



# St. Pete Beach Sustainability Action Plan 2020 - 2050



## St. Pete Beach Sustainability Action Plan\*

### 1. Context: Science and Water Threats

Global Science Connects CO<sub>2</sub>, Temperature and Sea Level Rise

Local Predictions of Sea Level Rise

Water Threats: Global, National, Florida, St. Pete Beach

### 2. Vulnerability Assessment

The 'Water Stack'

Flash Flooding, King Tide, Sea Level Rise, Hurricanes

### 3. Adaptation Strategies

### 4. Implementation Strategies

### 5. Action Plan

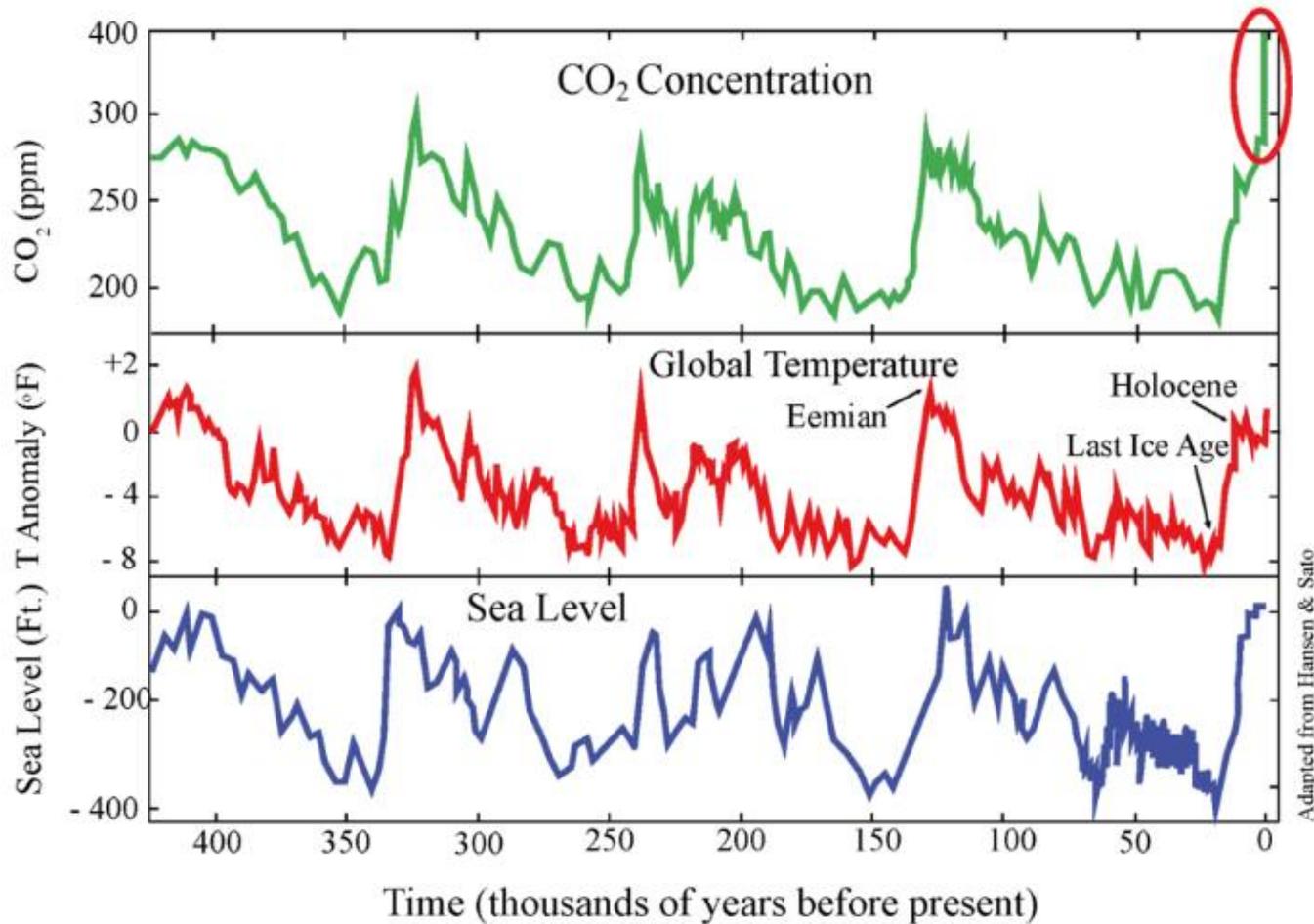
\* This report follows the table of contents of  
the Florida Adaptation Planning Guidebook:  
June 2018

# Cities Most Vulnerable to Coastal Flooding Today

Top 25 cities and their populations at risk (thousands) within FEMA's 100-year coastal floodplain

1.	New York	245	14.	Lauderhill, Fla.	66
2.	Miami	126	15.	Charleston, S.C.	64
3.	Pembroke Pines, Fla.	116	16.	Cape Coral, Fla.	59
4.	Coral Springs, Fla.	115	17.	Tamarac, Fla.	58
5.	Miramar, Fla.	93	18.	Margate, Fla.	50
6.	St. Petersburg, Fla.	88	19.	Tampa, Fla.	50
7.	Davie, Fla.	87	20.	Fountainebleau, Fla.	48
8.	Fort Lauderdale, Fla.	85	21.	Miami Gardens, Fla.	44
9.	Miami Beach, Fla.	85	22.	Country Club, Fla.	43
10.	Hialeah, Fla.	76	23.	Atlantic City, N.J.	37
11.	Sunrise, Fla.	74	24.	North Lauderdale, Fla.	37
12.	Pompano Beach, Fla.	73	25.	Kendale Lakes, Fla.	37
13.	Hollywood, Fla.	69			

## Global Science CO<sub>2</sub>, Temperature and Sea Level



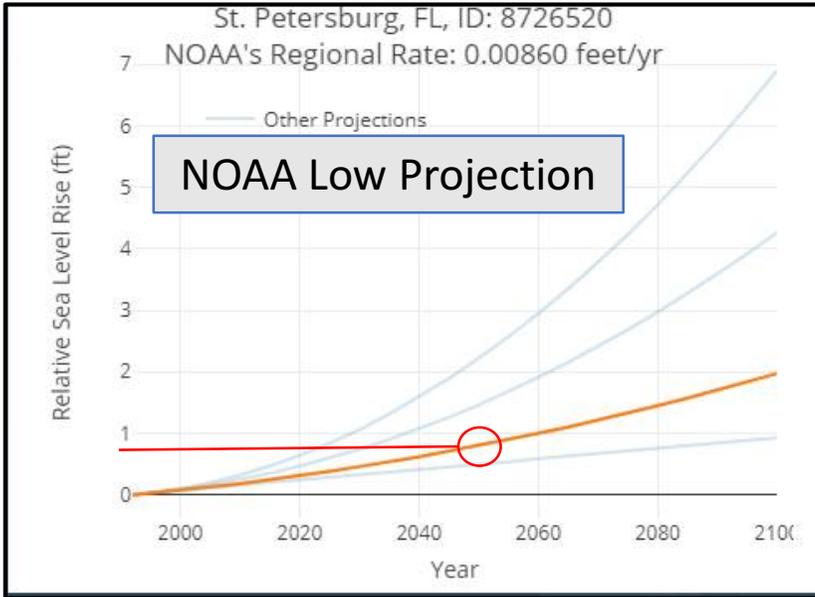
United Nations  
Intergovernmental Panel on Climate Change  
1,300 Independent Scientific Experts

Conclusion: Human produced greenhouse gases including carbon dioxide contribute to global warming.

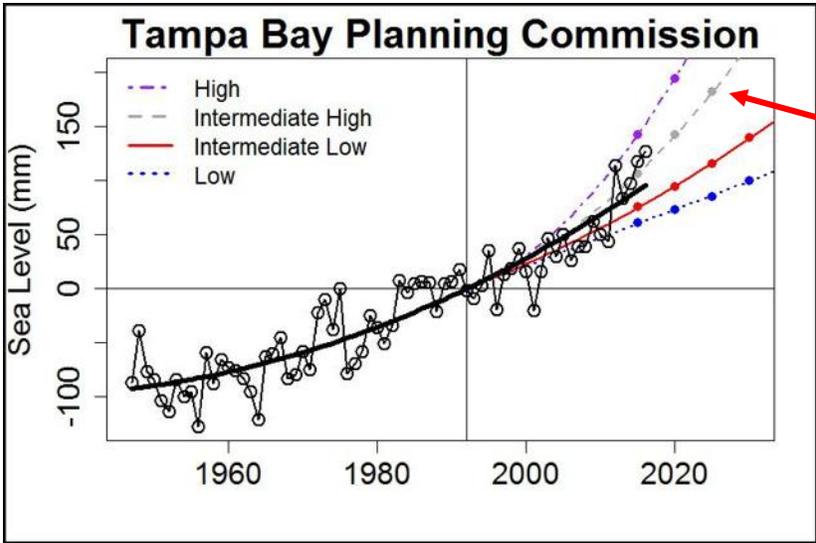
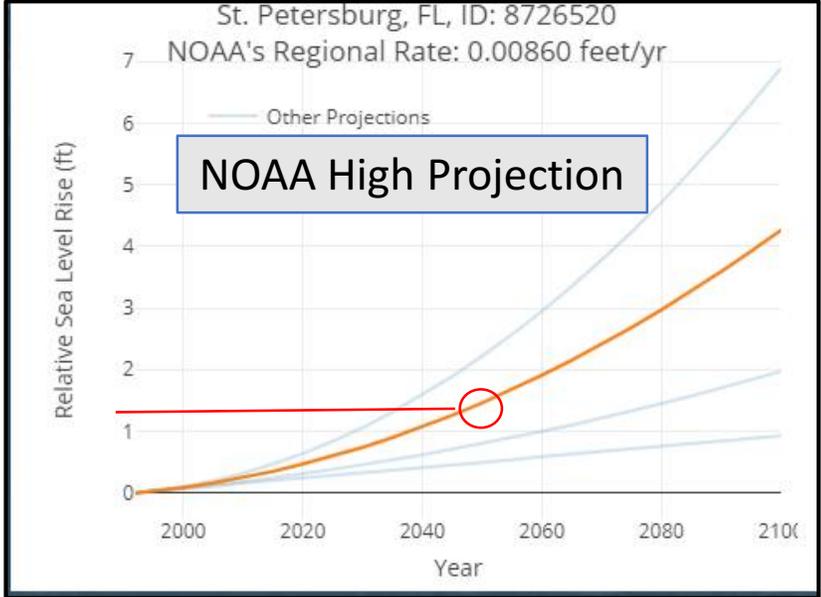
Global Warming Contributes to Sea Level Rise

- Thermal Expansion
- Glacial Melt

# Local Predictions of Sea Level Rise Tampa Bay Region



Sea Level is Rising  
and  
The Rate of Rise is  
Accelerating



**Acceleration**

# Water Threats Global



Village of East Yorkshire  
United Kingdom



Winda Woppa  
New South Wales, Australia

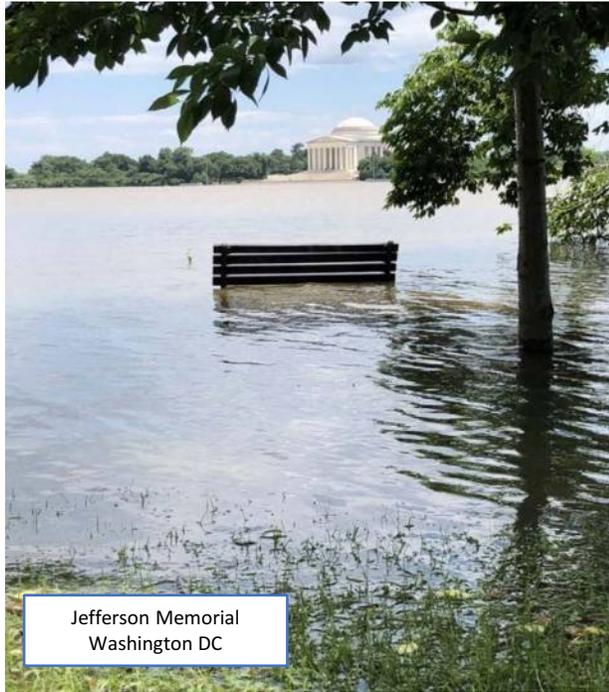


Venice  
Italy

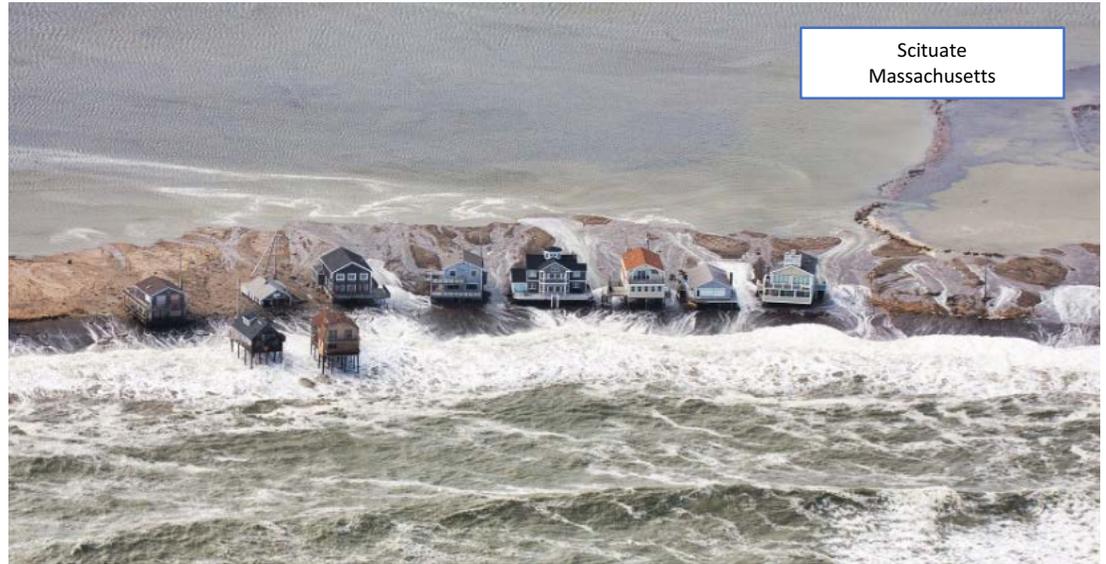


Jakarta  
Indonesia

# Water Threats National



Jefferson Memorial  
Washington DC



Scituate  
Massachusetts



Tangier Island  
Virginia



Broad Beach  
California

## Water Threats Florida



Launch Complex 39B at Kennedy Space Center. (Photo: NASA)

By conservative estimates, [NASA projects](#) Kennedy Space Center will experience 5 to 8 inches of sea level rise by the 2050s. But if pollution continues to warm the planet causing polar ice to melt more rapidly, then NASA predicts 17 to 24 inches by the 2050s.



Miami  
Florida

# Water Threats St. Pete Beach



Intersection of  
Casablanca and Cabrillo



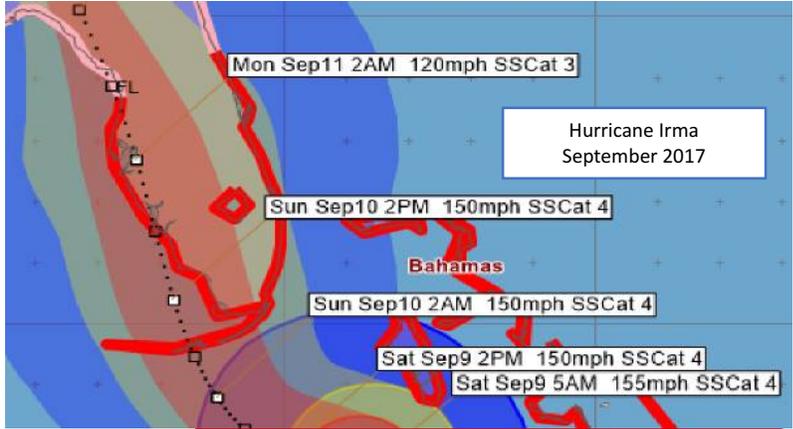
Intersection of  
Maritana and Alhambra



On Gulf Blvd  
Looking Down 36<sup>th</sup> Ave



Sanitary Sewer  
Overflows



Hurricane Irma  
September 2017

## STORM SURGE INUNDATION



3-5 ft

2-4

5-8 ft

8-12 ft

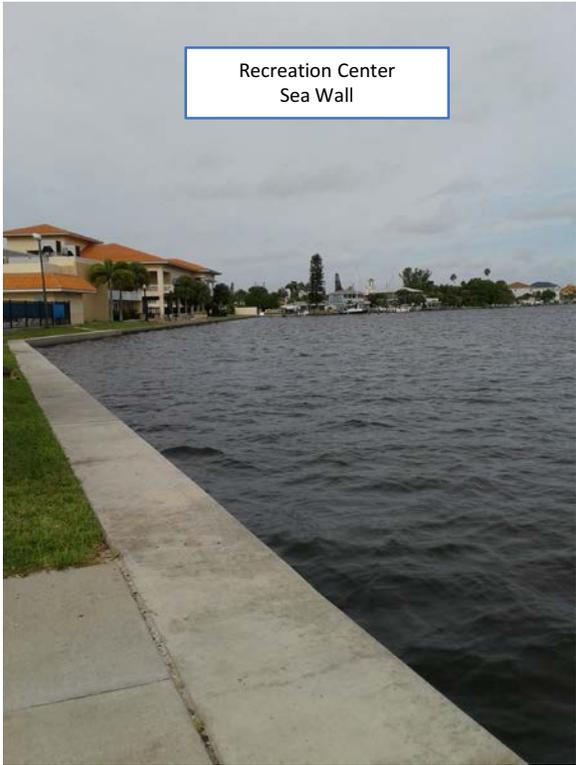
# Water Threats St. Pete Beach



Belle Vista Dr near  
Curotto Park Looking North



Intersection of  
75<sup>th</sup> and Boca Ceiga Dr



Recreation Center  
Sea Wall



Barcelona St Looking  
at the Bay Way

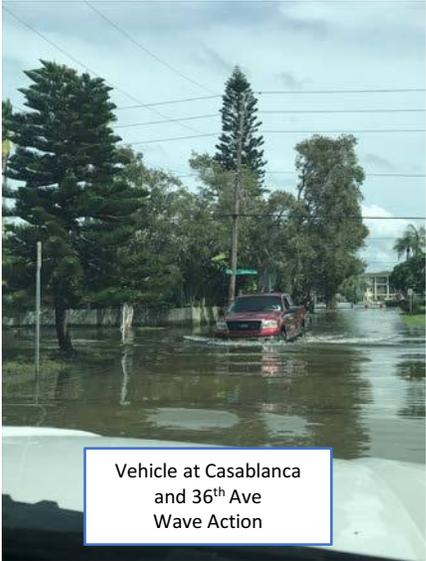


Merry Pier  
Pass-A-Grille Sea Wall



Intersection of  
55<sup>th</sup> and Pali Way Sea Wall

# Water Threats St. Pete Beach



Vehicle at Casablanca  
and 36<sup>th</sup> Ave  
Wave Action



Pass-A-Grille Beach  
at 3<sup>rd</sup> Avenue



Intersection of  
Casablanca and 36<sup>th</sup> Ave  
Homes Isolated



Intersection of Casablanca and  
36<sup>th</sup> Ave  
Private Property Encroachment



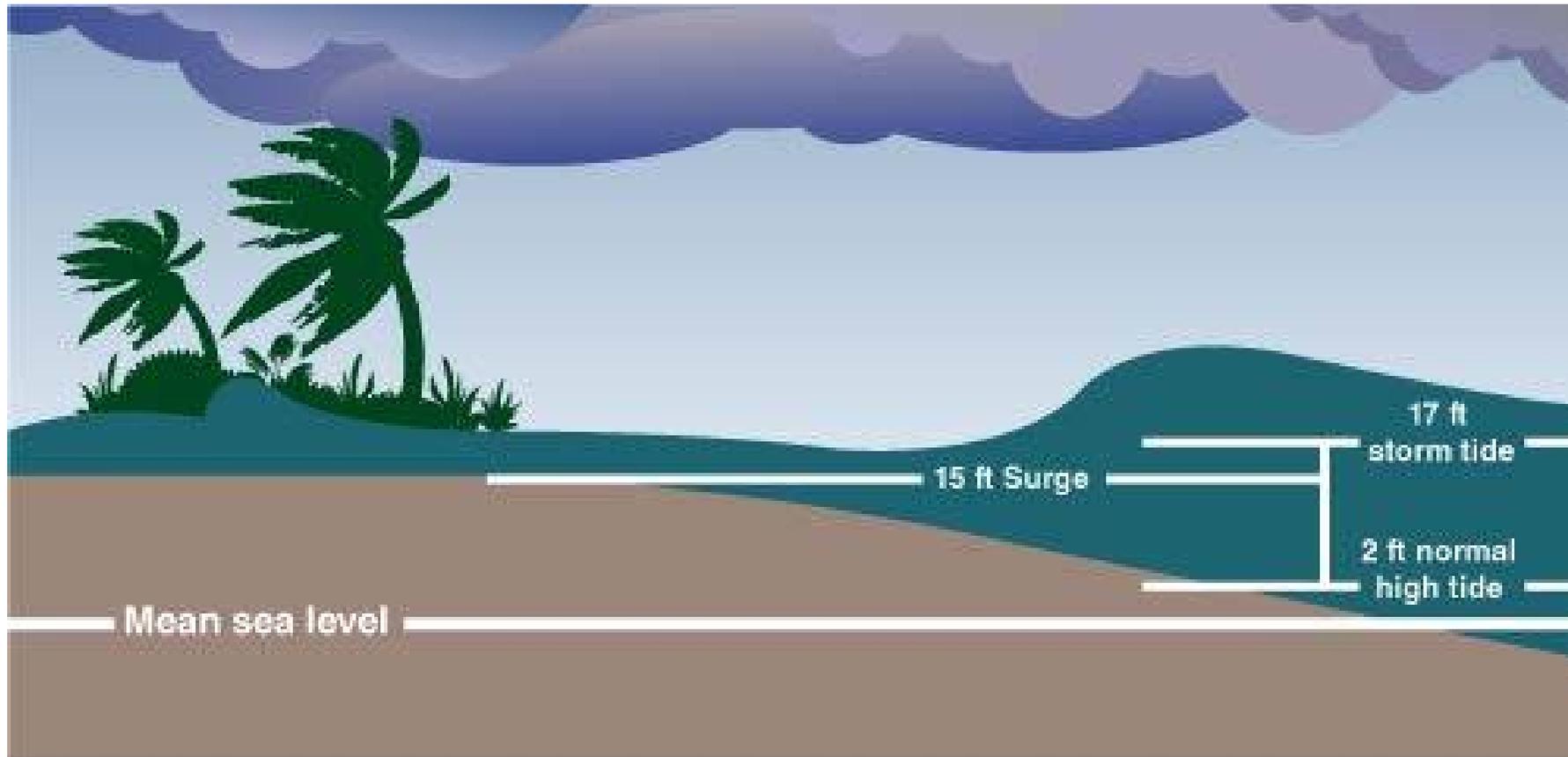
Gulf Beach at 37<sup>th</sup> Ave  
Looking South at the Don



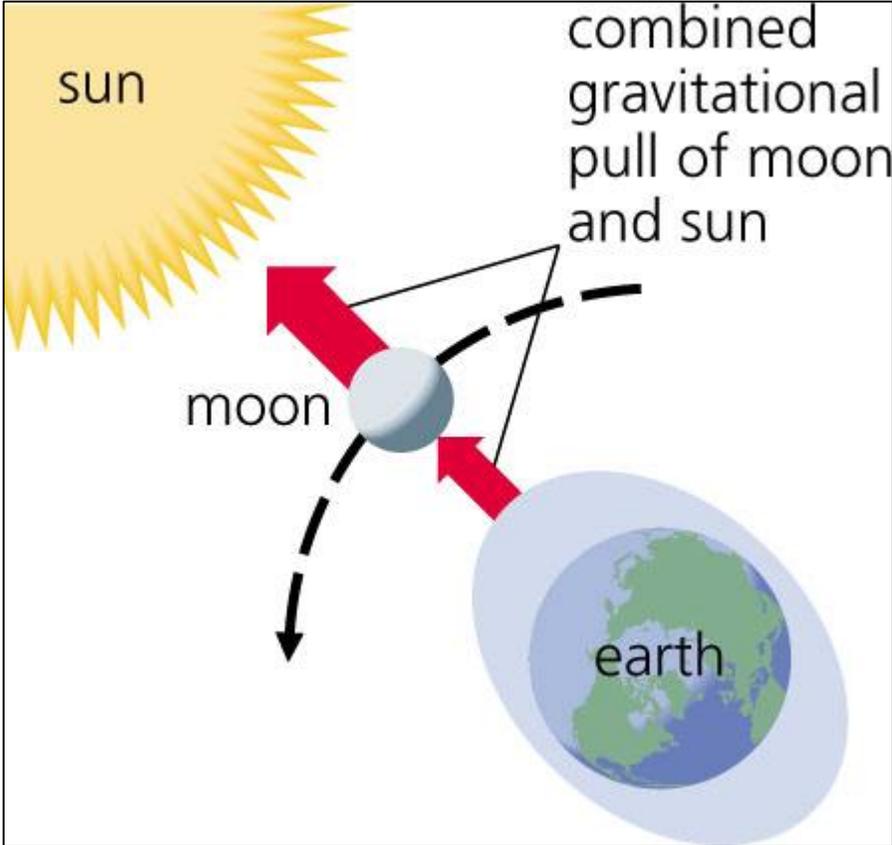
## Vulnerability Assessment

1. **Flash Flooding:** Dozens of locations throughout the City.  
Flooding caused by heavy rain fall in a short period of time usually 6 hours or less.
  2. **King Tides:** Astronomical and growing worse due to Sea Level Rise.  
The highest predicted tide of the year at a coastal location; astronomically driven.
  3. **Sea Level Rise:** Long term and accelerating.
  4. **Storm Surge:** Normally dry land flooding caused by hurricanes.  
An abnormal rise of water generated by a storm above the predicted astronomical tide.
- Mean Sea Level: The average height of the sea surface including all tides measured over a period of 19 years.
  - Flood: The inundation of normally dry land from rising water in an existing waterway, rivers or stream.
  - Storm Tide: The water level rise due to the combination of storm surge and astronomical tide.

# The 'Water Stack'



King Tide  
St. Pete Beach



# NOAA Sea Level Rise Tracker

Don-Ce-Sar Place

Vina del Mar Park

Mud Key

NOAA  
Sea Level Rise 2 FT  
Above Mean Sea Level

Pine Key

Don-Ce-Sar Place

Vina del Mar Park

Mud Key

NOAA  
Sea Level Rise 3 FT  
Above Mean Sea Level

Pine Key

Don-Ce-Sar Place

Vina del Mar Park

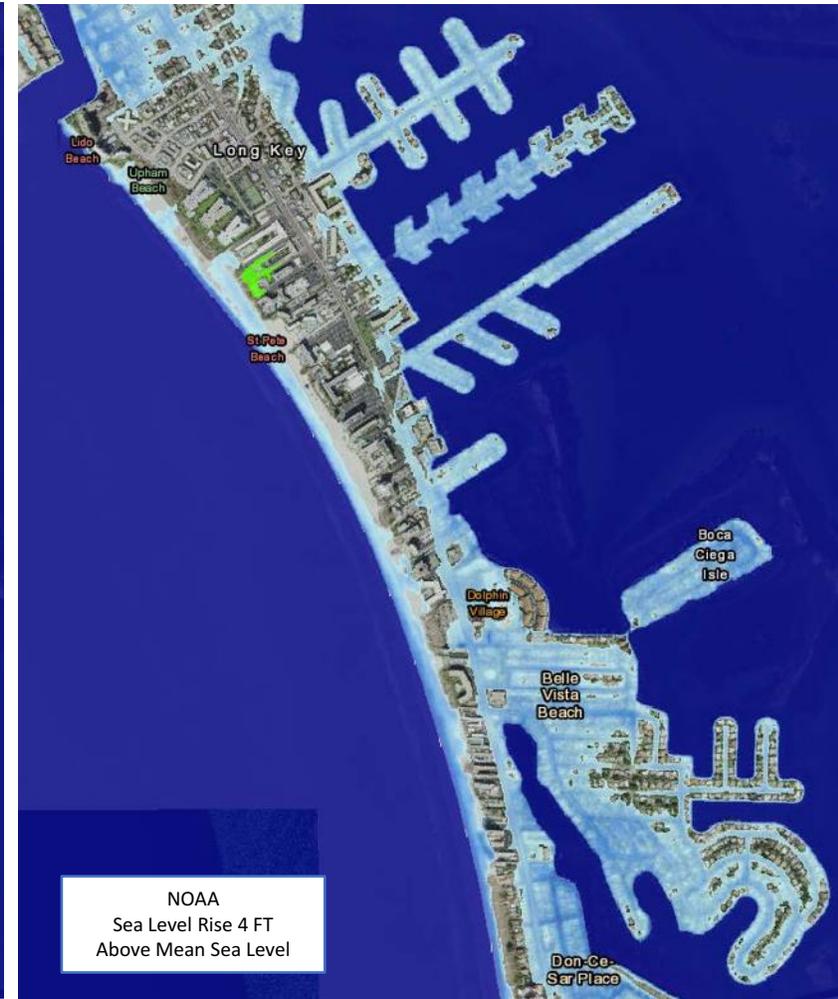
Mud Key

NOAA  
Sea Level Rise 4 FT  
Above Mean Sea Level

Pine Key



# NOAA Sea Level Rise Tracker



# NOAA Sea Level Rise Tracker



Sea Level Rise  
St. Pete Beach

**Projections for 2050**

**Data clarification comments by K-H**  
*“Existing baseline tidal conditions are based on the Mean Higher High Water (MHHW) level recorded over 2014-2019 by the NOAA St. Petersburg Station 8726520. The intent of this evaluation was to identify the baseline water elevations using NOAA 2017 sea level rise projections coupled with rainfall to identify asset-threat relationships based on the analyzed scenarios. Storm surge and wave impacts were not included in the evaluation.”*

**Group I**

Sea Level Rise	Low
Sea Level Rise	Intermediate
Sea Level Rise	High

**Group II**

Sea Level Rise	Low	25 Year Rain Event: 24 Hours
Sea Level Rise	Intermediate	25 Year Rain Event: 24 Hours
Sea Level Rise	High	25 Year Rain Event: 24 Hours

**Group III**

Sea Level Rise	Low	100 Year Rain Event: 24 Hours
Sea Level Rise	Intermediate	100 Year Rain Event: 24 Hours
Sea Level Rise	High	100 Year Rain Event: 24 Hours



Sea Level Rise  
St. Pete Beach  
Group I  
2050 Sea Level Rise: Intermediate





Sea Level Rise  
St. Pete Beach  
Group II

2050 Sea Level Rise: Low + 25 Year Rain Event: 24 Hours



Sea Level Rise  
St. Pete Beach  
Group II

2050 Sea Level Rise: Intermediate +25 Year Rain Event: 24 Hours



Sea Level Rise  
St. Pete Beach  
Group II  
2050 Sea Level Rise: High + 25 Year Rain Event: 24 Hours



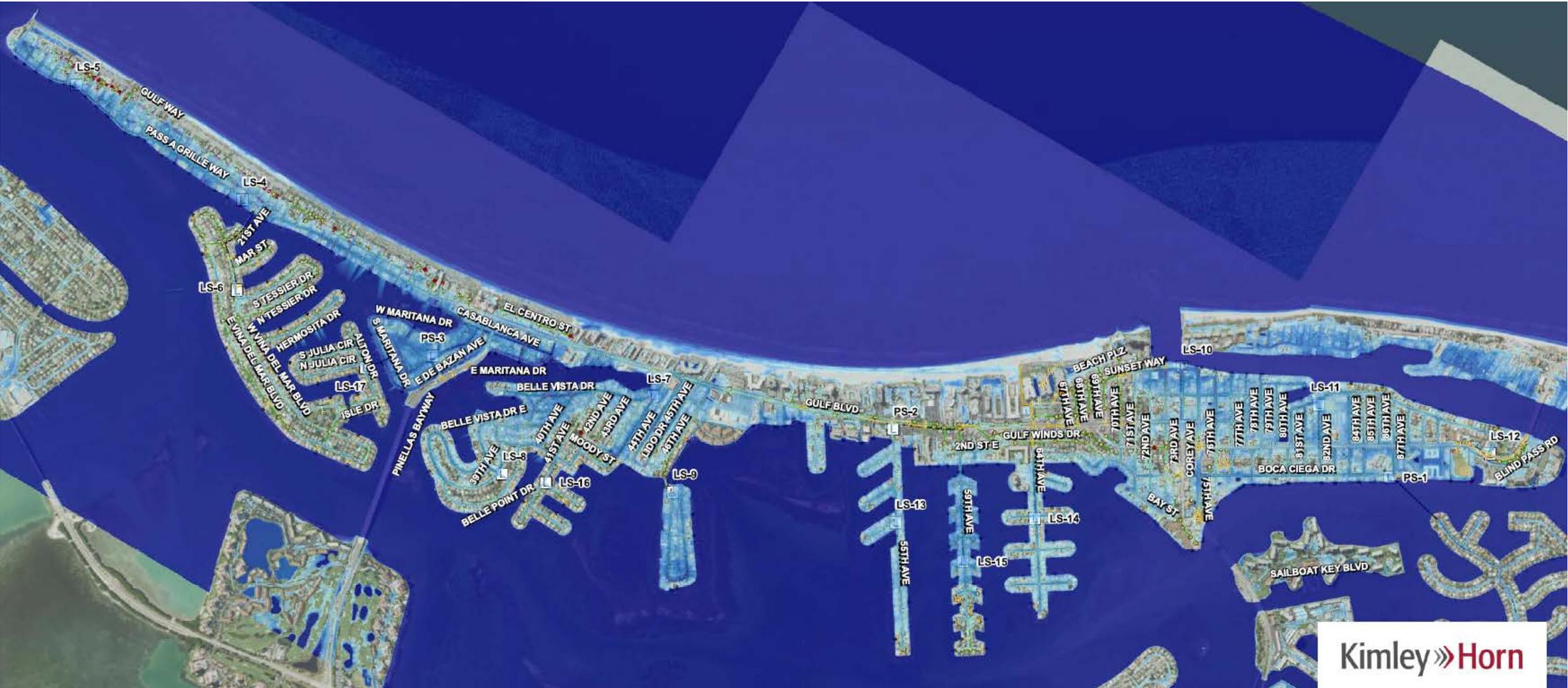
Sea Level Rise  
St. Pete Beach  
Group III

2050 Sea Level Rise: Low + 100 Year Rain Event: 24 Hours





Sea Level Rise  
St. Pete Beach  
Group III  
2050 Sea Level Rise: High + 100 Year Rain Event: 24 Hours



# Hurricane Tracks

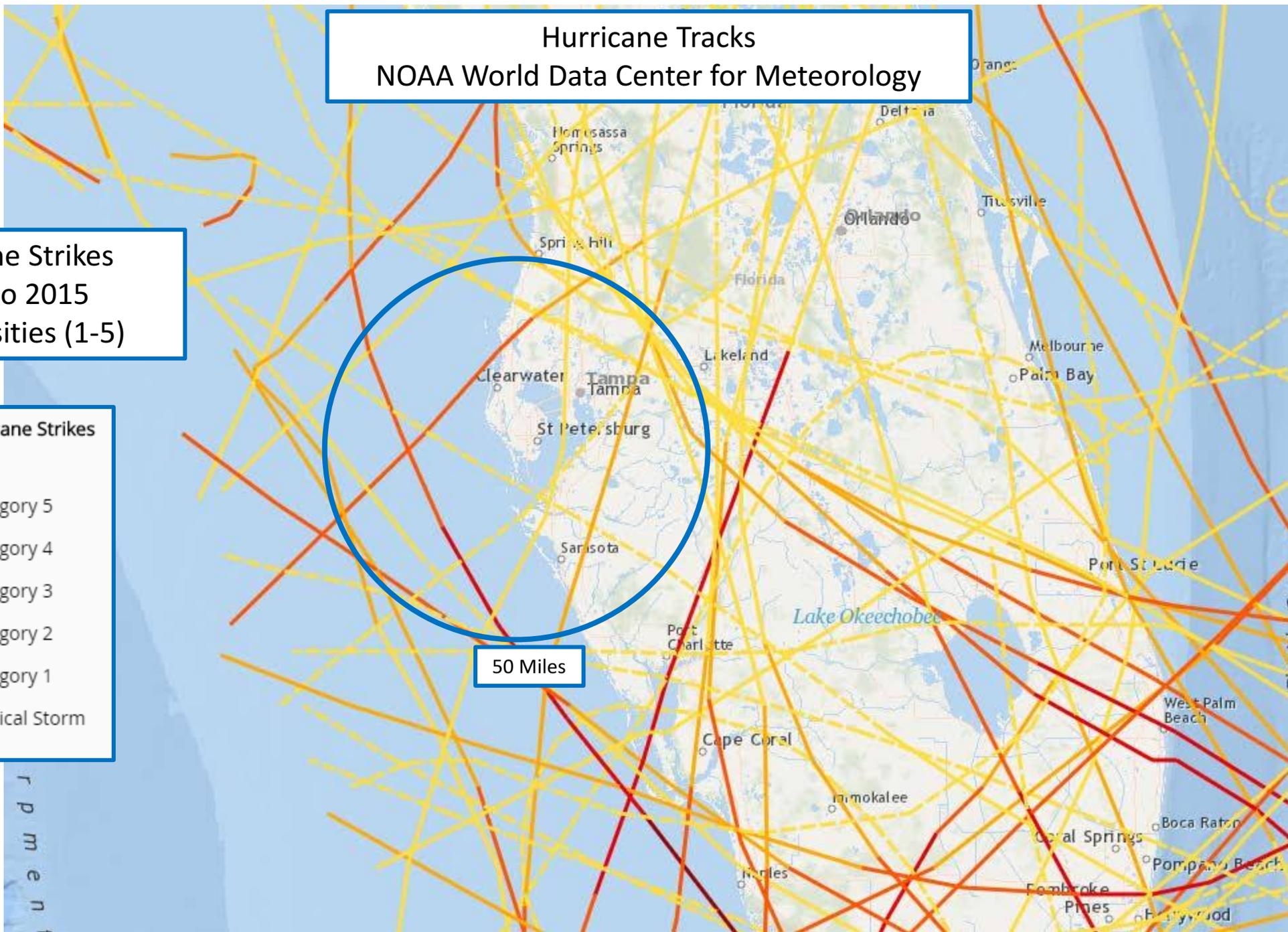
NOAA World Data Center for Meteorology

Hurricane Strikes  
1900 to 2015  
All Intensities (1-5)

U.S. Hurricane Strikes  
1900-2018

- Category 5
- Category 4
- Category 3
- Category 2
- Category 1
- Tropical Storm

50 Miles





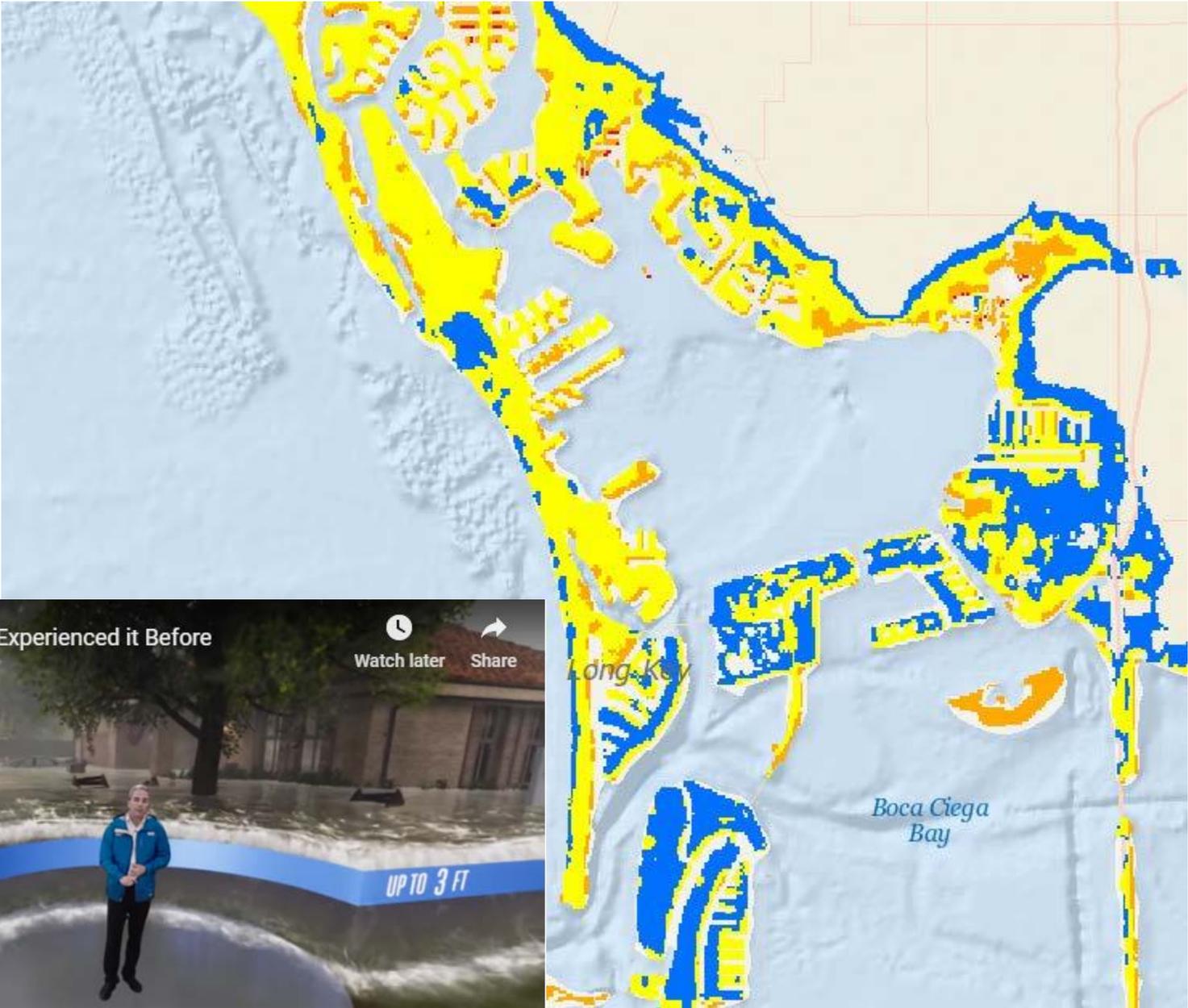
An Approximation of the Accumulation of Tides, SLR and Cat I Hurricane at 8<sup>th</sup> Ave Pass-A-Grille

# National Hurricane Center Storm Surge Unit SLOSH Model **Category 1**

Sea, Lake, and Overland Surges from Hurricanes (SLOSH).

The abnormal rise of water generated by a storm over and above the predicted astronomical tides.

Factors include the storm track, intensity, size, forward speed of the storm and the coastline characteristics.



### Category 1 Storm Surge Inundation

Inundation Height

- Up to 3 feet above ground
- Greater than 3 feet above ground
- Greater than 6 feet above ground
- Greater than 9 feet above ground

- A** Greater than 9 feet above ground
- B** 6-9 feet above ground
- C** 3-6 feet above ground
- D** 1-3 feet above ground

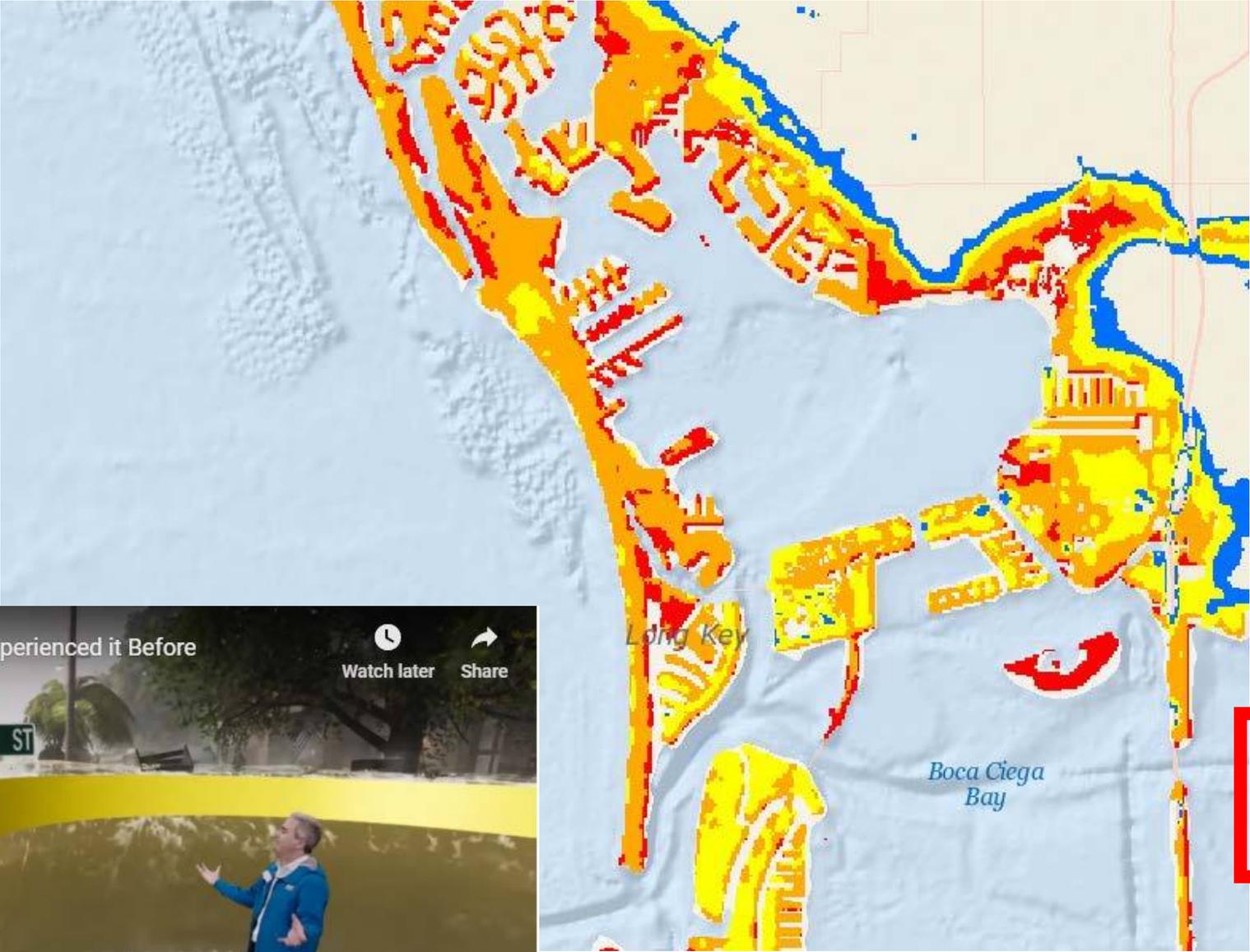


# National Hurricane Center Storm Surge Unit SLOSH Model **Category 2**

Sea, Lake, and Overland Surges from Hurricanes (SLOSH).

The abnormal rise of water generated by a storm over and above the predicted astronomical tides.

Factors include the storm track, intensity, size, forward speed of the storm and the coastline characteristics.



### Category 2 Storm Surge Inundation

Inundation Height

- Up to 3 feet above ground
- Greater than 3 feet above ground
- Greater than 6 feet above ground
- Greater than 9 feet above ground

- A** Greater than 9 feet above ground
- B** 6-9 feet above ground
- C** 3-6 feet above ground
- D** 1-3 feet above ground

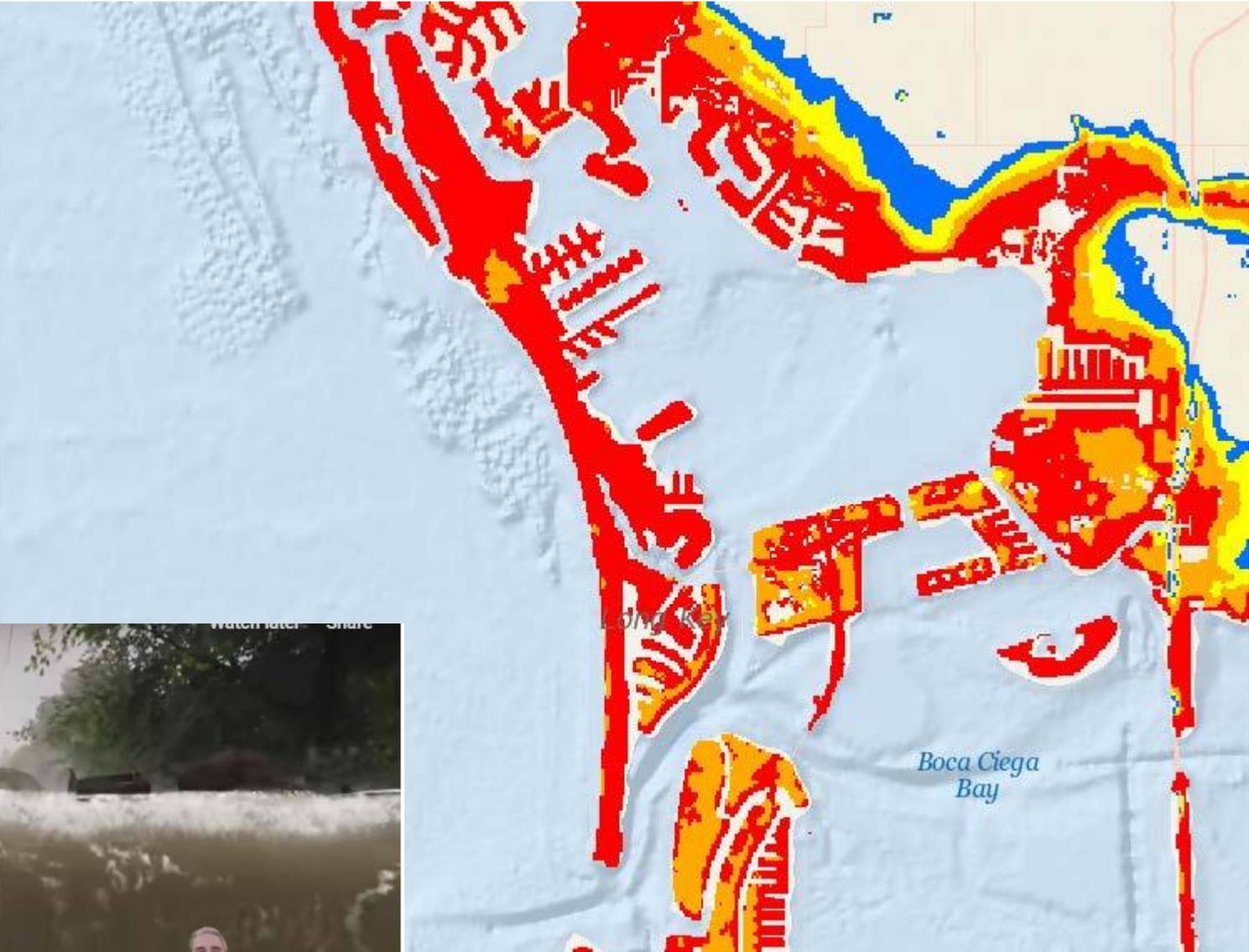


# National Hurricane Center Storm Surge Unit SLOSH Model **Category 3**

Sea, Lake, and Overland Surges from Hurricanes (SLOSH).

The abnormal rise of water generated by a storm over and above the predicted astronomical tides.

Factors include the storm track, intensity, size, forward speed of the storm and the coastline characteristics.



### Category 3 Storm Surge Inundation

Inundation Height

- Up to 3 feet above ground
- Greater than 3 feet above ground
- Greater than 6 feet above ground
- Greater than 9 feet above ground

Leveed Area -

**A** Greater than 9 feet above ground

**B** 6-9 feet above ground

**C** 3-6 feet above ground

**D** 1-3 feet above ground

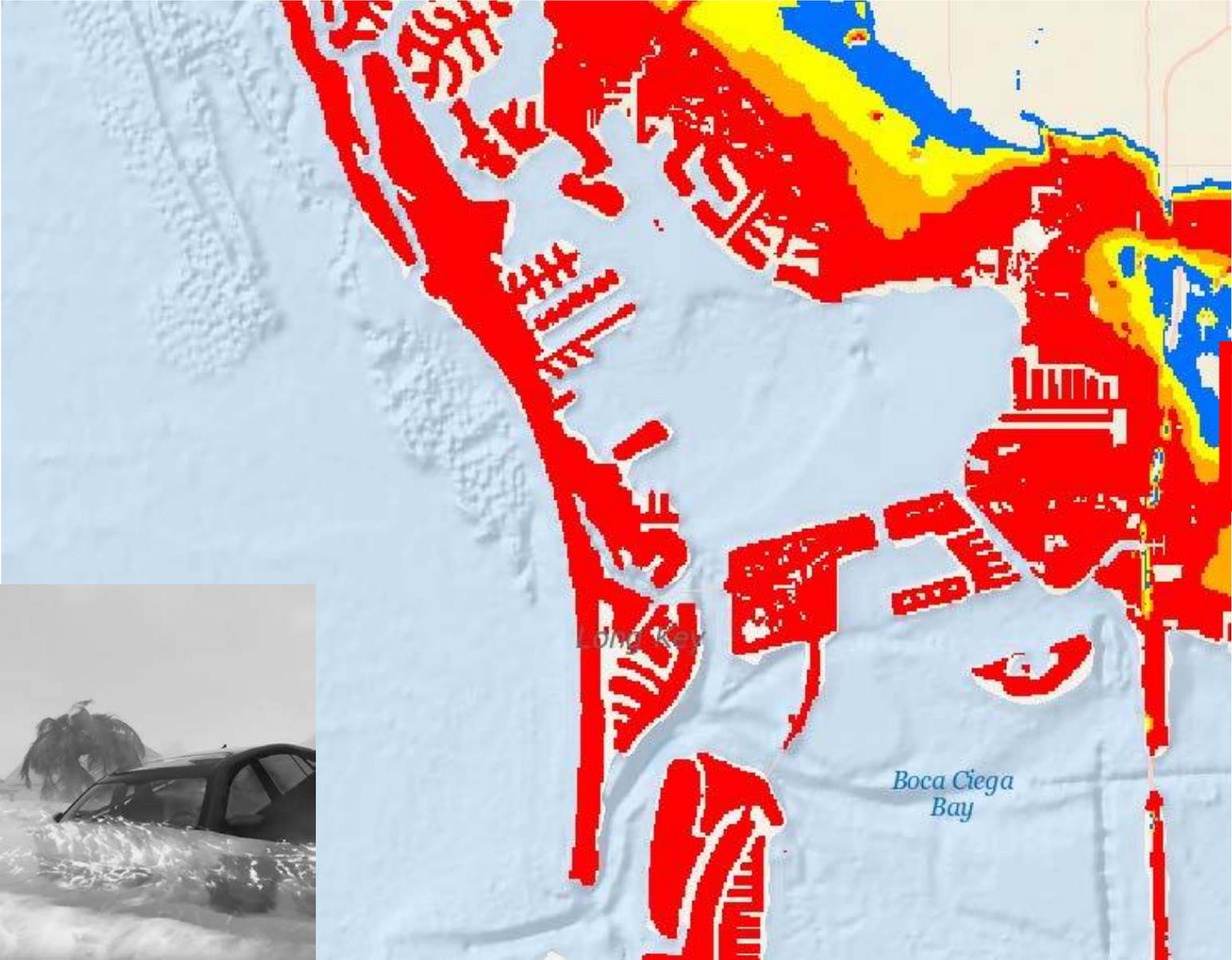


# National Hurricane Center Storm Surge Unit SLOSH Model **Category 4**

Sea, Lake, and Overland Surges from Hurricanes (SLOSH).

The abnormal rise of water generated by a storm over and above the predicted astronomical tides.

Factors include the storm track, intensity, size, forward speed of the storm and the coastline characteristics.



**Category 4 Storm Surge Inundation**

Inundation Height

- Up to 3 feet above ground
- Greater than 3 feet above ground
- Greater than 6 feet above ground
- Greater than 9 feet above ground

Leveed Area -

**A** Greater than 9 feet above ground

**B** 6-9 feet above ground

**C** 3-6 feet above ground

**D** 1-3 feet above ground



Group III  
Intermediate Sea Level Rise  
+ the 100 Year Storm

Kimley  
Horn

NOAA  
Sea Level Rise 2FT  
Above Mean Sea Level

## Water Threats St. Pete Beach

Recommended Level of Service  
4 Feet Above Current MSL

2 Ft of King Tide: Current Events  
+2 FT of Sea Level Rise: 2050

This is an approximate average between the NOAA 2 FT SLR Scenario and the Kimley-Horn Study Group 3 Intermediate Prediction Including the 100 Year Storm for 2050 as our water threats resiliency planning prioritization model for the next 5 fiscal years updated annually.

This sets the standard for development of Adaptation and Implementation Strategies.



## Adaptation Strategies

### Intergovernmental Panel on Climate Change

“The ability of a system to adjust to climate change, to moderate potential damages, to take advantage of opportunities, or to cope with the consequences.”

- 1. Protection:** Structurally defensive measures that directly protect vulnerable structures.
- 2. Accommodation:** Alter the physical design of vulnerable structures to allow the structure or land use to stay in place with modification.
- 3. Retreat:** From land, infrastructure or structures where protection or accommodation will not be efficient or effective.
- 4. Avoidance:** Guiding new development away from area that are subject to coastal hazards.



## Implementation Strategies

### Transition Adaptation Strategies into Implementation Activities

- 1. Planning:** Continue the Planning Process: 2020 to 2050 and Beyond
- 2. Funding:** Identify Funding Opportunities
- 3. Schedule:** Develop a Schedule of Action Plans: This FY, The 5 Year CIP, Long Range
- 4. Monitor and Evaluate Progress:** Use an Adaptive Management Mindset; Incorporate Lessons Learned and Evolving Data and Knowledge



## Implementation Strategies

### Prioritization of Individual Strategies

STAPLEE Developed by NOAA and FEMA

- 1. Social:** What strategies are socially acceptable in our community?
- 2. Technical:** Is the proposed strategy technically feasible?
- 3. Administrative:** Can St. Pete Beach implement the strategy at our level?
- 4. Political:** What strategies are politically acceptable in our community?
- 5. Legal:** Are selected strategies legally implementable under state and local law?
- 6. Economic:** Is the strategy cost effective and is funding available?
- 7. Environmental:** Is the strategy favorable to the environment?



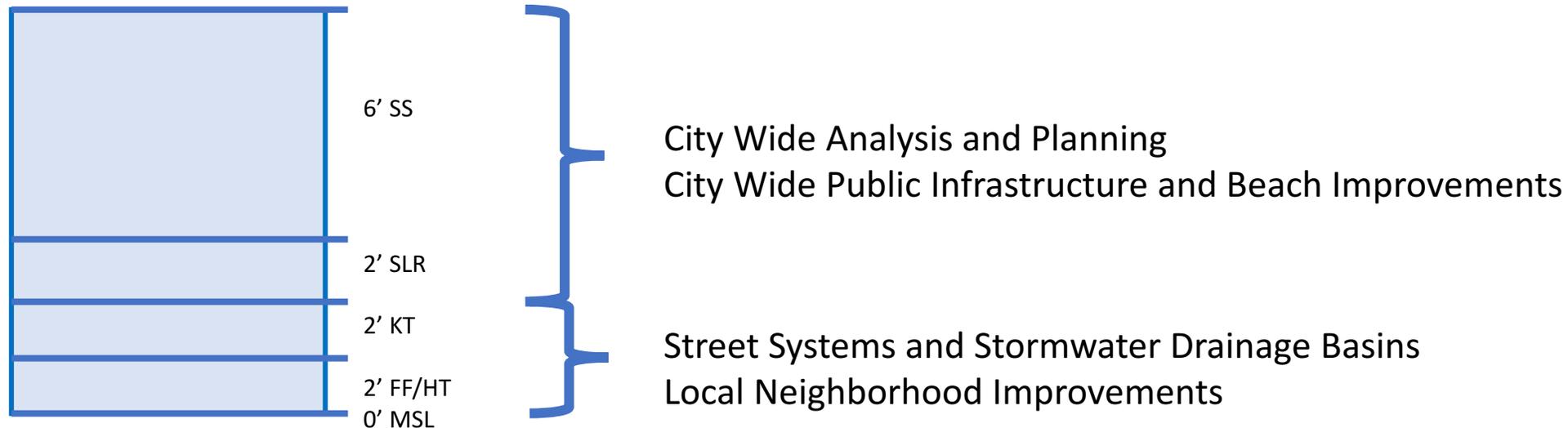
## Action Plan

### What Are we Planning to Defend Against?

Multiple Water Threats at Multiple Island Locations; Property, Structures and Infrastructure

### How do we Plan to Prepare?

City Wide and Localized Approach Incorporating Systems Integration



Group III  
Intermediate Sea Level Rise  
+ the 100 Year Storm

Kimley»Horn



## Action Plan

### City Wide Analysis and Planning

- FY 12 Stormwater Master Plan
- FY 19 Coastal Resiliency Plan PH I
- FY 20 Stormwater Master Plan Update
- FY 20 Coastal Resiliency Plan PH II
- FY 20 Sea Wall Replacement Study 1<sup>st</sup> to 12<sup>th</sup> Ave PAG (major)
- FY 20 Sea Wall Replacement Study 80<sup>th</sup> Ave (individual)
- FY 20 Maritana Neighborhood Protection Study, SLR

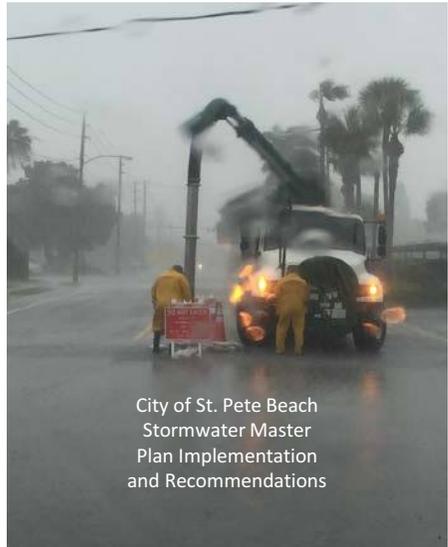
### City Wide Public Infrastructure and Beach Improvements

- FY 17-20 Sanitary Sewer Conveyance Improvements
- FY 17-20 Sanitary Sewer Pump and Lift Station Improvements
- FY 17-20 Stormwater Drainage Improvements
- FY 19 Upham Beach Nourishment
- FY 20 Dune Resiliency Study
- FY 21 Pass-A-Grille Beach Nourishment (projected)

# Stormwater Master Plan



City of St. Pete Beach  
2012 Stormwater  
Master Plan Update

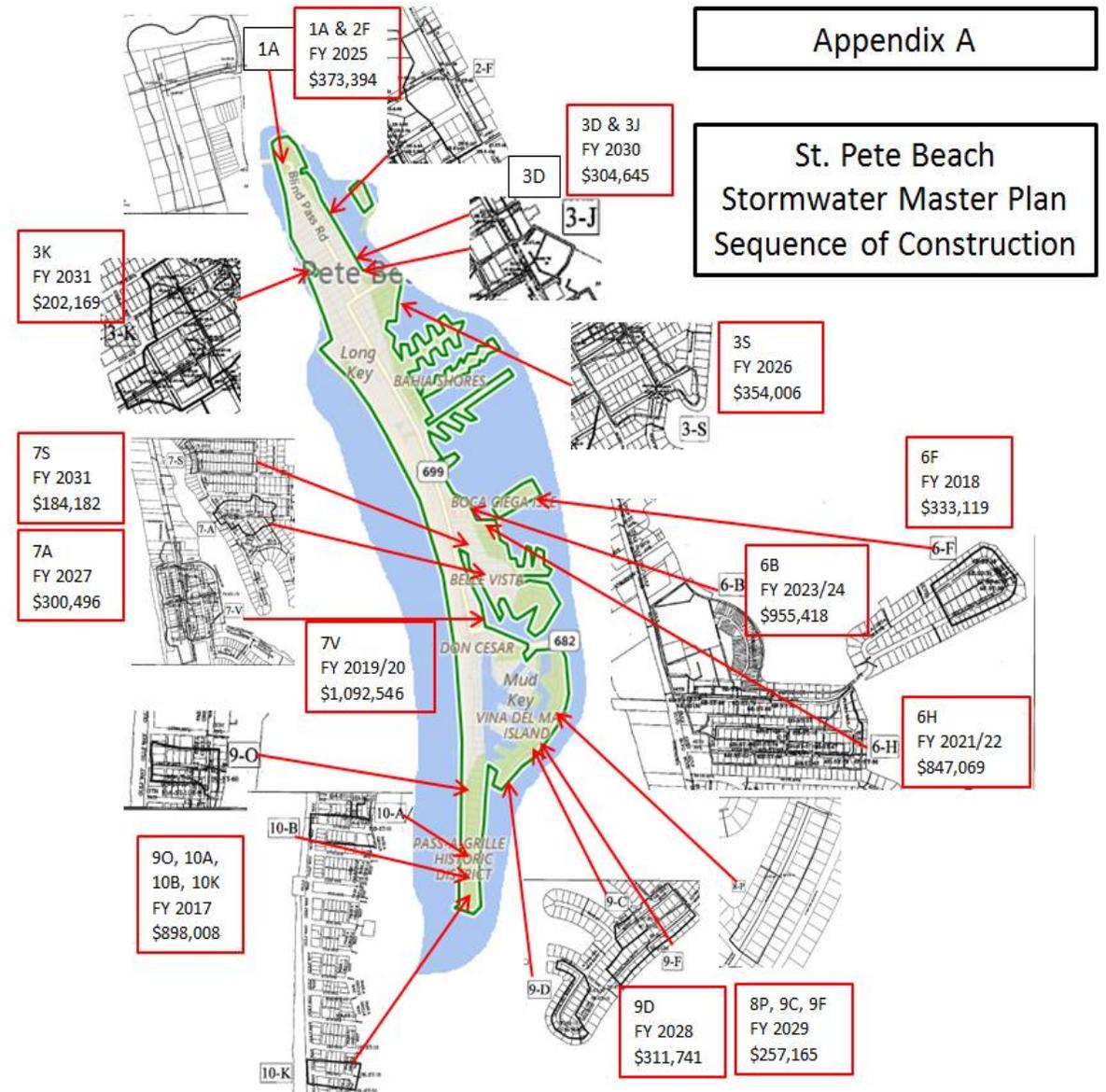


City of St. Pete Beach  
Stormwater Master  
Plan Implementation  
and Recommendations

FY12  
Stormwater Master  
Plan

FY17  
Implementation Plan

- Complete
- 9O FY 2017
  - 10A FY 2017
  - 10B FY 2017
  - 10C FY 2017
  - 6F FY 2018
  - 7V FY 2019/20
  - 6H FY 2021/22
  - 6B FY 2023/24
  - 1A FY 2025
  - 2F FY 2025
  - 3S FY 2026
  - 7A FY 2027
  - 9D FY 2028
  - 8P FY 2029
  - 9C FY 2029
  - 9F FY 2029
  - 3D FY 2030
  - 3J FY 2030
  - 3K FY 2031
  - 7S FY 2031



April 2019

# ST. PETE BEACH COASTAL RESILIENCY PLAN

FUNDING AND FLOODING VULNERABILITY



Prepared for:  
City of St. Pete Beach  
155 Corey Avenue  
St. Pete Beach, FL 33706

**Kimley»Horn**

Prepared by:  
Kimley-Horn and Associates, Inc.  
100 Second Avenue South  
Suite 105 N  
St. Petersburg, FL 33701



## Coastal Resiliency Plan PH I

The City's first step in developing a comprehensive framework for the Coastal Resiliency Plan.

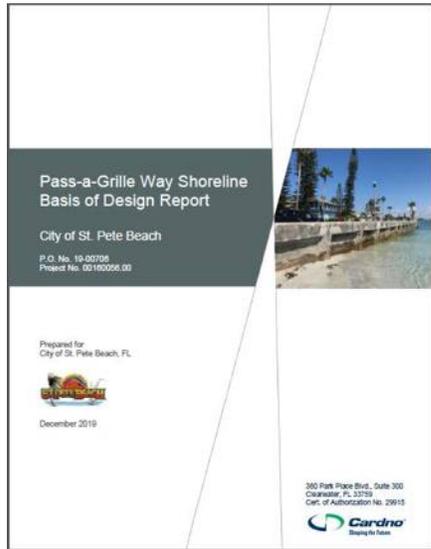
Vision: Be Prepared for Sea Level Rise and Storm Intensification

Mission: Prepare by mitigating the impact through research and planning to develop goals and tasks that are specific and actionable.

Goals:

- Develop land management strategies through research to develop predictive models of impacts.
- Research and Apply for Grant Funding (PH II \$70k)
- Promote Public Awareness

# Seawall Replacement Study 1<sup>st</sup> to 12<sup>th</sup> Avenue Major



# Seawall Replacement Study 80th Avenue Individual



# Maritana Neighborhood Protection Study Sea Level Rise



NOAA  
Sea Level Rise 2FT  
Above Mean Sea Level



## Action Plan

### Street Systems and Stormwater Drainage Basins

- FY 17-19 PAGW Street Rehabilitation Including Tide 23 Flex Valves
- FY 17-20 Blind Pass Road Rehabilitation Including Tide Flex Valve
- FY 21-26 Boca Ceiga Dr and Gulf Winds Dr Rehabilitation
- FY 19-25 Stormwater Drainage Quality Improvements

### Local Neighborhood Improvements

- FY 18 Local Sea Wall Repair Design for 4 Locations: King Tide
- FY 19 Local Drainage Improvements Study for 11 Locations: King Tide
- FY 20 Boca Ceiga Isle. Dr. Neighborhood Drainage Improvement: King Tide
- FY 20 Casablanca Neighborhood Drainage Improvement: King Tide
- FY 20 Maritana Neighborhood Drainage Improvement: King Tide

# SEAWALL REPAIRS

## ALHAMBRA STREET, ALFONSO STREET

## 27TH AVENUE, AND 78TH AVENUE

### CONSTRUCTION DRAWINGS

ST. PETE BEACH, FLORIDA  
FEBRUARY 2019  
BID SET



**VICINITY MAP**  
N.T.S.



**LOCATION MAP**  
N.T.S.

SHEET	INDEX
1	COVER SHEET
2	GENERAL CONSTRUCTION NOTES
3	GENERAL DEMOLITION NOTES
4	ALHAMBRA STREET EXISTING CONDITIONS
5	ALHAMBRA STREET DEMO, EROSION CONTROL, SITE & GRADING PLAN
6	ALHAMBRA STREET SEAWALL CAP DETAIL
7	ALFONSO STREET EXISTING CONDITIONS
8	ALFONSO STREET DEMO, EROSION CONTROL, SITE & GRADING PLAN
9	ALFONSO STREET SEAWALL CAP DETAIL
10	27TH AVENUE EXISTING CONDITIONS
11	27TH AVENUE DEMO, EROSION CONTROL, SITE & GRADING PLAN
12	78TH AVENUE SEAWALL CAP DETAIL
13	78TH AVENUE EXISTING CONDITIONS
14	78TH AVENUE DEMO, EROSION CONTROL, SITE & GRADING PLAN
15	78TH AVENUE SEAWALL CAP DETAIL
16	CIVIL DETAILS

**CLIENT**  
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RUEBEN CLARSON CONSULTING  
972 31ST AVENUE NORTHEAST  
ST. PETERSBURG, FL 33704

MATT WALKER	FL REG No. 70246
DATE: _____	

NO.	BY	DATE	DESCRIPTION	INITIALS	DATE

PREPARED FOR:  
CITY OF ST. PETE BEACH  
155 COREY AVENUE  
ST. PETE BEACH, FL 33706

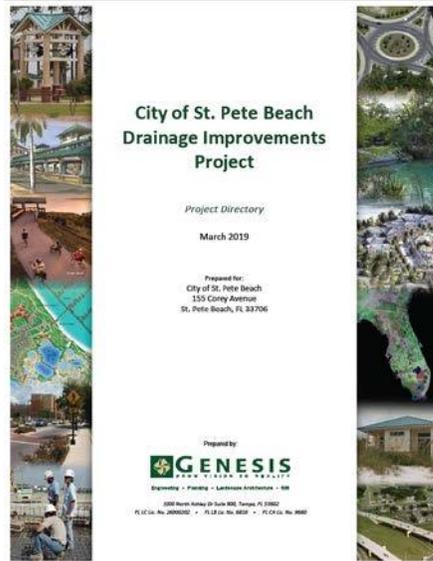


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ENGINEERING CERTIFICATE OF AUTHORIZATION NUMBER 21  
CIVIL & TRANSPORTATION ENGINEERING ECOCLOGY/ECOLANDSCAPE ARCHITECTURE  
PLANNING SURVEYING/INDUSTRIAL UTILITY ENGINEERING  
GAINESVILLE • WAREHOOD RANCH • ORLANDO • ST. PETERSBURG • TAMPA

MATT WALKER No. 70246  
DATE \_\_\_\_\_

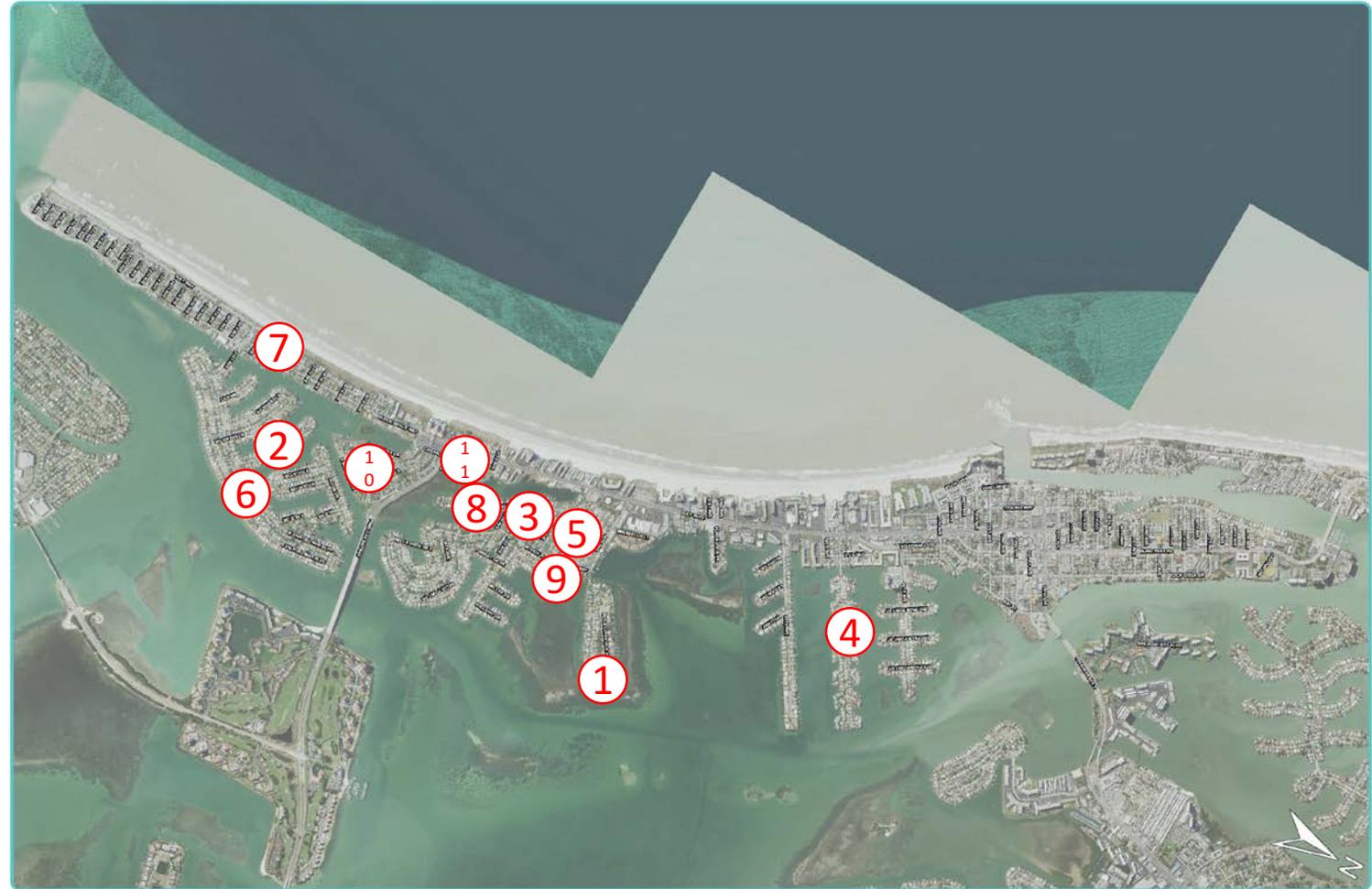
**ST. PETE BEACH**  
SEAWALL REPAIR

JOB NO.  
17Y047065G  
SHEET NO.  
1



Local Drainage Improvement Projects  
Based on Staff Observations  
Not in Priority Order

1. Boca Ceiga Isle Dr. Jan 20 Construction \$294,853.
2. Hermosita Dr. 100% Design \$1,027,086
3. 341<sup>st</sup> Ave and Belle Vista Dr. 100% Design \$101,882
4. 59<sup>th</sup> Ave 30% Design \$838,740
5. 45<sup>th</sup> Ave 30% Design \$2,264,412
6. Vina Del Mar Blvd 30% Design \$778,794
7. Sunset Way 30% Design \$439,679
8. Mangrove Point and Belle Vista Dr 30% Design \$TBD
9. 44<sup>th</sup> Ave and Moody St. 100% Design \$207,821
10. S. Debazan Ave 100% Design 12,890
11. Casablanca Ave and 37<sup>th</sup> Ave Concept Design



Boca Ceiga Isle. Dr. Neighborhood  
Drainage Improvement  
King Tide



Casablanca Neighborhood  
Drainage Improvement:  
King Tide



Maritana Neighborhood  
Drainage Improvement  
King Tide



 GENESIS | HALFF

 GENESIS | HALFF

 GENESIS | HALFF



## What is Next

### For the Most At-Risk Areas: For Each Area

- Develop Policy Recommendations for Private Property Regulation
- Develop Policy Recommendations for Public Improvements w/OPC
- Develop Action Plans

### Evaluate Funding Opportunities

- State and Federal Grants
- Special Benefit Assessment Districts

### Meet With Each Community Separately to Discuss Action Plans