

SEAWALL HEIGHT CRITERIA

Town of Surfside, Florida

Prepared for

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1 INTRODUCTION

The Town of Surfside (the Town) has identified the need to develop a Town Ordinance setting a minimum, and potential maximum, seawall height for new construction and repairs of seawalls. Sections 90-60.2(2)c and 90-63.4 of the Town's Zoning Code currently require a seawall height of "five feet above mean low water". With a mean low water for the coastal area of Surfside defined by the National Oceanic and Atmospheric Administration (NOAA) as 0.13 ft NAVD88, the current minimum height for a seawall with the Town is 5.13 ft NAVD88 (6.68 ft NGVD29). Other local municipalities in south Florida require minimum seawall heights ranging between 5.7 ft NAVD88 (7.25 ft NGVD29) and 6.0 ft NAVD88 (7.55 ft NGVD29). In addition, new seawall permits have recently been approved in the Town for 5.71 ft, 5.95 ft, and 8.35 ft NAVD88 (7.26 ft, 7.50 ft, and 9.90 ft NGVD29).

The objective of this desktop review of seawall height ordinances elsewhere in the region is to assist the Town in developing allowable minimum and maximum seawall heights to be implemented within the Town.

2 CURRENT SEA LEVEL RISE PROJECTIONS

Nova reviewed readily available data on sea level rise and projections as they relate to South Florida. Sources reviewed included the Southeast Florida Regional Climate Change Compact (the Work Group), the Intergovernmental Panel on Climate Change (IPCC), and NOAA. Data review focused on the 50-year planning horizon for the design life of a typical seawall.

The Work Group's 2019 Unified Sea Level Rise Projection for Southeast Florida reported that sea level is projected to rise 21 to 54 inches above 2000 mean sea level by 2070 (Southeast Florida Regional Climate Change Compact, 2020). The 50-year design life of a typical seawall classifies them as non-critical infrastructure, as critical projects include those projects which are not easily replaceable or removable, have a long design life (more than 50 years), and are interdependent with other infrastructure or services. The range recommended by the Work Group for non-critical infrastructure in service during or after 2070 utilizes the IPCC median curve (IPCC, 2014) as the lower range and the 2017 NOAA Intermediate-High Curve (Sweet et al., 2017) as the upper range, as shown in Figure 2-1. Taking this into account, the sea level rise projections applicable for seawalls is 21 to 40 inches.

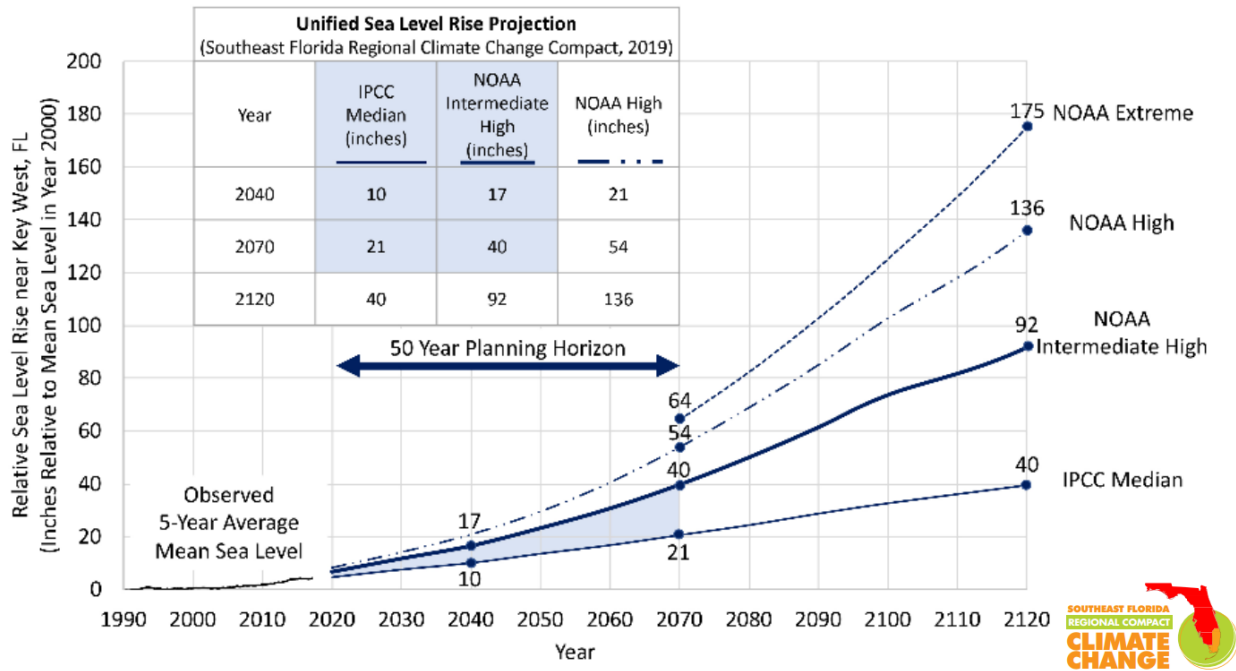


Figure 2-1 Unified Sea Level Rise Projection (Southeast Florida Regional Climate Change Compact, 2019)

The Work Group recommends the use of the NOAA High curve, the NOAA Intermediate High curve, and the median of the IPCC Fifth Assessment Report (AR5) RCP 8.5 scenario (IPCC, 2013) as the basis for a Southeast Florida sea level rise projection for the 2040, 2070 and 2120 planning horizons. Since the Work Group’s 2019 report, IPCC has released an updated Sixth Assessment Report (AR6) and NOAA has released an updated 2022 Global and Regional Sea Level Rise Scenarios for the United States. An Interagency Sea Level Rise Scenario Tool has been developed which incorporates the updates from these most recent IPCC and NOAA reports. The predicted sea level rise scenarios for Virginia Key, FL, the closest gauge to the Town of Surfside, are shown in Figure 2-2. The interagency tool projects sea level to rise 13 inches (1.12 feet) to 39 inches (3.28 feet) by 2070, which is lower than the Work group’s 2019 projection.

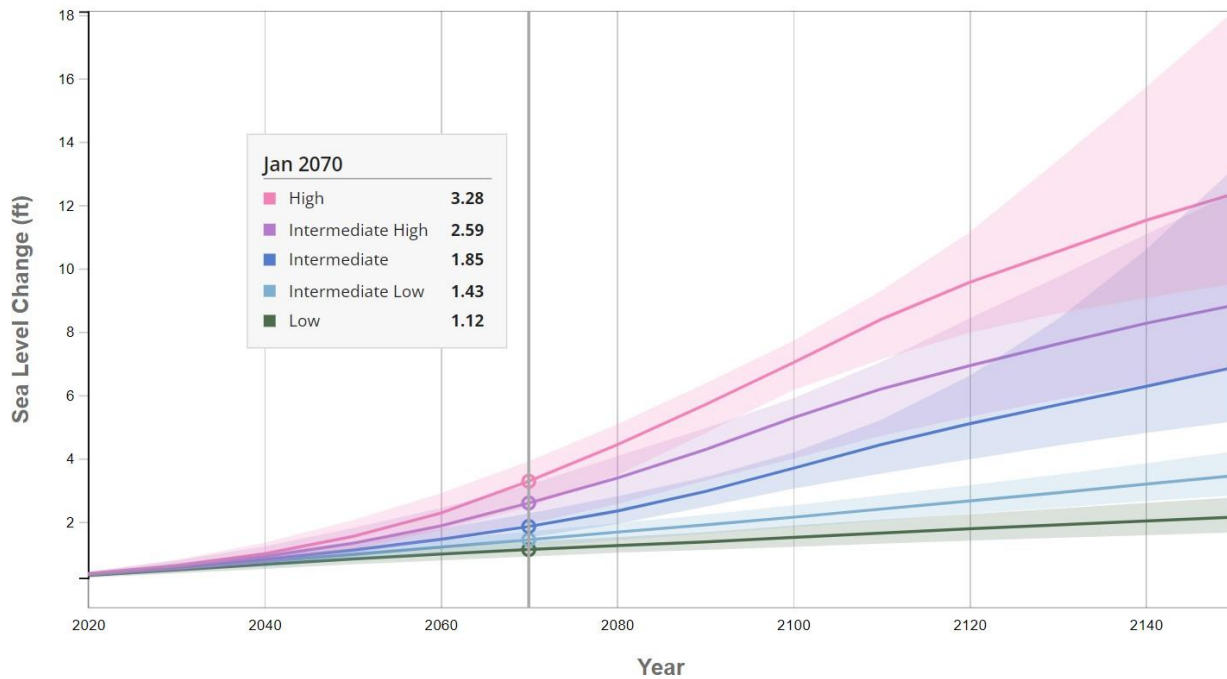


Figure 2-2 Interagency Sea Level Rise Projections for Virginia Key, Florida (NASA, 2023)

3 LOCAL MUNICIPAL SEAWALL ORDINANCES

Nova reviewed local municipal ordinances and design guidelines for the regulation of seawall heights for new seawall construction and repair of existing seawalls. Municipalities included the City of Fort Lauderdale, Broward County, the City of Miami, the City of Miami Beach, Miami-Dade County, and the City of Delray Beach.

In 2016, the City of Fort Lauderdale updated its seawall ordinance in response to flooding which occurred in 2015 during the seasonal King tides. The ordinance requires that the top surface of seawalls have a minimum elevation of 5.45 feet NGVD29 (3.9 feet NAVD88), and a maximum elevation of 6.55 feet NGVD29 (5.0 feet NAVD88) not exceeding the base flood elevation (BFE). The ordinance also encourages seawalls constructed lower than 5.0 feet NAVD88 to have the foundation designed to accommodate a future seawall height extension up to the minimum elevation of 5.0 feet NAVD88. Nancy Gassman, assistant public works director, explained that the maximum height is imposed to prevent stormwater runoff from flooding homes (Swanson, 2016).

In 2020, Broward County adopted Land Use Policy 2.21.7, the first countywide policy establishing tidal flood barrier infrastructure standards to mitigate high tide flooding associated with realized and additional sea level rise through the year 2070. The regional standard was informed by technical work undertaken with support from the U.S. Army Corps of Engineers (USACE) as part of the joint Broward County/USACE Flood Risk Management Study for Tidally Influenced Coastal Areas. The policy is based on the estimated rise of sea level to over two feet by 2070. The ordinance set a minimum elevation of 6.55 feet NGVD29 (5.0 feet NAVD88) for coastal infrastructure within tidally influenced areas. No maximum elevation was established.

In 2020, the City of Miami Commission adopted an ordinance requiring that the top elevation of new seawalls, bulkheads, living shorelines or other shoreline protection structures or elements fronting the Miami River or its tributaries must be constructed to a minimum elevation of 4.0 feet NAVD88, designed and constructed with the ability to be incrementally raised a minimum of two feet above their initial designed and constructed elevation to mitigate high tide flooding associated with realized and additional sea level rise through the year 2070. For all other tidally influenced areas or shoreline properties, seawalls must be constructed with a minimum top elevation of 6.0 feet NAVD88. No maximum elevation was established.

In 2021, the Miami Beach City Commission adopted an ordinance modeled after seawall ordinances adopted by Broward County and the City of Fort Lauderdale. Under the new ordinance, all new seawalls must be constructed to a minimum elevation of 5.7 feet NAVD88 or 4.0 feet NAVD88 if designed to support a future elevation of 5.7 feet NAVD88. This ordinance is based on the estimated increase in sea level of approximately 10 to 17 inches by 2040, 21 to 40 inches by 2070, and 40 to 92 inches by 2120. No maximum elevation was established.

In October 2022, Miami-Dade County adopted a minimum seawall height via the Miami-Dade County Flood Criteria Map. The County Flood Criteria sets the minimum Flood Protection Level of Service for finished grade elevation of developed sites, secondary canal banks and crown/grade of roads. The County Flood Criteria is based on flood conditions created by a 10-year/24-hour storm event and a sea level rise forecast of 2 feet by 2060. Under the new criteria, the minimum top of seawall elevation increased from the previous minimum elevation of 3.5 feet NAVD88 to 6.0 feet NAVD88. Miami-Dade County does not have a maximum seawall height requirement.

In 2021, the City of Delray Beach also adopted a seawall height ordinance. The regulations require that the owners of new construction properties build seawalls with a minimum top elevation of 5.75 feet NGVD29 (4.2 feet NAVD88). If the seawall is built under 4.2 feet NAVD88, it must be designed such that it can be raised to meet the regulation. Delray Beach also enforces a maximum allowable seawall height. For

properties in a floodplain with a BFE greater than or equal to 6.55 feet NGVD29 (5.0 feet NAVD88), the maximum seawall elevation is equal to the BFE of the property. For properties within floodplains that have a BFE equal to 5.55 feet NGVD29 (4.0 feet NAVD88), the maximum seawall elevation is 6.55 feet NGVD (5.0 feet NAVD88). For property's not in a floodplain (in Zone X), the maximum seawall height is at grade as determined by the City Code.

The minimum and maximum elevations of seawalls specified by local municipalities is shown in Table 3-1.

Table 3-1 Minimum and Maximum Top of Seawall Elevations of Local Municipalities

Municipality	Minimum Top of Seawall Elevation (ft NGVD29)	Minimum Top of Seawall Elevation (ft NAVD88)	Maximum Top of Seawall Elevation (ft NGVD29)	Maximum Top of Seawall Elevation (ft NAVD88)
Town of Surfside	6.68	5.13	N/A	N/A
City of Fort Lauderdale	5.45	3.90	6.55 or BFE	5.00 or BFE
Broward County	6.55	5.00	N/A	N/A
City of Miami	7.55	6.00	N/A	N/A
City of Miami Beach	7.25	5.70	N/A	N/A
Miami-Dade County	7.55	6.00	N/A	N/A
City of Delray Beach	5.75	4.20	6.55 or BFE	5.00 or BFE

4 RECOMMENDATIONS

The Town of Surfside contracted Nova Consulting, Inc. (Nova) to perform a desktop review of seawall heights to assist in developing allowable minimum and maximum top of seawall elevations to be implemented within the Town. Nova's review consisted of available current sea level rise projections and local municipal seawall ordinances and design guidelines.

Review of current sea level rise projections from the 2022 Interagency Sea Level Rise Scenario Tool revealed that sea level is projected to rise 13 to 39 inches by 2070 within southeast Florida. The City of Miami Beach utilizes the projections of 21 to 40 inches as recommended by the Work Groups 2019 report.

Sections 90-60.2(2)c and 90-63.4 of the current Town's Zoning Code require a seawall height of "five feet above mean low water". Mean low water is currently defined by NOAA as 0.13 feet NAVD88, meaning that the current minimum height for a seawall is 5.13 feet NAVD88 or 6.68 feet NGVD29. Using the Work Group's more conservative sea level projections of 21 to 40 inches as recommended for the 50-year planning horizon, the mean low water is expected to be 1.88 to 3.46 feet NAVD88 by 2070.

Considering the conservative boundary of this projection, exposure of the Town's barrier island setting, and accounting for recent extreme King Tide events of +3.0 feet (City of Delray Beach, 2018), 6.5 feet NAVD88 would be the recommended minimum height required to provide sufficient protection for the Town and extend the useful life of the seawalls through 2070. The proposed recommended seawall height exceeds the minimum elevation of 6.0 feet NAVD88 as required by Miami-Dade County. In areas surrounding the Town of Surfside, several municipalities have adopted similar ordinances with minimum top of seawall elevations ranging from 5.45 to 7.55 feet NGVD29 (3.90 to 6.00 feet NAVD88) which are consistent with the proposed recommended minimum seawall height.

In recent years, local municipalities have adopted two types of ordinances pertaining to seawalls: (1) Ordinance with minimum elevation requirements only, and (2) Ordinances with elevations and timeline requirements. The first option does not require repairs or replacement on a certain timeline, rather the private owner determines when to undergo the work. This option would be triggered when a private resident submits a permit application for a seawall improvement, or when improvements to the upland property exceed 50% of the existing value, or by a different trigger identified by the Town. The advantage of this method is that at some point in the future, there should be a higher level of protection from rising waters throughout the Town.

The second option the Town may elect is to adopt an ordinance with timeline requirements such as what has been implemented in the Cities of Fort Lauderdale and Delray Beach, which enforce code violations when a condition has been triggered. These ordinances contain two provisions under which a property owner may receive a code violation: (1) failing to maintain a seawall in good repair and (2) requiring owners to prevent tidal waters entering their property from impacting other properties or the public right of way. In addition to this, seawalls that are newly permitted seawalls or undergoing significant repairs are required to meet the minimum elevation requirements. Requiring the prevention of tidal waters from impacting neighbors' property or the public right of way may encourage neighborhoods to improve seawalls without mandating a specific timeframe. This type of ordinance allows for steady systematic improvements to the seawall; however, a single storm surge event may result in widespread citations and subsequent challenges to the marine industry to assist homeowners in complying with the ordinance.

The ordinances adopted by the Cities of Fort Lauderdale and Delray Beach also include both minimum and maximum top of seawall elevation requirements. As stated previously, 8.05 feet NGVD29 (6.5 feet NAVD88) is recommended as a minimum elevation to maintain consistency with surrounding municipalities and provide adequate protection from King Tide events. Considering recent seawall permits approved within the Town for 5.71 to 8.35 ft NAVD88 (7.26 to 9.90 feet NGVD29), it may be necessary to implement a maximum height. Cities of Fort Lauderdale and Delray Beach enforce a maximum height of 6.55 feet NGVD29 not exceeding the BFE of the property to prevent flooding from stormwater runoff. Using the Town's BFE of 10 feet NGVD29 and projected 2070 sea level rise, a similar maximum height requirement could be implemented.

In conclusion, the recommended top of seawall elevations for the Town of Surfside are as follows:

- 1) A minimum top of seawall elevation of 8.05 feet NGVD29 (6.5 feet NAVD88), with an option to have the structural foundation to raise the wall an additional foot (to 7.5 ft NAVD88) in the future to provide an additional level of protection and extend the life of the seawall; and
- 2) A maximum top of seawall elevation of 10 feet NGVD29 (8.45 feet NAVD88), not exceeding the Base Flood Elevation.

5 REFERENCES

Broward County, Florida, Code of Ordinances § 39.

City of Delray Beach, Florida, Code of Ordinances § 7.

City of Delray Beach, 2018. City of Delray Beach Intracoastal Waterway Water Level & Infrastructure Vulnerability Study.

City of Fort Lauderdale, Florida, ULDR § 47.

City of Miami, Florida, Code of Ordinances § 54.

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