Improving Resiliency to Coastal Flooding

City of Delray Beach

Town Hall Meeting – Island South of Atlantic
January 30, 2020

Presentation Overview

- Resilience Planning Efforts
- Capital Improvement Projects
- State & Federal Coordination
- Comparison of Seawall Ordinances In Nearby Communities
- Community Input

Resilience Planning Efforts

- Stormwater Master Plan Updates
- Seawall Vulnerability Study
- Dune Management

Cynthia Fuentes, PE
Engineering Division Manager
City of Delray Beach

Stormwater Master Plan (SWMP) Update

- Update of the City's previous Master Plan from 2001
- Completed by ADA Engineering
- Identified and ranked Problem Areas
  - Including drainage problems, street flooding, tidal flooding, inadequate infrastructure, stormwater quality and recharge
- Create a plan to address issues over the next 30 Years
- Entire Plan Estimated Cost ~ $380M
  - South of Atlantic ~$123M

SWMP Implementation Approach

- Current Capital Projects Under Way
  - Thomas Street Pump Station
  - Tropic Isle Improvement
  - Marine Way Drainage & Pump Station

- Future Capital Improvements Projects
  - Using recommendations in the SWMP
  - Available Funding
  - Coordination with other projects
  - Input from residents

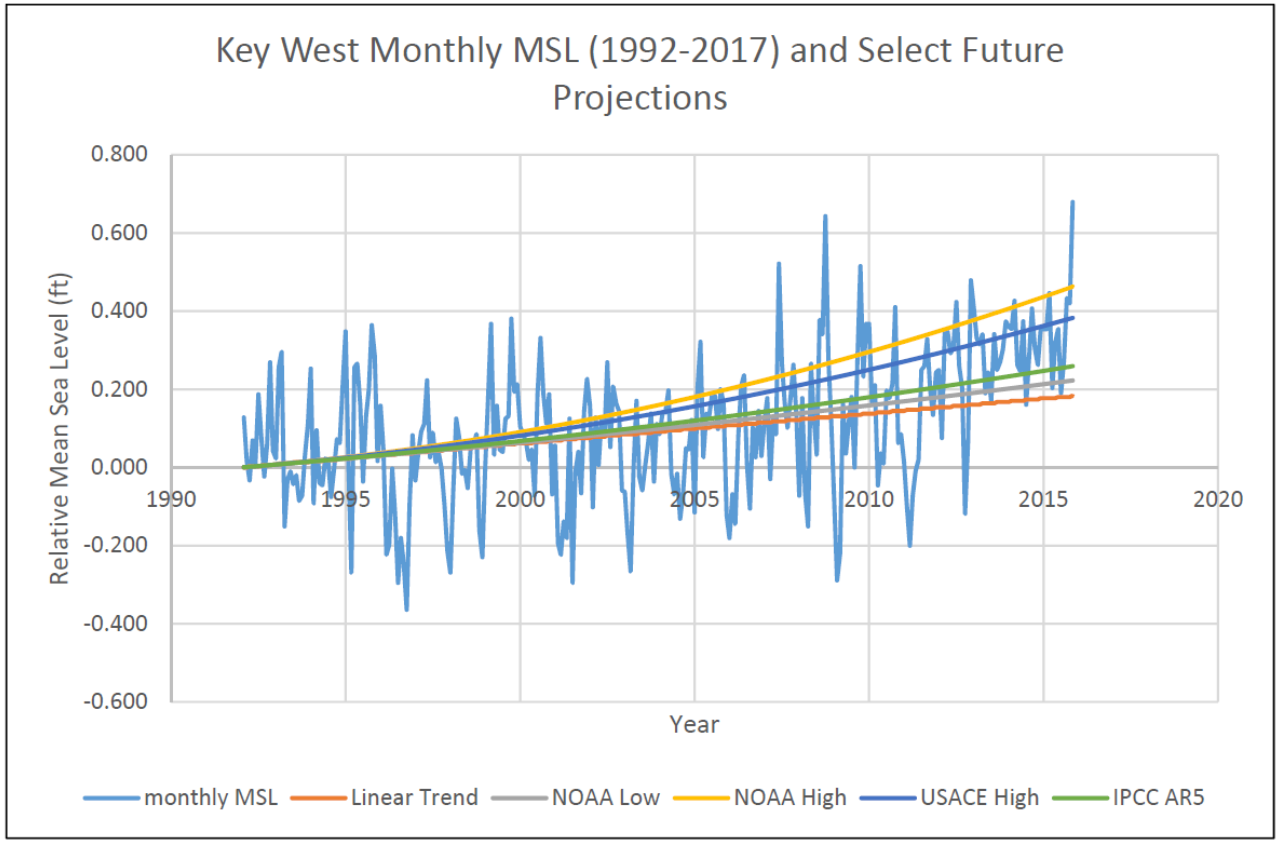
- Repair and Rehabilitation – Continuous Effort
  - Pipe Lining
  - Backflow prevention

Seawall Vulnerability Analysis

Intracoastal Waterway (ICW) Water Level and Infrastructure Vulnerability Study

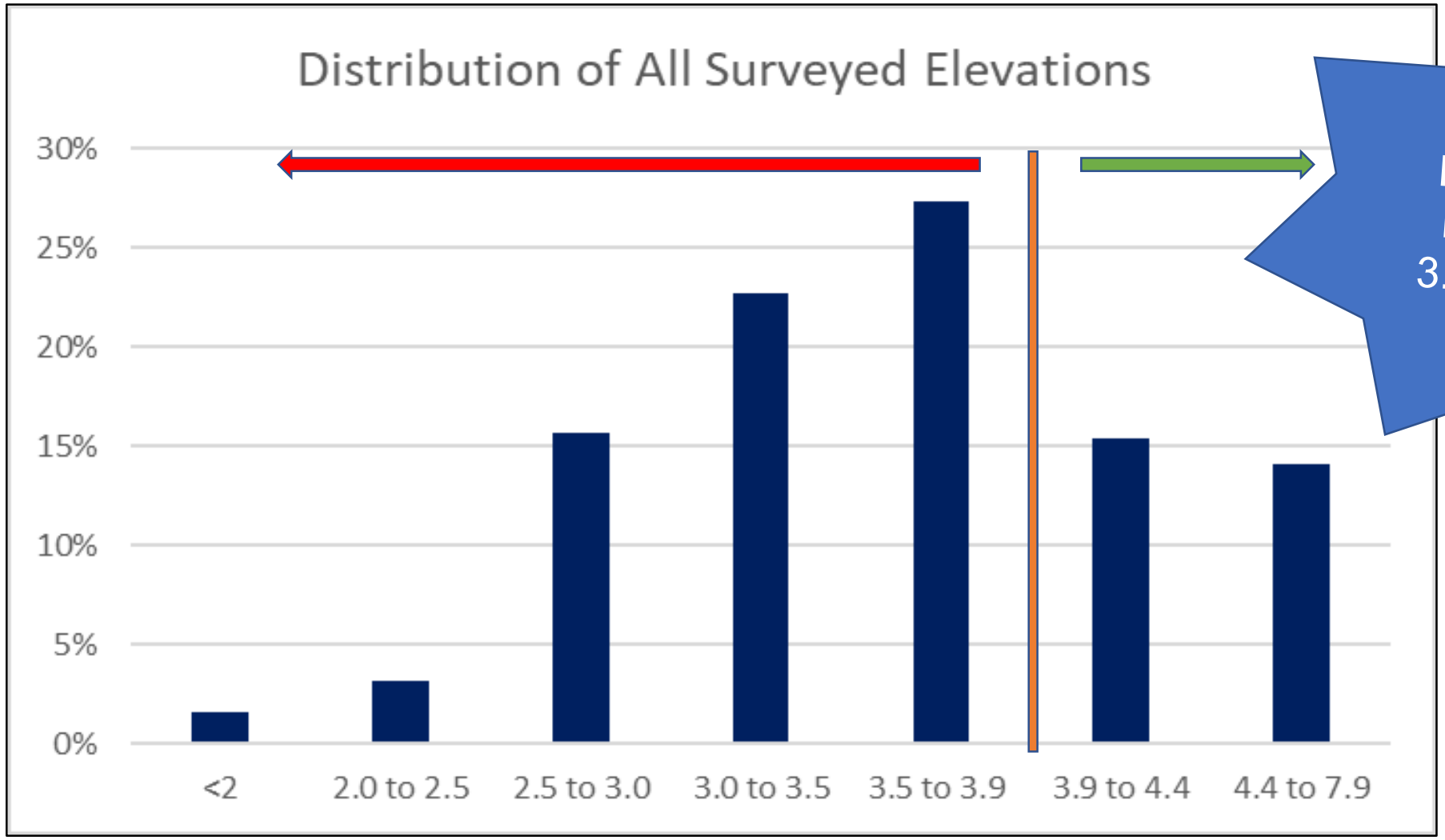
- 1 Mile of Public Seawalls
- 20 Miles of Private Seawalls
- Assessed vulnerability to flooding along ICW
  - Water level predictions for 30 years
  - Assessed current conditions of seawalls
- Identified options to protect infrastructure
  - Compared current conditions against water level predictions

30-Year Planning Elevation

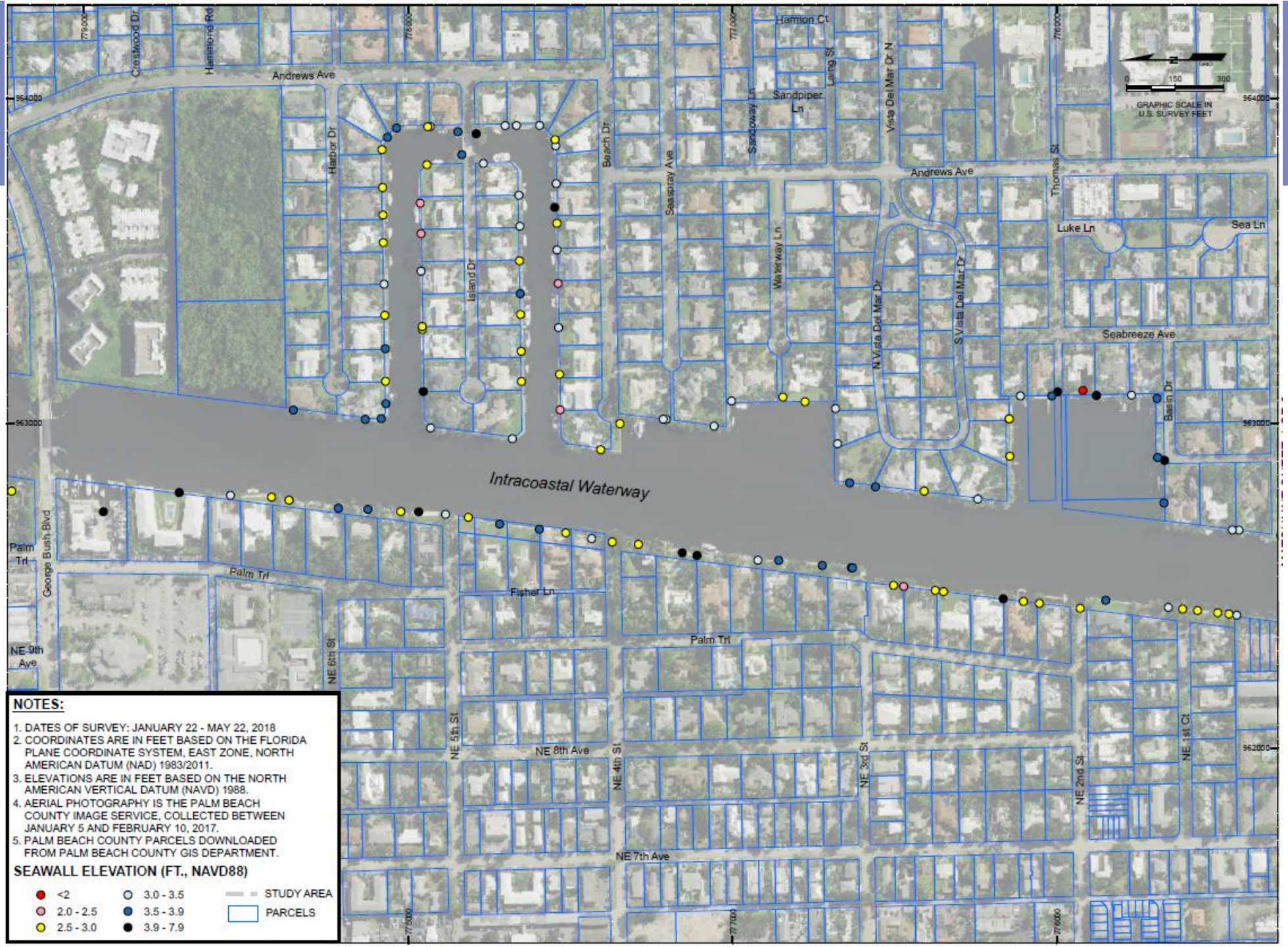


Average Daily Maximum Water Level 2017	**1.0 ft.**
30 years of Sea Level Rise	**0.6-1.1 ft.**
5-year Return Period Event	**1.8 ft.**
Freeboard	**0.5 ft.**
	3.9 to 4.4 ft. NAVD

Seawall Elevation Analysis

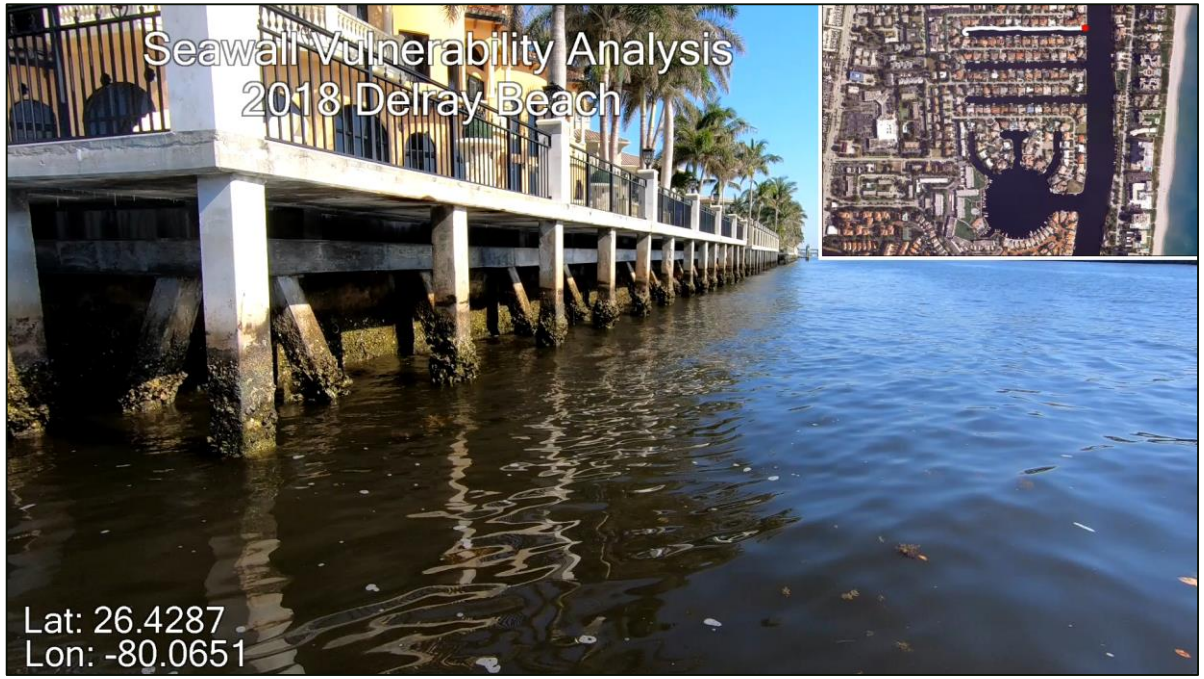


30-Yr Planning Elevation Range = 3.9 - 4.4 Ft NAVD

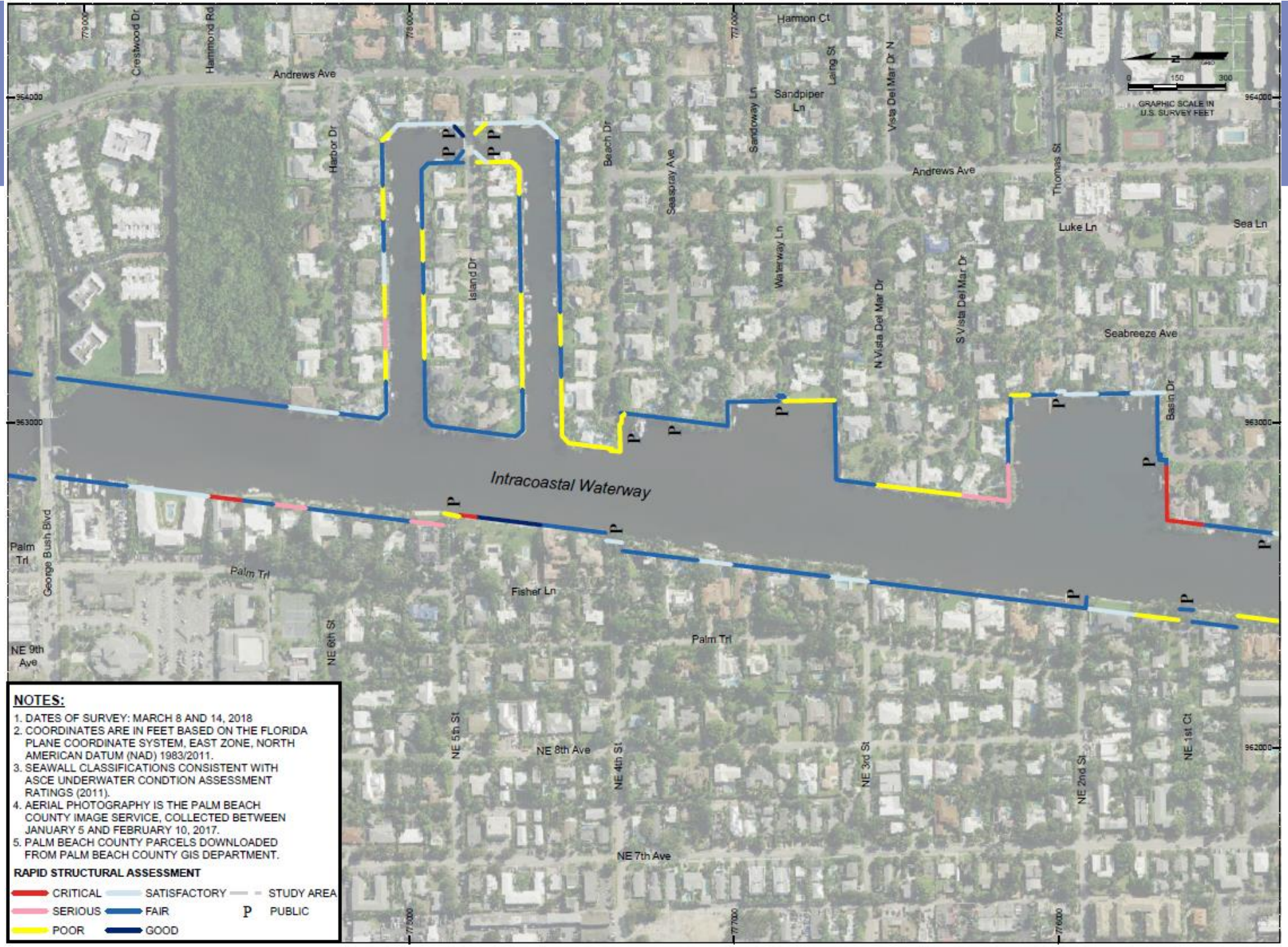

Andrews Ave
Harbor Dr
Island Dr
Beach Dr
Seaspray Ave
Sandpiper Ln
Harmon Ct
Laing St
Vista Del Mar Dr N
Andrews Ave
Thomas St
Luke Ln
Sea Ln
Waterway Ln
N Vista Del Mar Dr
S Vista Del Mar Dr
Seabreeze Ave
Basin Dr
Intracoastal Waterway
Palm Trl
George Bush Blvd
Palm Trl
Fisher Ln
Palm Trl
NE 9th Ave
NE 6th St
NE 5th St
NE 8th Ave
NE 4th St
NE 3rd St
NE 2nd St
NE 1st Ct
NE 7th Ave
964000
963000
962000
GRAPHIC SCALE IN U.S. SURVEY FEET
0
150
300
NOTES:
1. DATES OF SURVEY: JANUARY 22 - MAY 22, 2018
2. COORDINATES ARE IN FEET BASED ON THE FLORIDA PLANE COORDINATE SYSTEM, EAST ZONE, NORTH AMERICAN DATUM (NAD) 1983/2011.
3. ELEVATIONS ARE IN FEET BASED ON THE NORTH AMERICAN VERTICAL DATUM (NAVD) 1988.
4. AERIAL PHOTOGRAPHY IS THE PALM BEACH COUNTY IMAGE SERVICE, COLLECTED BETWEEN JANUARY 5 AND FEBRUARY 10, 2017.
5. PALM BEACH COUNTY PARCELS DOWNLOADED FROM PALM BEACH COUNTY GIS DEPARTMENT.
SEAWALL ELEVATION (FT., NAVD88)
<2
2.0 - 2.5
2.5 - 3.0
3.0 - 3.5
3.5 - 3.9
3.9 - 7.9
STUDY AREA
PARCELS

Seawall Condition Analysis

	Good	Satisfactory	Fair	Poor	Serious	Critical
Public	1	16	9	3	0	0
Private	48	170	450	152	41	7
Total %	4%	19%	53%	18%	5%	1%



Beach Drive


Intracoastal Waterway
Andrews Ave
Harbor Dr
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Basin Dr
Palm Trl
George Bush Blvd
Fisher Ln
NE 9th Ave
NE 6th St
NE 5th St
NE 8th Ave
NE 4th St
NE 3rd St
NE 2nd St
NE 1st Ct
NE 7th Ave
GRAPHIC SCALE IN U.S. SURVEY FEET
NOTES:
1. DATES OF SURVEY: MARCH 8 AND 14, 2018
2. COORDINATES ARE IN FEET BASED ON THE FLORIDA PLANE COORDINATE SYSTEM, EAST ZONE, NORTH AMERICAN DATUM (NAD) 1983/2011.
3. SEAWALL CLASSIFICATIONS CONSISTENT WITH ASCE UNDERWATER CONDTION ASSESSMENT RATINGS (2011).
4. AERIAL PHOTOGRAPHY IS THE PALM BEACH COUNTY IMAGE SERVICE, COLLECTED BETWEEN JANUARY 5 AND FEBRUARY 10, 2017.
5. PALM BEACH COUNTY PARCELS DOWNLOADED FROM PALM BEACH COUNTY GIS DEPARTMENT.
RAPID STRUCTURAL ASSESSMENT
CRITICAL
SERIOUS
POOR
SATISFACTORY
FAIR
GOOD
STUDY AREA
P PUBLIC

Seawalls - Implementation Approach

- Public
  - Approximately half of seawalls either already raised or under way
- Private
  - City to adopt Ordinance to Protect City and Residents from Projected Sea Level Rise

2018 Veteran's Park Seawall Improvement

Dunes are our first line of defense

- Natural barrier to destructive forces of wind and waves
- Absorb impact of storm surge and high waves, moderating inland flooding
- Supply sand to the eroding beach during storms
- Buffer windblown sand and salt spray

Dune Maintenance

- City Efforts
  - Dune Trimming
  - Removing Exotics
  - Keeping public off the dunes
- What you can do:
  - Use dedicated walkways to get to the beach
  - Keep recreational activities away from the dune, including boats, surfboards, and beach chairs
  - Educate friends and family about the impacts

Future Capital Improvement Storm Water Projects

- Neighborhood Improvement Projects: Basis of Design
- 30-Year Sea Level Rise (ADA Engineering)

Isaac Kovner, PE
Principal Engineer
City of Delray Beach

Capital Improvement Projects South of Atlantic Avenue

- Neighborhood Improvement Project Areas

• Area #5 – Atlantic Avenue Basin	$28.0 Million
• Area #6 – Bay Street Basin	$21.1 Million
• Area #7 – Seasage Drive Basin	$32.9 Million
• Area #8 – Hibiscus Road Basin	$25.5 Million
• Area #9 – Brooks Lane Basin	$15.9 Million
• Total Cost of Projects (approx.)	$123.4 Million

Atlantic Avenue Basin

Concerns:

- City Evaluate Efficiency of Pump Station and System Piping
- City doesn't own Storm Pipe
- Existing Pump Station Capacity

Remedies:

- Install Check Valves
- Upgrade System Piping (ownership issues)
- Raise Seawalls
- Upgrade Pump Station
- Raise Roadway Elevations

Cost: $28.0 million

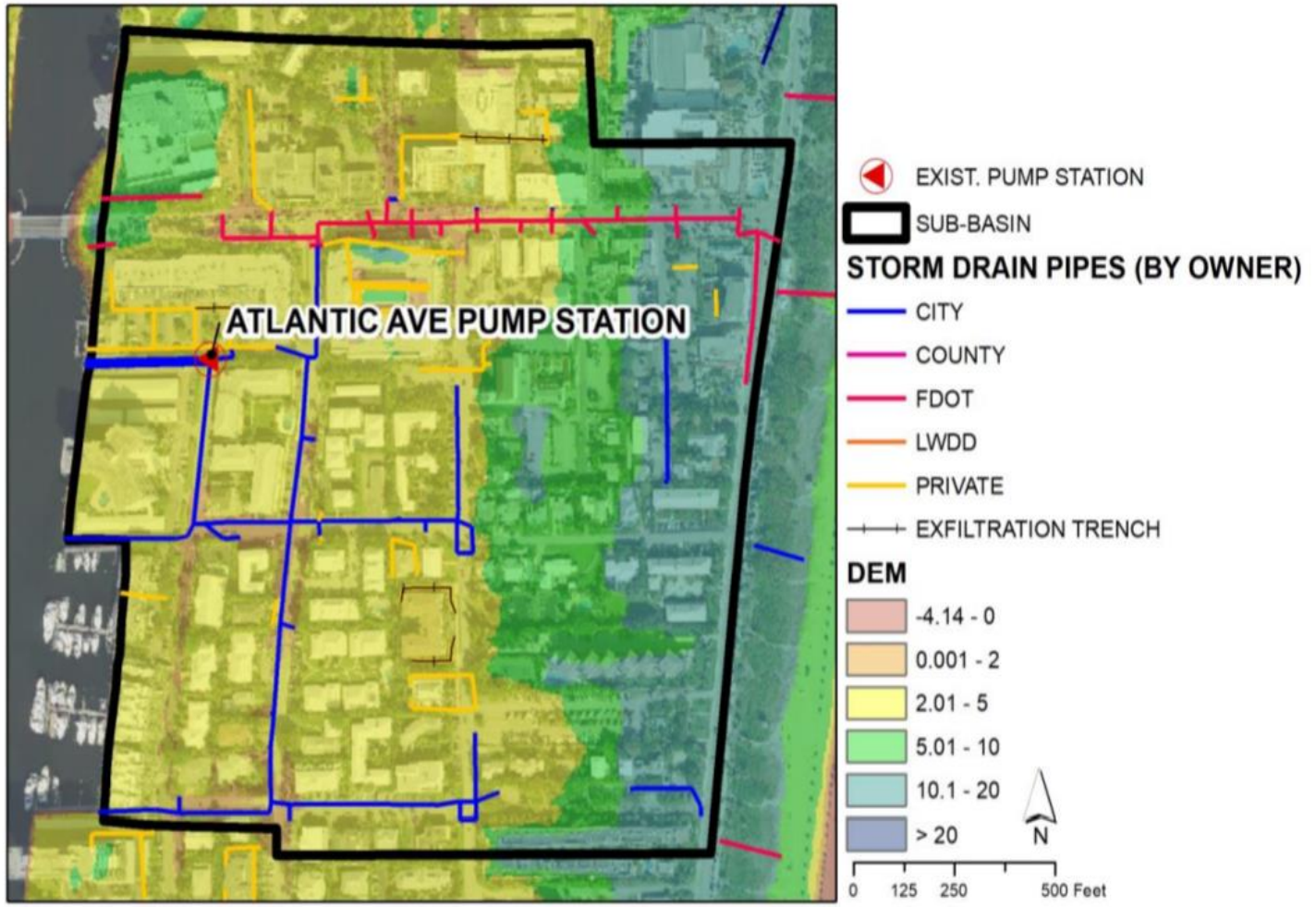


Figure 4-13: Problem Area 5 Topography and Infrastructure

Bay Street Basin

Concerns:

- Resident Complaint (Nassau Street and Langer Way/Gleason Street)
- Roadway and Tidal Flooding
- Existing Pump Station Undersized
- Drainage System Undersized

Remedies:

- Install Check Valves
- Upgrade Drainage System Piping
- Raise Seawalls
- Upgrade Pump Station
- Raise Roadway Elevations

Cost: $21.1 million

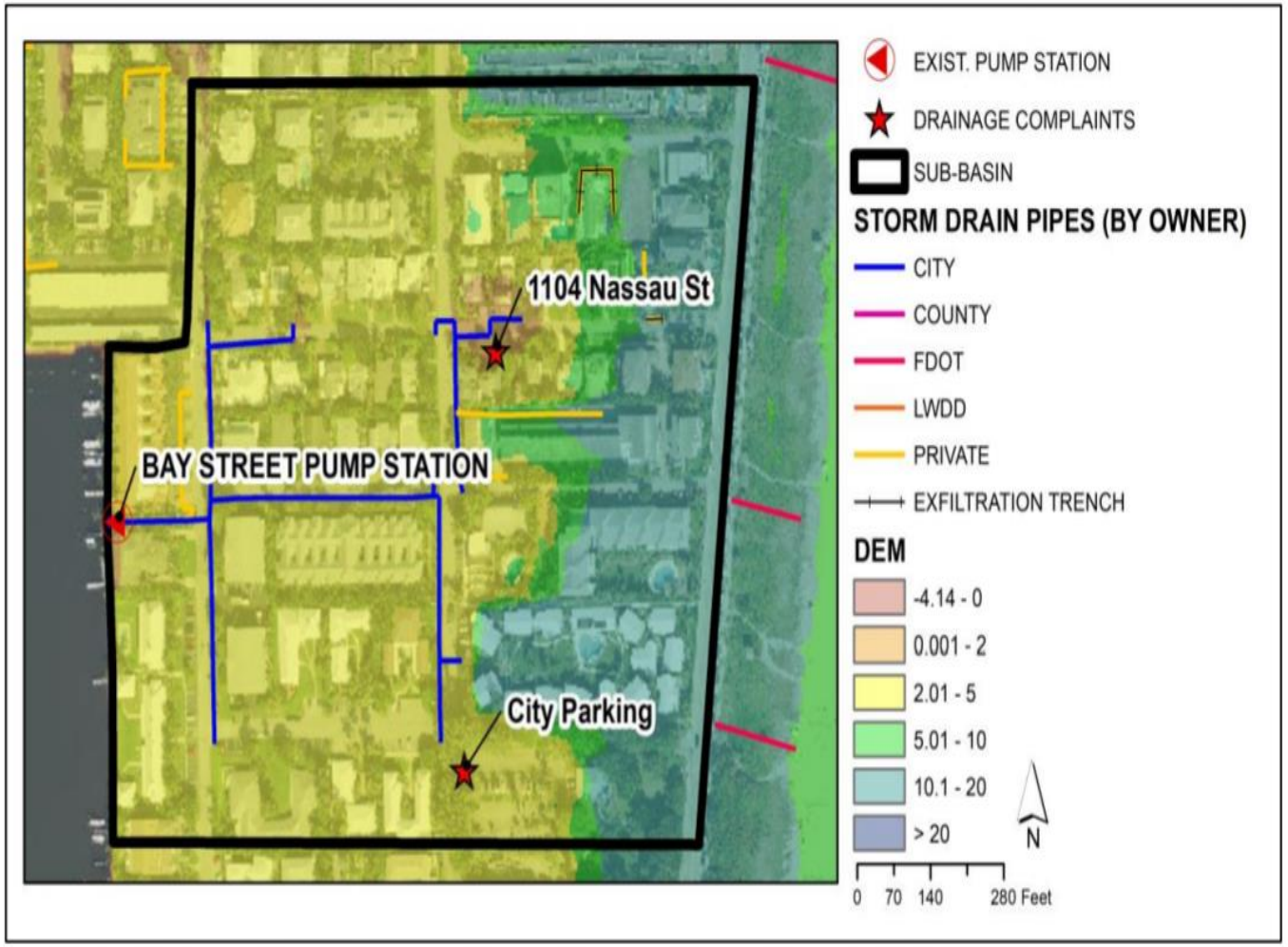


Figure 4-14: Problem Area 6 Topography and Infrastructure

Seasage Drive Basin

Concerns:

- Resident Complaint (Melaluca Road)
- Roadway and Tidal Flooding
- Existing Pump Station Undersized
- Drainage System Undersized & Altered Landscape

Remedies:

- Install Check Valves
- Upgrade Drainage System Piping
- Install Swales
- Raise Seawalls
- Upgrade Pump Station
- Raise Roadway Elevations

Cost: $32.9 million

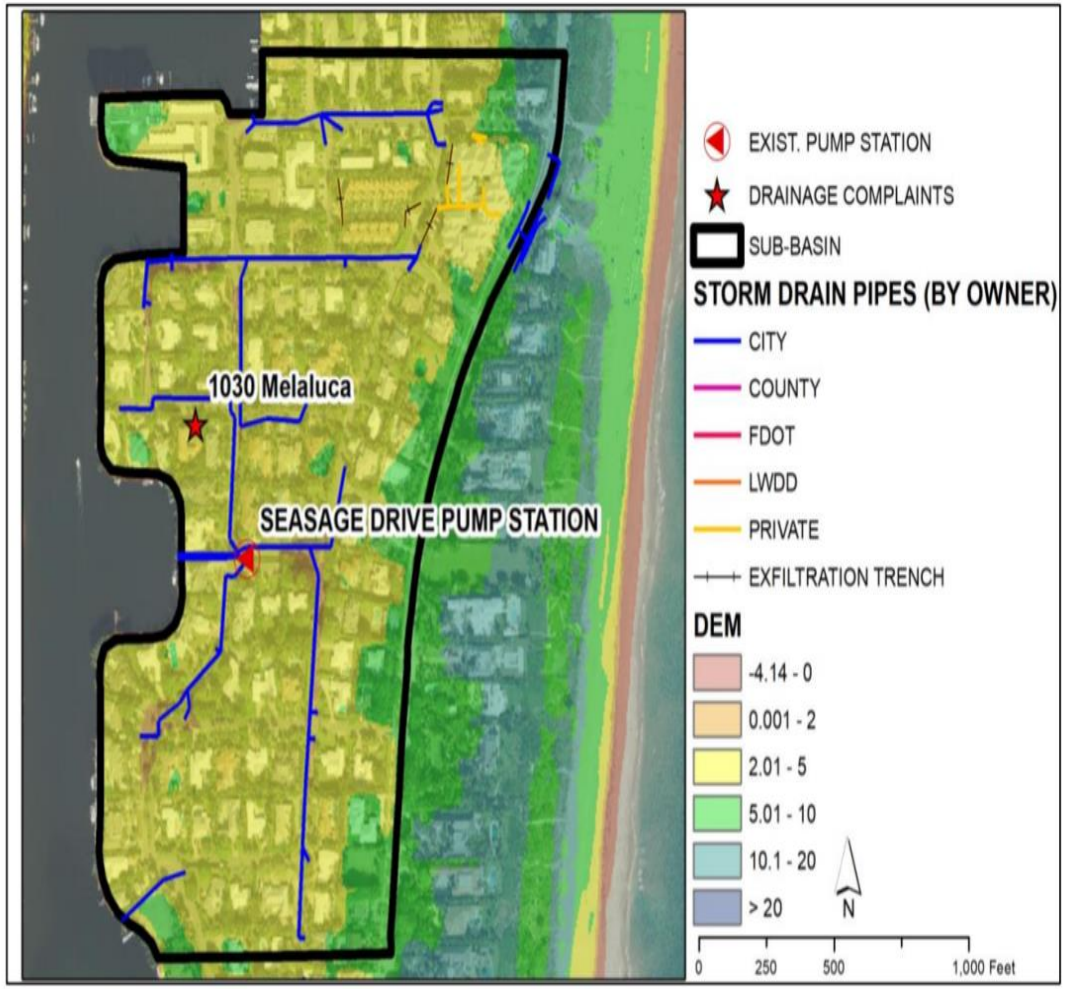


Figure 4-15: Problem Area 7 Topography and Infrastructure

Hibiscus Road Basin

Concerns:

- Resident Complaint (Hibiscus Road)
- Roadway and Tidal Flooding
- No Pump Station
- Drainage System Undersized

Remedies:

- Install Check Valves (Completed)
- Upgrade Drainage System Piping
- Raise Seawalls
- Construct Pump Station
- Raise Roadway Elevations

Cost: $25.5 million

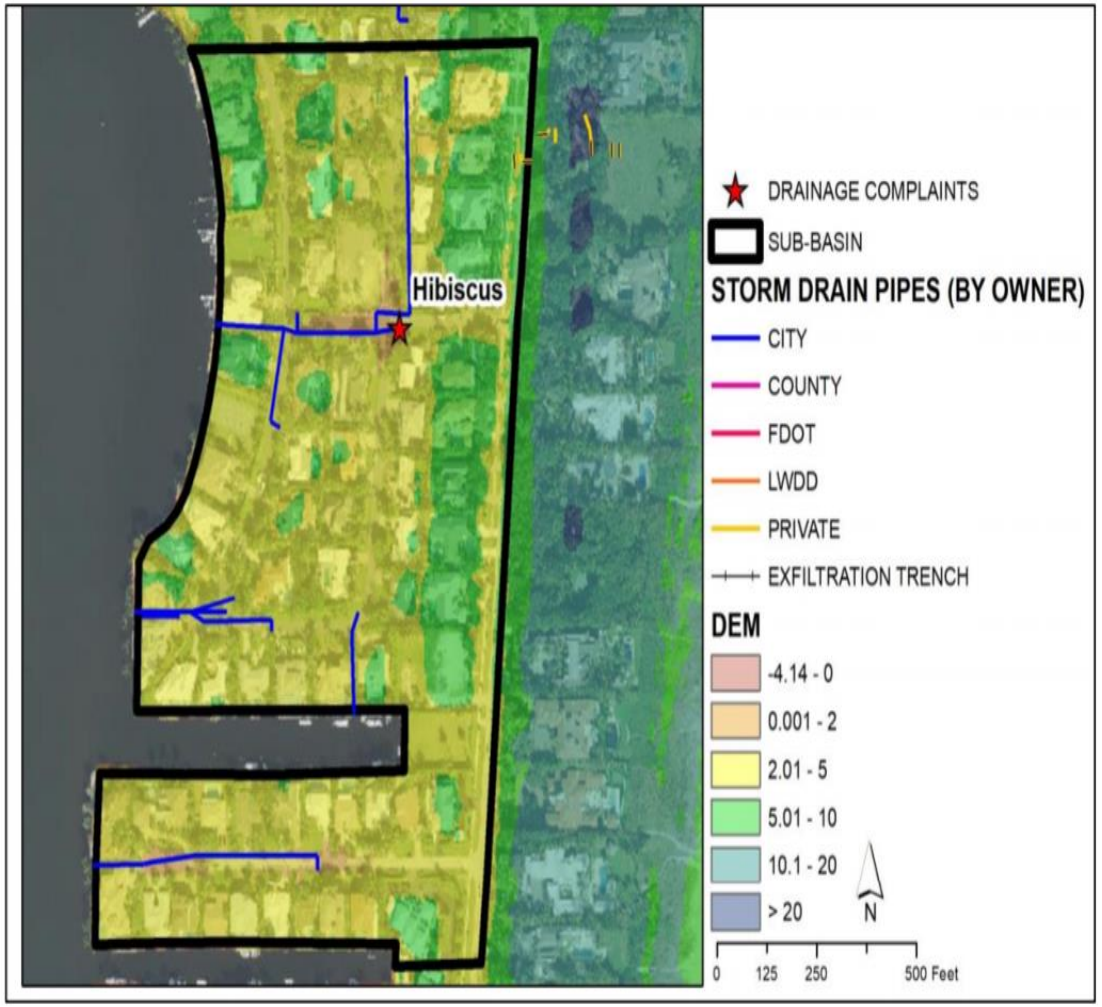


Figure 4-16: Problem Area 8 Topography and Infrastructure

Brooks Lane Basin

Concerns:

- Resident Complaint (Brooks Lane)
- Roadway and Tidal Flooding
- No Pump Station
- Drainage System Undersized

Remedies:

- Install Check Valves (Completed)
- Upgrade Drainage System Piping
- Raise Seawalls
- Construct Pump Station
- Raise Roadway Elevations

Cost: $15.9 million

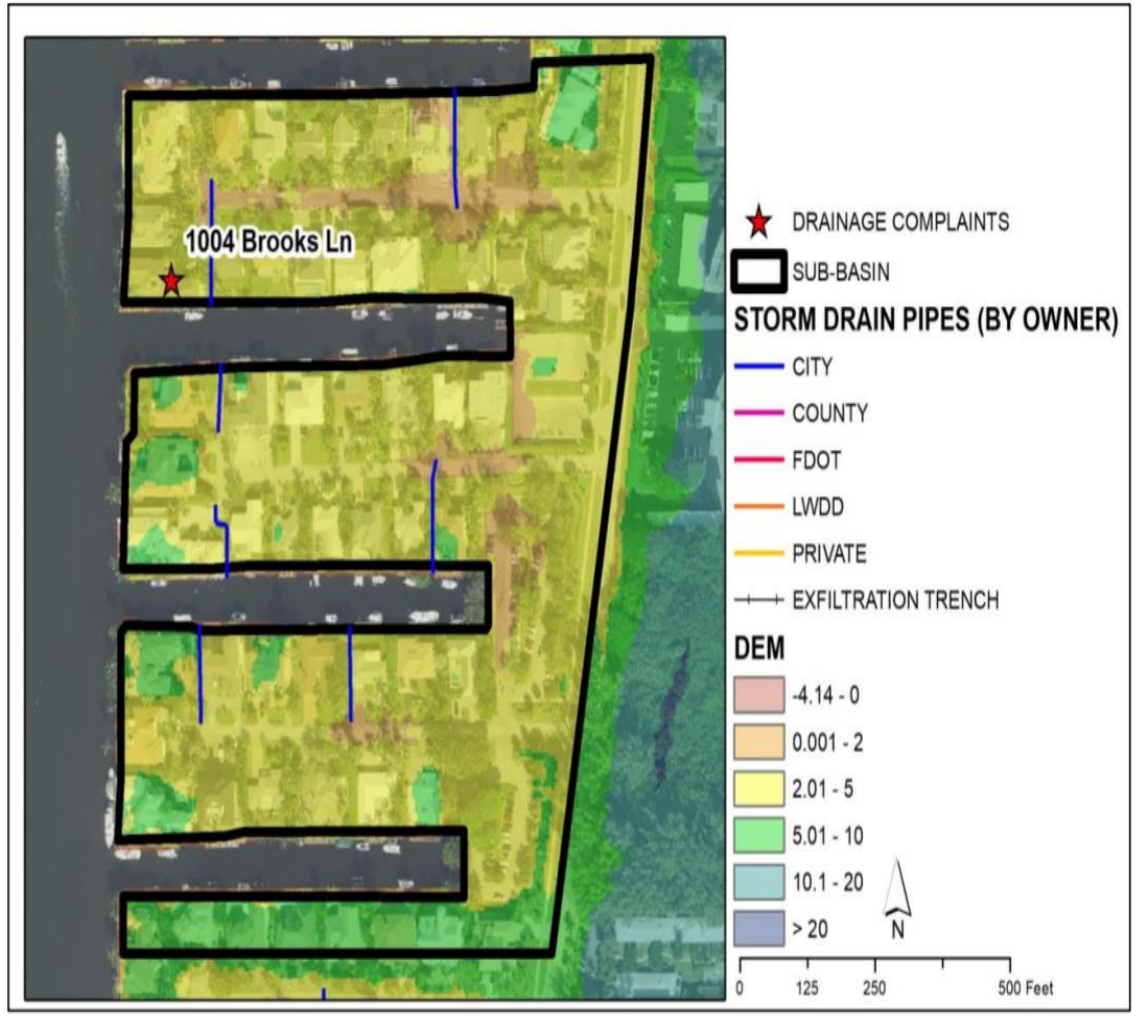


Figure 4-17: Problem Area 9 Topography and Infrastructure

State and Federal Coordination

- Community Rating System
- National Pollutant Discharge Elimination System
- Local Mitigation Strategy

Joseph Williams
Project Manager I
City of Delray Beach

Community Rating System

National Flood Insurance Program
Community Rating System (CRS)

- The National Flood Insurance Program's (NFIP) Community Rating System (CRS) is an organization that ranks participating communities in accordance with their level of participation and documentation of flood prevention activities.
- Cities earn credits which helps residents receive discounts on their flood insurance premiums.
- The City of Delray Beach is an active participant on the NFIP CRS program and has recently received an additional credits which equates to a 15% discount on flood insurance premiums for residents of Delray Beach.

Community Rating System

Message	Outcome
1. Know your flood hazard	More map information inquiries
2. Insure your property for flood hazard	Increase in the number of flood insurance policies
3. Protect people from the hazard	Fewer water rescues and police citations for ignoring barricades
4. Protect your property from the hazard	Reduced property loss due to flooding
5. Build responsibly	Reduced number of building department citations
6. Protect natural floodplain functions	Improved water quality as reported in NPDES
7. Be prepared for hurricanes and storm surges	Reduced property loss from hurricanes and storm surges
8. Maintain your stormdrains	Reduced street flooding events from clogged stormdrains
9. Drive responsibly in flood events	Reduced reports of stalled cars and home flooding from traffic wake
10. Plan for sea level rise	Increased openness to freeboard restrictions and other mitigation

National Pollutant Discharge Elimination System (NPDES)

- Created in 1972 by the Clean Water Act, the NPDES permit enables the state to enforce water pollution regulations.
- NPDES permits make sure that a state's mandatory standards for clean water and the federal minimums are being met
- City participates in countywide MS4 permit with the State of Florida

  - 2018-2019 study reported decreased pollution results!
  - Improved drainage abilities with maintenance of roadways and stormwater conveyance systems
  - Reduced phosphorus levels in shared water bodies through joint efforts with neighboring communities (such as the Lake Ida drainage basin)

Local Mitigation Strategy (LMS2020)

- The City of Delray Beach participates in the Local Mitigation Strategy (LMS) steering committee consisting of all 38 municipalities within Palm Beach County making our City more resilient using local, state and federal funding sources to mitigate against storm surge, sea level rise and climate change hazards by:
    - Increasing the number of planning stakeholders we are working with for assessments
    - Analyzing local flooding conditions as it relates to Palm Beach County communities
    - The City includes mitigation projects in its Master Plans and Capital Improvement plans such as:
        - Tidal Check valves
        - Seawall Improvements
        - Stormwater Pump Stations

PALM BEACH COUNTY FLOOD MAPS ARE CHANGING

DO YOU KNOW YOUR RISK?

STOP BY WHICHEVER OPEN HOUSE IS MORE CONVENIENT TO SPEAK WITH A SPECIALIST AND FIND ANSWERS TO YOUR QUESTIONS. NO APPOINTMENT NECESSARY.

TUESDAY, FEBRUARY 4
4 – 7PM

MARY V. MCDONALD-WILSON CENTER
1505 N. Australian Avenue
West Palm Beach, Florida 33401

WEDNESDAY, FEBRUARY 5
9AM – 12PM

MARY V. MCDONALD-WILSON CENTER
1505 N. Australian Avenue
West Palm Beach, Florida 33401

FLOODING CAN HAPPEN TO ANYONE

Flooding is the most common and costly natural disaster in the United States. Learn about the updated Palm Beach County flood maps and your flood risk by attending a Flood Risk Open House.

Seawall Ordinance Comparisons

- Comparison of Seawall Ordinances In Nearby Communities
- Community Input

Molly Daly
Assistant Sustainability Planner
City of Delray Beach

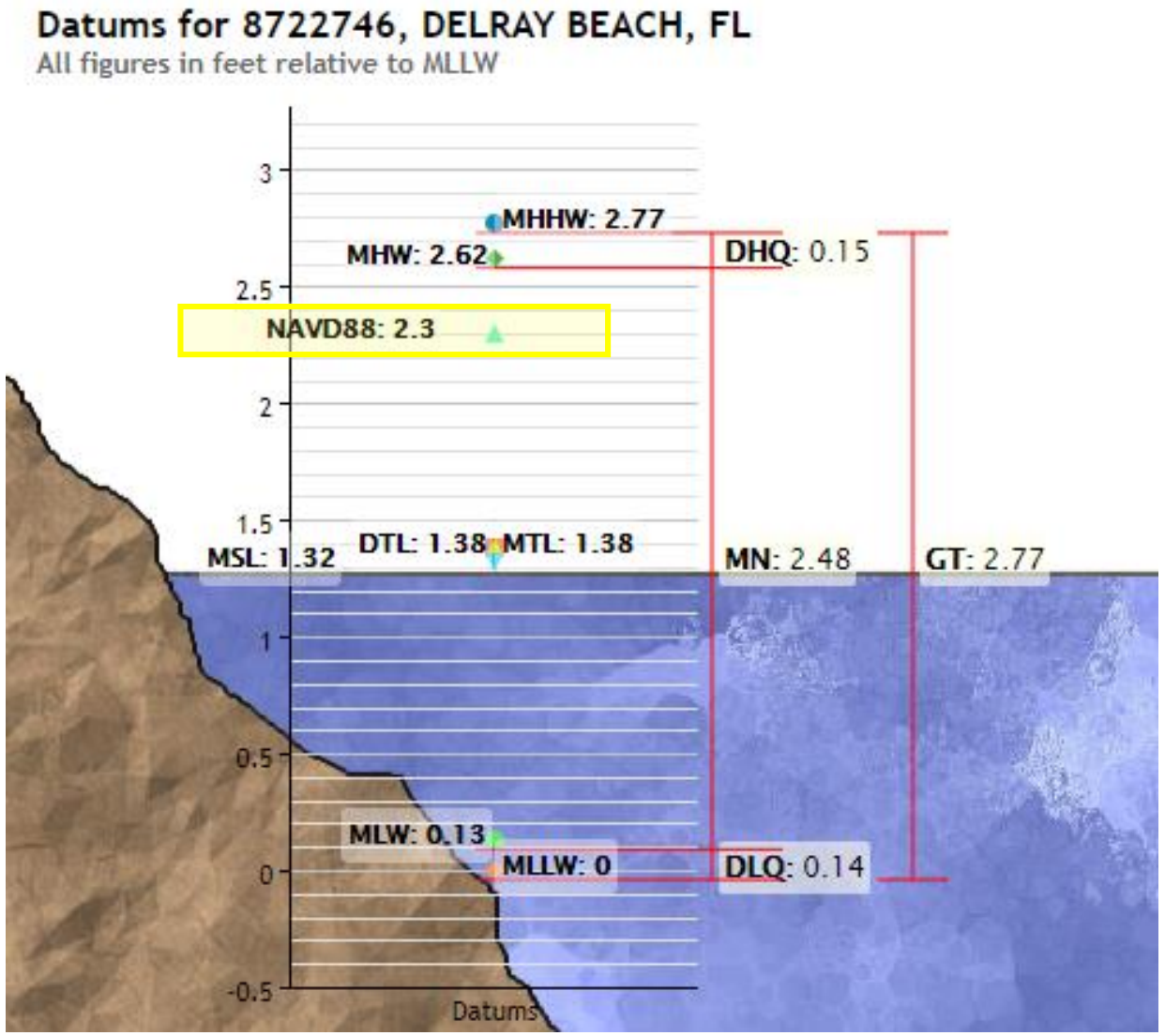
Definitions

N. American Vertical Datum of 1988 (NAVD88):

Uses a tidal benchmark and mean sea level from 1985 to establish a vertical datum

Elevation (Elev.):

Height above a reference point



Seawall Ordinance

What seawall ordinances typically include:

Applicability

- E.g.: Applies to all new seawalls and to those undergoing repairs/renovations of more than 50% of length of the seawall

Maintenance

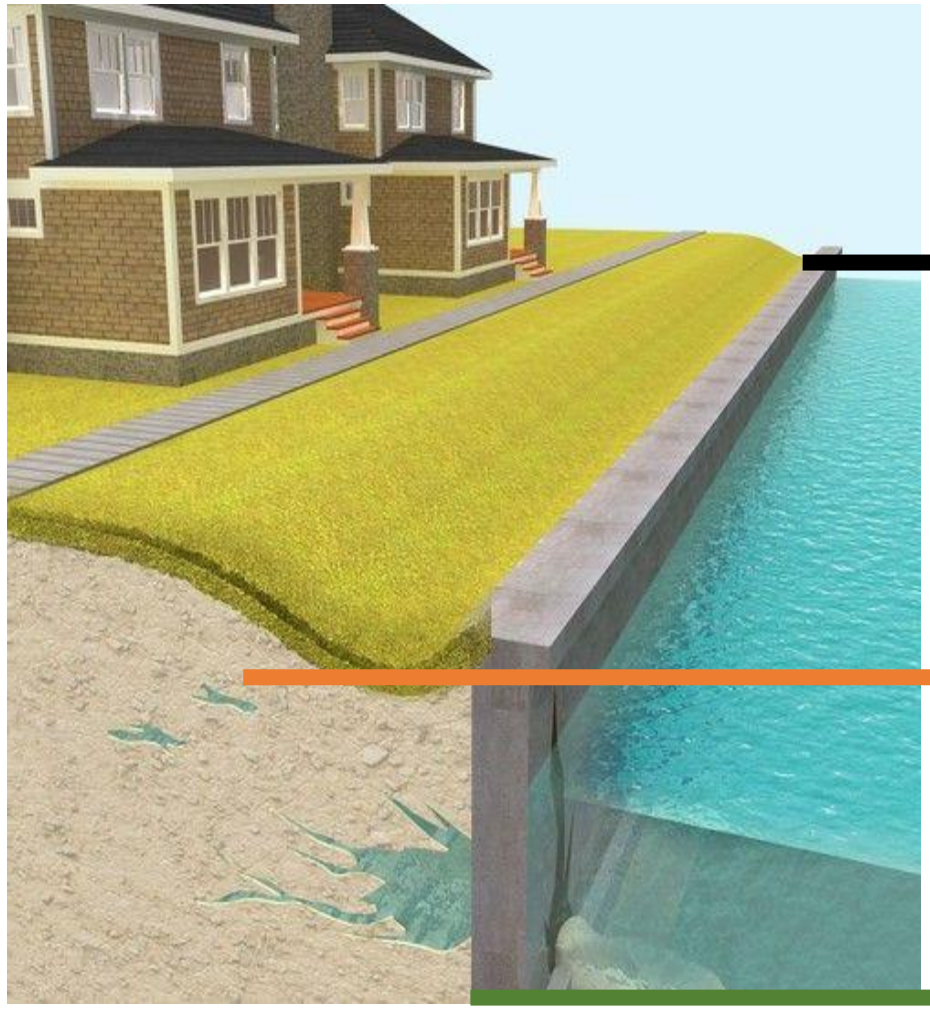
- E.g.: Must maintain the seawall in "good" condition

Seawall Elevation

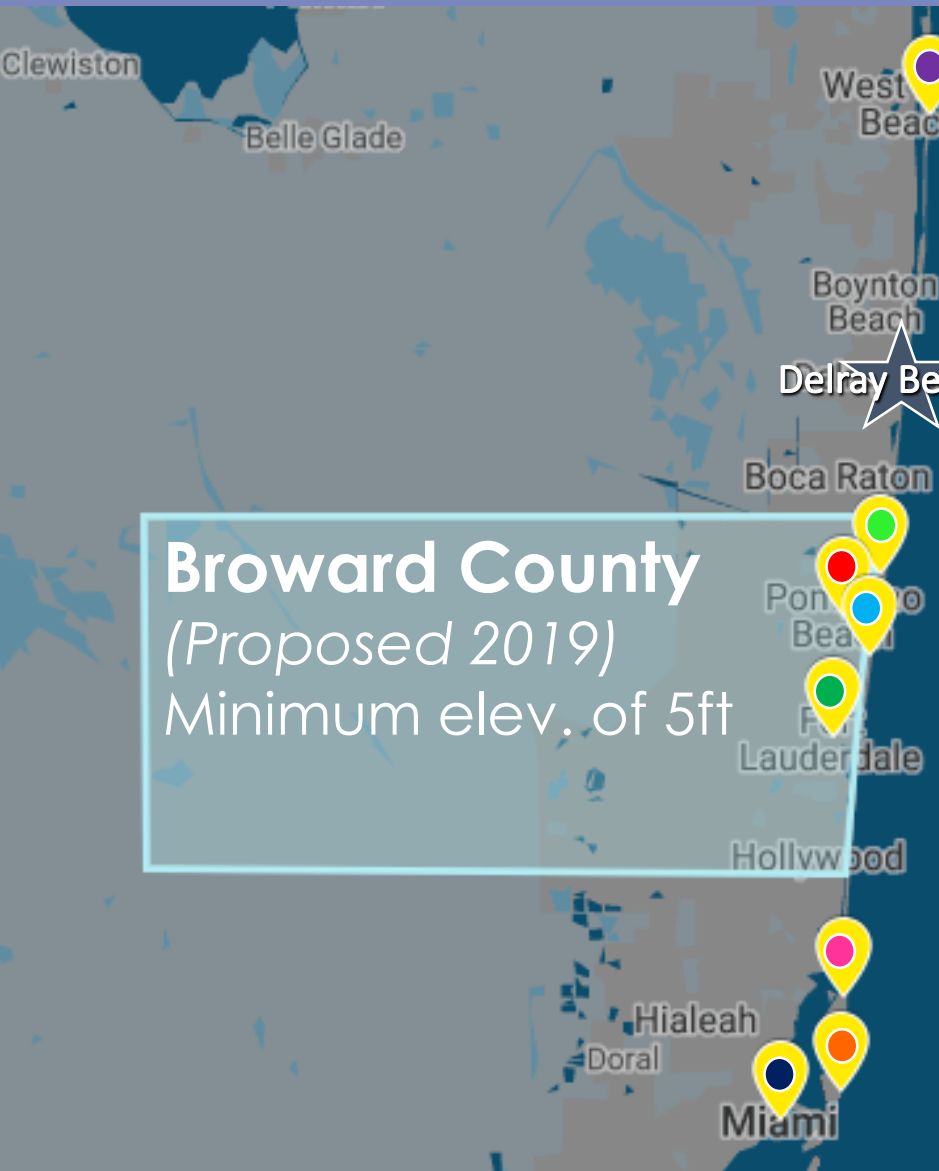
- E.g.: Requiring a minimum and/or maximum seawall elevation

Penalties for Seawall Failure

- E.g.: If a seawall fails to prevent flooding and damages are caused



Comparison of Seawall Ordinances In Other Communities (NAVD88)



Broward County
(Proposed 2019)
Minimum elev. of 5ft

Surfside
Min. elev. of 3.5 ft

Sea Ranch Lakes
Elev. of 5ft 10 inch

Lighthouse Point
Max elev. of 4.0 ft

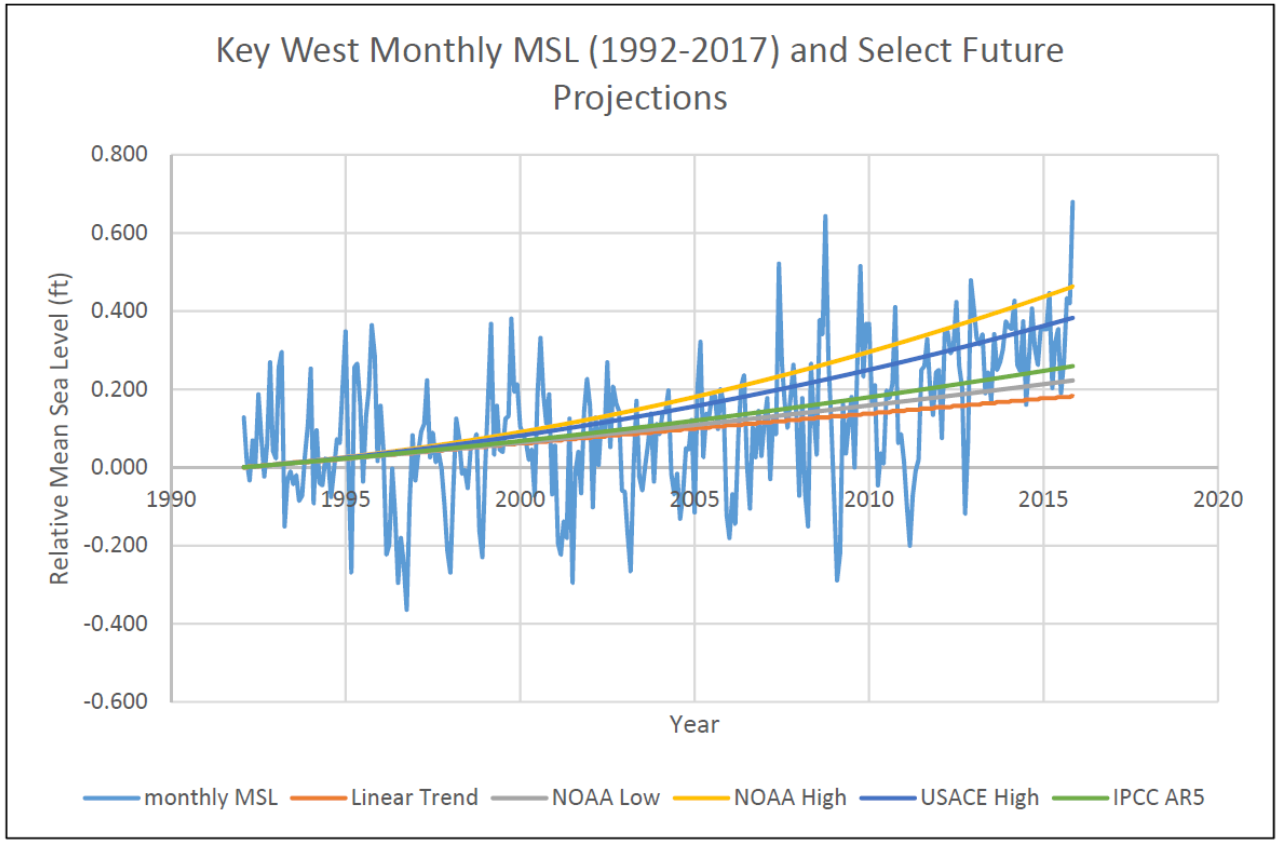
Miami Beach
Min. elev. of 5.7 ft

Ft. Lauderdale
Min. elev. of 3.9 ft and max base flood elev. (FEMA)

Miami
(Proposed 2019: Elev.= 7 ft)
North of Rickenbacker Causeway: Min. elev. of 3.5 ft
South of Rickenbacker Causeway: Min. elev. of 4.45 ft

Pompano Beach
Max elev. of 5ft 10 inch

30-Year Planning Elevation



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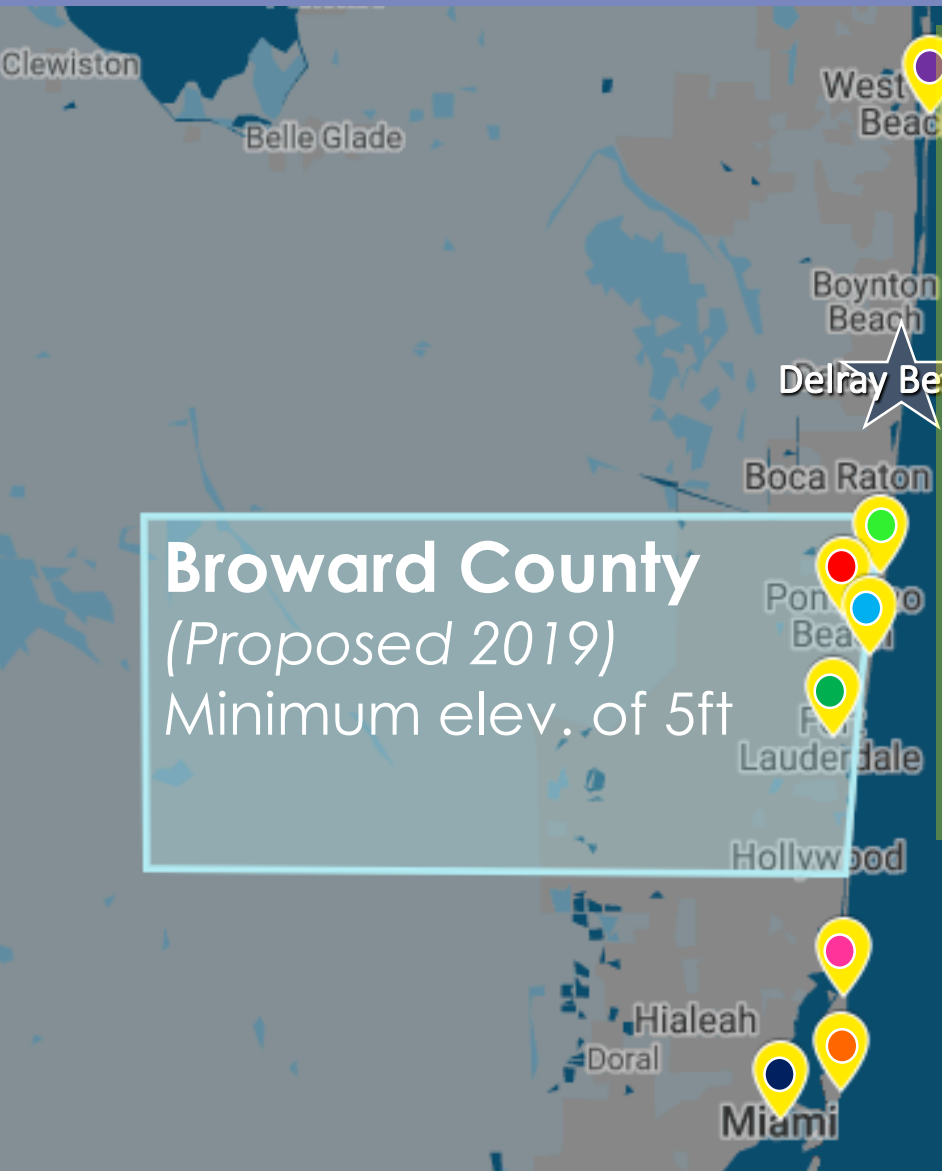

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Miami
(Proposed 2019: Elev.= 7 ft)
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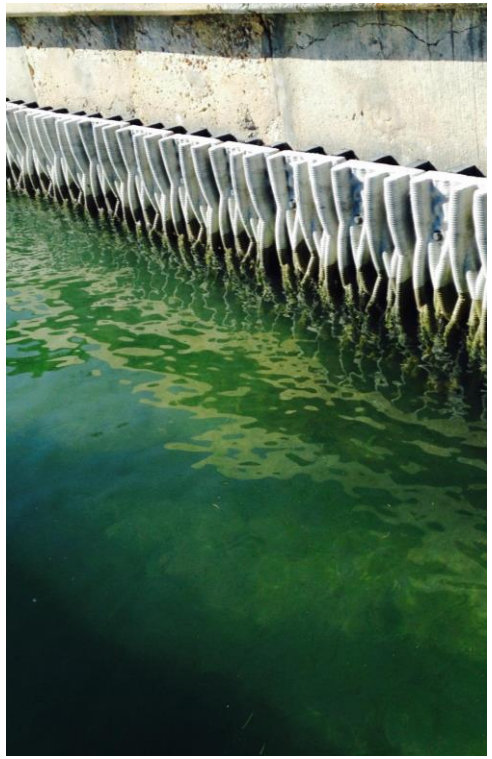
Community Involvement

What type of seawall standards would you like to see in Delray Beach?



Potential Financial Assistance if HB 365 passes in 2020

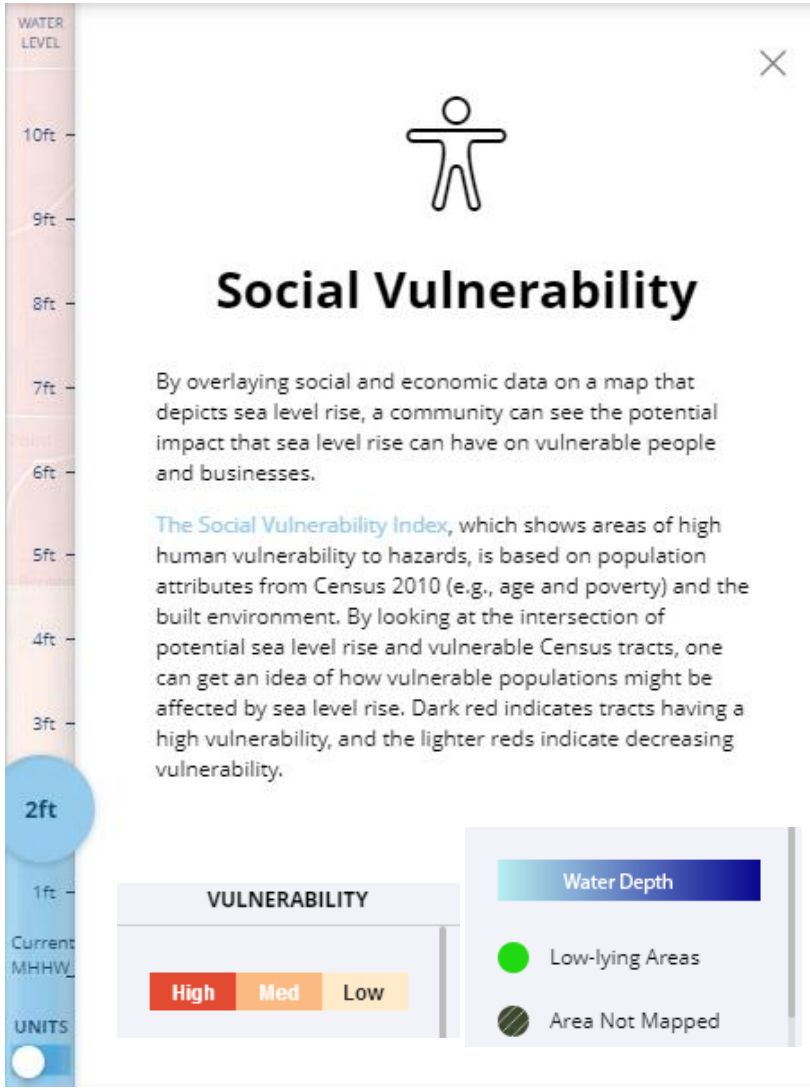
Additional Resources

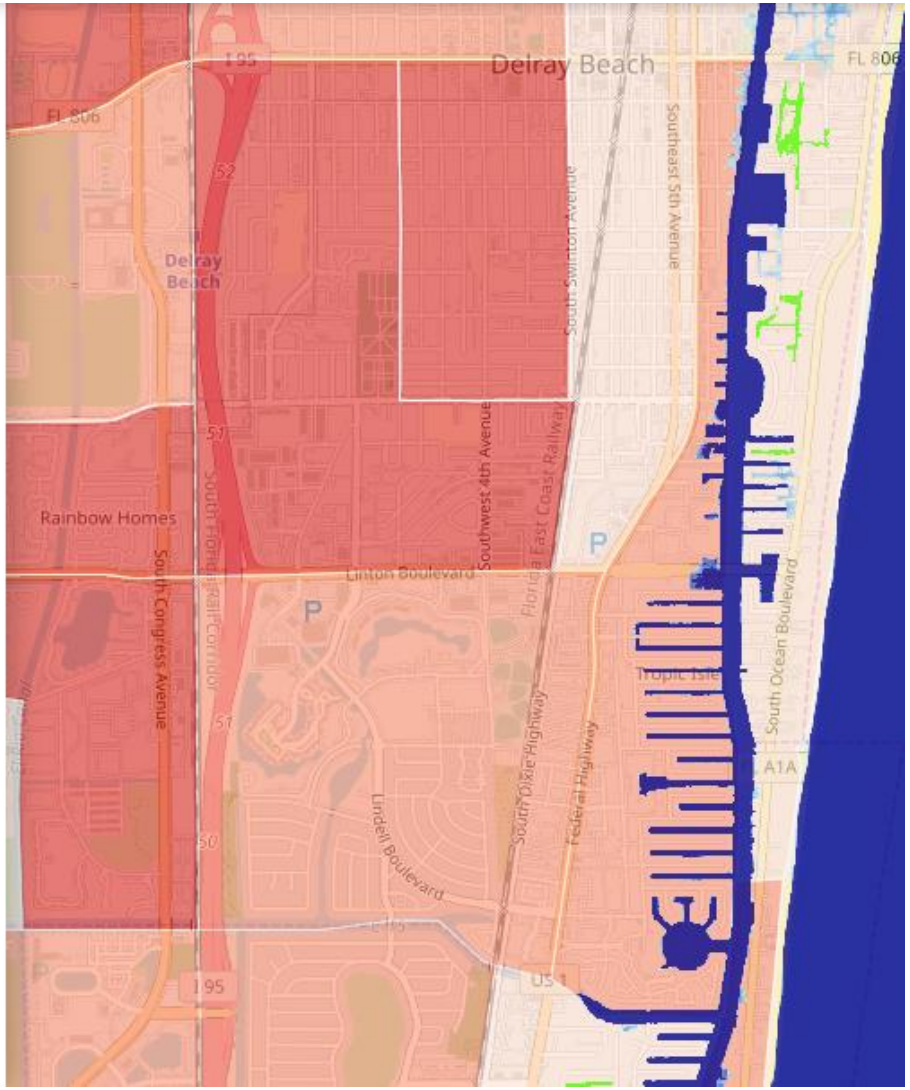
Upcoming:

Climate Change Vulnerability Assessment for SE Palm Beach County

The Palm Beach Post

[“Palm Beach County, cities band together to study climate change vulnerabilities”]

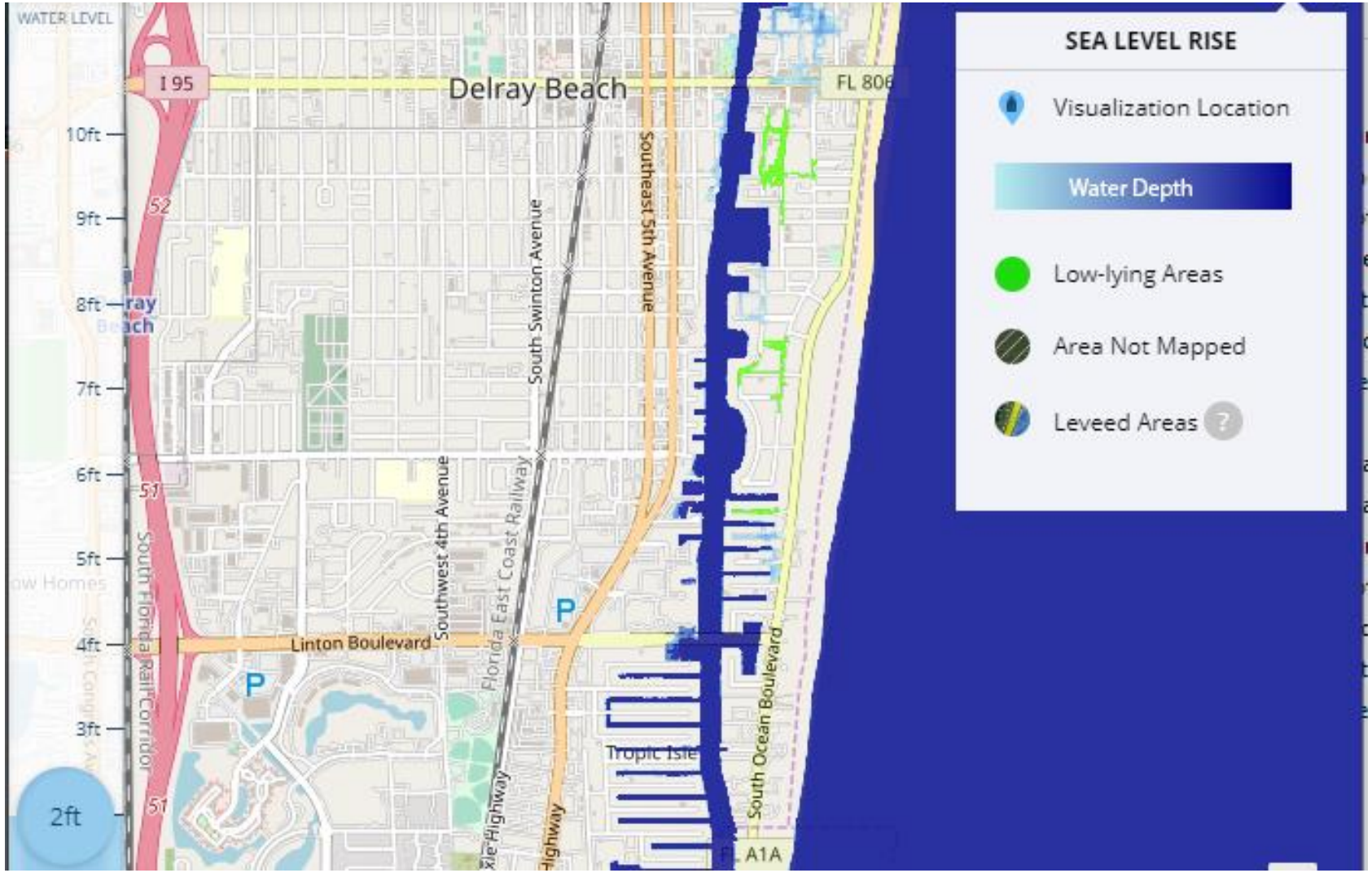




Additional Resources

Upcoming:

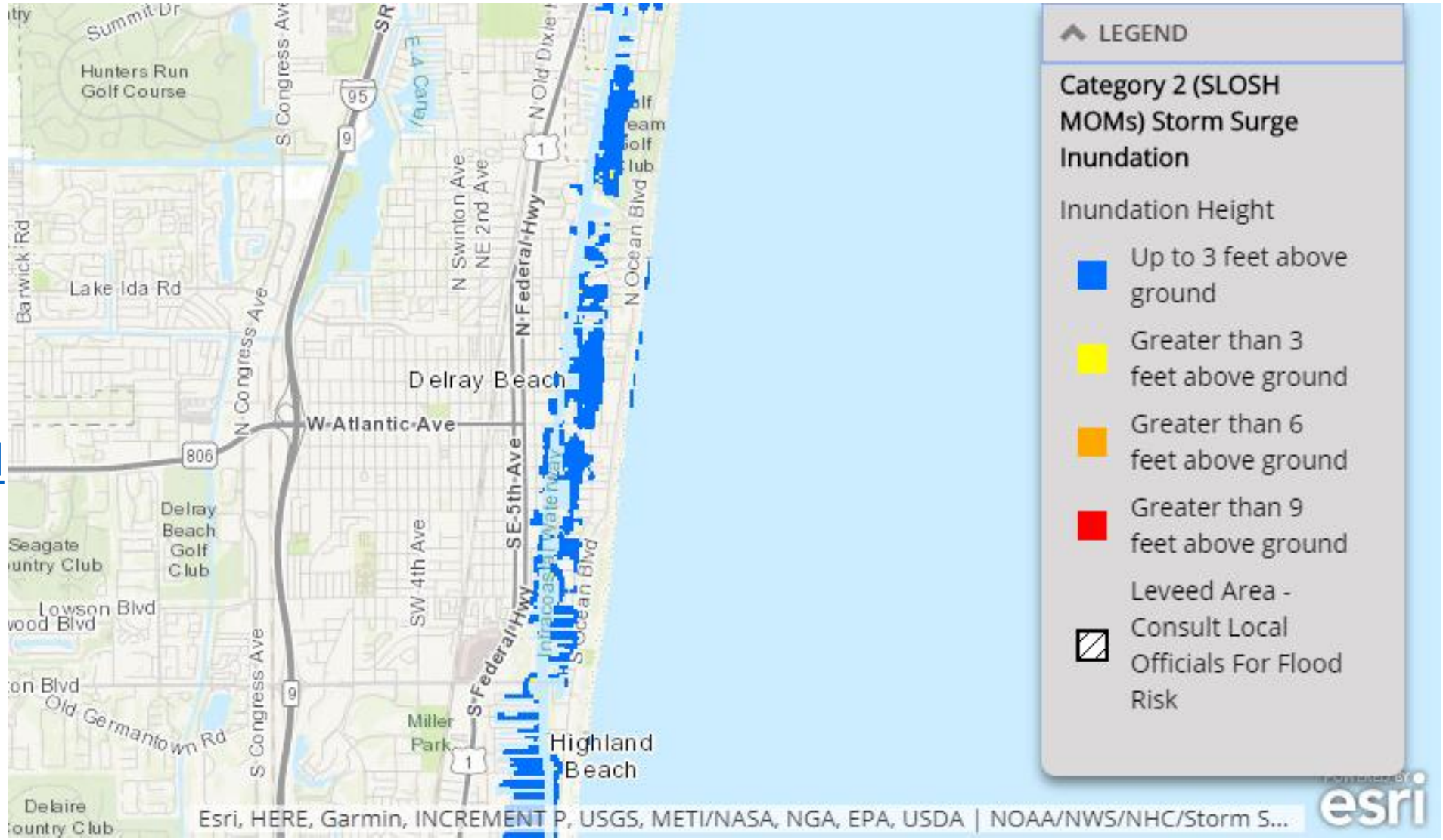
Updated Sea Level Rise Map for Delray Beach



Additional Resources

NOAA Storm Surge Hazard Maps (Interactive)

https://noaa.maps.arcgis.com/apps/MapSeries/index.html?appid=d9ed7904dbec441a9c4dd7b277935fad



Questions?

For this presentation and more information, please go to:

www.ResilientDelray.com

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Please return your comment cards now or mail/email it to the address listed