documented in the June 2016 survey which were less than 10 cm in diameter (too small to ensure successful relocation) which may remain on the seawall at the time of construction. There is no guarantee that these smaller corals will be relocated, and for the purposes of analysis are assumed to be lost from the ecosystem until sufficient time passes for corals of similar size and species composition to colonize the new seawall once replacement is complete. Permanent loss of the eleven colonies (six to education facilities, and five lost, will not significantly impact the population levels of the four species of coral, as the colonies are already isolated from the breeding populations offshore of southeast Florida due to their location on a manmade structure inside of Biscayne Bay. Over time, larvae of corals may be flushed back into the Bay and allow for settlement on the new seawall face.

Prior to initiation of any construction activities, USACE will require the contractor to relocate any colonies greater than 10 cm located on the seawall. The 10 cm size was chosen in consultation with coral relocation experts (Dr. Keith Spring, CSA *pers comm*.) who conveyed that corals smaller than 10 cm are often flatter and more easily broken during relocation efforts. The collections and relocations will be made by coral experts and trained professionals.

3.6.4.3.2. Alternative 2

With the partial replacement of the seawall, only 10 individual coral colonies would be impacted. There is one colony that would not be impacted because it is located within the 130 linear feet of seawall where only a 1.5 foot concrete lift would be added and no sheetpile would be constructed in front of the newer existing seawall. This one colony (*O. diffusa*) is greater than 10 cm in diameter, therefore only a total of five colonies would be relocated with this alternative. Population level impacts would be similar to Alternative 1.

3.6.4.4. MIGRATORY BIRDS

3.6.4.4.1. Alternative 1

Migratory birds are currently able to rest on the seawall at the Mount Sinai Medical Facility Center. As a result, birds may be temporarily unable to utilize the seawall as a resting area during construction.

3.6.4.4.2. Alternative 2

Effects for the partial replacement of the seawall at the facility will be similar in nature to the effects for replacement of the entire seawall as described above.

3.6.5. ESSENTIAL FISH HABITAT ASSESSMENT

The following subsections describe the individual and cumulative impacts of the proposed action(s) and alternatives on EFH, federally managed fisheries, and associate species, such as major prey species, including affected life history stages.

3.6.5.1. ALTERNATIVE 1

The replacement of the existing 3,200 linear feet of seawall will result in the permanent impact of 9,600 SF (0.22 acres) of substrate comprised of sand, muck, and rubble, and replacement of a manmade structure covered in various encrusting plants and organisms detailed in the survey found in Appendix D-3. A subset of this contains approximately 0.05 acres of mixed seagrass. Only 25% of the project proposes in-water construction. Temporary indirect impacts to the seagrass beds adjacent to the seawall could also occur due to scouring and turbidity. Although these impacts would be temporary, and the seagrass habitat would be expected to repopulate once construction is complete, if scouring occurs, the contractor should regrade the impacted area to pre-project levels to allow the reestablishment of the seagrass community.

3.6.5.2. ALTERNATIVE 2

Effects would be similar to Alternative 1. However, the portion of the 130 linear feet seawall where only a 1.5 foot concrete lift would be added and no sheet pile would be constructed, in front of the newer existing seawall, is the same location where seagrass was observed within 3 feet of the base of the existing seawall and had the potential to be impacted. Temporary impacts to adjacent seagrass beds due to in-water construction would be the same as with the preferred alternative.

3.6.6. HISTORIC PROPERTIES

All project alternatives, including the no action alternatives, are based within the Mount Sinai Medical Facility Center. The hospital complex was constructed beginning in 1958 through dredge and fill. No impacts to the hospital buildings are anticipated. The northern section of the seawall was constructed circa May 1959, and the remaining extent, 2,600 feet, of the seawall was constructed circa March 1967. The seawall was constructed following standardized construction design plans, and does not embody distinctive characteristics of a type, period, or method of construction. Consultation in accordance with Section 106 of the National Historic Preservation Act of 1966, as amended, and its implementing regulations in 36 CFR Part 800: Protection of Historic Properties, will be coordinated with the Florida State Historic Preservation Office regarding the project. No recorded submerged or terrestrial archaeological sites exist along the seawall. The entire project footprint has been previously disturbed by construction.

3.6.6.1. ALTERNATIVE 1

No impacts to the hospital buildings are anticipated. The northern section of the seawall was constructed circa May 1959, and the remaining extent, 2,600 feet, of the seawall was constructed circa March 1967. The seawall was constructed following standardized construction design plans, and does not embody distinctive characteristics of a type, period, or method of construction. Consultation in accordance with Section 106 of the National Historic Preservation Act of 1966, as amended, and its implementing regulations in 36 CFR Part 800: Protection of Historic Properties, will be coordinated with the Florida State

Historic Preservation Office regarding the project. No recorded submerged or terrestrial archaeological sites exist along the seawall. The entire project footprint has been previously disturbed by construction.

3.6.6.2. ALTERNATIVE 2

Effects for the partial replacement of the seawall at the facility will be similar in nature to the effects for replacement of the entire seawall as described above.

3.6.7. SOCIO-ECONOMIC

All action alternatives are not expected to affect socio-economic conditions in the vicinity of the Mount Sinai Medical Facility Center. The project is taking place along the existing seawall and should not hamper any other activities which would result in socio-economic impacts to others.

3.6.8. AESTHETICS

All action alternatives are not expected to affect aesthetics in the vicinity of the Mount Sinai Medical Facility Center. The project is within an existing developed area that contains a hardened shoreline. Construction will obscure the view of the waterway; however this will be temporary and therefore have a negligible effect on the public interest.

3.6.9. RECREATION

All action alternatives are not expected to affect aesthetics in the vicinity of the Mount Sinai Medical Facility Center and Meloy Channel. The area will remain open for boating and other recreational activities in the vicinity of the Mount Sinai Medical Facility Center.

3.6.10. WATER QUALITY

All action alternatives would have similar impacts to water quality due to construction activities. A State Water Quality exemption will be obtained under Section 401 of the CWA for the bulkhead replacement and state water quality standards will be met during construction.

Replacement of the bulkhead shall be conducted under Nationwide Permit #3, which states:

> "(a) The repair, rehabilitation, or replacement of any previously authorized, currently serviceable structure, or fill, or of any currently serviceable structure or fill authorized by 33 CFR 330.3, provided that the structure or fill is not to be put to uses differing from those uses specified or contemplated for it in the original permit or the most recently authorized modification. Minor deviations in the structure's configuration or filled area, including those due to changes in materials, construction techniques, requirements of other regulatory agencies, or current construction codes or safety standards that are necessary to make the repair, rehabilitation, or replacement are authorized. Any stream channel modification is limited to the minimum necessary for the repair, rehabilitation, or replacement of the structure or fill; such modifications, including the removal of material from the stream channel, must be immediately adjacent to the project or within the boundaries of the structure or fill. This NWP also authorizes the repair, rehabilitation, or replacement of those structures or fills destroyed or damaged by storms, floods, fire or other discrete events, provided the repair, rehabilitation, or replacement is commenced, or is under contract to commence, within two years of the date of their destruction or damage. In cases of catastrophic events, such as hurricanes or tornadoes, this two-year limit may be waived by the district engineer, provided the permittee can demonstrate funding, contract, or other similar delays."

Section 33 CFR 330.3 states:

> "330.3 Activities occurring before certain dates. The following activities were permitted by NWPs issued on July 19, 1977, and, unless the activities are modified, they do not require further permitting: (b) Structures or work completed before December 18, 1968, or in waterbodies over which the DE had not asserted jurisdiction at the time the activity occurred, provided in both instances, there is no interference with navigation. Activities completed shoreward of applicable Federal Harbor lines before May 27, 1970 do not require specific authorization. (Section 10)."

As original construction of the bulkheads that will be replaced by this project was in the 1950s, they are consistent with the requirements for Nationwide Permit #3 under Section 33 CFR 330.3 .

Both alternatives will cause temporary increases in turbidity where the seawall is being placed. The State of Florida water quality regulations require that water quality standards not be violated during construction. The standards state that turbidity outside the mixing zone shall not exceed 29 NTU's above background. Various protective measures and monitoring programs will be conducted during construction to ensure compliance with state water quality standards. Should turbidity exceed state water quality standards during construction, as determined by monitoring, the contractor will be required to cease operations until conditions return to normal.

3.6.11. HAZARDOUS, TOXIC, AND RADIOACTIVE WASTE

The proposed action, replacement of the seawall, is not expected to affect the status of hazardous, toxic, and radioactive waste in the vicinity of the Mount Sinai Medical Facility Center.

3.6.12. AIR QUALITY

Pursuant to the General Conformity Rule of the Federal Clean Air Act (CAA), as promulgated by the EPA, a Federal agency must make a General Conformity Determination for all Federal actions in non-attainment or maintenance areas where the total of direct and indirect emissions of a non-attainment pollutant or its precursors exceed levels established by the regulations. All action alternatives may result in small, localized, temporary increases in concentrations of nitrogen dioxide (NO_2), SO_2, CO, VOC, and PM. Emissions associated with the dredge plant would be the largest contribution to the inventory. However, the total increases are relatively minor in context of the existing point and nonpoint and mobile source emissions in Miami-Dade County. Projected emissions from the proposed action would not adversely impact air quality given the relatively low level of emissions and the likelihood of prevailing offshore winds. Short term impacts from dredge emissions, and other construction equipment associated with the Preferred Alternatives, would not significantly impact air quality. No air quality permits would be required. The proposed action, replacement of the seawall, is not expected to affect the status of air quality in the vicinity of the Mount Sinai Medical Facility Center.

3.6.13. NOISE

3.6.13.1. ALTERNATIVE 1

The effects of noise in the marine environment, and to protected species, has been previously discussed and are incorporated by reference. The remaining analysis will discuss the potential effects of airborne noise.

The proposed action would result in a temporary increase in airborne noise levels in the project area. Estimated source levels for airborne noise from pile driving are given in **Table 3-7**; source levels were selected from published literature. Because there are no available airborne sound pressure level measurements from steel sheet, data from 24 inch diameter steel pipe piles was used to estimate the airborne sound source levels.

Table 3-7: Estimated Source Levels for Airborne Pile Driving Noise.

Driving Method	Source Level
Vibratory	96 dBA at 15m (50ft)
Impact	100 dBA at 11m (36ft)

Note m=meter
dBA = A-weighted decibel scale
ft. = feet

The source level selected for impact driving does not represent the maximum measured level for a 24 inch pipe pile (109 dBA; Illingworth & Rodkin 2012), which was obtained during short-term driving of a single pile in rocky sediment during the Navy Test Pile Program in Bangor, Washington in 2011. The selected source level shown in **Table 3-7** was obtained during driving of a 24 inch pipe pile for a bridge replacement in Washington (WSDOT 2010). Because softer sediments, such as those found in the area surrounding Mount Sinai Medical Facility Center, reduce the amount of force needed to drive a pile to desired depth, in turn reducing noise from pile reverberation (Kinsler et al. 1999), the non-maximal source level estimate selected is a reasonable assumption for airborne noise levels from pile driving at the Mount Sinai Medical Facility Center.

Estimates of airborne noise propagation from pile driving were based on the assumption that airborne construction noise behaves as a point-source, propagating in a spherical manner, with a 6 dB decrease in sound pressure level per doubling of distance (WSDOT 2008). The hardsite conditions proposed by WSDOT (2008) apply to both the over-water and over-land, mostly paved or hard surfaces, portions of the in-air project area.

Noise associated with vibratory pile driving is expected to attenuate to 65 dBA within 0.34 miles (550 meters) of the source; impact pile driving noise is expected to attenuate to 65 dBA at 0.40 miles (650 meters). During both impact and vibratory pile driving, airborne noise levels are expected to exceed 84 dBA (the threshold for hearing protection) within 246 feet (75 meters) of the incident pile. These estimates assume a free flowing medium (e.g. over water) without obstructions, which is a reasonable assumption for the majority of the project area. Vegetation, and buildings within the land areas of the proposed action, may obstruct sound transmission in the project area; however, this model did not include possible attenuation from land-based obstructions, e.g. vegetation and buildings. The ranges given are therefore a conservative estimate of the affected area.

3.6.13.2. ALTERNATIVE 2

Effects for replacement of the seawall at the facility will be similar in nature to the effects above, but will take place only within a portion of the facility.

3.6.14. PUBLIC SAFETY

3.6.14.1. SEAWALL REPLACEMENT (ALTERNATIVES 1 AND 2)

Implementation of both alternatives will allow the Mount Sinai Medical Center to continue to stabilize the shoreline. The threatened facilities are key to disaster emergency operations, not only as a hospital facility, but also as a disaster staging area, or for other EOS operation facilities.

The shoreline that protects these facilities is at risk of erosion through seawall failure that could impact the perimeter road and parking. Furthermore, the seawall is overtopped by extreme high tide events multiple times per year, resulting in inundation as the primary driver for the current erosion problems. Land subsidence behind the wall, combined with low crest elevation, results in overtopping and standing water. These factors complicate and compromise operations and patient health. Overtopping allows material to migrate under the existing seawall, through cracks, and be carried over the wall as the water recedes; all of which could impact public safety.

3.6.15. ENERGY REQUIREMENTS AND CONSERVATION

The energy requirements for construction activity would be confined to fuel for the barge, labor, transportation, and other construction equipment.

3.6.16. NATURAL OR DEPLETABLE RESOURCES

The gasoline and diesel fuel used by the construction equipment is considered a depletable resource.

3.6.17. REUSE AND CONSERVATION POTENTIAL

The proposed action would not directly present any reuse or conservation potential.

3.6.18. SCIENTIFIC RESOURCES

The proposed action would not have any impact on scientific resources.

3.6.19. NATIVE AMERICANS

No Native American communities or any tribal lands exist within the project areas. The project will not adversely impact Native Americans or any tribal lands.

3.6.20. URBAN QUALITY

The replacement of the seawall at Mount Sinai Hospital is not expected to have any effect on the Urban Quality of Miami Beach.

3.6.21. DRINKING WATER

The repair of the seawall along the shoreline at Mount Sinai Hospital is not expected to have any effect on drinking water for Miami Beach or Miami-Dade County.

3.6.22. INVASIVE SPECIES

The replacement of the seawall at Mount Sinai Hospital is not expected to have any effects on invasive species in the vicinity of the project areas.

3.6.23. CUMULATIVE IMPACTS

Cumulative impact is the impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (Federal or non-federal) or person undertakes such other actions (40 CFR 1508.7).

An inherent part of the cumulative effects analysis is the uncertainty surrounding actions that have not yet been fully developed. The CEQ (1997) regulations provide for the inclusion of uncertainties in the EA analysis, and state that "(w)hen an agency is evaluating reasonably foreseeable significant adverse effects on the human environment in an EIS and there is incomplete or unavailable information, the agency shall always make clear that such information is lacking" (40 CFR Part 1502.22). The CEQ regulations do not say that the analysis cannot be performed if the information is lacking. Consequently, the analysis contained in this section includes what could be reasonably anticipated to occur given the uncertainty created by the lack of detailed investigations to support all cause and effect linkages that may be associated with the Proposed Action.

The geographic areas used for the scope of this analysis vary for each affected resource. For example, air quality is generally evaluated on a county by county basis by USEPA, so the cumulative effects for air quality would be evaluated by this bounding area. Marine resources, however, are affected only within the waters of central Biscayne Bay. Relevant past, current, and future projects have been included in the cumulative impact analysis. However, the uncertainty of future trends, and lack of detailed planning documents for the various alternative locations, allows for only a general evaluation of future trends.

The proposed action would result in long-term benefits, which should outweigh any short-term environmental losses. The cumulative impact of maintaining the Mount Sinai Medical Center's seawall allows for the continued shoreline stabilization of the threatened facility. Cumulative impacts to EFH and ESA listed species for this project would be minimal. Turbidity and disturbance associated with the seawall replacement will be temporary and no long term impacts are anticipated.

Past Actions in the area of Mount Sinai Hospital.

The Mount Sinai Medical Center is located on the eastern side of Biscayne Bay, north of Government Cut and the Port of Miami, and west of Miami Beach, in a very developed urban environment. The hospital complex was constructed beginning in 1958 from dredged and fill material. The northern section of the seawall was constructed in the late 1950s, and the remaining extent, 2,600 feet, of the seawall was constructed in the late 1960s. In 2011, a DA permit was issued, authorizing the replacement of "130 linear feet of failed concrete pile and panel bulkhead at the same location with a new concrete pile and panel structure. The work will also include shoreline stabilization via placement of 22.7 cubic yards of lime rock boulders adjacent to a new 130 linear foot bulkhead."

The areas of Miami Beach are significantly developed, and the native mangrove ecosystem, which was located along the shores of Biscayne Bay, has been entirely removed from the vicinity of Mount Sinai Hospital. Dredge and fill activities in the vicinity of the hospital include the construction of the Julia Tuttle Causeway in 1959 that impacted seagrass beds west of the hospital.

Present Actions.

As residential development continues to increase, the shoreline in the watershed has become hardened with vertical seawalls to stabilize the upland properties. In addition, docks for personal watercraft, and minor maintenance dredging are likely to occur to maintain navigation. High levels of nutrients enter bay

waters from storm runoff of fertilizer from homes surrounding the bay. This has decreased water clarity in the bay and is expected to continue for the foreseeable future. Recently backfilling of some of the dredged holes north of the Julia Tuttle Causeway has been completed in an attempt to restore shallow water seagrass habitat.

Future Actions.
It is expected that the medical facility will continue to operate and that the adjacent waterway will continue to be maintained and utilized.

3.6.24. POTENTIALLY AFFECTED RESOURCES

The analysis of impacts must focus on specific resources or impact areas. The resources and areas that were identified at risk for the potential of impacts include marine resources such as seagrasses, corals, and associated hardbottom species that have encrusted on the existing seawall, as well as manatees, swimming sea turtles, smalltooth sawfish, and bottlenose dolphins, which may transit through the adjacent waterway.

3.6.24.1. CORALS AND ASSOCIATED ENCRUSTING ORGANISMS ON THE EXISTING SEAWALL

Corals which have encrusted manmade structures within Biscayne Bay are lost to the reef system offshore of the county, and the temporary loss of these corals from the existing seawall (corals are expected to recolonize the new seawall) is not expected to have a cumulative effect on corals and associated organisms in Miami-Dade County.

3.6.24.2. SEAGRASSES BEING IMPACTED THROUGH CONSTRUCTION OF NEW SEAWALL

Seagrass has been documented within the project area. Direct impacts to seagrass would be minor; less than 0.05 acres. It is expected that if grasses are indirectly impacted through in-water construction by scouring or turbidity, they will be able to recolonize. The total aerial coverage of seagrass in Biscayne Bay is estimated to be 159,363 acres (Yarbo, 2013). Based on this assessment, no permanent impact on seagrass is expected within Biscayne Bay.

3.6.25. RESOURCES NOT LIKELY TO BE CUMULATIVELY AFFECTED

Based on current available information, there are some resources that are not likely to experience measurable cumulative effects, although this EA has addressed the specific effects of the proposed project in accordance with NEPA. Also, as additional information becomes available, or as a result of public or agency comments received, the need for cumulative impact analysis for these resources will be addressed. The resource areas, and the basis for not including a cumulative impact analysis for these areas at this time, are as follows:

- *Land Use*. The project would result in a relatively small change in land use, and there are no additional reasonably foreseeable projects other than those included in this analysis.

- *Geology and Sediments*. The overall effect to the sandy bottom of Meloy channel by the loss of 0.21 acres of benthic habitat will be minimal.

- *Threatened or Endangered Species*. Impacts to listed species were evaluated under the Endangered Species Act and for all species in the project area. For all such species but sea turtles and smalltooth sawfish, the project "may affect, but is not likely to adversely affect" them. There will be no affect to listed corals, Johnson's seagrass, or any designated critical habitat, even

though the project area is adjacent to designated critical habitat for Johnson's seagrass. Besides the potential affects to listed sea turtles and smalltooth sawfish, no additional incremental cumulative effects on threatened or endangered species are anticipated.

- *Other Fish and Wildlife*. Impacts to non-listed fish and wildlife are minimal and are not expected to result in a significant cumulative effect. Some of the coral colonies will be relocated from the seawall prior to construction, thus reducing impacts to the reproductive population, and construction of the new seawall will result in a new area for juvenile corals to settle onto the seawall.

- *Water Quality*. Water quality impacts would only be temporary due to construction activities, and there are no additional reasonably foreseeable projects other than those included in this analysis.

- *Hazardous, Radioactive, and Toxic Wastes*. The project would not result in a release of any hazardous, toxic, or radioactive waste, and there are no additional reasonably foreseeable projects other than those included in this analysis.

- *Air Quality*. Any impacts to air quality would result from construction of the replacement seawall and would be temporary. The total increase in air pollutants would be relatively minor to the existing point- and mobile-source emissions in Miami-Dade County. Miami-Dade County is in a designated attainment area and a conformity statement would not be required. No foreseeable future actions leading to an increase in emissions would result from this project.

- *Noise*. Noise impacts would be temporary as a result of construction activities, and the project will result in only a minor incremental impact due to noise. As a result, a minor increase in cumulative impact is expected.

- *Aesthetic Resources*. Only temporary adverse effects to aesthetic resources would occur during construction; therefore, there would be no adverse cumulative effect to aesthetic resources resulting from this project.

- *Recreation*. Only temporary adverse effects to recreation would occur during construction; therefore, there would be no adverse cumulative effect to recreation resulting from this project.

- *Cultural and Historic Resources*. It is anticipated that no cultural or historic resources would be affected by the project. Therefore, no cumulative effect on these resources would result from this project.

- *Native American Resources*. The project would have no effect and would not influence any foreseeable future actions that could adversely affect Native American tribes.

- *Environmental Justice*. The project would have no effect and would not influence any foreseeable future actions that could adversely affect minority and low-income populations.

- *Invasive Species.* The project would have no effect on invasive species and would not influence any foreseeable actions that could incrementally increase the impacts of invasive species in Biscayne Bay.

3.6.26. CUMULATIVE EFFECTS ASSESSMENT CONCLUSION

Due to efforts to avoid and minimize the environmental impact of the proposed action within the project area and its vicinity, and due to avoidance and minimization actions that will be carried out for the proposed project and those that are likely to be required for any future actions, USACE anticipates that any cumulative impacts associated with replacement of the seawall at the Mount Sinai Medical Center will be negligible.

3.7. IRREVERSIBLE AND IRRETRIEVABLE COMMITMENT OF RESOURCES

3.7.1. IRRETRIEVABLE

An irretrievable commitment of resources is one in which, due to decisions to manage the resource for another purpose, opportunities to use or enjoy the resource as they presently exist are lost for a period of time. An example of an irretrievable loss might be where a type of vegetation is lost due to road construction. Replacement of the existing seawall would result in the permanent loss of any stony corals less than 10 cm in size, and all other encrusting organisms on the seawall. These affects would be temporary as the new seawall would recolonize over time, based on the level of colonization of the current seawall. The permanent loss of seagrass within the direct footprint of the project would also occur.

3.7.2. IRREVERSIBLE

An irreversible commitment of resources is one in which the ability to use, and/or enjoy the resource, is lost forever. One example of an irreversible commitment might be the mining of a mineral resource. The energy and fuel used during construction would also be an irreversible commitment of resources.

3.8. UNAVOIDABLE ADVERSE ENVIRONMENTAL EFFECTS

There may be a temporary, unavoidable reduction in water clarity and increased turbidity during construction operations. This would be limited to the immediate areas of the proposed dredging and seawall construction. This impact would be temporary and should disappear shortly after construction completion.

Those species that are not able to escape the dredging or seawall construction are expected to recolonize after project completion. Construction of the new seawall will result in unavoidable impacts to hardbottom species which have colonized the existing seawall that are not relocated prior to construction. This will be due to placement of the new sheet pile in front of the existing seawall and filling between the new and existing seawall. Relocation of stony corals will minimize these impacts. There will be unavoidable loss of the infaunal community in the area of the new seawall placement.

3.9. COMPATIBILITY WITH FEDERAL, STATE, AND LOCAL OBJECTIVES

The preferred alternative is consistent with the state's Coastal Zone Management plan and with Federal, State, and local laws, plans, and objectives.

3.10. CONFLICTS AND CONTROVERSY

During the required permitting and consultation processes, no significant conflicts or controversy associated with the proposed project were expressed by any resource or permitting agency.

3.11. UNCERTAIN, UNIQUE, OR UNKNOWN RISKS

Repairing and replacing an existing seawall in order to stabilize the shoreline is a long-established practice in Florida. The construction method for the seawall is to place the new seawall in front of the old one, thus encapsulating the existing seawall, and potentially having minimal fill material released into the surrounding environment. There are no additional uncertain, unique, or unknown risks associated with this project. The uncertain and unknown risks associated with sea level rise (SLR) will affect the Mount Sinai Medical Center over the next 50 years. The long term impacts of SLR are unknown.

3.12. PRECEDENT AND PRINCIPLE FOR FUTURE ACTIONS

The proposed action would not set any precedent or principle for future actions. USACE will obtain all necessary permits and authorizations prior to all future seawall replacement activities, as well as conduct required NEPA analysis and subsequent consultations under Federal and state law.

3.13. SCREENING OF FINAL ALTERNATIVES VS RELOCATION

Per ER 1105-2-100 Appendix F, Section III, F-23**, the least cost alternative plan is considered to be justified if the total costs of the proposed alternative are less than the costs to relocate the threatened facility.**

In order to determine if either Alternatives 1 or 2 are justified, their costs must be compared to the costs to relocate the threatened facilities. As stated earlier, relocation consists of the vertical relocation of the perimeter road adjacent to Biscayne Bay, with constructed support for the portion of the existing seawall adjacent to the elevated road. This would require 2,100 feet of the perimeter road to be raised on a berm to an elevation of 4 feet NAVD88. 1,000 feet of sheetpile would be driven on the seaward side of the existing seawall to stabilize the wall section under additional load from the raised road. Relocation also includes the movement of approximately 250 vulnerable parking spaces to a new parking garage constructed on the medical center property. **Figure 3-5** depicts the relocation option in plan view.

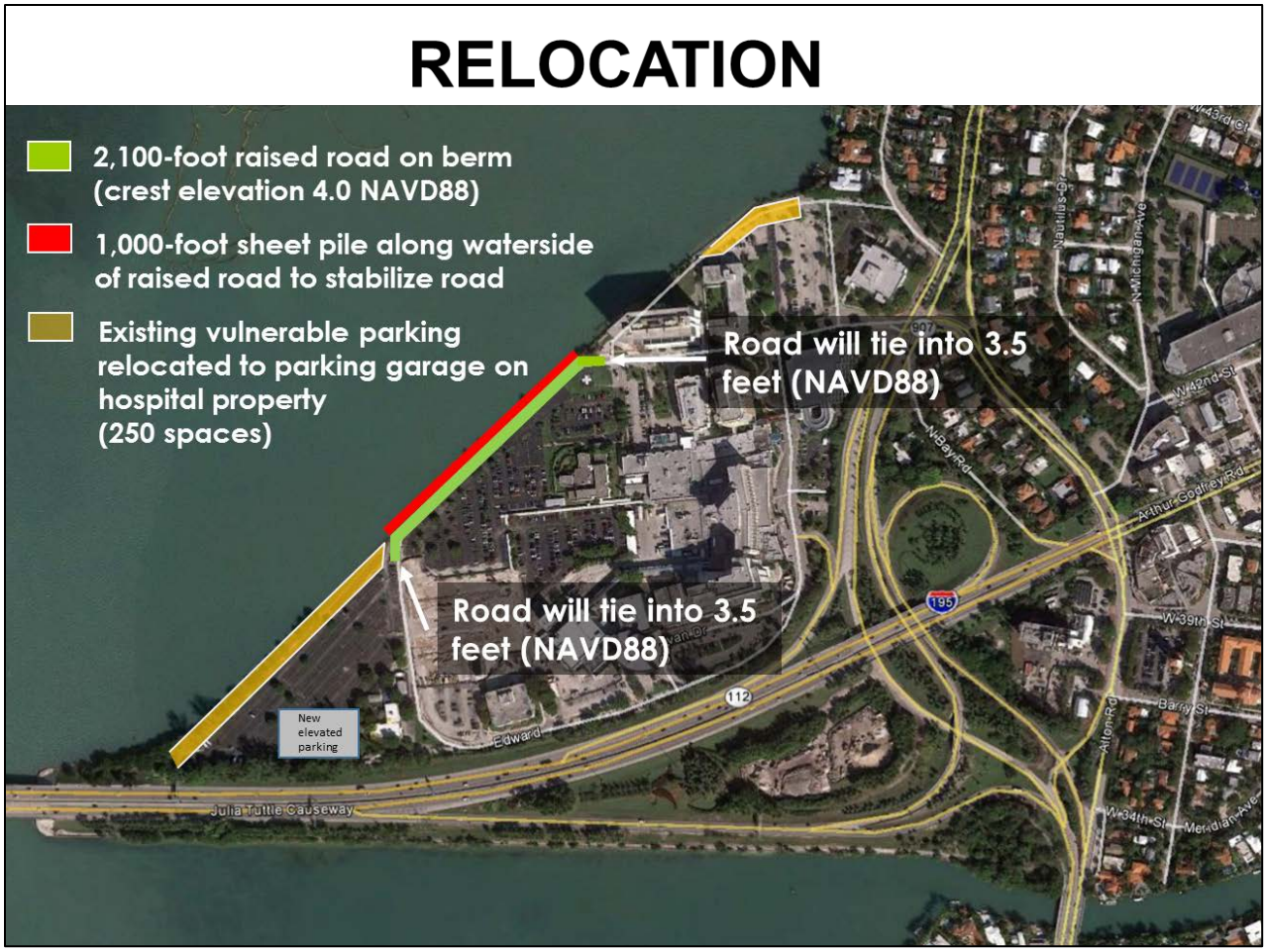

Figure 3-5: Relocation plan.

3.13.1. COST COMPARISON

Planning level costs of Alternative 1, Alternative 2, and Relocation are shown in Table 3-8. Both alternative costs are less than relocation. Alternative 2 is preferable to No Action and is the least cost alternative plan. Alternative 2 is therefore considered to be justified and is the Recommended Plan. Details on cost estimates are given in the Cost Engineering Appendix.

Table 3-8: Cost comparison (FY16 Price Levels. Planning Level Costs).

	Item	Number of Units	Units	Cost
Relocation	parking garage	250	parking spaces	$5,500,000
	sheet pile	1000	lf	$1,345,000
	elevated road	1310	lf	$707,400
			Total =	**$7,552,400**
Alternative 1	**Item**	**Number of Units**	**Units**	**Cost**
	sheet pile	3200	lf	$4,304,000
	T-wall	300	lf	$91,500
			Total =	**$4,395,500**
Alternative 2	**Item**	**Number of Units**	**Units**	**Cost**
	sheet pile	3070	lf	$4,129,200
	1.5 ft concrete lift	130	lf	$9,800
	T-wall	300	lf	$91,500
			Total =	**$4,230,500**

3.14. IMPACT AVOIDANCE AND MINIMIZATION

Mitigation includes those measures and features that avoid, minimize, and/or compensate for environmental impacts. For the seawall replacement, mitigation includes endangered species protection by compliance with USACE/FWS standard manatee construction protocols, and compliance with the NMFS sea turtle and smalltooth sawfish construction protocols, avoidance and minimization of impacts to seagrass, voluntary relocation of scleractinian corals greater than 10 cm in diameter from the seawall to an alternative location, and monitoring for marine mammal presence during seawall construction operations, with appropriate shutdown criteria should dolphins or manatees approach within 130 feet of the construction area. This determination is in compliance with 403.813, Florida Statutes, and 404(f) of the Clean Water Act.

4. RECOMMENDED PLAN

A. DESIGN AND CONSTRUCTION CONSIDERATIONS

I. GENERAL DESCRIPTION

The Recommended Plan (Alternative 2) includes installation of 3,070 linear feet of sheetpile (25-foot long PZC-13 steel sheetpile) driven to a depth of 16 feet. The sheetpile will be driven approximately 3 feet seaward of the existing seawall with a concrete cap elevation of 4.0 feet (NAVD88). The three foot offset is necessary for workers to reconnect any drainage system or utilities between the new and existing walls. The three foot offset will be filled with stone. At the northeast end of the driven sheetpile, a T-wall will tie-in to the sheetpile and continue landward to the 3.5 foot contour to prevent flanking of the seawall. Sheetpile will not be driven in front of the 130 foot section of seawall constructed in 1990. This section has been deemed structurally sound enough to add a 1.5 foot concrete lift to the top of the existing wall to reach an overall crest elevation of 4.0 feet NAVD88. **Figure 4-1** depicts the Recommended Plan in plan view.

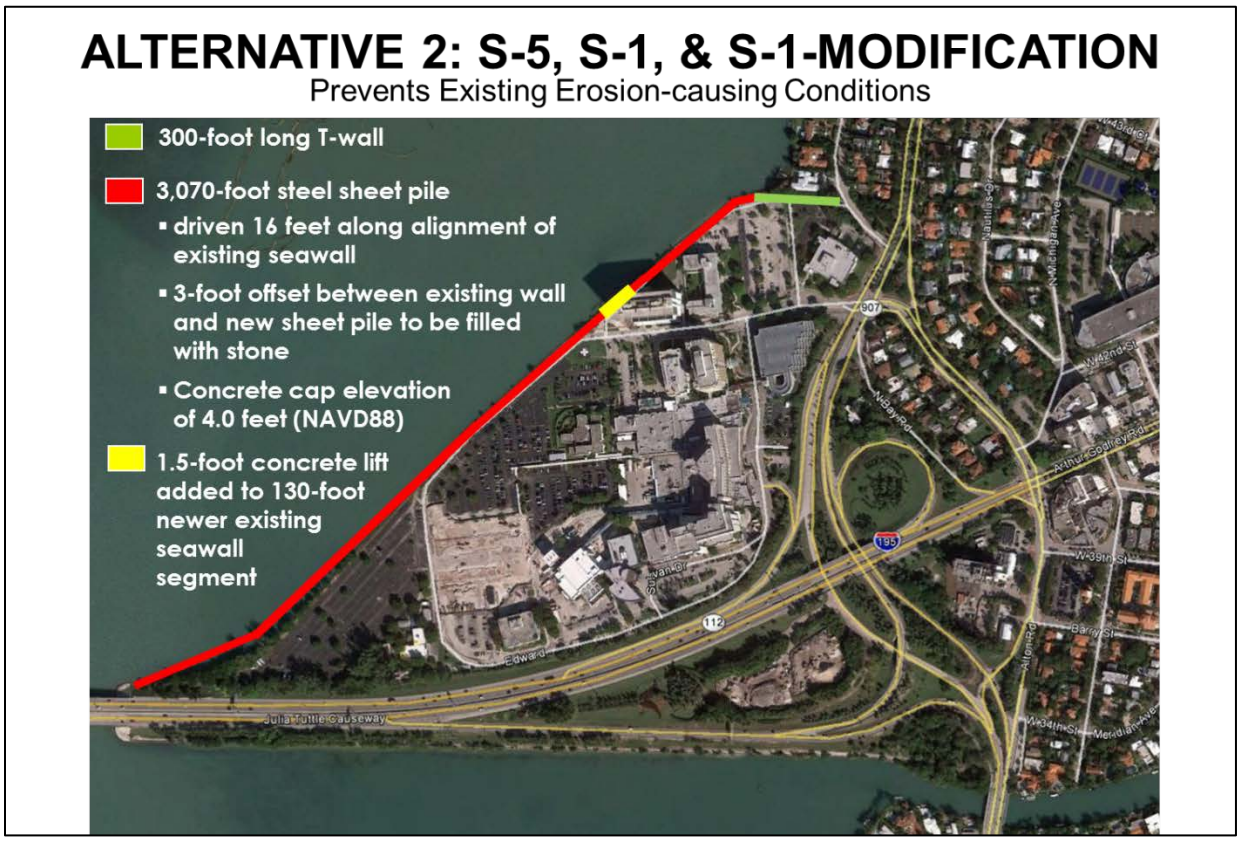

Figure 4-1: Recommended Plan.

II. ENVIRONMENTAL OPERATING PRINCIPLES

The feasibility study was carried out in a manner consistent with the USACE Environmental Operating Principles (EOPs). The principles are consistent with NEPA, the Army's Environmental Strategy with its four pillars (prevention, compliance, restoration, and conservation), and other environmental statutes that govern USACE activities. USACE Environmental Operating Principles were considered throughout plan formulation, as reflected in the selection of an alternative which minimizes environmental impacts while meeting all project objectives to the maximum extent practicable.

III. PLAN IMPLEMENTATION REQUIREMENTS

NON-FEDERAL RESPONSIBILITIES

The non-federal sponsor for the project is Miami-Dade County. The non-federal project sponsor will provide an up-front cash contribution for the construction costs of the proposed project. The non-federal sponsor shall provide lands, easements, and rights-of-way, and bear a portion of the administrative costs associated with land requirements. The non-federal project sponsor will be responsible for all costs related to operation, maintenance, repair, rehabilitation, and replacement of project features. Section 402 of the 1986 Water Resources Development Act (33 USC 701b-12), as amended by Section 14 of the 1988 Water Resources Development Act, states that "Before construction of any project for local flood protection or any project for hurricane or storm damage reduction, that involves Federal assistance from the Secretary, the non-federal interests shall agree to participate in and comply with applicable Federal floodplain management and flood insurance programs." The non-federal sponsor and communities must be enrolled in, and in compliance with, the National Flood Insurance Program (NFIP) to receive Federal funding for a recommended storm damage reduction project. Miami-Dade County is enrolled in, and in compliance with, the NFIP.

FEDERAL RESPONSIBILITIES

USACE is responsible for budgeting for the Federal share of future Federal construction projects. Federal funding is subject to the budgetary constraints inherent in the formation of the national civil works budget in a given fiscal year. USACE would perform the necessary preconstruction engineering and design (PED) needed prior to construction. USACE would obtain water quality certification, coordinate with the state as required by the Coastal Zone Management Act, and construct the project. Cost sharing of PED and construction are subject to the availability of appropriations.

WORK-IN-KIND

No work-in-kind is anticipated at this time.

PROJECT PARTNERSHIP AGREEMENT

The Project Partnership Agreement (PPA) remains to be developed.

SPONSOR'S VIEWS

The sponsor is in full support of the recommended plan and does not wish to pursue a Locally Preferred Plan.

REAL ESTATE REQUIREMENTS

Twenty-five percent of construction is proposed to take place from the water and seventy-five percent from land. Construction of 3,070 linear feet of sheet pile wall will occur along the northwest shoreline of Mount Sinai Medical Center. The sheet pile wall will tie into a 300-foot T-wall along the northern edge of Mount Sinai Medical Center property line. The non-federal sponsor will certify that lands are available via the flood protection levee easement for construction and operations and maintenance of both the sheet pile wall and the T-wall. A staging area of approximately 0.95 acre of lands has been identified. The non-federal sponsor will certify the availability of the staging area via a temporary work area easement. Access will be provided via pubic access roads. Access to the staging area will not require exclusive use of the identified access route. The non-federal sponsor will certify the availability of access via a temporary road easement. Construction is estimated to take approximately 18 months. The Real Estate Appendix provides additional detail.

B. DETAILED COST ESTIMATE AND COST SHARING

A detailed cost estimate is provided in the Cost Engineering Appendix. These costs are more developed and will vary from those shown in Chapter 2, which were planning level costs. **Table 4-1** shows a cost summary, and **Table 4-2** details the Federal and non-federal cost apportionment.

Table 4-1: Recommended Plan cost summary (FY16 price levels)

Mt. Sinai CAP Section 14	
Summary of Project Cost (FY16 Price Levels)	
Item	**Project First Cost**
Construction	$4,867,000
PED	$590,000
Construction Management	$350,000
Real Estate	$1,059,000
TOTAL	**$6,866,000**
* costs include contingency	

Table 4-2: Cost Sharing of the Recommended Plan (FY16 price levels)

Mt. Sinai CAP Section 14					
Summary of Project Cost Sharing (FY16 Price Levels)					
Item	Federal Cost Share	Federal Cost	Non-federal Cost Share	Non-federal Cost	Project First Cost
Implementation Cost Share	65.0%	$4,462,900	35.0%	$2,403,100	$6,866,000
Non-federal LERRD Contribution*				$35,340	
Non-federal Cash Contribution				$2,367,760	
* Includes non-federal admin costs only					
NOTE: Dollar values are rounded					

C. SEA LEVEL CHANGE CONSIDERATIONS

The project area, and Miami Beach as a whole, are vulnerable to sea level rise. However, given the emergency nature and funding constraints of the CAP Section 14 authority, future sea level rise was not a key factor for alternative development. Alternative development focused on preventing current erosion-causing conditions. However, future sea level rise was considered, per guidance, in order to recommend an alternative that prevents current erosion-causing conditions and is able to be adapted to future sea level change by the sponsor if necessary. The Recommended Plan includes a concrete cap at elevation 4.0 NAVD88 on the driven sheetpile and a concrete lift along the 130 feet of seawall constructed in 1990. As sea levels rise, extreme high tide events will begin to overtop the Recommended Plan. At that time, the Recommended Plan could be adapted by the sponsor by construction of a concrete elevation lift. Any investigation, design, and construction of such adaptations would be the responsibility of the sponsor.

D. RESIDUAL RISK

Even with implementation of the Recommended Plan, residual risk remains. The Recommended Plan addresses current erosion-causing conditions driven by overtopping of the bayside seawall as an emergency repair. It is not designed to prevent erosion resulting from extreme high tide events beyond those that have been experienced or that will occur as a result of sea level rise. Residual risk remains that extreme high tide events in the future could overtop the new seawall and that the Mount Sinai property could be inundated by other current and future events such as rainfall, which the Recommended Plan is not designed to address.

5. ENVIRONMENTAL COMPLIANCE

5.1. SCOPING

Consistent with USACE NEPA regulations and guidance, a Notice of Availability of the draft EA/FONSI shall be issued to the public for review and comment.

5.2. AGENCY COORDINATION

The proposed project shall be coordinated with the following agencies: U.S. Fish and Wildlife Service, National Marine Fisheries Service, U.S. Environmental Protection Agency, Florida State Clearinghouse, Florida State Historic Preservation Officer, Florida Fish and Wildlife Conservation Commission, and the Florida Department of Environmental Protection. All agency coordination letters shall be included in Appendix D.

5.3. LIST OF RECIPIENTS

A complete mailing list for the Study/FONSI is included Appendix E.

5.4. COMMENTS RECEIVED AND RESPONSE

Comments on the Study/FONSI and USACE responses shall be included within the signed FONSI.

5.5. ENVIRONMENTAL COMMITMENTS

USACE, and its contractors commit to avoiding, minimizing, or mitigating for adverse effects during construction activities by including the following commitments in the contract specifications:

5.5.1. PROTECTION OF MANATEES DURING ALL IN-WATER CONSTRUCTION ACTIVITIES

USACE shall incorporate the standard manatee protection construction conditions into the plans and specifications for this project.

5.5.2. PROTECTION OF ALL MARINE MAMMALS (MANATEES AND DOLPHINS) DURING SEAWALL CONSTRUCTION ACTIVITIES

USACE will utilize a shutdown zone which will always be a minimum of 15 meters (50 feet) around the work area. For impact pile driving, which generates impulsive sound, a larger 40 meter (130 foot) shutdown zone shall be implemented for marine mammals only; the standard shutdown zone will continue to be applied for all other protected species. If a manatee or bottlenose dolphin approaches or enters a shutdown zone during any in-water work, activity will be halted and delayed until either the animal has voluntarily left and been visually confirmed beyond the shutdown zone or 15 minutes have passed without re-detection of the animal.

5.5.3. PROTECTION OF SEA TURTLES AND SMALLTOOTH SAWFISH

USACE shall incorporate NMFS' "Sea Turtle and Smalltooth Sawfish Construction Conditions" into the plans and specifications for this project. USACE will utilize a shutdown zone, which will always be a

minimum of 15 meters (50 feet) around the work area. If a sea turtle or smalltooth sawfish is observed approaching or entering a shutdown zone during any in-water work, activity will be halted and delayed until either the animal has voluntarily left and been visually confirmed beyond the shutdown zone or 15 minutes have passed without re-detection of the animal.

5.6. COMPLIANCE WITH ENVIRONMENTAL REQUIREMENTS

5.6.1. NATIONAL ENVIRONMENTAL POLICY ACT OF 1969

Environmental information on the project has been compiled and this integrated report has been prepared. A Notice of Availability for the integrated report/FONSI shall be coordinated with interested stakeholders for review and comment. The project shall be in compliance with the National Environmental Policy Act of 1969, as amended, 42 U.S.C. 4321, *et seq*. P.L. 91-190.

5.6.2. ENDANGERED SPECIES ACT OF 1973

Pursuant to Section 7 of the Act, consultation shall be conducted with the NMFS and USFWS. This project shall be fully coordinated under the Endangered Species Act and will, therefore, be in full compliance with the Act. Consultation documents for this EA are located in Appendix D.

5.6.3. FISH AND WILDLIFE COORDINATION ACT OF 1958

This project is being coordinated with the USFWS through the NEPA and ESA requirements.

5.6.4. NATIONAL HISTORIC PRESERVATION ACT OF 1966 (INTER ALIA)

Consultation with the Florida State Historic Preservation Officer (SHPO) shall be initiated in accordance with the National Historic Preservation Act of 1966, as amended, and as part of the requirements and consultation processes contained within the NHPA implementing regulations of 36 CFR 800. This project shall be in compliance with the Archeological Resources Protection Act (96-95), the Abandoned Shipwreck Act of 1987 (PL 100-298; 43 U.S.C. 2101-2106), American Indian Religious Freedom Act (PL 95-341), Executive Orders (E.O) 11593, 13007, & 13175, and the Presidential Memo of 1994 on Government to Government Relations. The Florida Department of State, State Historic Preservation Officer reviewed the project and by letter dated September 26, 2016 found that “proposed project is unlikely to adversely affect historic properties.” A copy of this letter is included in Appendix E.

5.6.5. CLEAN WATER ACT OF 1972

The project shall be in compliance with this Act. Application for Section 401 water quality exemption/certification shall be made to the Florida Department of Environmental Protection. All state water quality standards would be met. A Section 404 (b)(1) evaluation is included in this report as Appendix D-1.

5.6.6. CLEAN AIR ACT OF 1972

The project area is in attainment and no air quality permits are required for this project.

5.6.7. COASTAL ZONE MANAGEMENT ACT OF 1972

A Federal consistency determination in accordance with 15 CFR 930 Subpart C is included in this report as Appendix D-2. A consistency determination with the State’s Coastal Zone Management Program shall be made with the issuance of the Section 401 water quality exemption/certification.

5.6.8. FARMLAND PROTECTION POLICY ACT OF 1981

No prime or unique farmland would be impacted by implementation of this project. This Act is not applicable.

5.6.9. WILD AND SCENIC RIVER ACT OF 1968

No designated Wild and Scenic river reaches would be affected by project related activities. This act is not applicable.

5.6.10. MARINE MAMMAL PROTECTION ACT OF 1972

There is no anticipated take of any marine mammal during any activities associated with the project. Appropriate actions will be taken to avoid listed and protected marine mammal species effects during project construction. If a marine mammal is identified within the project boundaries, cease work requirements will be implemented until the animal leaves the project area of its own volition, preventing potential take of the animal under the MMPA. As a result of this, the project shall be in compliance with the Act.

5.6.11. ESTUARY PROTECTION ACT OF 1968

No designated estuary would be affected by project activities. This Act is not applicable.

5.6.12. SUBMERGED LANDS ACT OF 1953

The project would occur on the submerged lands of the State of Florida. USACE has Navigational Servitude under the Supremacy Clause of the U.S. Constitution and is not required to obtain a lease or authorization from the state to use state owned lands for projects that support navigation. By coordination of the project through the permit exemption process, the State shall be coordinated with and this project shall be in compliance with the Act.

5.6.13. COASTAL BARRIER RESOURCES ACT AND COASTAL BARRIER IMPROVEMENT ACT OF 1990

There are no designated coastal barrier resources in the project area that would be affected by this project. These Acts are not applicable.

5.6.14. RIVERS AND HARBORS ACT OF 1899

The proposed work would not obstruct the navigable waters of the United States. The proposed action shall be subject to public notice and other evaluations normally conducted for activities subject to the Act. The project is in full compliance.

5.6.15. ANADROMOUS FISH CONSERVATION ACT

Anadromous fish species would not be affected. The project shall be coordinated with the National Marine Fisheries Service and is in compliance with the act.

5.6.16. MIGRATORY BIRD TREATY ACT AND MIGRATORY BIRD CONSERVATION ACT

No migratory birds would be affected by project activities. The project is in compliance with these Acts.

5.6.17. MARINE PROTECTION, RESEARCH AND SANCTUARIES ACT

Replacement of the seawall at the Mount Sinai Medical Center is in compliance with the Marine Protection, Research, and Sanctuaries Act.

5.6.18. MAGNUSON-STEVENS FISHERY CONSERVATION AND MANAGEMENT ACT

An Essential Fish Habitat (EFH) Assessment is included within this integrated report and shall be coordinated with the NMFS. Copies of the correspondence shall be located in Appendix C.

5.6.19. UNIFORM RELOCATION ASSISTANCE AND REAL PROPERTY ACQUISITION POLICIES ACT OF 1970

The project does not involve real property acquisition and/or displacement of property owners or tenants. The Act is not applicable to this project.

5.6.20. E.O. 11990, PROTECTION OF WETLANDS

No wetlands would be affected by project activities. This project is in compliance with the goals of this Executive Order (EO).

5.6.21. E.O. 11988, FLOOD PLAIN MANAGEMENT

The project has been evaluated in accordance with this EO. The project is in compliance.

5.6.22. E.O. 12898, ENVIRONMENTAL JUSTICE

This environmental justice assessment recognizes the issues addressed in the Environmental Justice Guidance under NEPA (CEQ 1997), and uses USEPA Guidance for Incorporating Environmental Justice Concerns in USEPA's NEPA Compliance Analyses (USEPA 1998) as a guide.

An environmental justice assessment requires an analysis of whether minority and low-income populations (i.e. "the populations of concern") would be affected by a proposed Federal action and whether they would experience adverse impacts from the proposed action at any of the site alternatives. If there are adverse impacts, the severity and proportionality of these impacts on populations of concern must be assessed in comparison to the larger non-minority or non-low-income populations. At issue is whether such adverse impacts fall disproportionately on minority and/or low-income members of the community and, if so, whether they meet the threshold of "disproportionately high and adverse." If disproportionately high and adverse effects are evident, then USEPA guidance advises that it should trigger consideration of alternatives and mitigation actions in coordination with extensive community outreach efforts (USEPA 1998).

The proposed action will not result in adverse human health or environmental affects which would disproportionally impact a particular minority or low-income population. The action will take place on and adjacent to a property of the Mount Sinai Medical Center. Properties located north of the hospital on Meloy Channel are a high dollar value private marina and private homes. Low-income populations and minority populations are not disproportionately located within the region of influence of the proposed action. The proposed activity would not (a) exclude persons from participation in, (b) deny persons the benefits of, or (c) subject persons to discrimination because of their race, color, or national origin, nor

would the proposed action adversely impact "subsistence consumption of fish and wildlife." Therefore, the project is in compliance with this EO.

5.6.23. E.O. 13089, CORAL REEF PROTECTION

This EO may apply to coastal projects, especially those which might directly or indirectly impact coral reefs. Although the project has corals growing on the seawall, the seawall is not considered as a coral reef under the EO, and the EO is not applicable to the project. However, USACE plans to relocate any scleractinian corals greater than 10 cm in size to an alternative location.

5.6.24. E.O. 13112, INVASIVE SPECIES

The replacement of the seawall Mount Sinai Hospital is not expected to have any effect on invasive species in the vicinity of the project area.

5.6.25. E.O. 13186, MIGRATORY BIRDS.

This EO requires, among other things, a Memorandum of Understanding (MOU) between the Federal Agency and the U.S. Fish and Wildlife Service concerning migratory birds. Neither the Department of Defense MOU nor the USACE' Draft MOU clearly address migratory birds on lands not owned or controlled by USACE. For many USACE civil works projects, the real estate interests are provided by the non-federal sponsor. Control and ownership of the project lands remain with a non-federal interest. Measures to avoid the destruction of migratory birds and their eggs or hatchlings shall be implemented, where applicable.

5.6.26. E.O. 13045, DISPARATE RISKS INVOLVING CHILDREN

This EO mandates that each Federal agency make it a high priority to identify and assess environmental health risks and safety risks that may disproportionately affect children and ensure that its policies, programs, activities, and standards address disproportionate risks to children that result from environmental health risks or safety risks.

As the proposed action does not affect children disproportionately from other members of the population, the proposed action would not increase environmental health or safety risks to children.

6. RECOMMENDATIONS

I have given consideration to all significant aspects in the overall public interest, including engineering feasibility, economic, social, cost and risk analysis, and environmental effects. The Recommended Plan described in this final report provides the optimum solution for emergency shoreline protection within the study area that can be developed with the framework of the formulation concepts. Implementation of the Recommended Plan for the Mount Sinai CAP Section 14 Project is recommended at this time, with such modification as the discretion of the Commander, South Atlantic Division, U.S. Army Corps of Engineers (SAD), deems advisable.

The Recommended Plan is described in the previous chapters. The plan will address current erosion issues at the Mount Sinai Medical Facility, providing emergency erosion protection to the only hospital facility on the barrier island, which also operates as an Essential Services facility and a disaster coordinating point.

6.1 DRAFT ITEMS OF LOCAL COOPERATION

Recommendations for provision of Federal participation in the Recommended Plan described in this report would require the project sponsor to enter into a written PPA, as required by Section 221 of Public Law 91-611, as amended, to provide local cooperation satisfactory to the Secretary of the Army. Such local cooperation shall provide the following non-federal responsibilities:

a. Provide 35 percent of initial project costs as further specified below:

b. For so long as the project remains authorized, operate, maintain, and repair the completed project, or functional portion of the project, at no cost to the Federal Government, in a manner compatible with the project's authorized purposes and in accordance with applicable Federal and state laws and regulations, and any specific directions prescribed by the Federal Government;

c. Give the Federal Government a right to enter, at reasonable times and in a reasonable manner, upon property that the non-federal sponsor, now or hereafter, owns or controls for access to the project for the purpose of inspecting, operating, maintaining, repairing, replacing, rehabilitating, or completing the project. No completion, operation, maintenance, repair, replacement, or rehabilitation by the Federal Government shall relieve the non-federal sponsor of responsibility to meet the non-federal sponsor's obligations, or to preclude the Federal Government from pursuing any other remedy at law or equity to ensure faithful performance;

d. Hold and save the United States free from all damages arising from the initial construction, periodic nourishment, mitigation, operation, maintenance, repair, replacement, and rehabilitation of the project and any project related betterments, except for damages due to the fault or negligence of the United States or its contractors;

e. Keep and maintain books, records, documents, and other evidence pertaining to costs and expenses incurred pursuant to the project in accordance with the standards for financial management systems

set forth in the Uniform Administrative Requirements for Grants and Cooperative Agreements to State and Local Governments at 32 Code of Federal Regulations (CFR) Section 33.20;

f. Perform, or cause to be performed, any investigations for hazardous substances that are determined necessary to identify the existence and extent of any hazardous substances regulated under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), Public Law 96-510, as amended, 42 U.S.C. 9601 9675, that may exist in, on, or under lands, easements, or rights-of-way that the Federal Government determines to be required for the initial construction, periodic nourishment, operation, and maintenance of the project. However, for lands that the Federal Government determines to be subject to the navigation servitude, only the Federal Government shall perform such investigations unless the Federal Government provides the non-federal sponsor with prior specific written direction, in which case the non-federal sponsor shall perform such investigations in accordance with such written direction;

g. Assume complete financial responsibility for all necessary cleanup and response costs of any CERCLA regulated materials located in, on, or under lands, easements, or rights-of-way that the Federal Government determines to be necessary for the initial construction, periodic nourishment, operation, or maintenance of the project;

h. Agree that the non-federal sponsor shall be considered the operator of the project for the purpose of CERCLA liability, and to the maximum extent practicable, operate, maintain, and repair the project in a manner that will not cause liability to arise under CERCLA;

i. If applicable, comply with the applicable provisions of the Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970, Public Law 91-646, as amended by Title IV of the Surface Transportation and Uniform Relocation Assistance Act of 1987 (Public Law 100 17), and the Uniform Regulations contained in 49 CFR Part 24, in acquiring lands, easements, and rights-of-way, required for the initial construction, periodic nourishment, operation, and maintenance of the project, including those necessary for relocations, borrow materials, and dredged or excavated material disposal, and inform all affected persons of applicable benefits, policies, and procedures in connection with said Act;

j. Comply with all applicable Federal and state laws and regulations, including, but not limited to, Section 601 of the Civil Rights Act of 1964, Public Law 88-352 (42 U.S.C. 2000d), Department of Defense Directive 5500.11 issued pursuant thereto, as well as Army Regulation 600 7, entitled "Nondiscrimination on the Basis of Handicap in Programs and Activities Assisted or Conducted by the Department of the Army," and all applicable Federal labor standards requirements including, but not limited to, 40 U.S.C. 3141- 3148 and 40 U.S.C. 3701 – 3708 (revising, codifying, and enacting without substantial change the provisions of the Davis-Bacon Act (formerly 40 U.S.C. 276a *et seq.*), the Contract Work Hours and Safety Standards Act (formerly 40 U.S.C. 327 *et seq.*), and the Copeland Anti-Kickback Act (formerly 40 U.S.C. 276c *et seq.*);

k. Provide the non-federal share of that portion of the costs of data recovery activities associated with historic preservation that are in excess of 1% of the total amount authorized to be appropriated for the project in accordance with the cost sharing provisions of the agreement;

l. Participate in, and comply with, applicable Federal floodplain management and flood insurance programs;

m. Do not use Federal funds to meet the non-federal sponsor's share of total project costs unless the Federal granting agency verifies in writing that the expenditure of such funds is authorized;

n. Prescribe and enforce regulations to prevent obstruction of, or encroachment on, the project that would reduce the level of protection it affords or that would hinder future periodic nourishment and/or the operation and maintenance of the project;

o. Not less than once each year inform affected interests of the extent of protection afforded by the project;

p. Publicize floodplain information in the area concerned, provide this information to zoning and other regulatory agencies for their use in preventing unwise future development in the floodplain, and adopt such regulations as may be necessary to prevent unwise future development and to ensure compatibility with protection levels provided by the project;

q. Recognize and support the requirements of Section 221 of Public Law 91-611, Flood Control Act of 1970, as amended, and Section 103 of the Water Resources Development Act of 1986, Public Law 99-662, as amended, which provides that the Secretary of the Army shall not commence the construction of any water resources project, or separable element thereof, until the non-federal sponsor has entered into a written agreement to furnish its required cooperation for the project or separable element;

r. Comply with Section 402 of the Water Resources Development Act of 1986, as amended (33 U.S.C. 701b-12), which requires the non-federal sponsor to participate in and comply with applicable Federal floodplain management and flood insurance programs, prepare a floodplain management plan within one year after the date of signing the PPA, and implement the plan no later than one year after project construction is complete.

6.2 DISCLAIMER

The recommendations contained herein reflect the information available at this time and current departmental policies governing formulation of individual projects. They do not reflect program and budgeting priorities inherent in the formulation of a national civil works construction program nor the perspective of higher review levels within the Executive Branch. Consequently, the recommendations may be modified before they are transmitted to higher authority as proposals for project modification and/or implementation funding. The recommendations herein for provision of CAP Section 14 project for the Mount Sinai Medical facility do not include any provisions for work which would result in any new

Federal expenditures or financial assistance prohibited by the Coastal Barrier Resources Act (Public Law 97-348); nor were funds obligated in past years for this project for purposes prohibited by this Act.

Jason A. Kirk
Colonel, U.S. Army
District Engineer

Reference Maps

Erosion Drivers and Effects

- The primary driver for current erosion is the overtopping of the seawall during extreme high tide events.
- Overtopping, and the resulting inundation, drives erosion of material over/through the existing seawall and the subsidence of land behind the wall threatens vulnerable facilities, including a perimeter road and parking facilities.

Critical Facilities Vulnerable to Erosion

- Mount Sinai is the only major medical facility in Miami Beach.
- It serves as a "shelter in place" for the local population during disasters.
- Emergency Staging Area during disaster events.
- Perimeter road and parking are essential to hospital operations.

REF-1: Foldout map.

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