

# Resilient Florida Vulnerability Assessment

Town Council Meeting May 13, 2025



#### Introductions



#### **Bob Hamilton**

President, Senior Coastal Engineer.

- 25+ years of experience with Palm Beach
- Oversaw technical review of Comprehensive Coastal Management Program, Coastal Flood Vulnerability Assessment, and Implementation Plan



#### Alex Shaw, P.E.

Coastal Engineer/Modeler

- 10 years of engineering experience
- Lead modeler for Palm Beach projects



#### **Brittany Hoffnagle**

Climate Resiliency Specialist/GIS Analyst

- 10+ Years of GIS experience
- 4+ years experience with Palm Beach
- Developed key asset inventory and QA/QC exposure and sensitivity analysis



#### Linnea Laux

Climate Resiliency Specialist/Landscape Designer

Completed exposure ad sensitivity analysis and developed project graphics and visualizations



**Presentation Overview** 

- Background How we got here
- Updated Vulnerability Assessment Complying with Resilient FL program
- Storm Surge Barrier Feasibility Analysis Preliminary potential to reduce flood risk
- Level-Up Palm Beach Implementation Plan Refinements Initial insights
- Path Forward Activities to complete this work
- Questions/Discussion





# Background



#### Coastal Flood Vulnerability Assessment (2019)

The Coastal Flood Vulnerability Assessment (CFVA) was completed in 2019 to examine future coastal flood risk resulting from sea level rise and storms of increasing severity and intensity.

#### Flood Risk Model

#### $\rm ID\,/Rank$ Assets at Risk







#### Palm Beach Flood Risk Model

## Present Flood Probability and Depth



Probabilistic approach with hydrodynamic modeling of thousands of storm scenarios



#### Coastal Resilience "Level-Up" Implementation Plan (2021)

**Goal:** Set Palm Beach on path to achieve high standards of resilience to sea level rise, future storms, and related coastal flooding.

**Resilience:** the capacity of the community to:

- Anticipate future coastal flooding risks in a changing climate,
- Plan and implement effective coastal flood mitigation strategies,
- Monitor and adjust strategies to changes in coastal flood risk over time, and
- **Recover** faster and stronger from coastal flooding events.



#### **Town Facilities and Infrastructure**

Adapt Town assets to mitigate risks of damage and failure from future coastal flooding



#### Lake Worth Shoreline

Mitigate neighborhood and Town-wide exposure to future coastal flooding, emanating primarily from the Lake Worth shoreline



#### **Floodplain Development**

Improve the safety of buildings and their occupants from future coastal flooding

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#### **Comprehensive Planning**

Integrate future coastal flood risk mitigation with other Town planning, policy, and infrastructure funding priorities



## Town of Palm Beach, Resilient Florida Planning Grant (22PLN70)

Authorized by Town Council, contracted with Woods Hole Group via Coastal Resiliency Consultant On-Call in June 2023

#### **Project Tasks:**

- 1. Public Meetings Town Council meetings
- 2. Acquire Background Data update critical assets, survey data
- 3. Exposure Analysis update flood model, estimate depth of flooding for assets
- 4. Sensitivity Analysis identify most vulnerable areas or sectors
- 5. Storm Surge Barrier Feasibility Study use model to analyze Inlet storm surge barrier
- 6. Vulnerability Assessment Report and Implementation Plan Update





# **Updated Vulnerability Assessment**



#### Updated Vulnerability Assessment - Accomplishments

Defined updated water level and storm conditions per Resilient FL

- Completed detailed bulkhead survey
- Extensive new computer model simulations
- Interesting findings compared to effective FEMA maps
- Updated list and prioritization of Town assets at risk
- Satisfying grant Tasks 1-4 for compliance and reimbursement



#### Updating Sea Level Rise Scenarios

#### Town CFVA (2017)

 Included "Future" Intermediate High Scenario for 2065

## Updates to meet State requirements

 Intermediate-High and Intermediate-Low for 2040 and 2070

## New mapping products and exposure analysis

- High tide flooding depth
- > 100-year flooding depth
- > 10-year flooding depth



\*Updated modeling does not include future storm intensification\*



#### Why not?

- Scientific consensus is not highly confident on future changes in Atlantic tropical cyclones
- Resilient Florida Statute is silent on future storm intensification
- FDEP has not proposed rules or guidance supporting including it
- Avoid risk of being out of compliance with the State standards



#### High-Resolution Scans & Ground Spot Elevations





- Captures narrow features not picked up by LiDAR - tops of seawalls/bulkheads
- Implements action item from Town's Coastal Resilience Implementation Plan (Level-Up)
- Useful for administering Level-Up's recommended changes to Town bulkhead standards

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#### Storm Selection and Simulation



Туре	HSI	Total number	Probability of occurrence	Subsampled number for model simulations
1	N/A	2,607	51.7%	0
2	≤2	2,142	42.5%	197
3	2 - 4	227	4.5%	64
4	≥4	64	1.3%	64
Total	N/A	5,040	100.0%	325

Input or Questions?

#### Storm Selection:

1. Reviewed a total 5,040 storms.

2. Identified 2,433 storms impacting Town of Palm Beach.

3. Further categorized by strength using the Hurricane Surge Index (HSI).

4. A subset of 325 storms from various HSI categories selected for model simulations.

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## **Storm Animation**



# 1% Extent vs Effective FEMA Special Flood Hazard Area (SFHA)

Our updated statistical analysis of 100-year stillwater elevations was lower than FEMA (at the inlet, Atlantic Ocean and Lake Worth shorelines):

- Up to ~1.8 ft lower along Lake Worth
- Up to ~2.9 ft lower on the Atlantic Ocean

Stillwate	r elevations 1	t NAVD88
	Lake Worth	Atlantic Ocean
FEMA	5.4-5.8	7.2-7.4*
PB-FRM	4.2 (~4-4.5)	4.6 (~4.5-5.5)

\*Includes 2 ft of wave setup













Input or







## **Visualizing Flooding**



#### Visualizing Flooding – Bradley Park



#### Visualizing Flooding – Bradley Park



#### Visualizing Flooding – Bradley Park



## Visualizing Flooding – Palm Beach



## **Visualizing Flooding**











## Critical & Regionally Significant\* Assets – Initial Asset Inventory

Asset Class	Asset Type	Number of Assets pe Asset Type	r Number of Assets per Asset Class	Total Number of Assets in Inventory
	Bridges*	7		
Transportation and	Major Roadways* (individual segments)	611	602	
<b>Evacuation Routes</b>	Marinas Structures	3	023	
	Ports and Waterways*	2		
	Drinking Water Facilities*	2		
Critical	Solid and Hazardous Waste Facilities	1		
Infrastructure	Solid and Hazardous Wase Facilities- Structures	3	78	
mnastructure	Stormwater Treatment Facilities and Pump Stations*	23		
	Wastewater Treatment Facilities and Lift Stations*	49		
	Emergency Medical Services*	3		
	Emergency Operations Centers*	1		020
Critical Community	Fire Stations	3		030
and Emergency	Law Enforcement Facilities	1	11	
Facilities	Local Government Facilities	1		
	Community Centers	1		
	Schools*	1		
	Historical and Cultural Assets- Resources	13		
	Historical and Cultural Assets- Structures	12		
latural Cultural and	Parks	18	118	
listorical Resources	Parks- Structures	25		
	Shorelines	47		
	Wetlands	3		

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## Asset sensitivity to flooding

Accet Class	All Accets															
	Count			MHHW + 2'					10-Year					100-Year		
	Count	Present	Int-	Low	Int-ł	ligh	Present	Int-	Low	Int-ł	ligh	Present	Int-I	Low	Int-H	ligh
			2040	2070	2040	2070		2040	2070	2040	2070		2040	2070	2040	2070
Critical Community and																
Emergency Facilities	11	0%	18%	27%	18%	91%	0%	0%	45%	45%	45%	82%	82%	82%	100%	100%
tical Infrastructure	78	4%	21%	36%	35%	87%	1%	1%	22%	23%	56%	76%	77%	79%	82%	90%
Natural, Cultural, and																
Historical Resources	118	27%	42%	56%	53%	81%	18%	19%	44%	47%	69%	73%	77%	80%	80%	84%
Trasnportation and																
Evacuation Routes	623	5%	23%	34%	30%	77%	3%	4%	38%	39%	70%	75%	77%	81%	82%	87%
Grand Total	830	8%	26%	37%	<mark>34%</mark>	79%	5%	5%	38%	39%	68%	75%	77%	81%	82%	87%



			МН	HW +	⊦ 2'			10	)-Yea	r			10	0-Yea	ar	
Asset Name	Asset Type	Present	Int-	Low	Int-	High	Present	Int-	Low	Int-	High	Present	Int-	Low	Int-H	ligh
			2040	2070	2040	2070		2040	2070	2040	2070		2040	2070	2040	2070
Mid-Town Municipal Beach	Parks	5.9	6.6	7.3	7.1	9.2	6.5	6.7	7.3	7.4	9.2	10.9	10.9	11.5	11.6	13.3
Phipps Ocean Park Natural Shoreline	Shorelines	4.1	4.7	5.5	5.3	7.6	4.9	5.2	5.7	5.9	7.7	7.2	7.6	8.0	8.2	10.3
Ocean Blvd Dock Area	Historical and Cultural Assets-Structures	3.8	4.5	5.2	5.0	7.1	0.0	0.0	0.0	0.4	7.5	7.4	7.6	8.2	8.3	10.3
El Brillo Way ICWW Seawall	Shorelines	2.0	2.6	3.4	3.2	5.3	0.0	0.0	0.0	0.0	5.2	6.6	6.8	7.3	7.5	9.3
Palm Beach Inlet Seawall	Shorelines	3.7	4.4	5.1	4.9	7.0	0.0	0.0	0.0	0.0	6.6	6.5	6.7	7.2	7.3	9.3
Ibis Isle	Historical and Cultural Assets- Resources	1.2	1.8	2.6	2.4	6.4	2.1	2.3	2.8	2.8	4.8	4.2	4.7	5.1	5.3	9.1
D-18 Stormwater Pump Station	Stormwater Treatment Facilities and Pump Stations	1.2	1.8	2.6	2.4	4.4	0.0	0.0	0.0	0.0	4.4	5.7	6.0	6.5	6.7	8.5
Palm Beach CC ICWW Seawall	Shorelines	2.4	3.0	3.8	3.6	5.6	2.7	2.8	3.4	3.5	5.3	5.8	6.0	6.4	6.6	8.3
E-13 Ejector Station	Wastewater Treatment Facilities and Lift Stations	0.0	0.0	2.7	2.5	4.6	0.0	0.0	0.0	0.0	4.7	5.4	5.6	6.2	6.3	8.3
Clarendon Ave ICWW Seawall	Shorelines	0.0	0.0	2.8	2.6	4.7	0.0	0.0	0.0	0.0	4.7	5.3	5.6	6.1	6.3	8.3
Seaview Park	Parks	0.0	2.1	2.8	2.6	4.7	0.0	0.0	3.0	2.9	4.6	5.3	5.6	6.1	6.3	8.2
Bradley Park	Historical and Cultural Assets- Resources	2.1	2.8	3.6	3.3	5.4	1.4	1.5	2.7	2.6	5.2	5.9	6.1	6.5	6.8	8.2
E-11 Lift Station	Wastewater Treatment Facilities and Lift Stations	0.0	1.4	2.1	1.9	4.0	0.0	0.0	0.0	0.0	4.0	5.4	5.6	6.1	6.3	8.1
Par 3 ICWW Seawall	Shorelines	1.8	2.4	3.2	3.0	5.2	0.0	0.0	0.0	0.0	5.3	5.0	5.4	5.9	6.1	8.1
Phipps Ocean Park ICWW Seawall	Shorelines	1.8	2.4	3.2	3.0	5.2	2.8	2.9	3.4	3.6	5.4	4.9	5.3	5.7	5.9	8.0

\* Not including: Major Roads, Port/Waterways, Bridges, Wetlands

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			МН	HW -	⊦ 2'			1(	D-Yea	r			10	0-Yea	ar	
Asset Name	Asset Type	Present	t Int	Low	Int-	High	Present	Int-	Low	Int-	High	Present	Int-	Low	Int-	ligh
			2040	2070	2040	2070		2040	2070	2040	2070		2040	2070	2040	2070
D-14 Stormwater Pump Station	Stormwater Treatment Facilities and Pump Stations	0.6	1.2	2.0	1.8	3.9	1.0	1.2	1.7	1.9	3.6	3.9	4.1	4.7	4.9	7.0
D-12 Stormwater Pump Station	Stormwater Treatment Facilities and Pump Stations	0.0	1.3	2.1	1.9	3.9	0.0	0.0	3.0	2.9	3.9	4.6	4.8	5.2	5.3	6.9
Country Club Road ICWW Seawall	Shorelines	0.9	1.6	2.3	2.1	4.2	1.3	1.3	1.9	2.1	3.9	4.4	4.5	5.0	5.1	6.9
D-07 Fuel Tank	Stormwater Treatment Facilities and Pump Stations	0.0	0.8	1.6	1.4	3.5	0.0	0.0	1.0	1.1	3.2	3.8	4.0	4.7	4.9	6.9
Phipps Plaza Fountain	Parks_Structures	0.0	0.4	1.1	0.9	3.0	0.0	0.0	1.9	1.9	3.2	4.1	4.4	4.9	5.0	6.8
Seaview Park Recreation Center	Community Centers	0.0	0.7	1.5	1.3	3.3	0.0	0.0	1.5	1.6	3.2	4.0	4.2	4.8	5.0	6.8
Seaview Park Recreation Center	Parks_Structures	0.0	0.7	1.5	1.3	3.3	0.0	0.0	1.5	1.6	3.2	4.0	4.2	4.8	5.0	6.8
S Lake Trail ICWW Seawall	Shorelines	0.5	1.1	1.9	1.7	3.7	0.9	1.0	1.6	1.7	3.5	3.8	4.0	4.6	4.8	6.8
D-07 Stormwater Pump Station	Stormwater Treatment Facilities and Pump Stations	0.0	0.7	1.5	1.3	3.4	0.0	0.0	0.0	0.0	0.0	3.7	4.0	4.6	4.8	6.8
E-15 Ejector Station	Wastewater Treatment Facilities and Lift Stations	0.1	0.7	1.5	1.3	3.3	0.0	0.0	0.0	0.0	3.3	3.8	4.0	4.6	4.7	6.7
Worth Associates Building	Historical and Cultural Assets- Resources	0.0	0.1	0.8	0.6	2.7	0.0	0.0	1.1	1.3	2.7	4.0	4.2	4.7	4.9	6.6
D-16 Stormwater Pump Station	Stormwater Treatment Facilities and Pump Stations	0.0	0.0	0.6	0.4	2.5	0.0	0.0	0.0	0.0	2.4	3.7	3.9	4.5	4.6	6.5
E-16 Ejector Station	Wastewater Treatment Facilities and Lift Stations	0.0	0.4	1.2	0.9	3.0	0.0	0.0	1.2	1.3	3.1	3.5	3.7	4.3	4.5	6.5
E-12 Ejector Station	Wastewater Treatment Facilities and Lift Stations	0.0	0.0	0.7	0.5	2.5	0.0	0.0	0.0	0.0	2.7	3.6	3.8	4.4	4.5	6.5
Bradley Park ICWW Seawall	Shorelines	0.4	1.1	1.8	1.6	3.7	0.8	1.0	1.5	1.7	3.4	4.2	4.4	4.8	5.1	6.4

\* Not including: Major Roads, Port/Waterways, Bridges, Wetlands

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			МН	HW -	⊦ 2'			10	)-Yea	r			10	0-Yea	ar	
Asset Name	Asset Type	Present	t Int-	-Low	Int-	High	Present	Int-	Low	Int-	High	Present	Int-	Low	Int-i	High
			2040	2070	2040	2070		2040	2070	2040	2070		2040	2070	2040	2070
Bradley Park Restrooms	Parks_Structures	0.0	0.0	0.3	0.1	2.2	0.0	0.0	0.0	0.0	2.0	2.7	2.9	3.3	3.4	5.0
N Lake Trail ICWW Seawall	Shorelines	0.0	0.0	0.6	0.4	2.5	0.0	0.0	0.0	0.4	2.1	2.3	2.5	2.9	3.1	5.0
D-06 Controls	Stormwater Treatment Facilities and Pump Stations	0.0	0.0	0.1	0.0	1.7	0.0	0.0	0.0	0.0	0.0	1.9	2.1	2.8	3.0	5.0
D-09 Stormwater Pump Station	Stormwater Treatment Facilities and Pump Stations	0.0	0.0	0.0	0.0	2.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.9	3.0	4.9
Memorial (Reflecting) Fountain	Parks_Structures	0.0	0.0	0.0	0.0	0.9	0.0	0.0	0.0	0.0	1.1	2.3	2.5	3.0	3.2	4.9
Bradley Park Tea Room	Historical and Cultural Assets-Structures	0.0	0.0	0.3	0.1	2.2	0.0	0.0	0.0	0.0	0.0	2.6	2.8	3.2	3.3	4.9
Bradley Park Tea Room	Parks_Structures	0.0	0.0	0.3	0.1	2.2	0.0	0.0	0.0	0.0	0.0	2.6	2.8	3.2	3.3	4.9
E-22 Ejector Station	Wastewater Treatment Facilities and Lift Stations	0.0	0.0	0.0	0.0	1.7	0.0	0.0	0.0	0.0	1.8	2.0	2.2	2.8	2.9	4.9
Town Marina ICWW Seawall	Shorelines	0.0	0.0	0.0	0.0	1.8	0.0	0.0	0.0	0.0	1.5	1.8	2.0	2.7	2.9	4.9
N Lake Trail ICWW Seawall	Shorelines	0.0	0.0	0.3	0.1	2.1	0.0	0.0	0.0	0.0	1.9	2.7	2.9	3.3	3.5	4.9
D-02 Stormwater Pump Station	Stormwater Treatment Facilities and Pump Stations	0.0	0.0	0.0	0.0	2.3	0.0	0.0	0.0	0.0	2.6	2.6	2.8	3.4	3.5	4.8
N Lake Trail ICWW Seawall	Shorelines	0.0	0.0	0.3	0.0	2.1	0.0	0.0	0.0	0.0	1.8	2.2	2.4	2.8	3.0	4.8
Peruvian Dock House	Marinas_Structures	0.0	0.0	0.0	0.0	1.4	0.0	0.0	0.0	0.0	0.0	1.7	2.0	2.6	2.8	4.8
G-06 Lift Station	Wastewater Treatment Facilities and Lift Stations	0.0	0.0	0.0	0.0	1.4	0.0	0.0	0.0	0.0	0.0	1.7	2.0	2.6	2.8	4.8
Peruvian Dock House	Parks_Structures	0.0	0.0	0.0	0.0	1.4	0.0	0.0	0.0	0.0	0.0	1.7	2.0	2.6	2.8	4.8

\* Not including: Major Roads, Port/Waterways, Bridges, Wetlands



			MH	HW -	+ 2'			10	)-Yea	r			10	0-Yea	ar		
Asset Name	Asset Type	Present	Int-	Low	Int-	High	Present	Int-	Low	Int-	High	Present	Int-	Low	Int-	High	
		-	2040	2070	2040	2070		2040	2070	2040	2070		2040	2070	2040	2070	
Fire Station North	Historical and Cultural Assets-Structures	0.0	0.0	0.0	0.0	0.9	0.0	0.0	0.5	0.4	0.9	1.4	1.6	2.1	2.3	4.0	
A-05 Lift Station	Wastewater Treatment Facilities and Lift Stations	0.0	0.0	0.0	0.0	1.2	0.0	0.0	0.0	0.0	0.0	1.7	1.9	2.3	2.6	3.9	
Little Red Schoolhouse	Historical and Cultural Assets-Structures	0.0	0.0	0.0	0.0	1.1	0.0	0.0	0.0	0.0	1.3	0.9	1.3	1.7	1.9	3.9	
A-43 Lift Station	Wastewater Treatment Facilities and Lift Stations	0.0	0.0	0.0	0.0	1.2	0.0	0.0	0.0	0.0	1.5	0.0	1.4	2.0	2.1	3.9	
N Lake Trail ICWW Seawall	Shorelines	0.0	0.0	0.0	0.0	1.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	3.9	
Phipps Ocean Park Tennis Storage	Parks_Structures	0.0	0.0	0.0	0.0	0.9	0.0	0.0	0.0	0.0	1.2	0.0	1.0	1.5	1.7	3.8	
Phipps North Restroom	Parks_Structures	0.0	0.0	0.0	0.0	0.8	0.0	0.0	0.0	0.0	0.0	0.0	1.2	1.6	1.7	3.7	
E-03 Lift Station	Wastewater Treatment Facilities and Lift Stations	0.0	0.0	0.0	0.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.7	1.8	3.6	
Ibis Isle Fountain	Parks_Structures	0.0	0.0	0.0	0.0	0.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.5	1.0	3.5	
Phipps Ocean Park Tennis Office	Parks_Structures	0.0	0.0	0.0	0.0	0.5	0.0	0.0	0.0	0.0	0.7	0.0	0.7	1.1	1.3	3.3	
El Pueblo Way Atlantic Ocean Seawall	Shorelines	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	3.2	
Phipps Ocean Park Tennis Pavillion	Parks_Structures	0.0	0.0	0.0	0.0	0.3	0.0	0.0	0.0	0.0	0.5	0.0	0.5	0.9	1.1	3.1	
A-42 Lift Station	Wastewater Treatment Facilities and Lift Stations	0.0	0.0	0.0	0.0	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.3	3.1	
E-40 Ejector Station	Wastewater Treatment Facilities and Lift Stations	0.0	0.0	0.0	0.0	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.8	3.1	
E-25 Ejector Station	Wastewater Treatment Facilities and Lift Stations	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.4	
E-24 Ejector Station	Wastewater Treatment Facilities and Lift Stations	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.7	
N Lake Trail ICWW Seawall	Shorelines	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.7	

\* Not including: Major Roads, Port/Waterways, Bridges, Wetlands

#### **Critical Community and Emergency Facilities**

Asset Type	Asset Owner	Asset Name		r	иннм				1	0-Year				1	00-Year	•	
			Present	Int-	Low	Int-	High	Present	Int-	Low	Int-l	High	Present	Int-	Low	Int-l	High
				2040	2070	2040	2070		2040	2070	2040	2070		2040	2070	2040	2070
		Palm Beach Fire															
Emergency Medical		Rescue 1 and															
Services	Town of Palm Beach	Ambulance Services	0.0	0.0	0.0	0.0	0.2	0.0	0.0	0.0	0.0	0.0	1.7	1.9	2.4	2.5	4.3
Emergency Medical		South Fire Rescue and															
Services	Town of Palm Beach	Ambulance Services	0.0	0.0	0.0	0.0	1.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.0	4.3
Emergency Medical		North Fire Rescue and															
Services	Town of Palm Beach	Ambulance Services	0.0	0.0	0.0	0.0	0.9	0.0	0.0	0.5	0.4	0.9	1.4	1.6	2.1	2.3	4.0

Asset Type	Asset Owner	Asset Name		Ν	иннм				1	0-Year				1(	00-Year		
			Present	Int-	Int-Low		High	Present	Int-l	Low	Int-ł	ligh	Present	Int-	Low	Int-H	ligh
				2040	040 2070 20		2070		2040	2070	2040	2070		2040	2070	2040	2070
		Palm Beach Public															
Schools	County	School	0.0	1.8	2.5	2.3	4.4	0.0	0.0	2.7	2.4	4.3	5.0	5.2	5.8	6.0	7.9

Asset Type	Asset Owner	Asset Name		Ν	иннм				1	0-Year				1(	00-Year		
			Present	Int-	Int-Low		ligh	Present	Int-l	low	Int-H	ligh	Present	Int-	Low	Int-H	ligh
				2040	040 2070 2		2070		2040	2070	2040	2070		2040	2070	2040	2070
Law Enforcement		Palm Beach Police															
Facilities	Town of Palm Beach	Headquarters	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.6	2.8	3.3	3.4	5.1



#### **Critical Infrastructure**

Asset Type	Asset Owner	Asset Name	мннм			10-Year					100-Year						
			Present	Present Int-Low Int-High		Present	Int-Low		Int-High		High Present		Int-Low		High		
				2040	2070	2040	2070		2040	2070	2040	2070		2040	2070	2040	2070
Stormwater Treatment Facilities		D-18 Stormwater															
and Pump Stations	Town of Palm Beach	Pump Station	1.2	1.8	2.6	2.4	4.4	0.0	0.0	0.0	0.0	4.4	5.7	6.0	6.5	6.7	8.5
Stormwater Treatment Facilities		D-17 Stormwater															
and Pump Stations	Town of Palm Beach	Pump Station	0.0	0.0	2.5	2.2	4.3	0.0	0.0	0.0	0.0	4.4	5.0	5.2	5.8	6.0	7.9
Stormwater Treatment Facilities		D-14 Stormwater															
and Pump Stations	Town of Palm Beach	Pump Station	0.6	1.2	2.0	1.8	3.9	1.0	1.2	1.7	1.9	3.6	3.9	4.1	4.7	4.9	7.0
Stormwater Treatment Facilities		D-12 Stormwater															
and Pump Stations	Town of Palm Beach	Pump Station	0.0	1.3	2.1	1.9	3.9	0.0	0.0	3.0	2.9	3.9	4.6	4.8	5.2	5.3	6.9
Stormwater Treatment Facilities																	
and Pump Stations	Town of Palm Beach	D-07 Fuel Tank	0.0	0.8	1.6	1.4	3.5	0.0	0.0	1.0	1.1	3.2	3.8	4.0	4.7	4.9	6.9
Stormwater Treatment Facilities		D-07 Stormwater															
and Pump Stations	Town of Palm Beach	Pump Station	0.0	0.7	1.5	1.3	3.4	0.0	0.0	0.0	0.0	0.0	3.7	4.0	4.6	4.8	6.8
	•		•														
Asset Type	Asset Owner	Asset Name	мннw			10-Year					100-Year						
			Present Int-Low Int-High		Present	ent Int-Low Int-Hig			High	Present	Int-Low Int-High			ligh			

Asset Type	Asset Owner	Asset Name	IVIAAVV			TO-Lear				100-fear				1				
			Present	Int-	Low	Int-	High	Present Int-Low		Int-High		Present	nt Int-Low		Int-High		1	
				2040	2070	2040	2070		2040	2070	2040	2070		2040	2070	2040	2070	l
Wastewater Treatment Facilities and Lift Stations	Town of Palm Beach	E-13 Ejector Station	0.0	0.0	2.7	2.5	4.6	0.0	0.0	0.0	0.0	4.7	5.4	5.6	6.2	6.3	8.3	
Wastewater Treatment Facilities and Lift Stations	Town of Palm Beach	E-11 Lift Station	0.0	1.4	2.1	1.9	4.0	0.0	0.0	0.0	0.0	4.0	5.4	5.6	6.1	6.3	8.1	
Wastewater Treatment Facilities and Lift Stations	Town of Palm Beach	E-50 Lift Station	0.0	1.5	2.2	2.0	4.1	0.0	0.0	2.3	2.4	4.1	5.1	5.4	5.9	6.0	7.9	
Wastewater Treatment Facilities and Lift Stations	Town of Palm Beach	E-10 Ejector Station	0.0	0.0	1.4	1.2	3.3	0.0	0.0	1.8	2.0	3.4	4.8	5.0	5.5	5.7	7.5	
Wastewater Treatment Facilities and Lift Stations	Town of Palm Beach	E-09 Ejector Station	0.0	0.5	1.3	1.1	3.2	0.0	0.0	0.0	0.0	3.1	4.4	4.6	5.1	5.3	7.1	
Wastewater Treatment Facilities and Lift Stations	Town of Palm Beach	E-15 Ejector Station	0.1	0.7	1.5	1.3	3.3	0.0	0.0	0.0	0.0	3.3	3.8	4.0	4.6	4.7	6.7	
Wastewater Treatment Facilities and Lift Stations	Town of Palm Beach	E-16 Ejector Station	0.0	0.4	1.2	0.9	3.0	0.0	0.0	1.2	1.3	3.1	3.5	3.7	4.3	4.5	6.5	
Wastewater Treatment Facilities and Lift Stations	Town of Palm Beach	E-12 Ejector Station	0.0	0.0	0.7	0.5	2.5	0.0	0.0	0.0	0.0	2.7	3.6	3.8	4.4	4.5	6.5	

## \* Flooding improvements are coordinated with projects in the Town's Capital Improvement Plan where assets were assessed and prioritized based on criticality and remaining useful life of station

# Input or Questions?

#### $\bigstar$

In 5- year Capital Improvement Plan

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# **Storm Surge Barrier Feasibility Analysis**



## **Evaluate Feasibility of Surge Barrier at Lake Worth Inlet**

Could benefit the Town and neighbors along the intracoastal by mitigating coastal flooding from storms. Possibly limit the height bulkheads and shoreline infrastructure need to be raised - future high tide and small storms.



Inlets to Lake Worth and the Intracoastal Waterway

### Storm Surge Barrier Examples

Surge Barriers have been utilized around the world to prevent flooding. The barriers close before a surge event and, on some occasions, extreme king tides.

© Google Earth

© Netherlands Water Partnership





### Implementation and First Alternative-Surge Barrier

Expanded high-resolution model north up Indian River towards Saint Lucie River.

Improves model for evaluating storm surge barrier concept at Palm Beach Inlet.

Even with the Palm Beach Inlet surge barrier closed, storm surge could still enter Jupiter Inlet.

The first alternative connects high elevation points across the inlet, increased to 11 ft to fully block a 100-year event in the 2070 intermediate high SLR.

#### **Existing Conditions Surge Barrier** Existing Elevation: (NAVD88, ft) Surge Barrier Elevation AVD88, ft) 12.0 12.0 10.25 10.25 8.5 8.5 6.75 6.75 5.0 5.0 3.25 3.25 - 1.5 1.5 -0.25 -0.28 -2.0 .2.0 WOODS HOLE

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## Second Alternative - Surge Barrier and Continuous Coastal Bank

Limited colored areas show elevation applied to form a continuous bank along the Atlantic Ocean Shoreline. Emphasizes the benefits of natural limestone ridge and <u>highlights effectiveness of the Coastal Program</u>.



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#### **Present Day Surge Barrier Results**

The elevation was reduced by a substantial amount inside Lake worth with the Surge Barrier.

There was an additional reduction of approximately 0.2 ft from the complete barrier.

	Present Day Reduction (ft)									
	Palm Beach Inlet	Worth Ave	Ibis Island							
Surge Barrier	2.5	4.3		3.7						
Complete Barrier	2.7	4.5		4.0						







#### 2070 Intermediate High Surge Barrier Results

In the 2070 Intermediate High climate condition, the surge barrier was less effective due to the already increased sea level. This reduction could still be helpful.

	2070 Int High Reduction (ft)									
	Palm Beach Inlet	Worth Ave	Ibis Island							
Surge Barrier	1.4	3.2		3.1						
Complete Barrier	1.6	3.6		3.6						







## Task 5. Storm Surge Barrier Feasibility Study

Input or Questions?

- o Results indicate potential for surge barrier to reduce peak flooding
- Deliverable will be included with Final Vulnerability Assessment to satisfy FDEP scope
- Solution is beyond the responsibility of Palm Beach alone
- Town consider whether to pursue further work (e.g., request US Army Corps study, engage other communities)
- Alternative is substantial action on Lake side via Level-Up recommendations





# **Implementation Plan Refinements**



## Updated Vulnerability Assessment Will Refine Level-Up

#### • Specific Town Assets at Risk

- Recommended actions within or complementary to Capital Improvement Plan
- Resilient FL grants
- Lake Worth Shoreline
  - Bulkheads
  - Neighborhood Strategies

#### Town Policies and Codes

- Floodplain Development Flood Elevations, Building Heights, Flood Hazard Areas
- Comprehensive Planning Land use, Transportation, Infrastructure, Coastal Management/Conservation, Intergovernmental Coordination, Capital Improvements

#### • Implementation Plan





## **Path Forward**



## Next Steps and Schedule

#### May 2025

- Factor in any community input from public outreach meeting
- Submit Draft Vulnerability Assessment to FDEP (with mapping GIS deliverables)

#### > Summer 2025

- Obtain and incorporate DEP comments into the Vulnerability Assessment
- Finalize Surge Barrier Feasibility Report
- Update Level-Up Palm Beach Implementation Plan
- ID with staff and submit targeted grant applications before end of August

#### > Fall 2025

- Present Level-Up refinements and recommendations to Council
- End 2025
  - Finalize all documentation and submit Final VA with supporting surge barrier and Level-Up supplements
- > Grant close-out by June 30, 2026 All deliverables finalized by March 31, 2026





# **Questions/Discussion**

