



Scarborough Flood Vulnerability Assessment

Pine Point Public Meeting

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Project Overview and Goals

- 1. Understand Coastal Flood Risk**
- 2. Prioritize Infrastructure for Adaptation**
- 3. Provide Adaptation Options**
- 4. Introduce Pilot Projects**
- 5. Community Engagement**



Recent Flooding

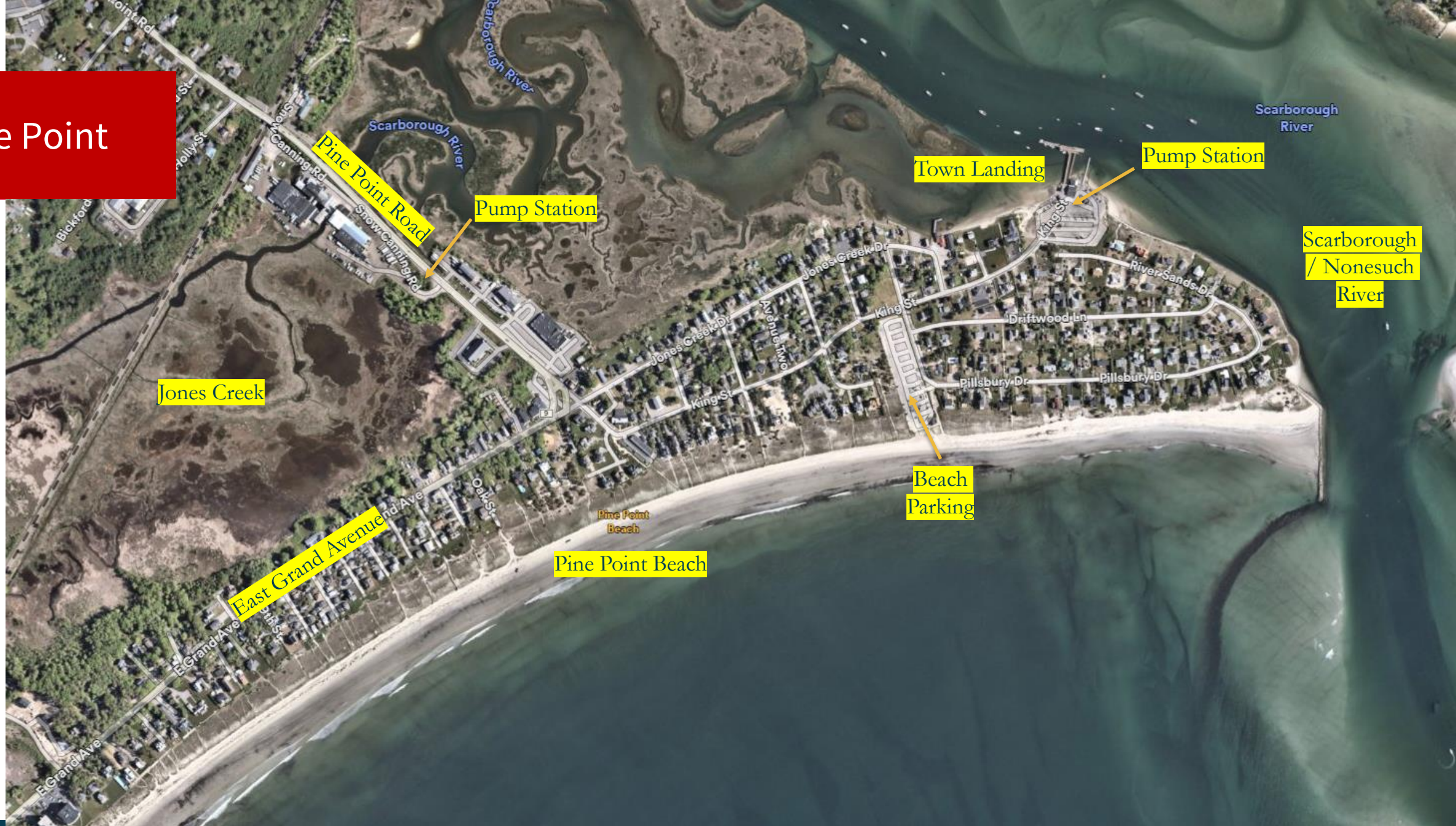
Pine Point Road



Photos from WGME and Downeast.com



Pine Point



Pine Point

Sand Dunes



Sand Dunes

D1:
Frontal Sand
Dune

D2:
Back Sand
Dune

Red Hash:
Erosion
Hazard Area



Maine Geological Survey

Address: 95 State House Station, Augusta, Maine 04333
Telephone: 207-287-2801 E-mail: mgs@maine.gov
Home page: www.maine.gov/dacf/mgs/

Coastal Sand Dune Geology

Pine Point Beach, Scarborough River,
Scarborough, Maine

by Peter A. Slovinsky and Stephen M. Dickson
Open-File Map No. 23-100
2023

This map supersedes Open-File Map No. 11-110

Sand Dunes – May 2024



Blue Line Drawn to
Boundary of Sand
Dune Vegetation



Sand Dunes – May 2018



Blue Line Drawn to
Boundary of Sand
Dune Vegetation in
May 2024

Between 30' and 60' of dune vegetation loss between May 2018 and May 2024



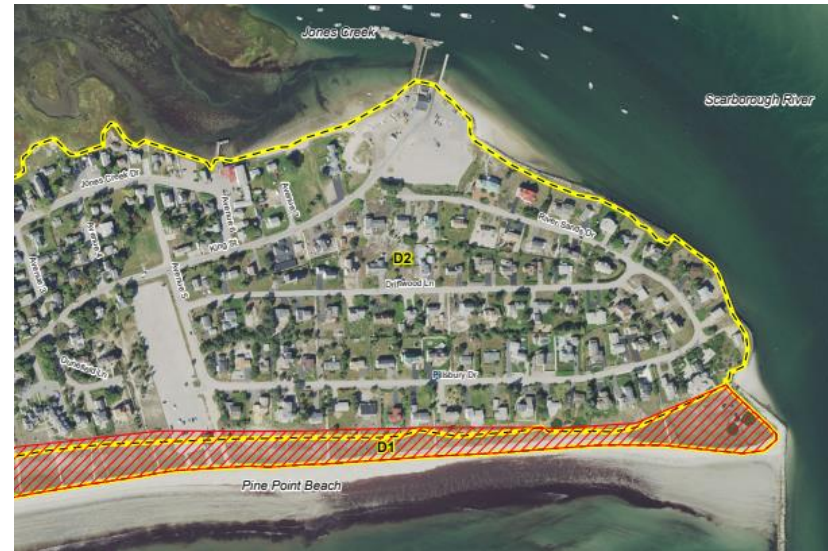
Sand Dune Restrictions

Not Allowed:

- New seawalls (including sloped barriers constructed out of rocks, wood, concrete or similar materials)
- Expanded road footprints (i.e., elevated roads)
- Closed fences
- In Frontal Dune and Areas Mapped in a V-Zone: New structures or addition to existing structure (some exceptions)

Allowed:

- Pile or post foundations
- Replacement of patio, deck, driveway, walkway, porch, or parking area
- Moving seawall landward or seawall replacement (same location and dimensions, including height)
- Temporary structures (less than 7 months)
- Repair of up to 50% of existing structure
- Elevated boardwalks, open fences, walkways, and driveways
- Beach nourishment / sand dune restoration
- Re-routing of road from frontal dune to back dune



D1: Frontal Sand Dune

D2: Back Sand Dune

Red Hash:

Erosion Hazard Area



Flood Scenarios

Sea Level Rise		Water Surface Elevations (NAVD88, ft)						
		"High Tides"		Coastal Storm Events				
Planning Scenario	SLR (ft)	MHHW	HAT	10 yr	50 yr	100 yr	Max Tide January 13, 2024	500 yr
Existing Sea Levels	0.0	4.6	6.5	7.9	8.5	8.8	9.3	9.5
2030	0.8	5.4	7.3	8.7	9.3	9.6	10.1	10.3
2050: Commit	1.5	6.1	8.0	9.4	10.0	10.3	10.8	11.0
2050: Prepare	1.9	6.5	8.4	9.8	10.4	10.7	11.2	11.4
2100: Commit	4.0	8.6	10.5	11.9	12.5	12.8	13.3	13.5
2100: Prepare	7.4	12.0	13.9	15.3	15.9	16.2	16.7	16.9

Mapping Scenario	Water Level (ft, NAVD88)
1	7.3
2	8.0
3	8.8
4	9.6
5	10.3
6	10.8
7	11.4
8	12.8
9	13.9
10	16.9

2050 "High Tide"

Present-Day Storm

2100 "High Tide"

2050 Storm

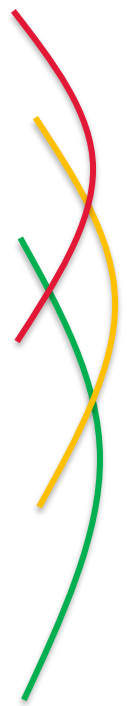
2100 Storm

Standing water flooding (i.e., no wave action). Rainfall events not included.



Flood Scenarios

Mapping Scenario	Water Level (ft, NAVD88)
1	7.3
2	8.0
3	8.8
4	9.6
5	10.3
6	10.8
7	11.4
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9	13.9
10	16.9



Near-Term Flood Risk

Medium-Term Flood Risk

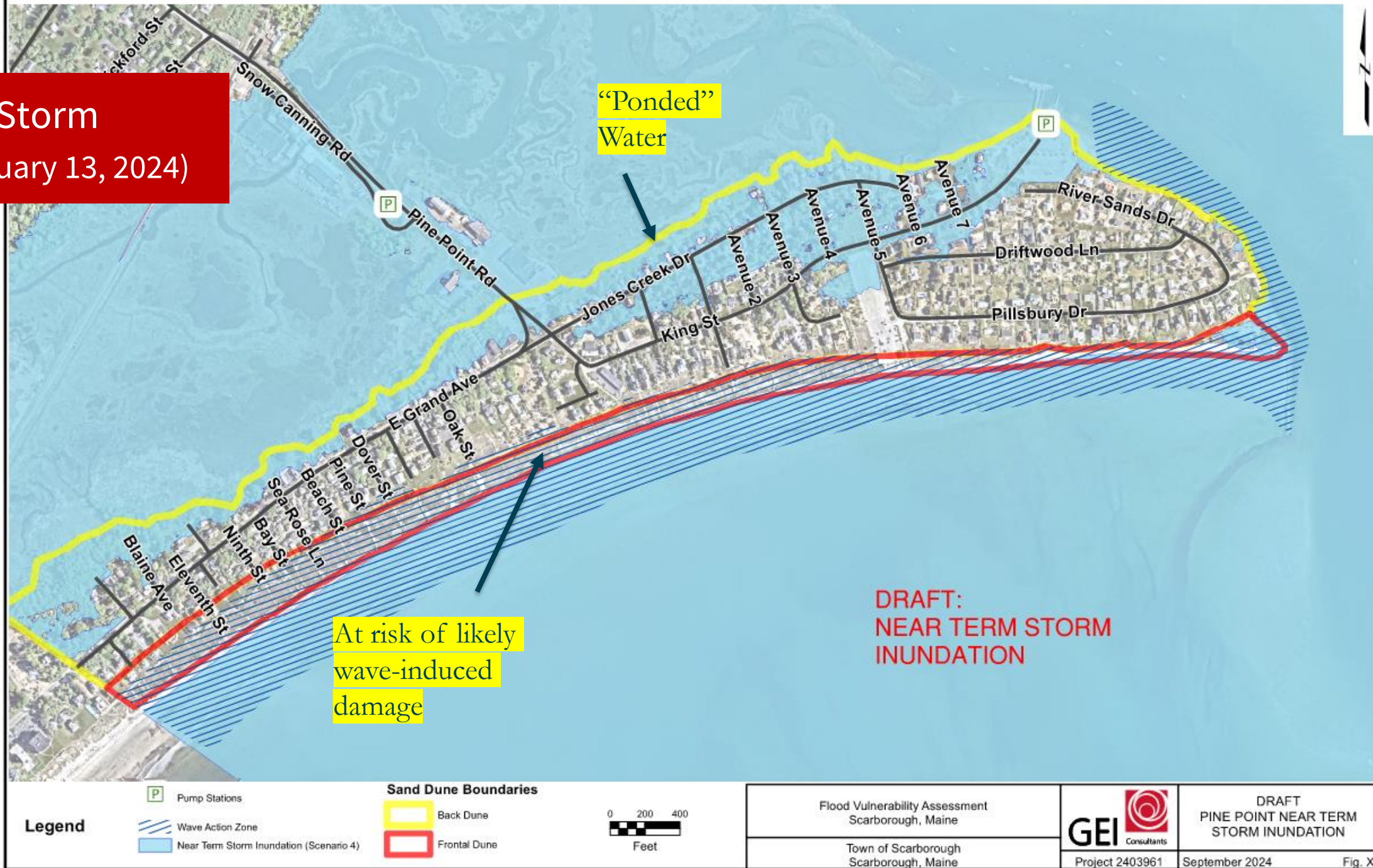
Long-Term Flood Risk



Near-Term Flooding



Near-Term Storm (similar to January 13, 2024)



Flood Inundation Maps

2050 Flooding

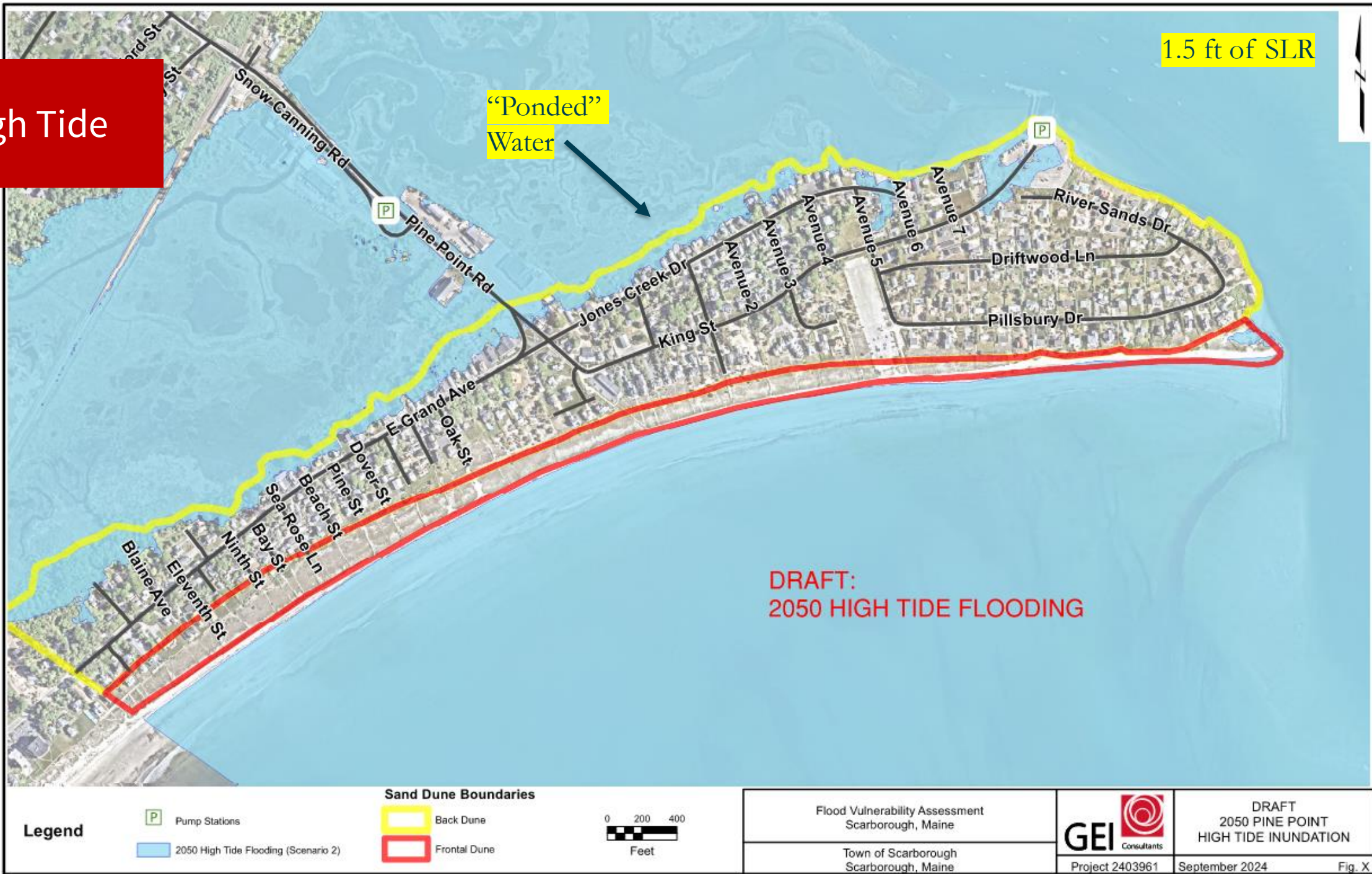


2050 – High Tide

1.5 ft of SLR

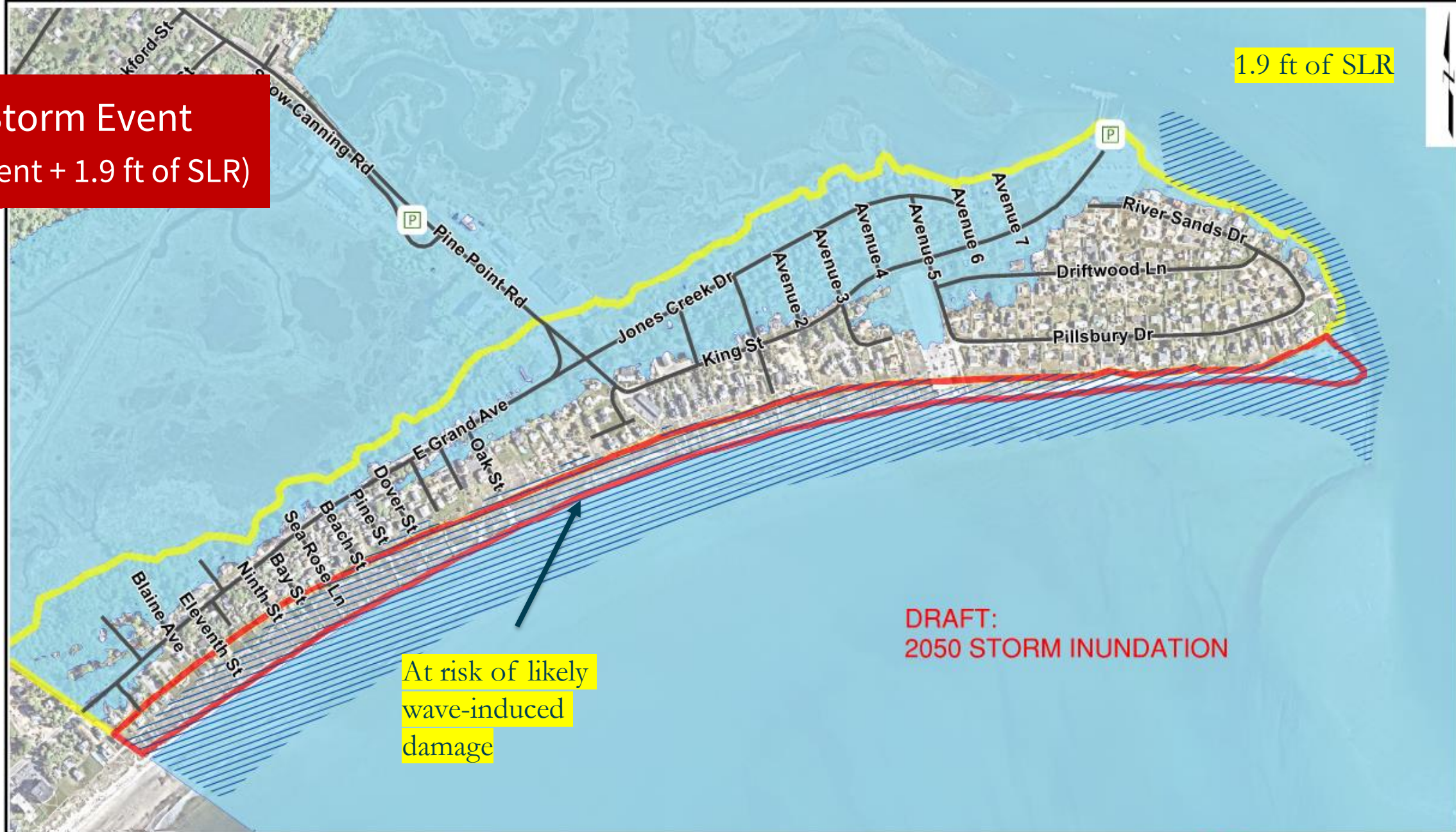
“Ponded”
Water

DRAFT:
2050 HIGH TIDE FLOODING



2050 – Storm Event
(Jan 13 event + 1.9 ft of SLR)

1.9 ft of SLR

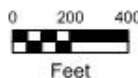


Legend

-  Pump Stations
-  Wave Action Zone
-  2050 Storm Inundation (Scenario 7)

Sand Dune Boundaries

-  Back Dune
-  Frontal Dune



Flood Vulnerability Assessment
Scarborough, Maine

Town of Scarborough
Scarborough, Maine



Project 2403961

DRAFT
2050 PINE POINT
STORM INUNDATION

September 2024

Fig. X

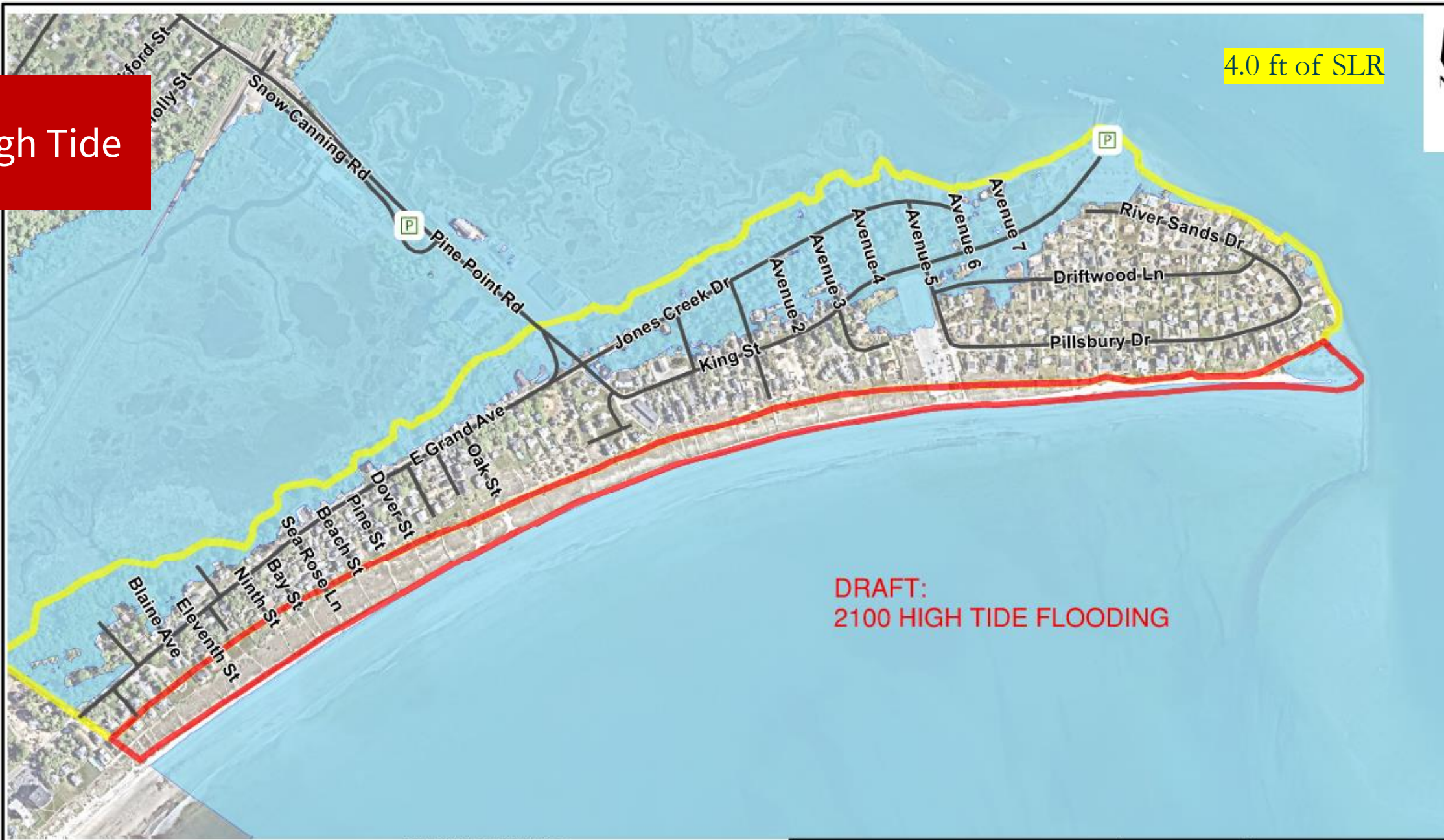
Flood Inundation Maps

2100 Flooding



2100 – High Tide

4.0 ft of SLR



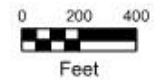
DRAFT:
2100 HIGH TIDE FLOODING

Legend

-  Pump Stations
-  2100 High Tide Flooding (Scenario 5)

Sand Dune Boundaries

-  Back Dune
-  Frontal Dune



Flood Vulnerability Assessment
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Scarborough, Maine



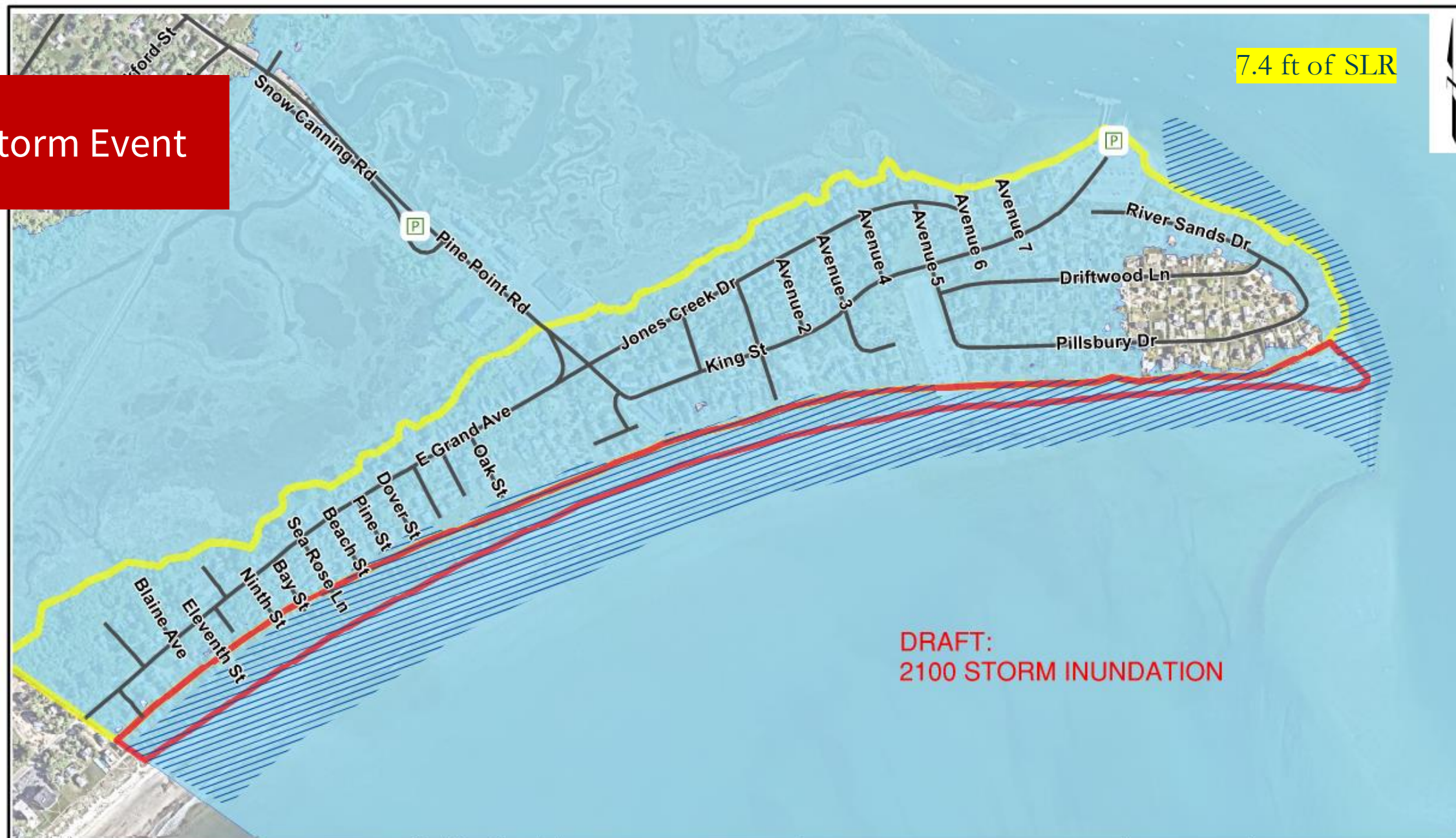
Project 2403961 September 2024

DRAFT
2100 PINE POINT
HIGH TIDE INUNDATION

Fig. X

2100 – Storm Event

7.4 ft of SLR



Legend

- Pump Stations
- Wave Action Zone
- 2100 Storm Inundation (Scenario 10)

Sand Dune Boundaries

- Back Dune
- Frontal Dune

0 200 400
Feet

Preliminary (Public) Roads Results: Pine Point

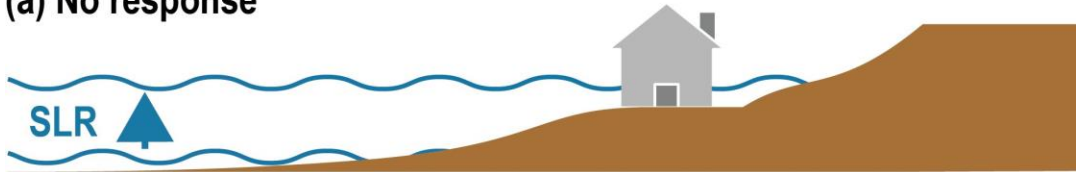
Results based on standing water flooding (i.e., no wave action).

Road (Public) Flood Exposure Summary (Length Inundated, ft)											
ROAD NAME	1	2	3	4	5	6	7	8	9	10	Dry Length
<i>Total Length of Roads Inundated, miles</i>	<i>0.2</i>	<i>5.9</i>	<i>11.0</i>	<i>1.6</i>	<i>2.0</i>	<i>2.4</i>	<i>2.6</i>	<i>4.0</i>	<i>4.6</i>	<i>5.1</i>	<i>7.4</i>
Snow Canning Rd	922	1,115	1,213	1,297	1,319	1,335	1,348	1,382	1,432	1,621	1,621
King St	241	375	758	1,618	1,659	1,678	1,699	2,955	2,955	2,955	2,955
Pine Point Rd	-	573	1,749	1,898	2,091	2,253	3,382	5,725	5,879	6,198	17,026
Jones Creek Dr	-	181	853	1,286	1,698	1,989	2,246	2,246	2,246	2,246	2,246
Avenue 6	-	5	23	217	223	223	223	223	223	223	223
Avenue 4	-	-	288	372	372	372	372	372	372	372	372
Avenue 5	-	-	254	433	492	543	594	781	815	815	815
Avenue 3	-	-	236	266	359	410	413	413	413	413	413
Avenue 1	-	-	206	296	325	361	374	602	674	674	674
Avenue 2	-	-	206	245	363	382	396	435	435	435	435
Avenue 7	-	-	169	190	217	228	228	228	228	228	228
Tasker Ave	-	-	112	154	253	295	315	332	332	332	332
Driftwood Ln	-	-	-	233	470	525	555	625	680	1,036	1,778
E Grand Ave	-	-	-	-	-	146	985	2,585	3,337	3,337	3,337
Oak St	-	-	-	-	-	127	212	372	388	388	388
Granite St	-	-	-	-	-	-	108	278	278	278	278
Bliss St	-	-	-	-	-	-	40	236	315	315	315
Dunefield Ln	-	-	-	-	-	-	38	393	433	433	433
Pine St	-	-	-	-	-	-	37	165	306	306	306
Beach St	-	-	-	-	-	-	18	86	321	321	321



Adaptation Overview

(a) No response



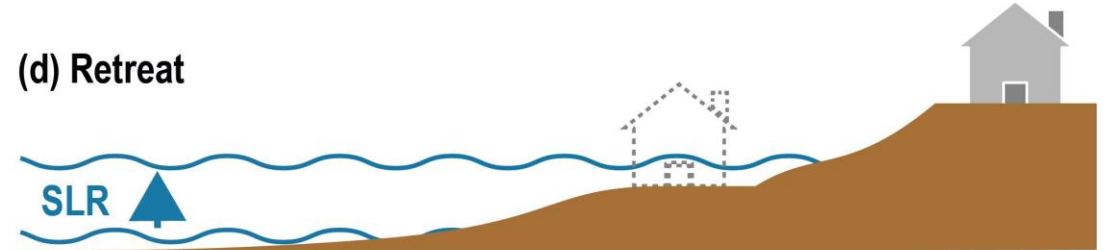
(b) Advance



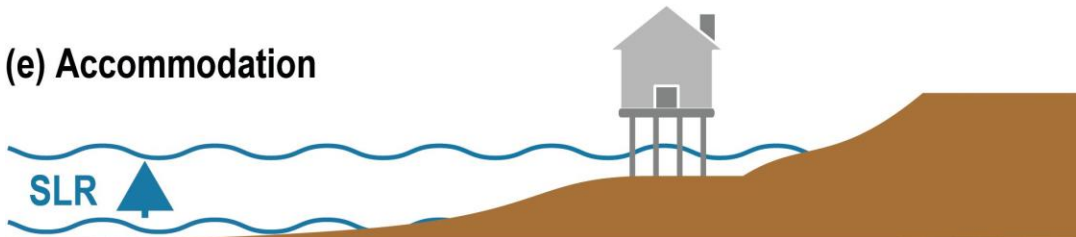
(c) Protection



(d) Retreat



(e) Accommodation



(f) Ecosystem-based adaptation



From IPCC (2019) Chapter 4, Box 4.3, Fig. 1



Flood Adaptation

Structural Measures

- Elevation (i.e., house on stilts, raised roads)
- ~~Permanent Flood Barrier (i.e., seawall)~~
- “Wet” and “Dry” Floodproofing (structure by structure basis)
- Wave Attenuation Device (WADs)
- Retreat



Non-Structural Measures / “Green” Infrastructure

- Flood Warning System
- Flood Emergency Preparedness Plans
- High Water Rescue Vehicle
- Temporary Barriers / Temporary Floodwalls
- Municipal buy-out, rent-back program (retreat)
- Dune Restoration



Temporary Flood Protection



Flood Logs



Deployable
Flood Barriers



Tiger Dams



HESCO Baskets



Municipal “buy-out, rent-back”

For example:

- Municipality buys out at-risk properties with a loan
- Municipality rents property to original owner (or anyone)
- Municipality pays off the loan w/rental income
- Property remains occupied until damaged or no longer safe to live in



Break Out Tables Activity

Discuss adaptation ideas for each time horizon:

- High-level thoughts (i.e., elevate, retreat, temporary barrier, etc.)
- Adjust adaptation ideas based on timeline and flood risk
- What do you all value in your neighborhood?
- What are your main concerns with flooding?



Next Steps

- Interactive online StoryMap available in early 2025
- Pilot Project selection and design October 2024 through April 2025
- Project finished July 2025



Thank you!
Questions?



GEI Consultants

Consulting
Engineers and
Scientists

Flood Adaptation

Structural Measures

- Elevation (i.e., house on stilts, raised roads *where allowed*)
- ~~Permanent Flood Barrier (i.e., seawall)~~
- “Wet” and “Dry” Floodproofing (structure by structure basis)
- Wave Attenuation Device (WADs)
- Retreat

Non-Structural Measures / “Green” Infrastructure

- Flood Warning System
- Flood Emergency Preparedness Plans
- High Water Rescue Vehicle
- Temporary Barriers / Temporary Floodwalls
- Municipal buy-out, rent-back program (retreat)
- Dune restoration
- Artificial reef system



Flood Scenarios

Mapping Scenario	Water Level (ft, NAVD88)	Flood Risk Time Horizon	
		Coastal Storm Event	"High Tide"
1	7.3	Now	2030
2	8.0	Now	2050
3	8.8	Now	2050
4	9.6	Now	2100
5	10.3	2030	2100
6	10.8	2050	2100
7	11.4	2050	2100
8	12.8	2100	2100
9	13.9	2100	2100
10	16.9	2100	2100



Flood Scenarios

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Sea Level Rise Projections

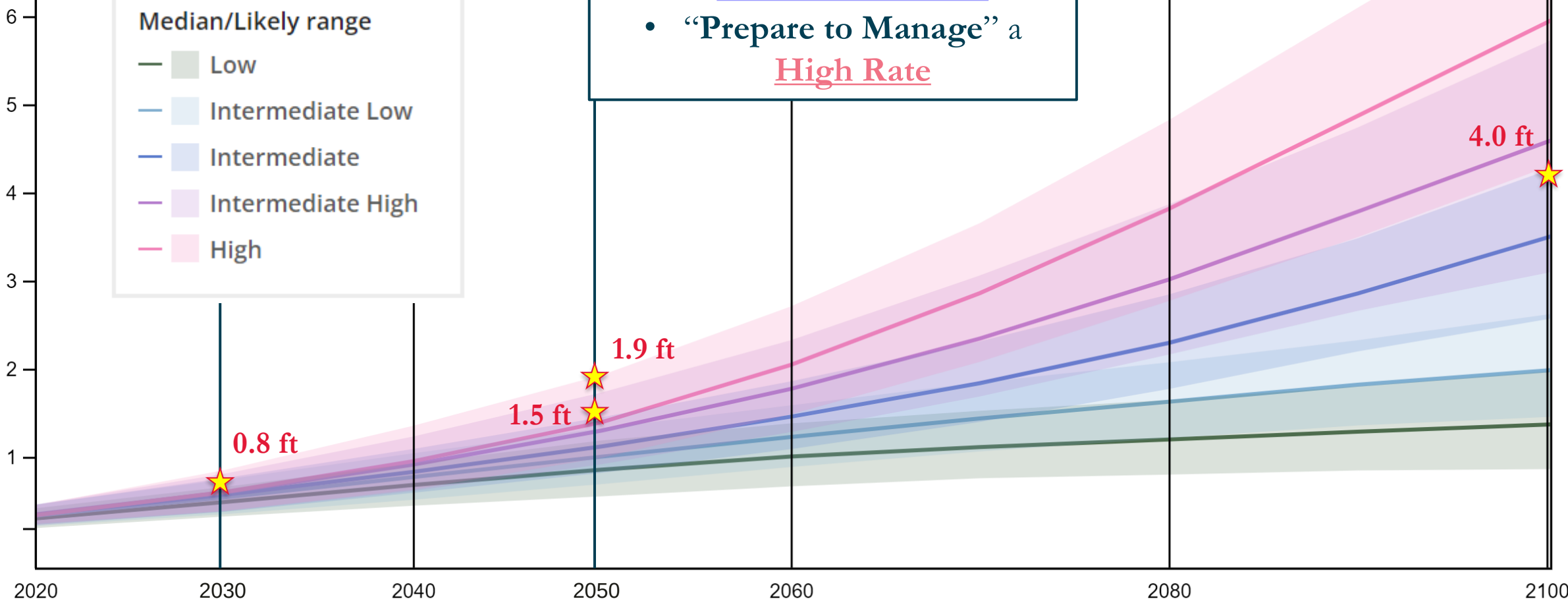
Sea Level Change (ft)

Median/Likely range

- Low
- Intermediate Low
- Intermediate
- Intermediate High
- High

Maine Climate Council Recommendations:

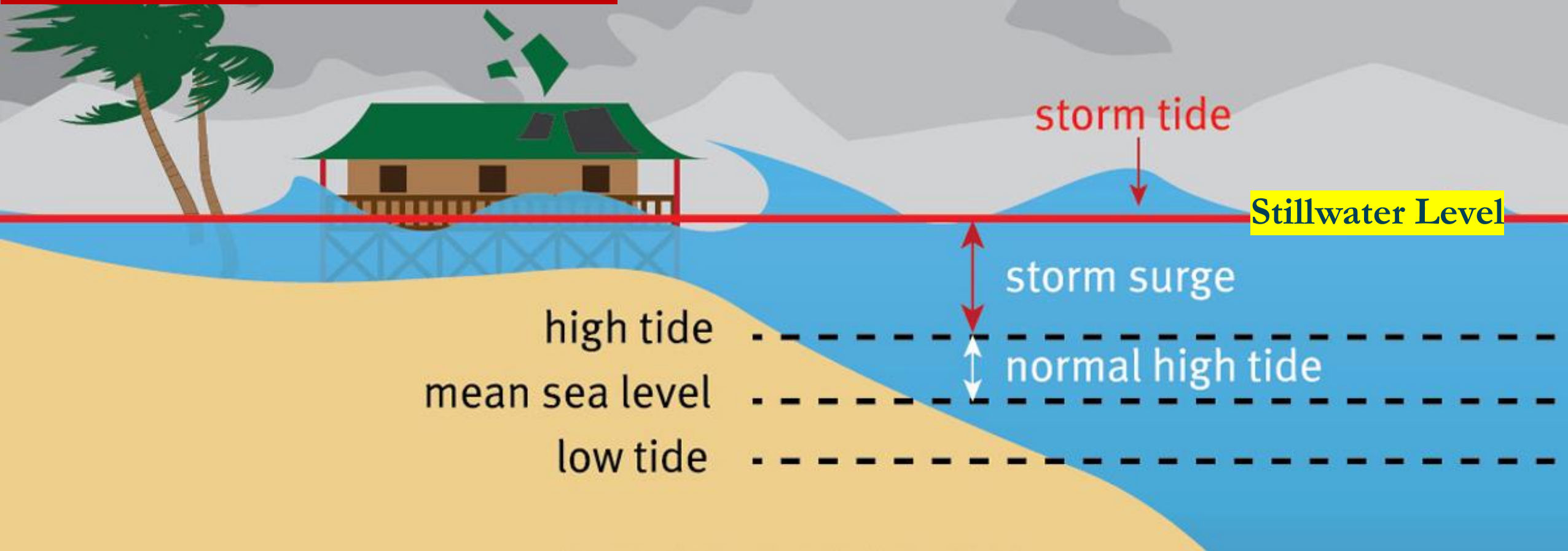
- “Commit to Manage” an Intermediate Rate
- “Prepare to Manage” a High Rate



Year

NOAA (2022)

What is Storm Surge?



Source: Rosenstiel Hurricane Hub



Assets in Study

Transportation Infrastructure

- Roads
- Rail Lines
- Sidewalks
- Bridges

Sewer Utilities

- Manholes
- Sewer Pump Stations
- Treatment Plant
- Septic Tanks

Buildings/Structures

- Structures (buildings, etc.)
- Municipal Property

Public Health & Safety

- DEP Remediation Sites
- Fire Hydrants
- Fire Stations
- Hospitals
- DEP Registered Tanks
- Police Stations
- Wells
- Evacuation Routes
- Streetlights

Coastal Structures

- Boat Ramps
- Coastal Structures

Drainage Utilities

- Dams
- Catch Basins
- Culverts
- Outfalls
- Outlet Control Structures

Conservation and Recreation

- Beaches
- Parks and Open Spaces
- Sand Dunes
- Walking Trails
- Wetlands

