TAYLOR ENGINEERING, INC.

Punta Gorda

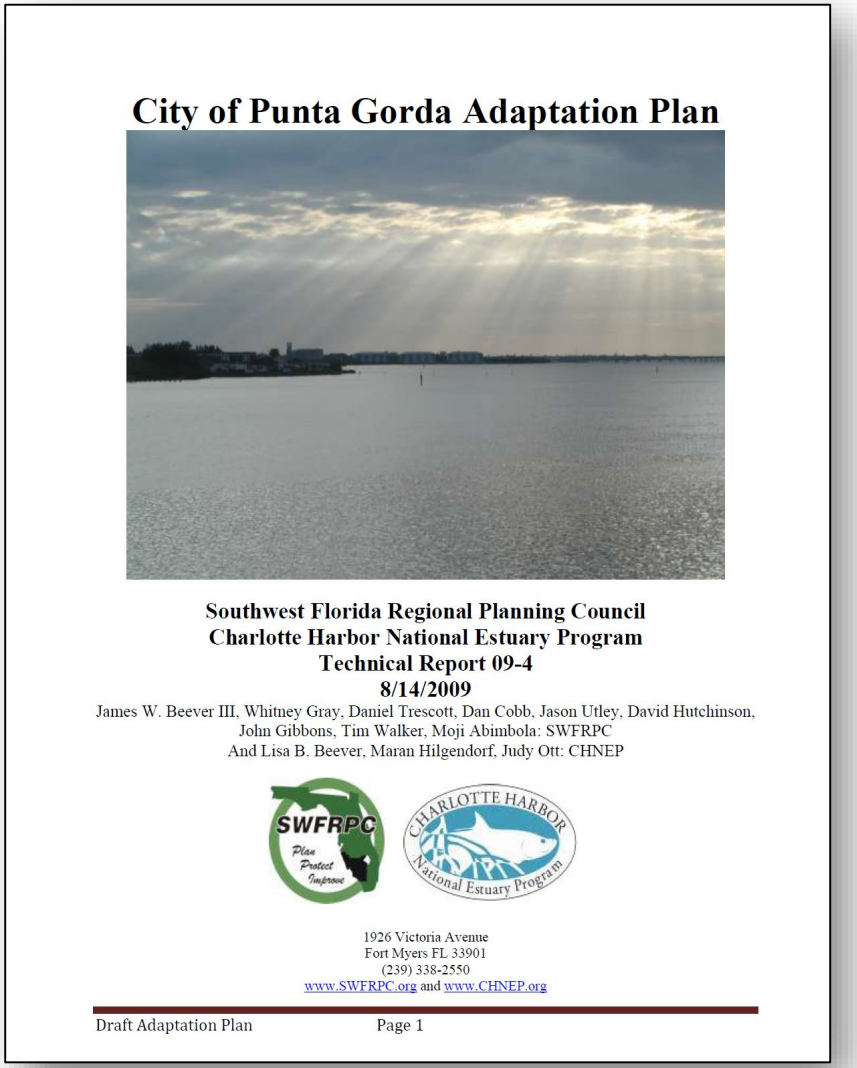
Climate Adaptation Plan Update

City Council Meeting

Jenna N. Phillips, M.S.
October 2, 2019

Project Purpose

- 2015 - “Peril of Flood” statute
- March 2018 - solicitation for engineering services
- Jan 2019 - FDEP Resilience Planning Grant
- Feb 2019 – Began work on an engineering approach to vulnerability analysis, adaptation, and comp. plan updates



City of Punta Gorda Adaptation Plan

Southwest Florida Regional Planning Council
Charlotte Harbor National Estuary Program
Technical Report 09-4
8/14/2009

James W. Beever III, Whitney Gray, Daniel Trescott, Dan Cobb, Jason Utley, David Hutchinson, John Gibbons, Tim Walker, Moji Abimbola: SWFRPC
And Lisa B. Beever, Maran Hilgendorf, Judy Ott: CHNEP

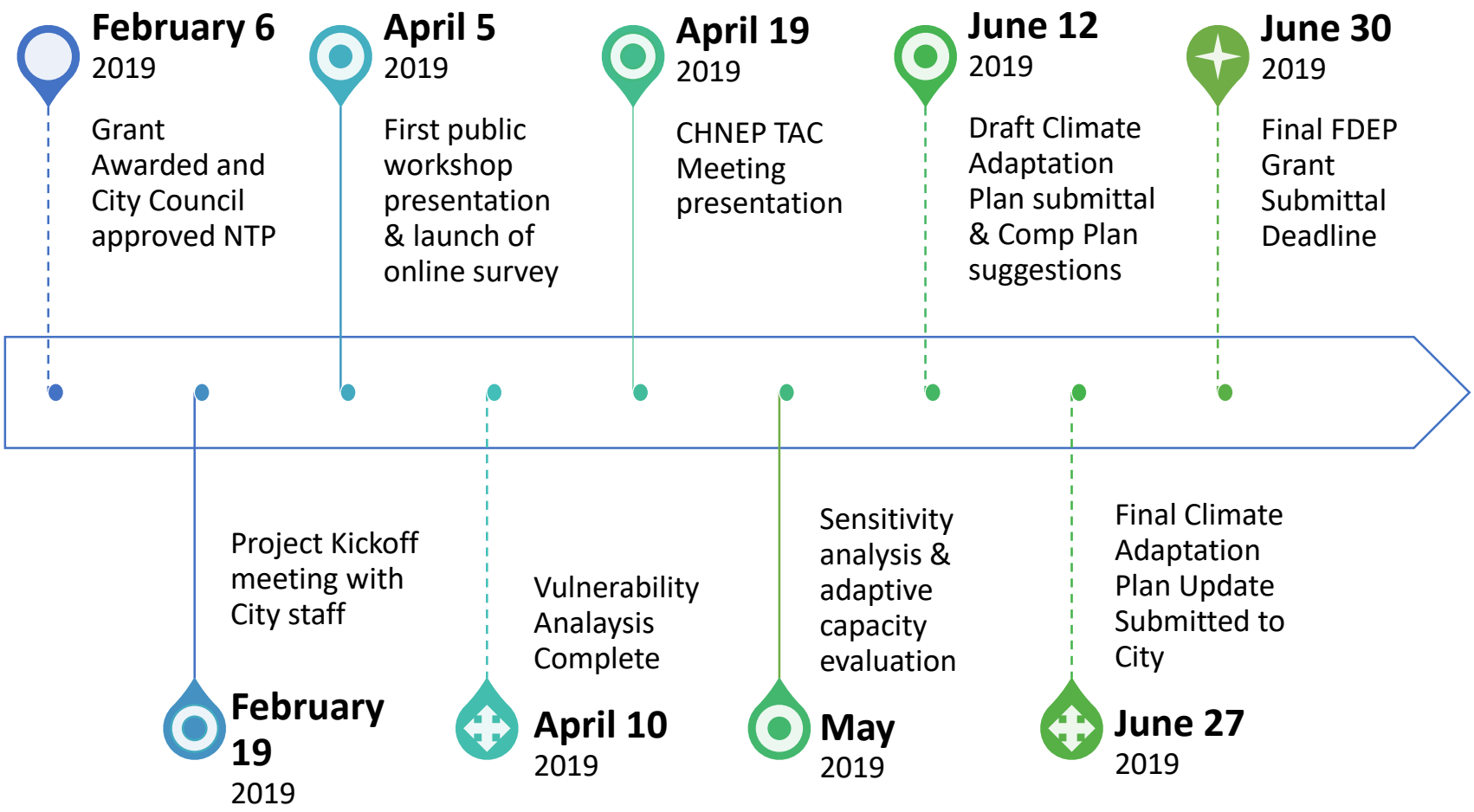
1926 Victoria Avenue
Fort Myers FL 33901
(239) 338-2550
www.SWFRPC.org and www.CHNEP.org

Draft Adaptation Plan Page 1

Project Overview

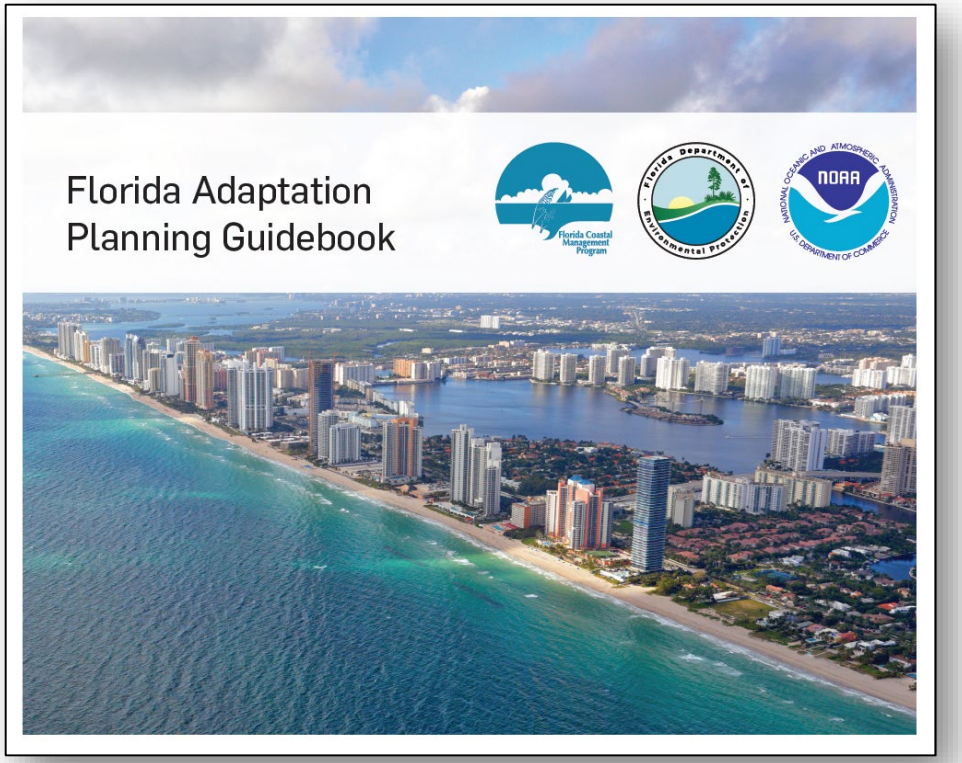
- Review of past studies, available data & City progress
- Vulnerability analysis
- Stakeholder engagement
  - Online survey
  - Public workshop
  - TAC meeting
- Adaptation Strategies
  - Living shorelines
- Addendum to 2009 Climate Adaptation Plan
- Funding alternatives

Project Timeline



Documents Reviewed

- City of Punta Gorda's Comprehensive Plan
- 2009 Adaptation Plan
- County and City 2035 Long Range Transportation Plan
- CHNEP Climate Change Vulnerability Assessment



https://floridadep.gov/sites/default/files/AdaptationPlanningGuidebook.pdf

City's Implementation Progress

- Sea grass acreage increased
- Fertilizer ordinance adopted
- Buyout of properties with flood damage
- Relocation of the City's public works facility
- Construction of new Emergency Management Center
- Improvements to local building codes

Progress Continued

- Pervious pavement on roads and sidewalks
- Living shoreline pilot project
- Tidal flex valves
- Coastal Resilience Decision Support Tool (TNC)
- Sea Grant Sea Level Rise Outreach Project with UF

Adaptation Planning Process

Source: Florida Adaptation Planning Guidebook

Defining Vulnerability

VULNERABILITY = EXPOSURE + SENSITIVITY + ADAPTIVE CAPACITY

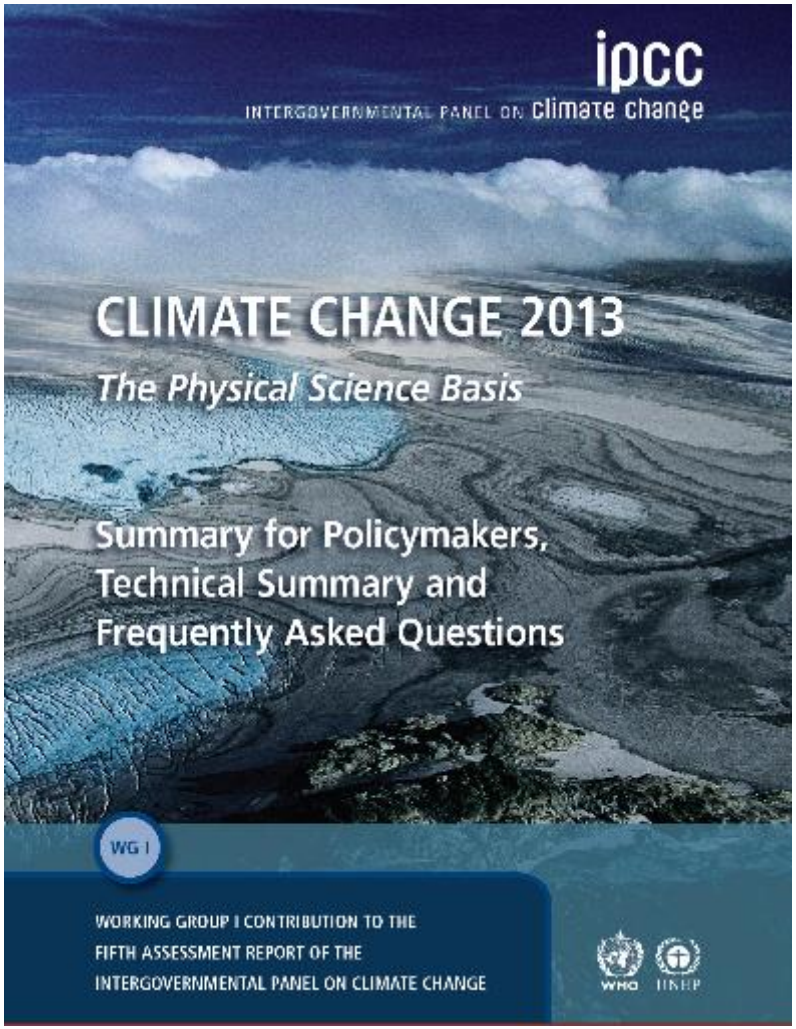
Exposure	- How much of the asset is in contact with the stressor - How long is it in contact with the stressor
Sensitivity	- Degree of impact if in contact with stressor - Level of existing stress or pressure
Adaptive Capacity	- Ability of the asset to adjust, repair, or respond to stressor

(Source: National Oceanic and Atmospheric Administration)

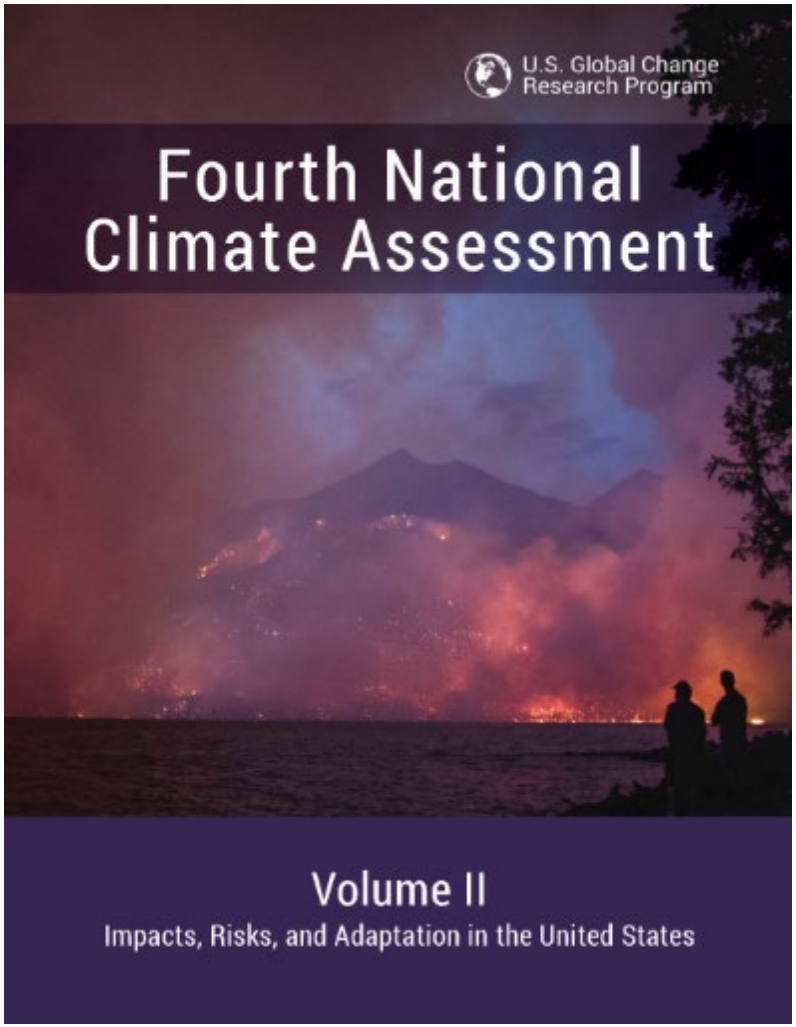
Vulnerability Analysis Datasets Reviewed

- 2007 SWFWMD topographic LiDAR (10ft resolution)
- Charlotte County property appraisal records
- County elevation certificates
- City elevation and floodproofing certificates
- City stormwater infrastructure
- City utilities: sanitary sewer system and water supply

Sea Level Studies

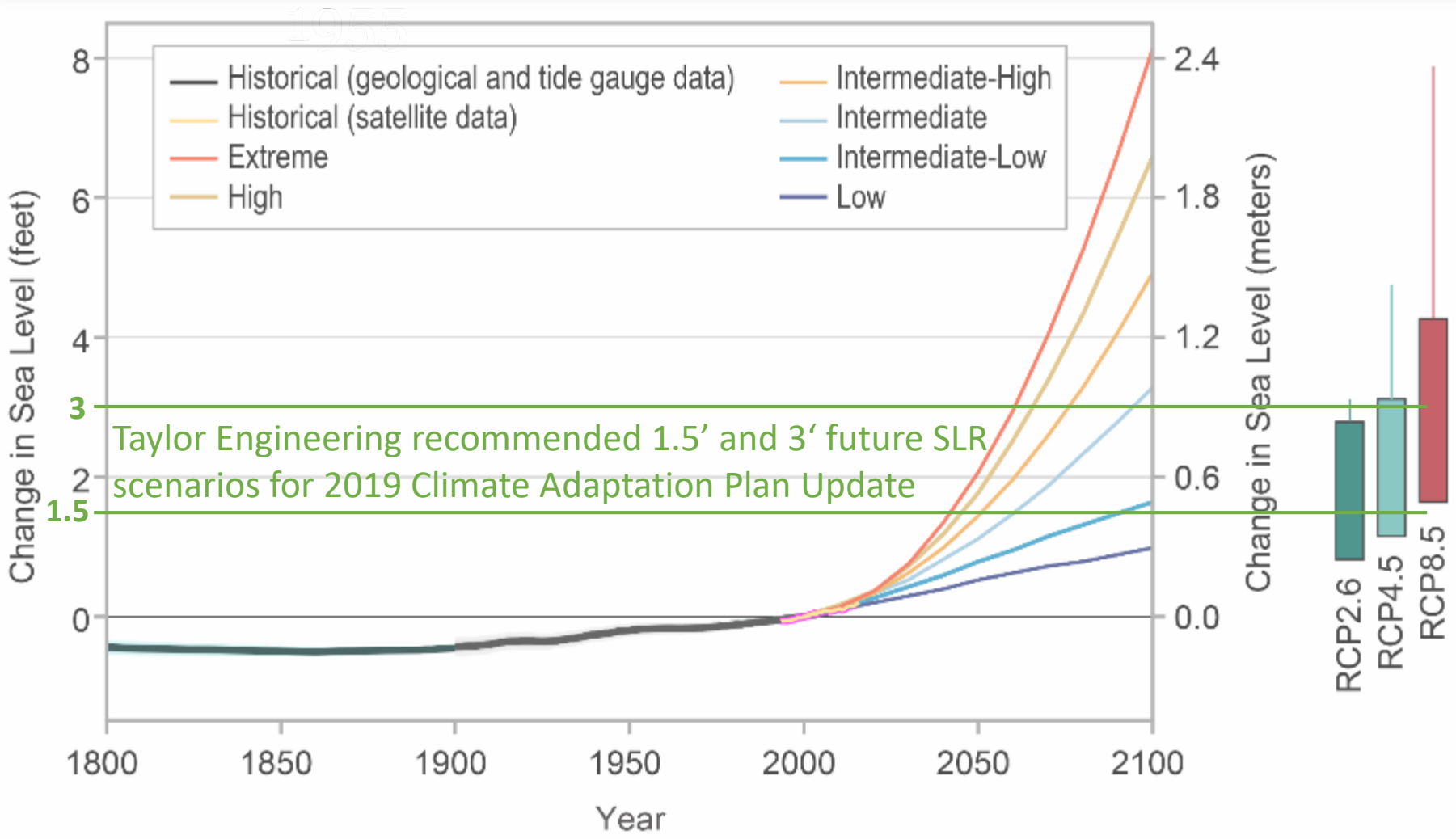


https://www.ipcc.ch/report/ar5/wg1/



https://nca2018.globalchange.gov/

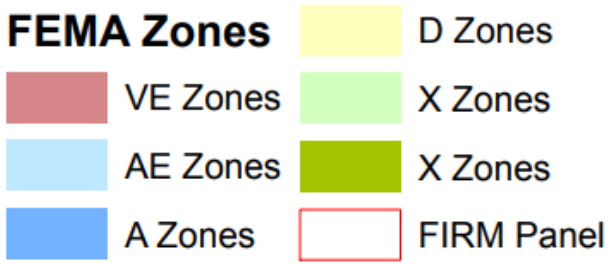
Global Mean Sea Level Future Scenarios

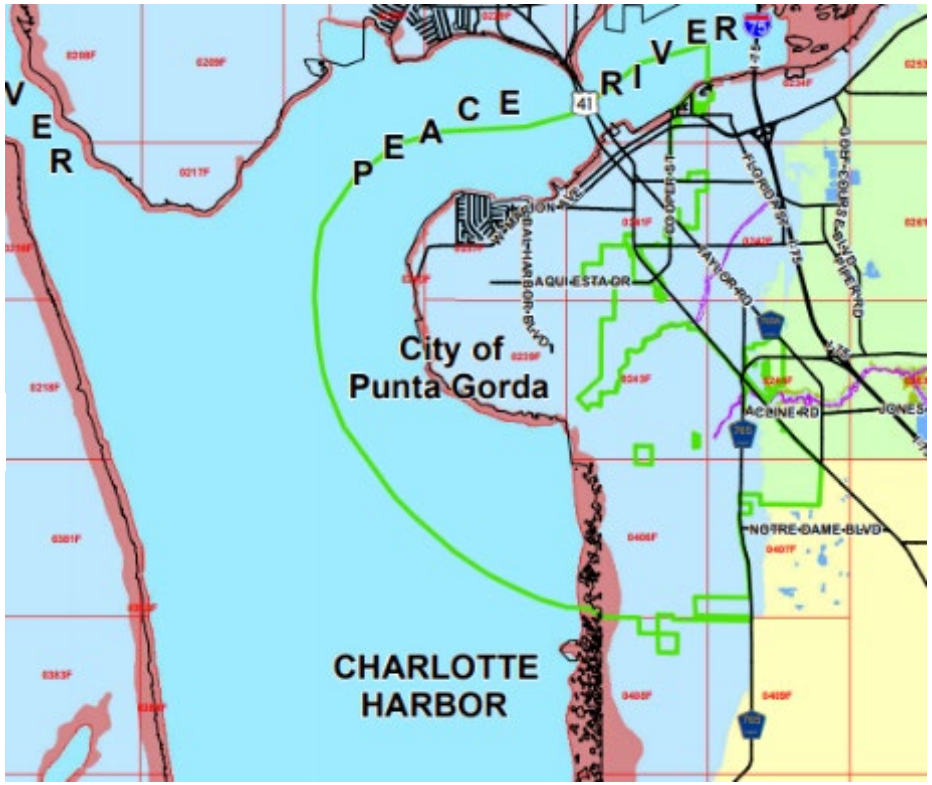


Source: Fourth National Climate Assessment (2018) and IPCC AR5 (2013)

Storm Surge Flood Scenarios

- FEMA Special Flood Hazard Area data
  - 4% annual chance flood (25 year)
  - 2% annual chance flood (50 year)
  - 1% annual chance flood (100 year)
  - 0.2% annual chance flood (500 year)





Coastal Flooding Vulnerability Assessment

Data inputs:

- Bldg Location
- FFE & LAG
- Replacement Value
- Contents Value
- Year Built
- Type of Construction

Flood Scenarios:

- MHHW (Blue-Sky Flooding)
- 1.5’ Sea Level Rise
- 3’ Sea Level Rise
- 4%, 2%, 1%, & 0.2% annual chance flood

Categorized list of vulnerable assets

- Publicly-owned
- Critical/Essential
- Historic

Twelve Flood Scenarios Modeled

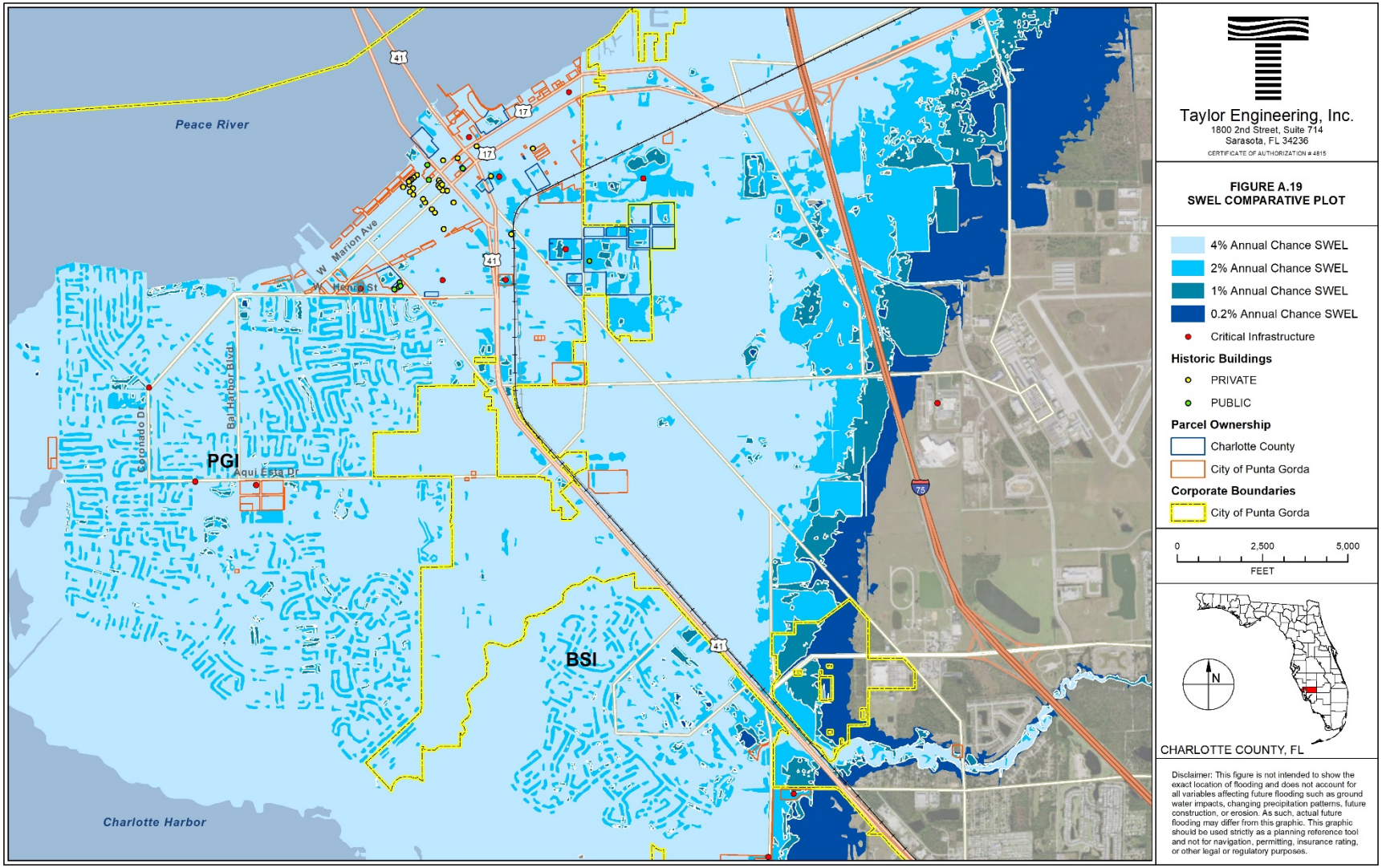
#	Flood Scenario		
1	2019 water level (MHHW)		
2	1.5 ft sea level rise		
3	3 ft sea level rise		
4	2019 water level (NAVD88)	+	4% annual chance flood
5	2019 water level (NAVD88)	+	1% annual chance flood
6	2019 water level (NAVD88)	+	0.2% annual chance flood
7	1.5 ft sea level rise	+	4% annual chance flood
8	1.5 ft sea level rise	+	1% annual chance flood
9	1.5 ft sea level rise	+	0.2% annual chance flood
10	3 ft sea level rise	+	4% annual chance flood
11	3 ft sea level rise	+	1% annual chance flood
12	3 ft sea level rise	+	0.2% annual chance flood

Sensitivity Analysis

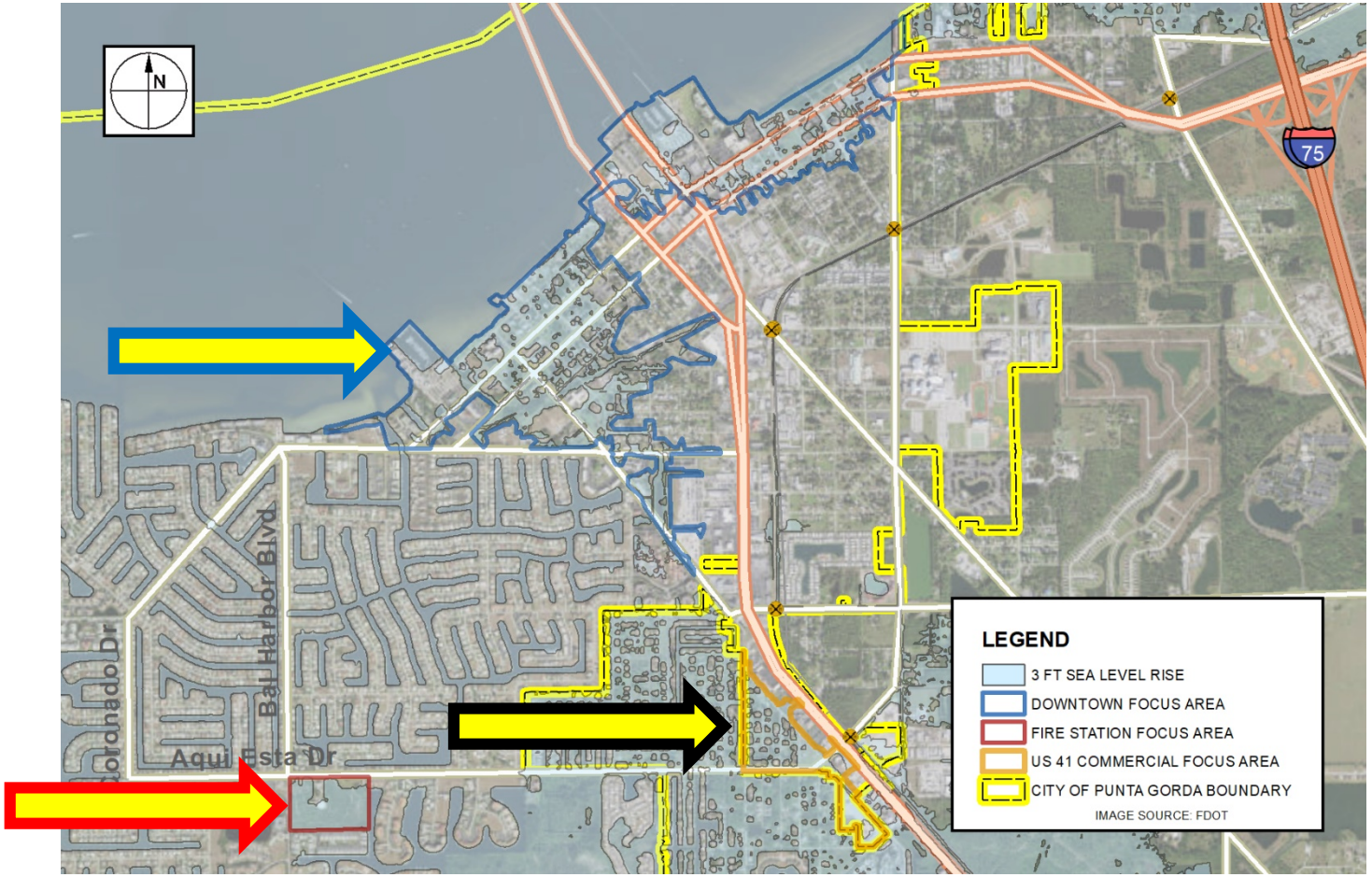
Percent of Public Property Flooded in the 12 Coastal Flooding Scenarios

Flood Scenario	Publicly Owned Acreage Flooded		% Of Publicly Owned Acreage Flooded
MHHW (Nuisance Flooding)	4.7	acres	1%
1.5' Sea Level Rise	151.3	acres	18%
3.0' Sea Level Rise	218.5	acres	25%
4% Annual Chance Flood	459.5	acres	53%
1.5 ft SLR + 4% Annual Chance	587.2	acres	68%
3 ft SLR + 4% Annual Chance	607.9	acres	71%
1% Annual Chance Flood	608.0	acres	71%
1.5 ft SLR + 1% Annual Chance	614.4	acres	71%
0.2% Annual Chance Flood	616.3	acres	72%
3 ft SLR + 1% Annual Chance	617.5	acres	72%
1.5 ft SLR + 0.2% Annual Chance	633.1	acres	74%
3 ft SLR + 0.2% Annual Chance	728.8	acres	85%

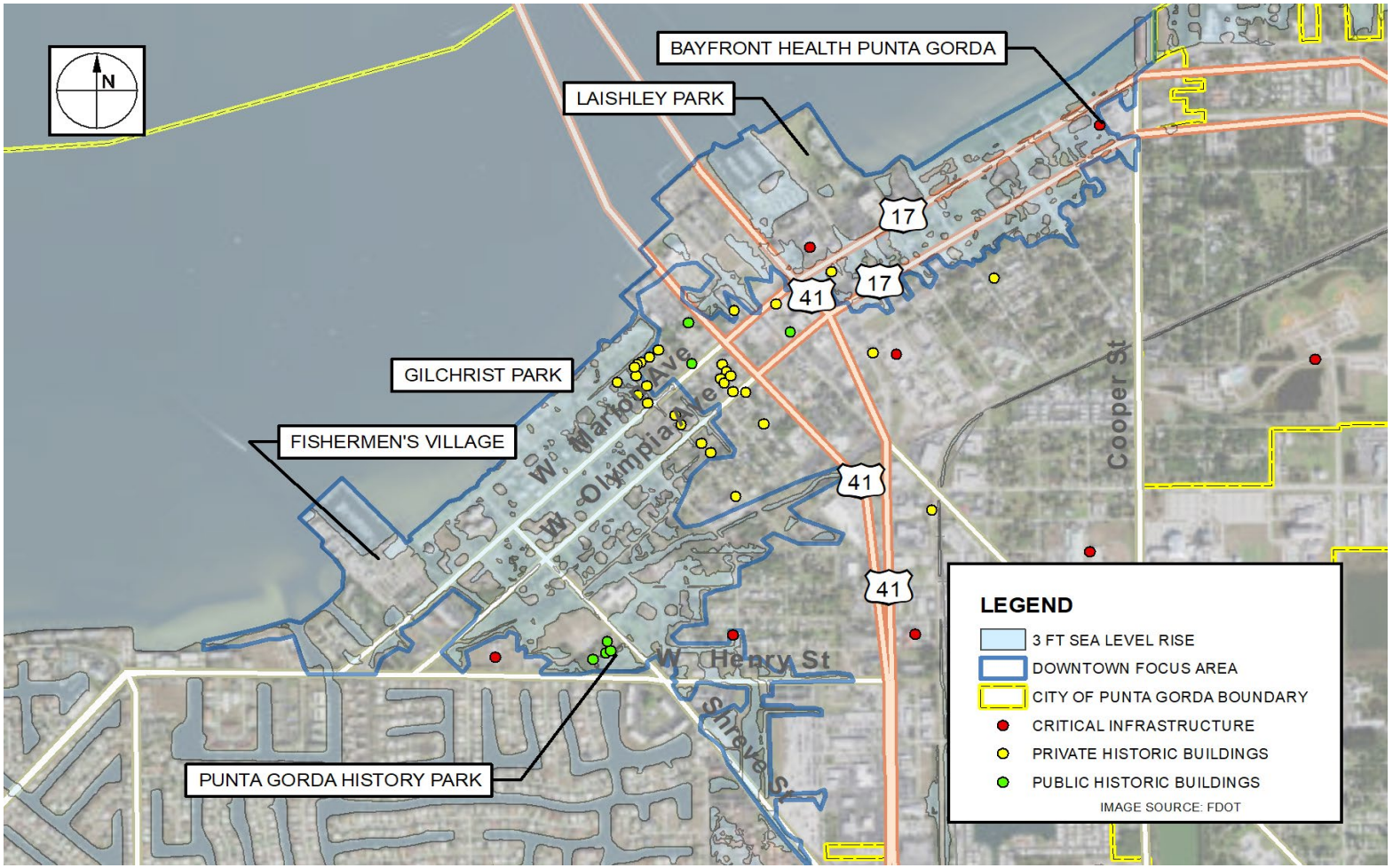
Combined Inundation Scenarios



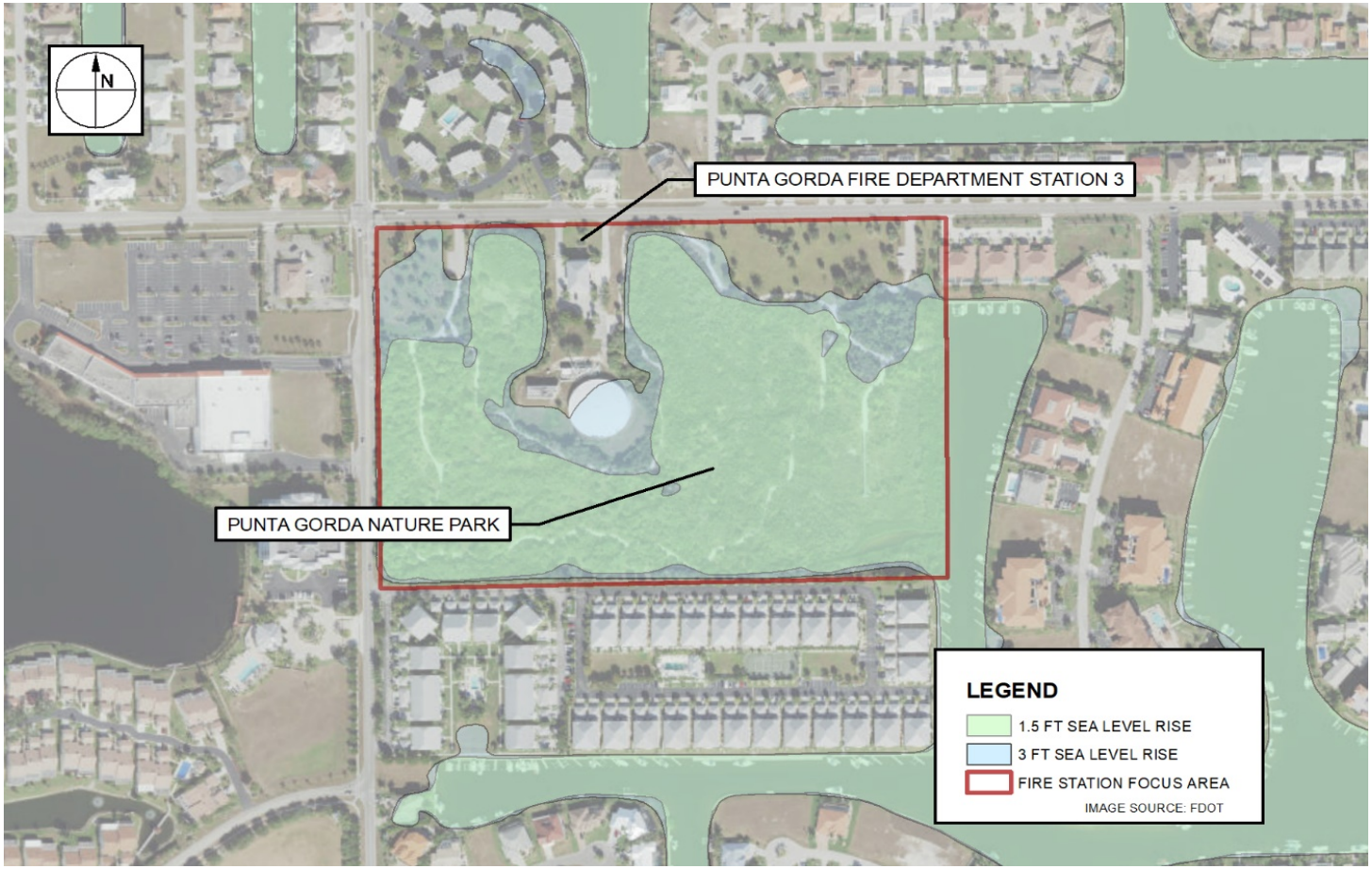
Assigning Focus Areas



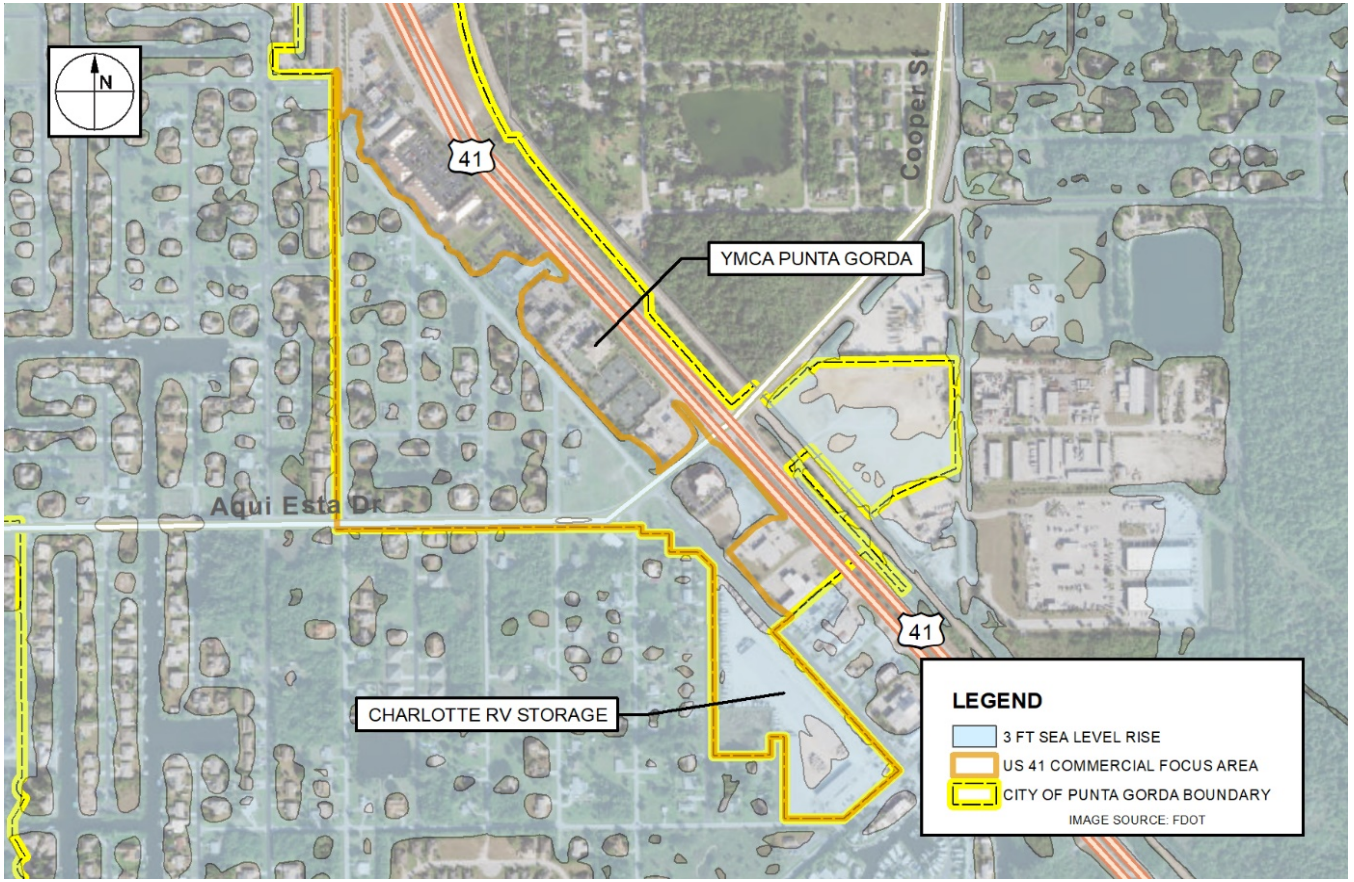
Downtown Focus Area



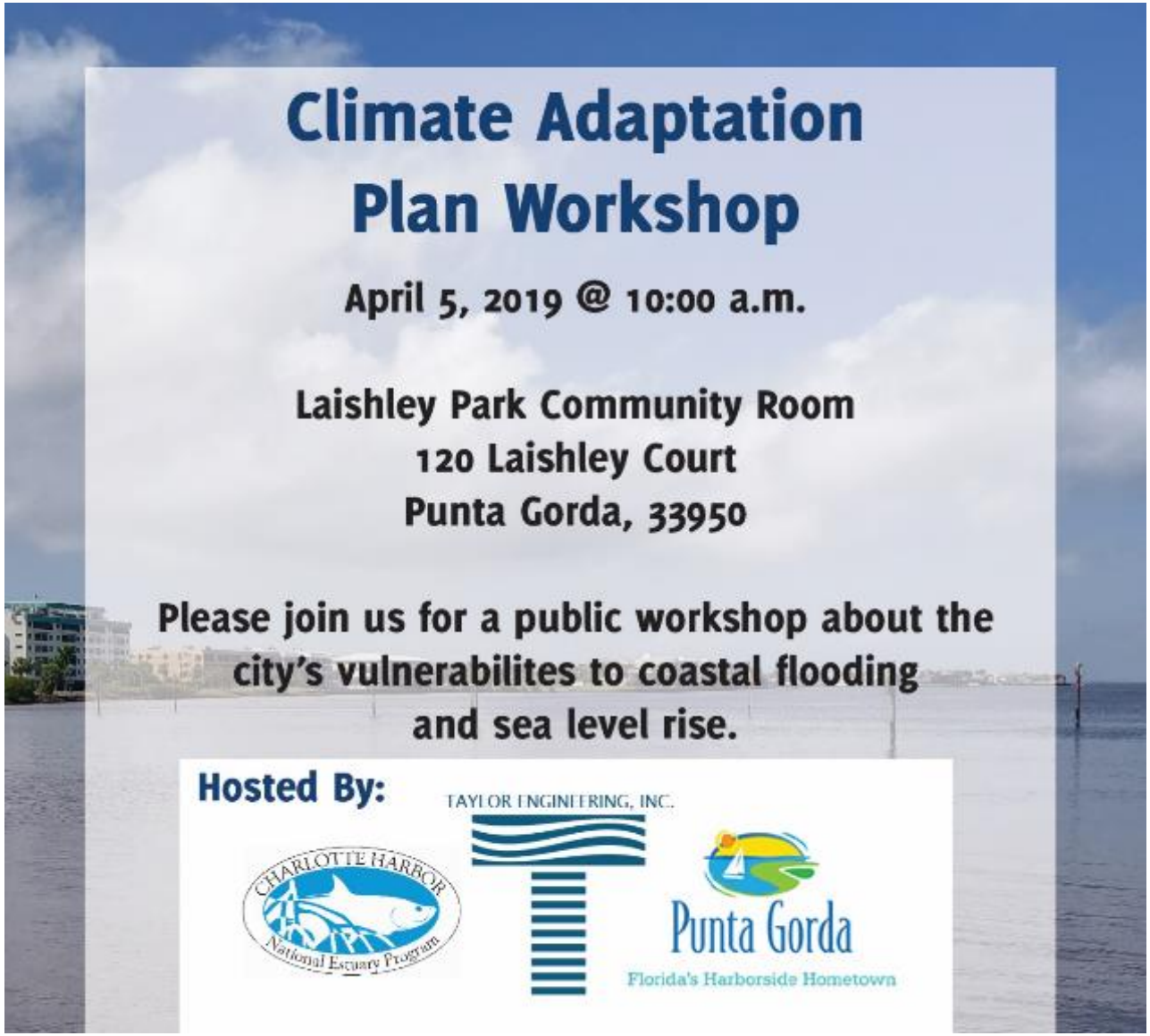
Fire Station Focus Area



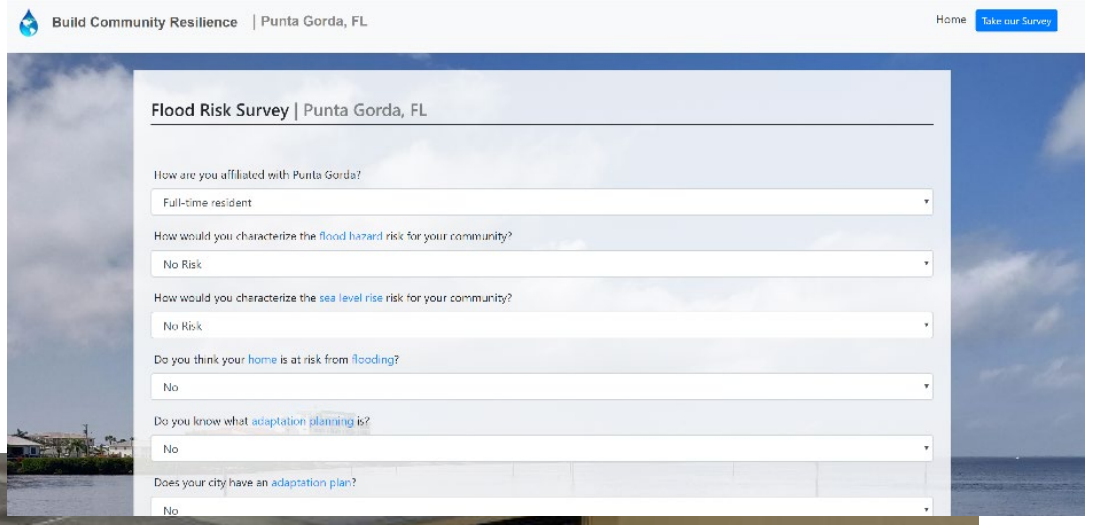
41 Corridor Focus Area



Public Workshop



Public Workshop and Outreach



Public Workshop

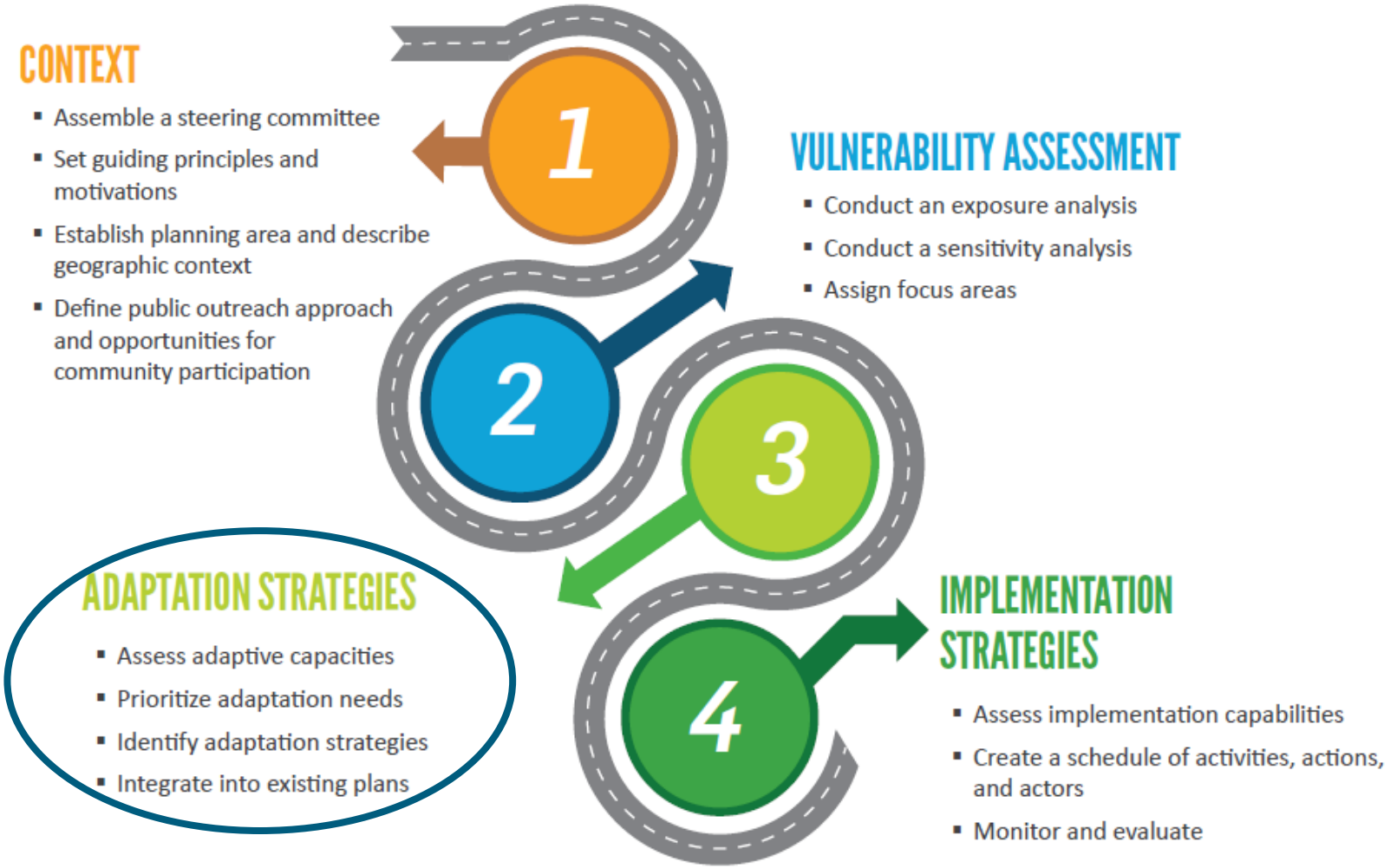
- "Top 10" list of properties vulnerable to flooding
- Asked participants to prioritize assets for protection
- Requested "write-in candidates" for other assets

Publicly-Owned Properties	
Property	*Votes*
Wastewater Station - Henry St.	11
County Grace St Annex	5
Cooper St Recreation Center	3
Fire Station III - Aqui Esta	3
County Visual Arts Center	2
Oak Tree Village - Public Housing	1
Charlotte High School	1
PG Boat Club	0
Bayfront Center YMCA	0
County Tax Collector's Office	0

Critical Infrastructure	
Property	*Votes*
Fresh Water Supply (Shell Creek Reservoir)	6
Hospital	4
Post Office	2
Punta Gorda Police Station	2
Electrical Power	1
Charlotte County Jail	1

Historic Properties	
Property	*Votes*
Old City Hall	6
Railroad Depot	4
Charlotte High School	3
History Park	2
County Courthouse	2
PG Women's Club	2
Blanchard House Museum	2
A.C. Freeman House	1
Ice House	1
Smith Arcade	0
First National Bank	0

Adaptation Planning Process



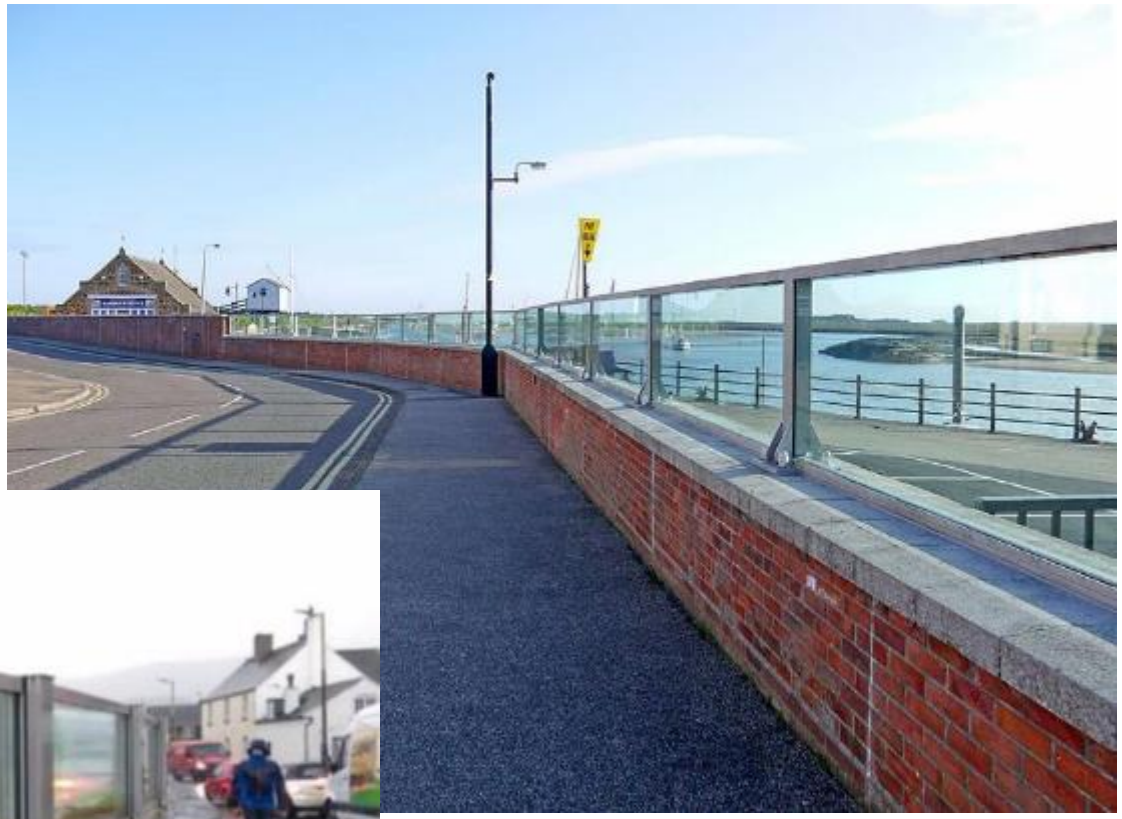
Source: Florida Adaptation Planning Guidebook

Adaptation Strategies

- Protect
- Accommodate
- Strategic Relocation
- Avoidance

St Johns Shore Protection Project
St Augustine Beach, FL
Photograph– *The St. Augustine Record*

Protect: Adapting Seawalls



Protect: Temporary Door Dams

Protect: Stormwater Valves

Protect: Passive Flood Barriers

Protect: Large-Scale Flood Gates

Accommodate: Raising Lift Stations

Accommodate: Raising Lift Stations

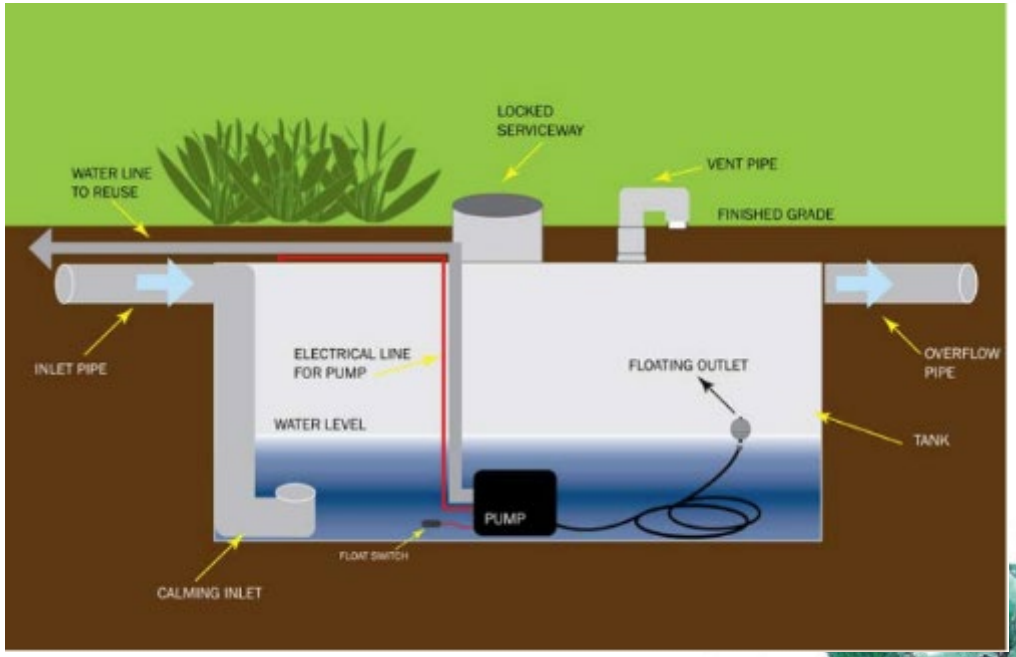
Accommodate: Wet Floodproofing

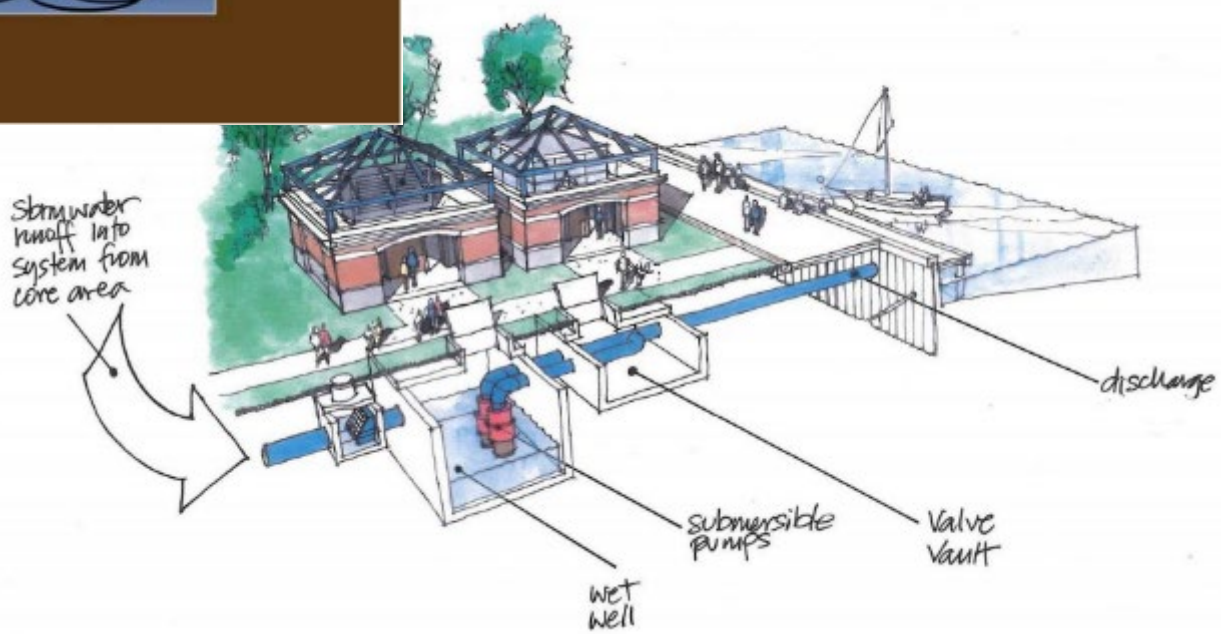
Accommodate: Stormwater Improvements

Accommodate: Living Shoreline

Accommodate: Floodable Parks

Accommodate: Water Storage and Reuse





Accommodate: Elevate

Strategic Relocation: Move Assets

Strategic Relocation: Buyouts

City plans to return South Shores area to natural floodplain

FEMA gives Jacksonville $3.4M grant to buy 17 homes, tear them down

By Jim Piggott - Reporter

Posted: 2:52 PM, February 15, 2019
Updated: 6:12 PM, February 15, 2019

News4JAX

Avoidance: Restricting Development

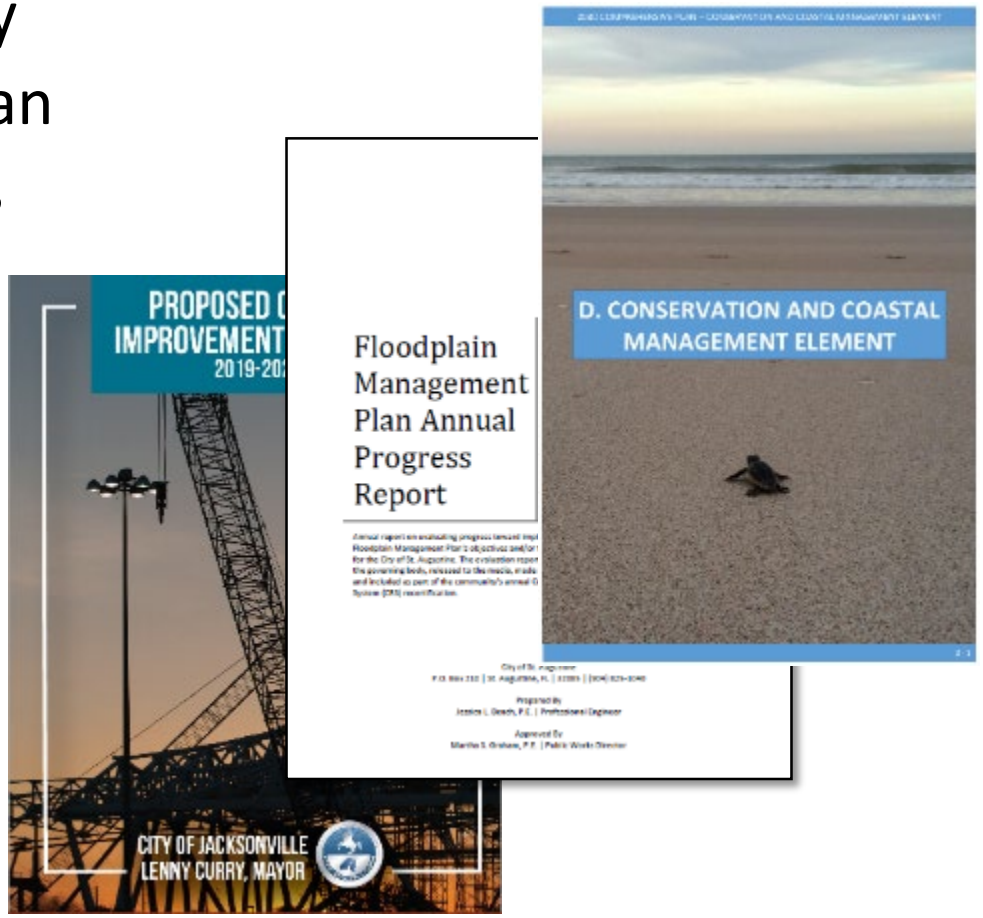
The Virginian-Pilot
PilotOnline.com

April 25, 2019

Judge rules Virginia Beach council can factor in sea level rise when deciding on new developments

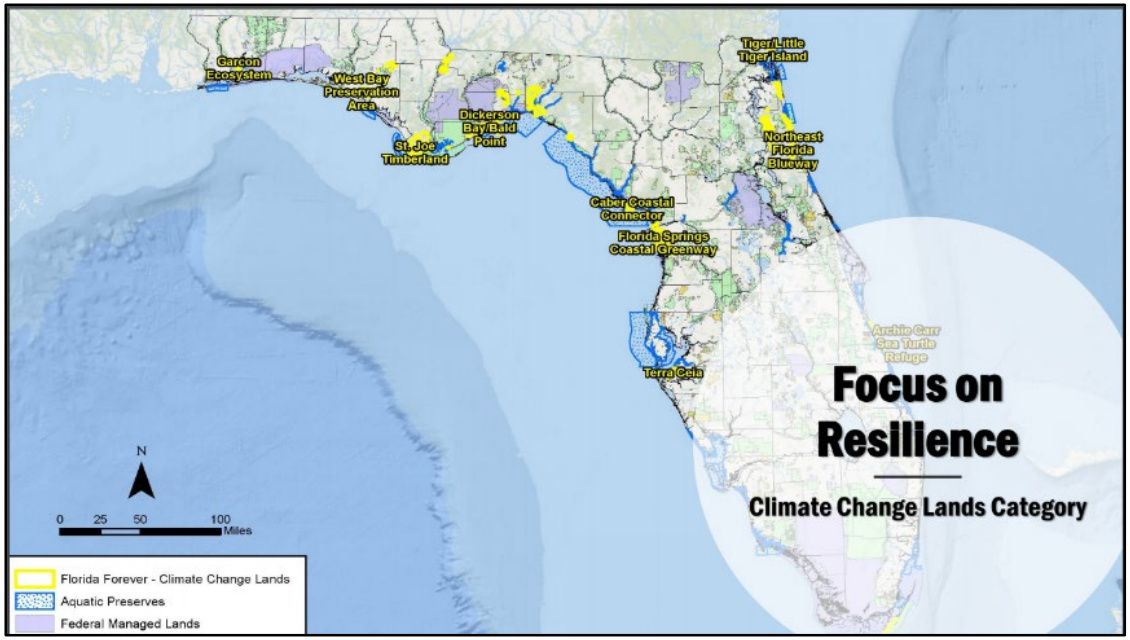
Avoidance: Policy Changes

- Regulatory and Planning
  - Local Mitigation Strategy
  - Local Comprehensive Plan
  - Adaptation Action Areas
- Infrastructure Upgrades
  - Capital Improvements Plan
  - Stormwater Management Plan
  - Historic Preservation Plan



Avoidance: Policy Changes

- Buyouts of Repetitive Loss Properties
- Land Conservation
- Increased Setbacks
- Building Codes
- Land Development Codes (BFE+)
- Transfer of Development Rights
- Rolling Easements
- Real Estate Disclosures

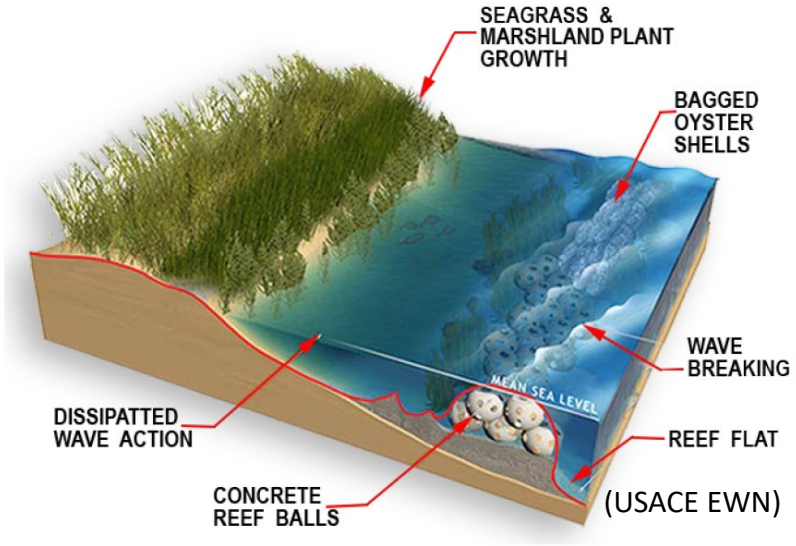


Adaptation Matrix: Options

ADAPTATION TYPE	ADAPTATION TITLE	DESCRIPTION	SHORT, INTERMEDIATE, OR LONG TERM	MICRO / MACRO	GRAY, GREEN, OR HYBRID	DEGREE OF PROTECTION (LOW, MED, HIGH)	COST ($,$$,$$$)
Infrastructure Management	Building on Partially Elevated Areas	Building on partially elevated areas reduces the flood risk locally. A farm located in a flood plain can for instance be constructed on an elevated area. The surrounding area is allowed to be flooded while the farm and its accompanying buildings remain dry.	LONG TERM	MICRO	HYBRID	MEDIUM	$$
Infrastructure Management	Construction on Piles	Constructions on piles are raised constructions built on piles. The piles can be used to create solid foundation and to make it possible for water to flow underneath the building. The ground flood level should be built above the design water level.	LONG TERM	MICRO	HYBRID	MEDIUM	$$
Infrastructure Management	Dams (To Redirect Water)	An artificially raised dam at a strategic location in a river or stream can redirect a part of the water flow into another direction. Most dams have a section called a spillway or weir over which, or through which, water flows, either sometimes or always. Dams generally serve the primary purpose of retaining water.	LONG TERM	MACRO	GRAY	HIGH	$$$
Infrastructure Management	Elevated Flood Wall / Flood Gate	A flood wall can be constructed to protect individual vital buildings/facilities against flooding. They can be either permanent or dismountable. Sometimes gates are built in a flood wall to create space for roads. These gates are only closed during flood events.	LONG TERM	MACRO	GRAY	HIGH	$$$
Infrastructure Management	By-Pass Creation	Creating a bypass for a river or canal can reduce flood levels in a specific location. A bypass provides extra discharge capacity for the river or canal. Thereby known bottlenecks can be solved.	LONG TERM	MACRO	GRAY	MEDIUM	$$$
Infrastructure Management	Amphibious (Floatable) Constructions / Buildings	Amphibious buildings rest on the ground level and only start to float during a flood period. The structure is built on a float. Like in floating buildings, these floats are guided by vertical posts to avoid drift of the amphibious building.	LONG TERM	MACRO	HYBRID	MEDIUM	$$$
Infrastructure Management	Artificial Islands	An artificial island is a man-made island is an island, which can be integrated with flood protection. The island can be created by land reclamation, expanding existing islets, construction on existing reefs, or merging several natural islets into a bigger island. Artificial islands may vary in scale from small islets for a single structure, to islands that support entire communities and cities.	LONG TERM	MACRO	HYBRID	HIGH	$$$
Infrastructure Management	Check Valve / Non-Return Valves	A check valve or non-return valve is installed in pipes which are vulnerable for backflow in flood conditions. Backflow is known to take place in toilets and sewer systems. The valve will block flow if water flows in the wrong direction.	INTERMEDIATE	MACRO	GRAY	MEDIUM	$$$
Infrastructure Management	Compartments in Dike Rings	A compartment in a dike ring is a smaller area enclosed by secondary flood protection within a main dike ring. The main reason for dividing a dike ring in smaller compartments is to reduce damage in case of a dike failure / breach. Compartments in dike rings will also slow down a flood in case of a major dike breach to create more time for evacuation protocols.	LONG TERM	MACRO	HYBRID	HIGH	$$$
Infrastructure Management	Compartments in Inflowing Large Waters	The compartments will divide large water surfaces into smaller and better controllable segments. These segments are connected with each other through a system of interacting locks or dams. A smaller amount of water can cause damage to low level terrain in case of a dike breach.	LONG TERM	MACRO	HYBRID	HIGH	$$$
Infrastructure Management	Dikes	A dike is an elongated artificially constructed embankment or levee, which protects low-lying areas against higher water levels. It is usually made of clay and sand. Rock or concrete are used to protect the water facing outer slope against waves. Most dikes are constructed parallel to the course of a river in its floodplain or along low-lying coastlines.	LONG TERM	MACRO	HYBRID	HIGH	$$$
Infrastructure Management	Dismountable and Temporary Buildings	Dismountable and temporary buildings can be an option for flood prone locations. For instance, temporary beach pavilions can be built along beaches to be used during summertime. During the stormy winter season, the buildings are dismounted.	INTERMEDIATE	MACRO	HYBRID	MEDIUM	$$$

Recommend: Expand Existing Adaptation Strategies

Living Shorelines



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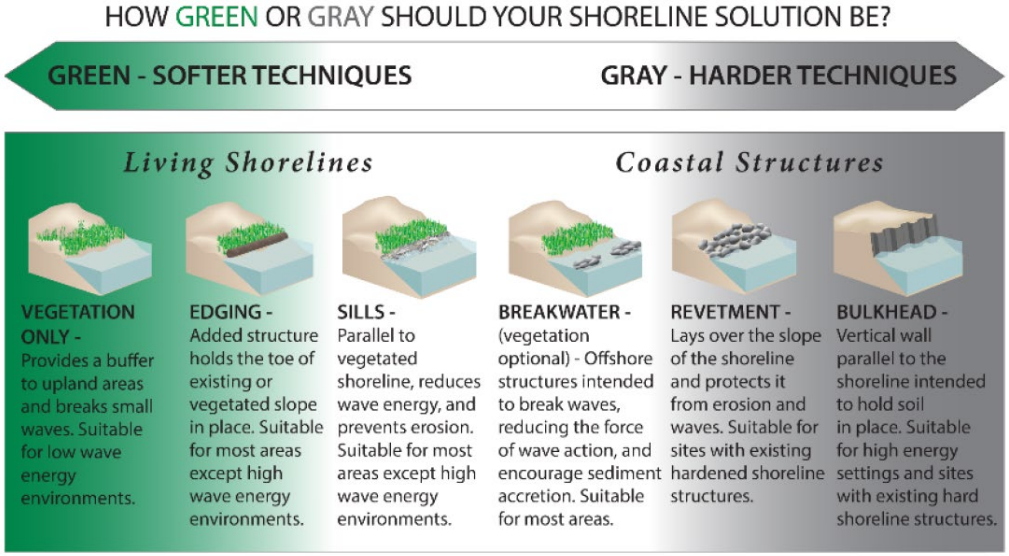

(NOAA adapted from USACE SAGE, 2015)

APPENDIX C

Living Shoreline

Technical Guidance Document

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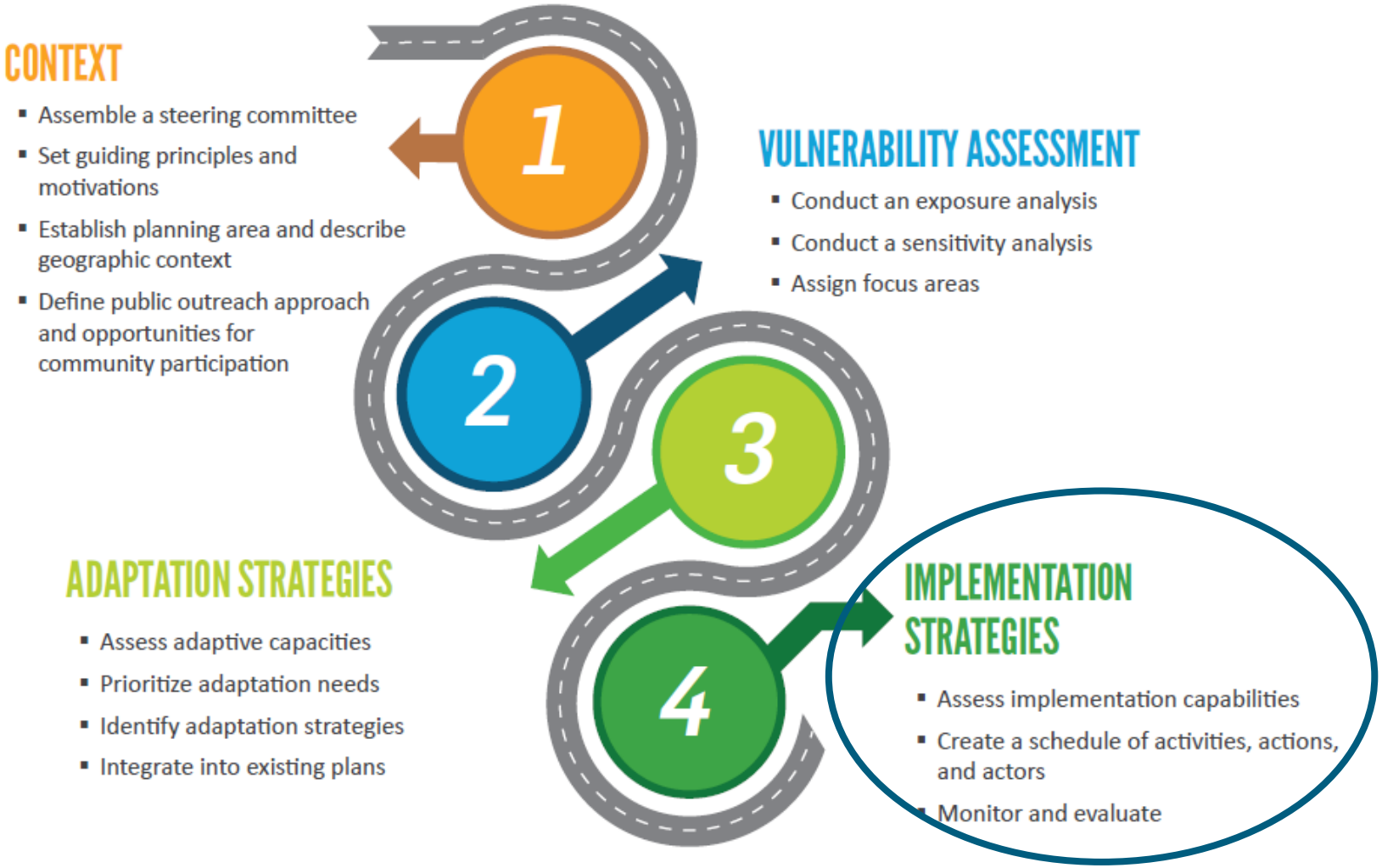
Adaptation Planning Process



Source: Florida Adaptation Planning Guidebook

Next Steps

- Comp Plan Policy Changes
  - Consider Adaptation Action Areas
- Identify and prioritize projects within Focus Areas
- Pursue funding via grant opportunities
  - FDEP, NOAA, NFWF, RESTORE funds
  - FEMA
    - Pre-Disaster Mitigation
    - Flood Mitigation Assistance
    - Hurricane Mitigation

- Pursue partnerships
  - FDEP, FDOT, CHNEP, Bayfront Health, Charlotte County, Public Utilities, CSX RR, adjacent communities, businesses
- Continue to update Climate Adaptation Plan as new data becomes available


THANK YOU
Questions?
Punta Gorda
FLORIDA