Sea Level Rise Vulnerability Assessment

September 12, 2023

BAXTER & WOODMAN Consulting Engineers

COMMISSION MEETING AGENDA

- Welcome
- Introductory Remarks
- Introduction of Steering Committee Members
- Purpose of Study
- Regional Context
- Critical and Important Assets
- Flood Scenarios
- Conclusions and Mitigation Strategies
- Next Steps

INTRODUCTION OF STEERING COMMITTEE MEMBERS

- **Alec Bogdanoff –** Brizaga Engineering
- **Rebecca Bradley –** Cadence, Landscape Architects
- **Hope Calhoun –** Dunay, Miskel and Backman PA
- **Ron Falk –** Wilton Manors Business Association
- **Bert Fisher –** Wilton Manors Utilities Department
- **Tim Hernandez –** New Urban Communities
- **Andrew Riddle –** Broward MPO
- **R. David Walker –** Audubon Society
- **Ginou Charles –** Student Member, Fort Lauderdale High
- **Sara Ellis –** Student Member, Fort Lauderdale High
- **Aiden Herrero –** Student Member, Somerset Academy Village
- **Cali Myers –** Student Member, St. Mark's Academy
- **Danni Shepard –** Student Member, Wilton Manors Elementary

WHAT IS A SEA LEVEL RISE VULNERABILITY ASSESSMENT

- Office of Resilience and Coastal Protection (ORCP), Resilient Florida Program
- Assess the impacts of Sea Level Rise (SLR) on assets owned by a municipality
- Identify Critical and Important Assets and Vulnerability to flooding
- To allow municipalities to prepare and mitigate for future impacts
- Assessments are fully funded by State Department of Environmental Protection
- Qualifies municipalities for potential grant assistance for Resiliency Projects

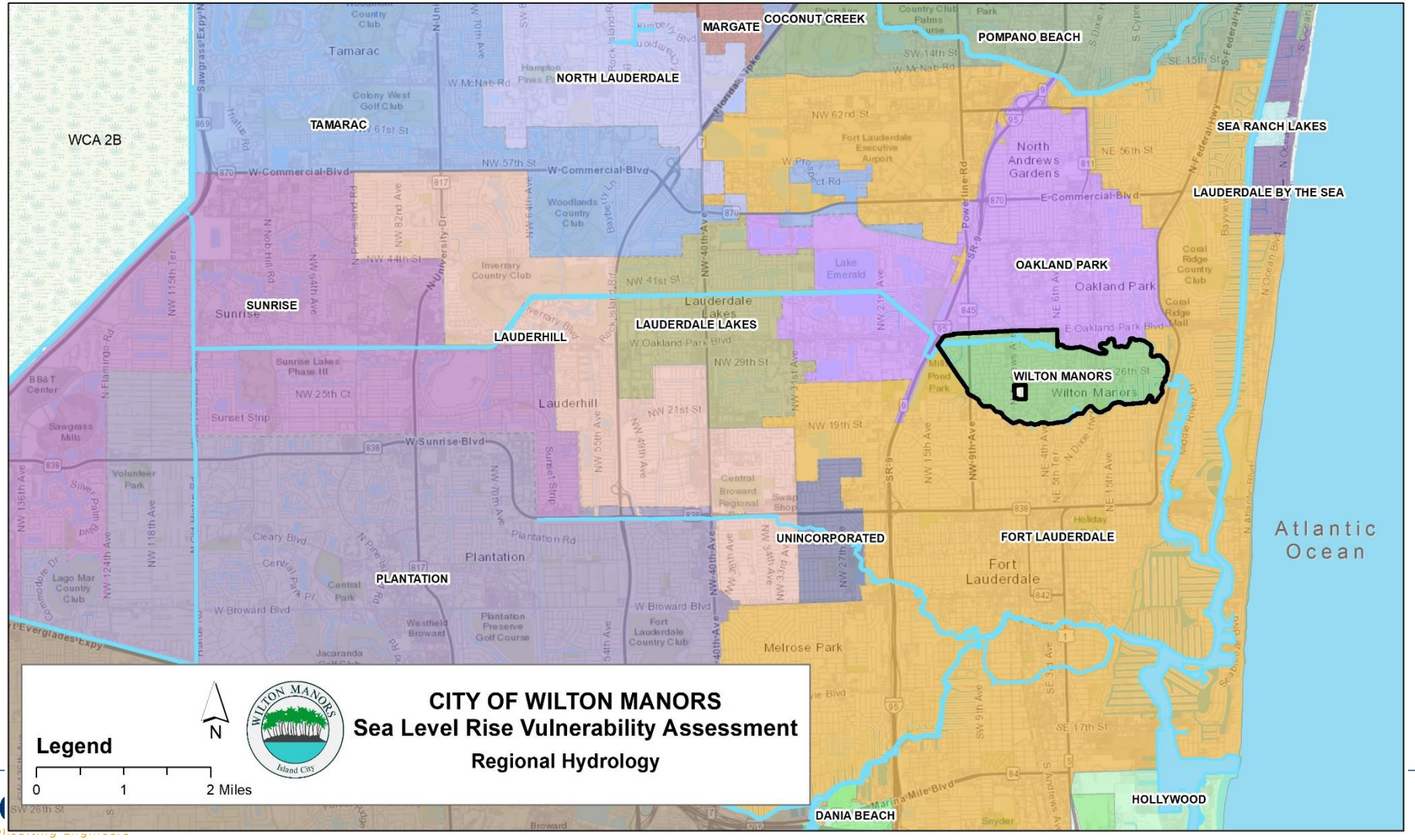
WHAT THE ASSESSMENT INCLUDES

- **Florida Statute § 380.093 and ORCP Guidelines**
- **Public Outreach**
- **Steering Committee**
  - Community and Commission Meetings
- **Data Collection**
  - Census Data
  - Assets in GIS
  - Sea Level Rise and Storm Intensity Projections
  - Hydrologic Information in GIS

WHAT THE ASSESSMENT INCLUDES (continued)

- **Flood Analyses for 2040 and 2070 Low and High Predictions**
  - Tailwater Effects (SLR and King Tides)
  - Storms (100-year and 500-year)
- **Exposure Analysis**
  - Flooding Depths on Assets
- **Sensitivity Analysis**
  - Percentiles of Vulnerabilities

CITY OF WILTON MANORS - REGIONAL CONTEXT



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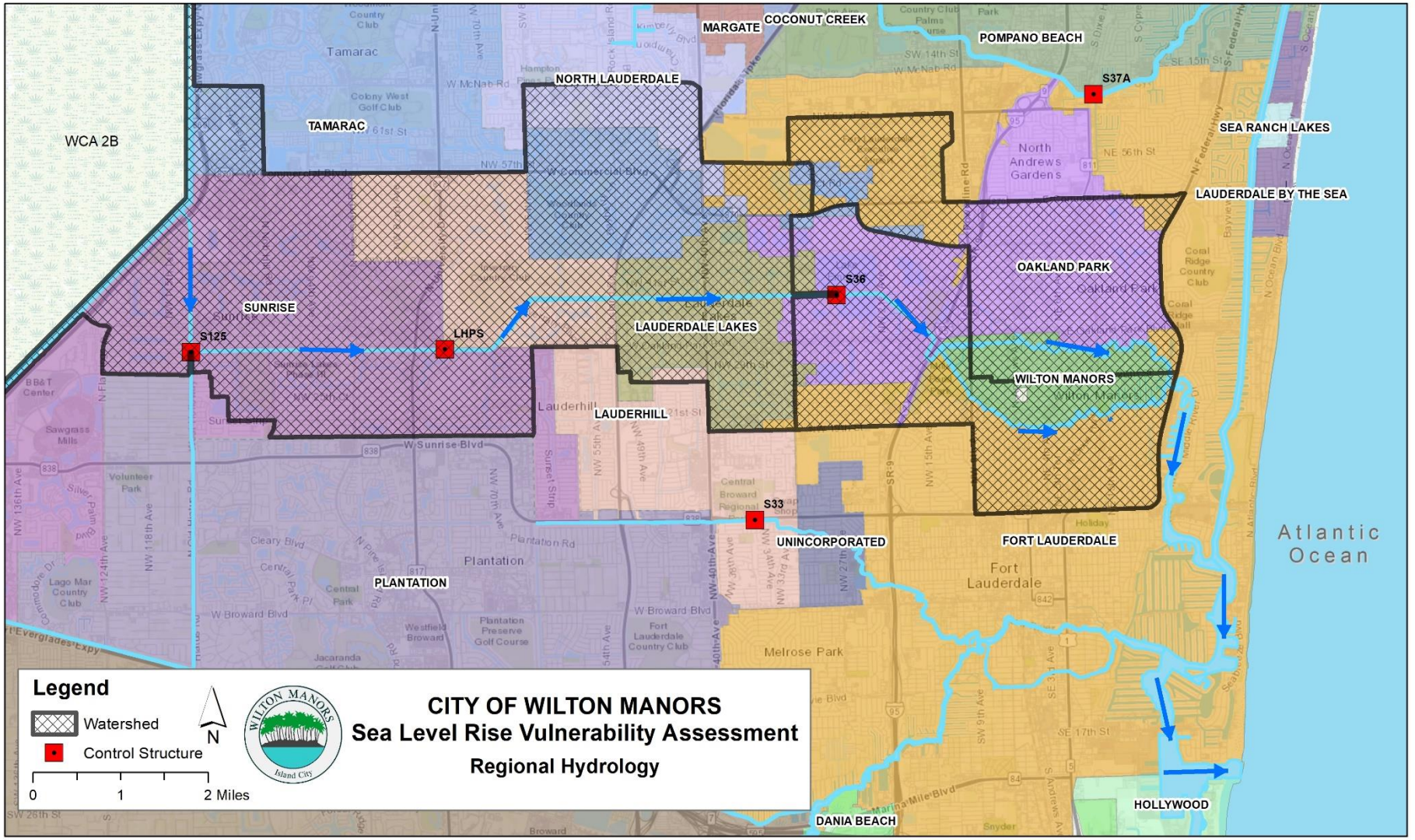
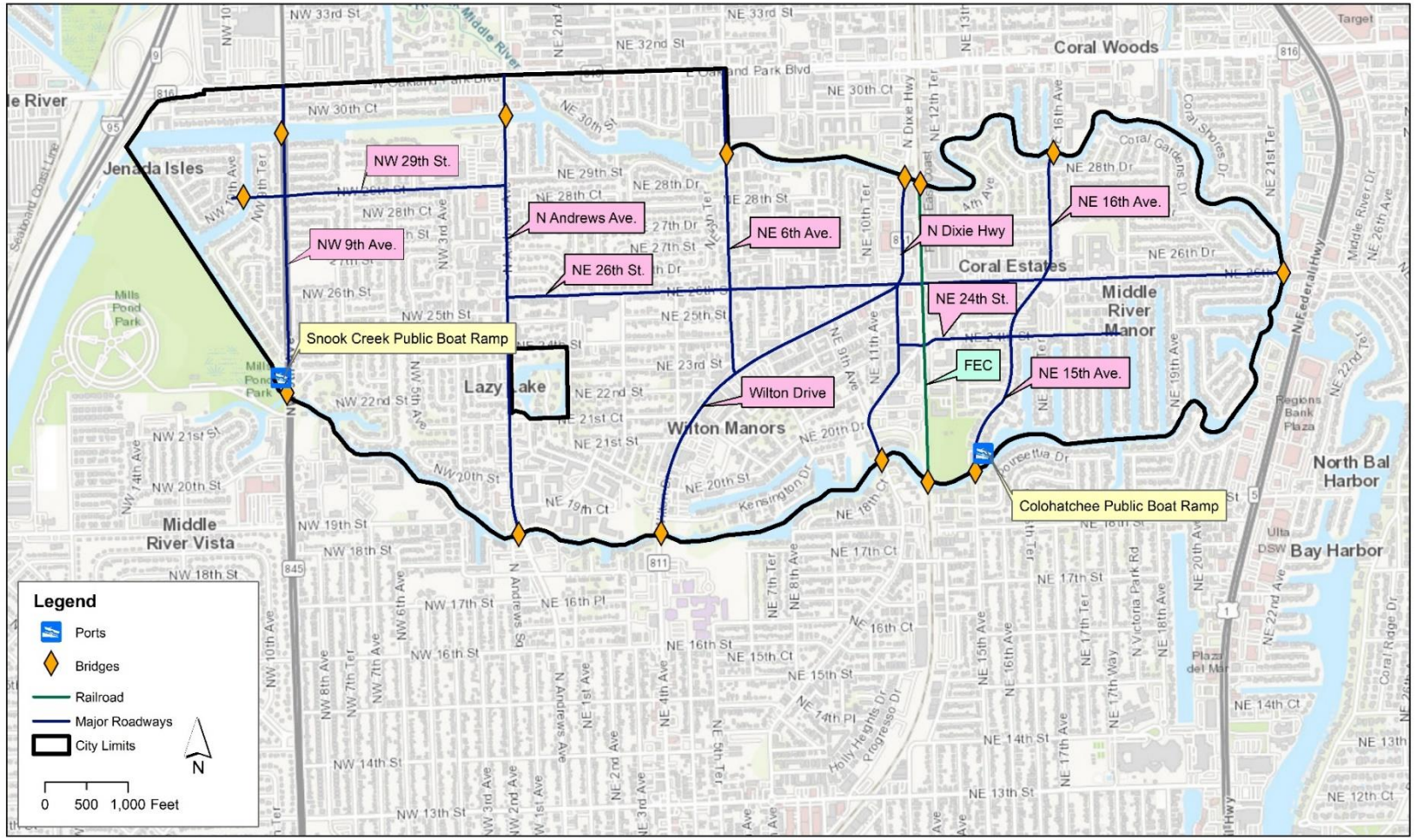


CRITICAL ASSETS
TRANSPORTATION



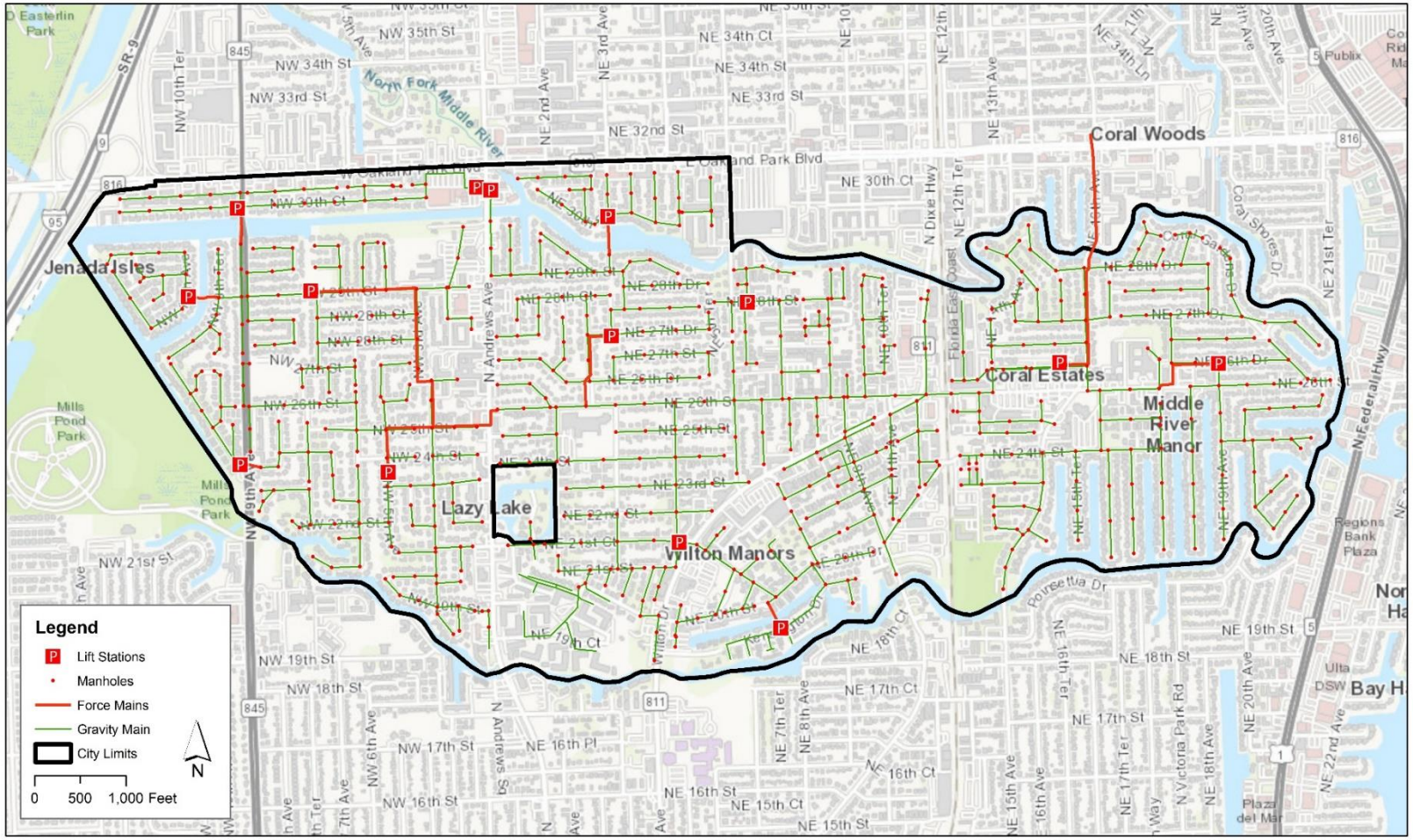
Roadway Bridges: 13

Railroad Bridges: 2

Boat Ramps: 2

Major Roadways: 10

CRITICAL ASSETS
WASTEWATER INFRASTRUCTURE



Gravity Main: 188,260 ft

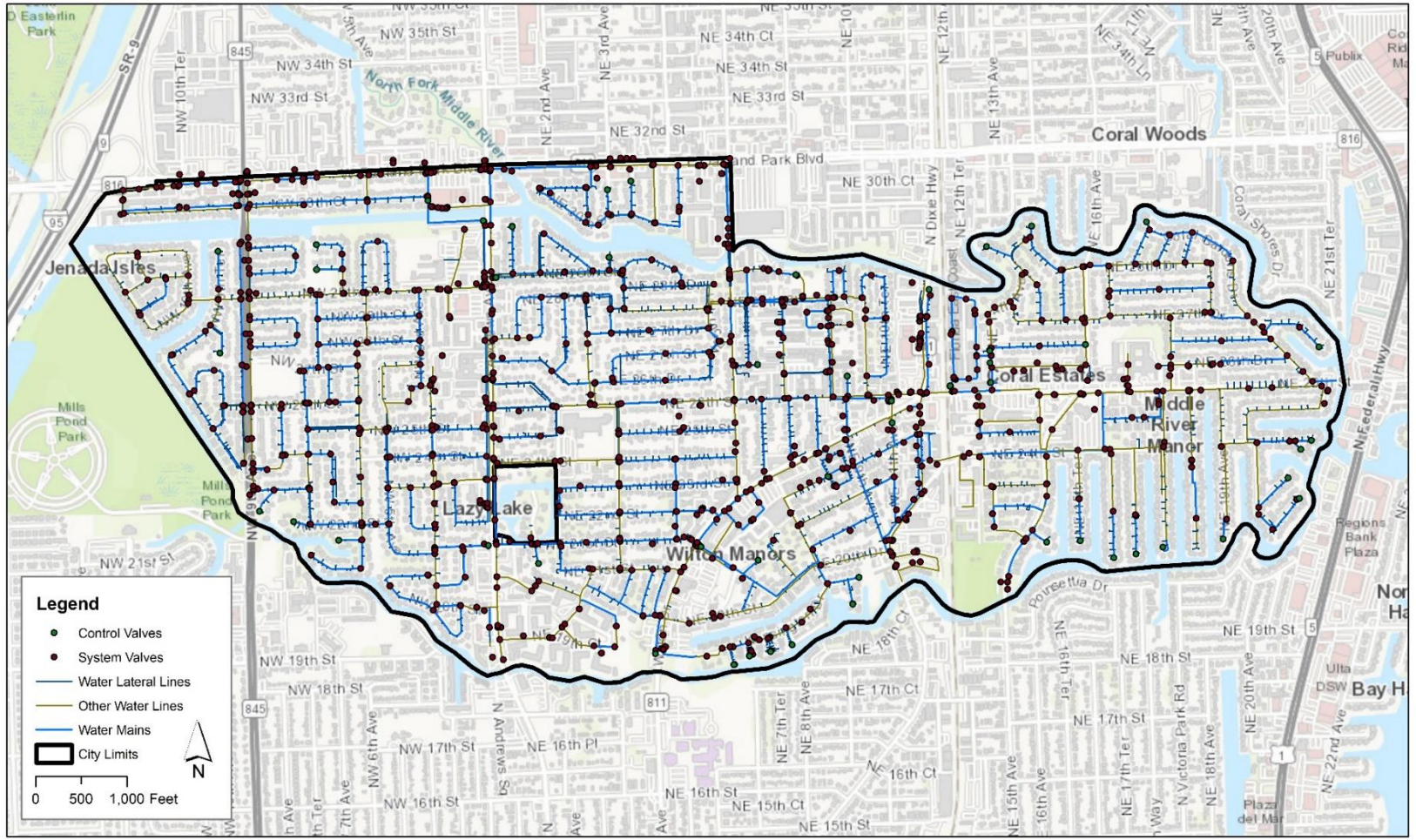
Manholes: 830

Force Main: 10,310 ft

Lift Stations (Public): 12

Lift Stations (Private): 2

CRITICAL ASSETS
WATER INFRASTRUCTURE



Water Main: 249,250 ft

Water Meters: 4,032

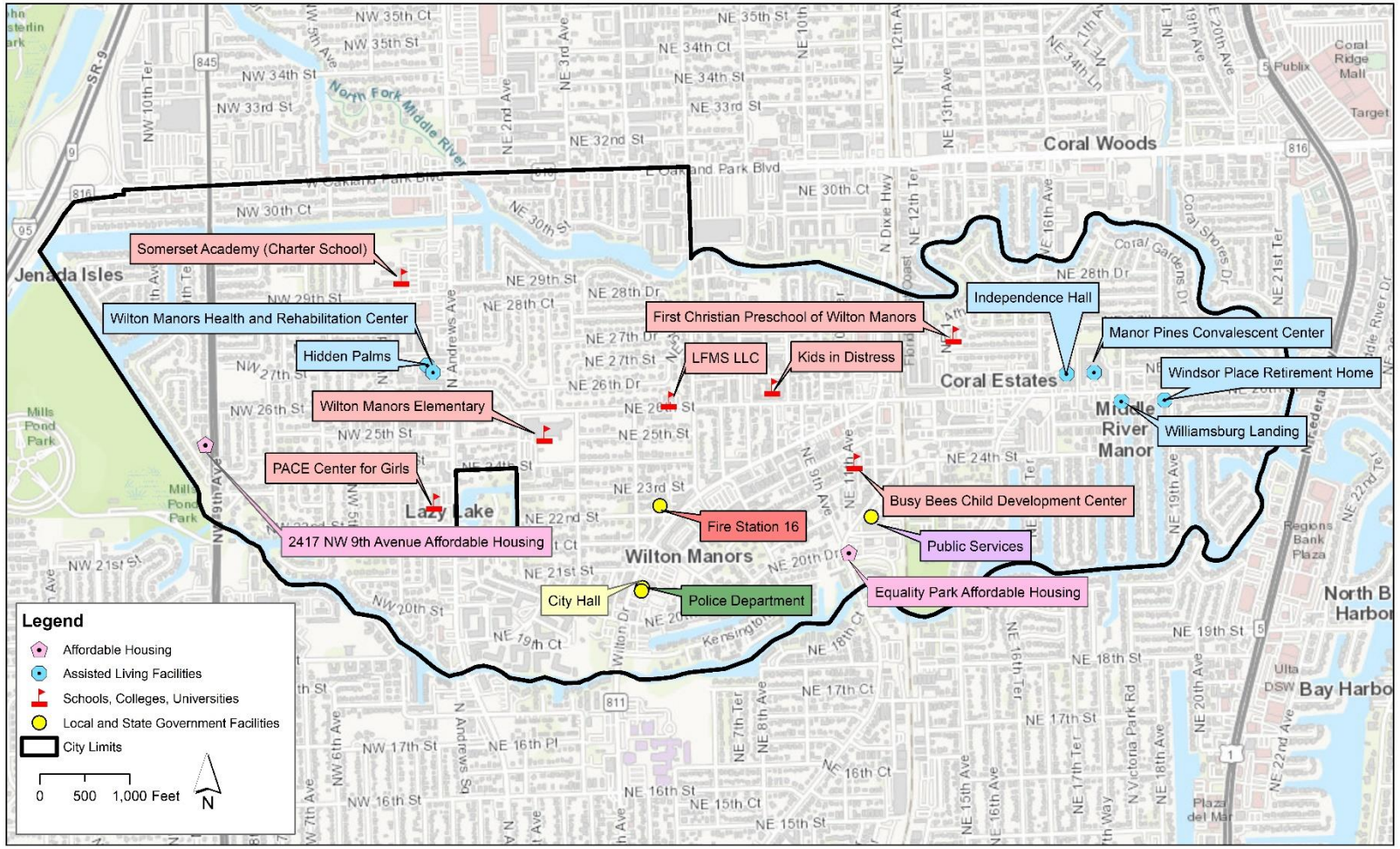
Fire Hydrants: 282

System Valves: 1,231

Control Valves: 53

Ft. Lauderdale Connections: 3

CRITICAL ASSETS
IMPORTANT COMMUNITY FACILITIES



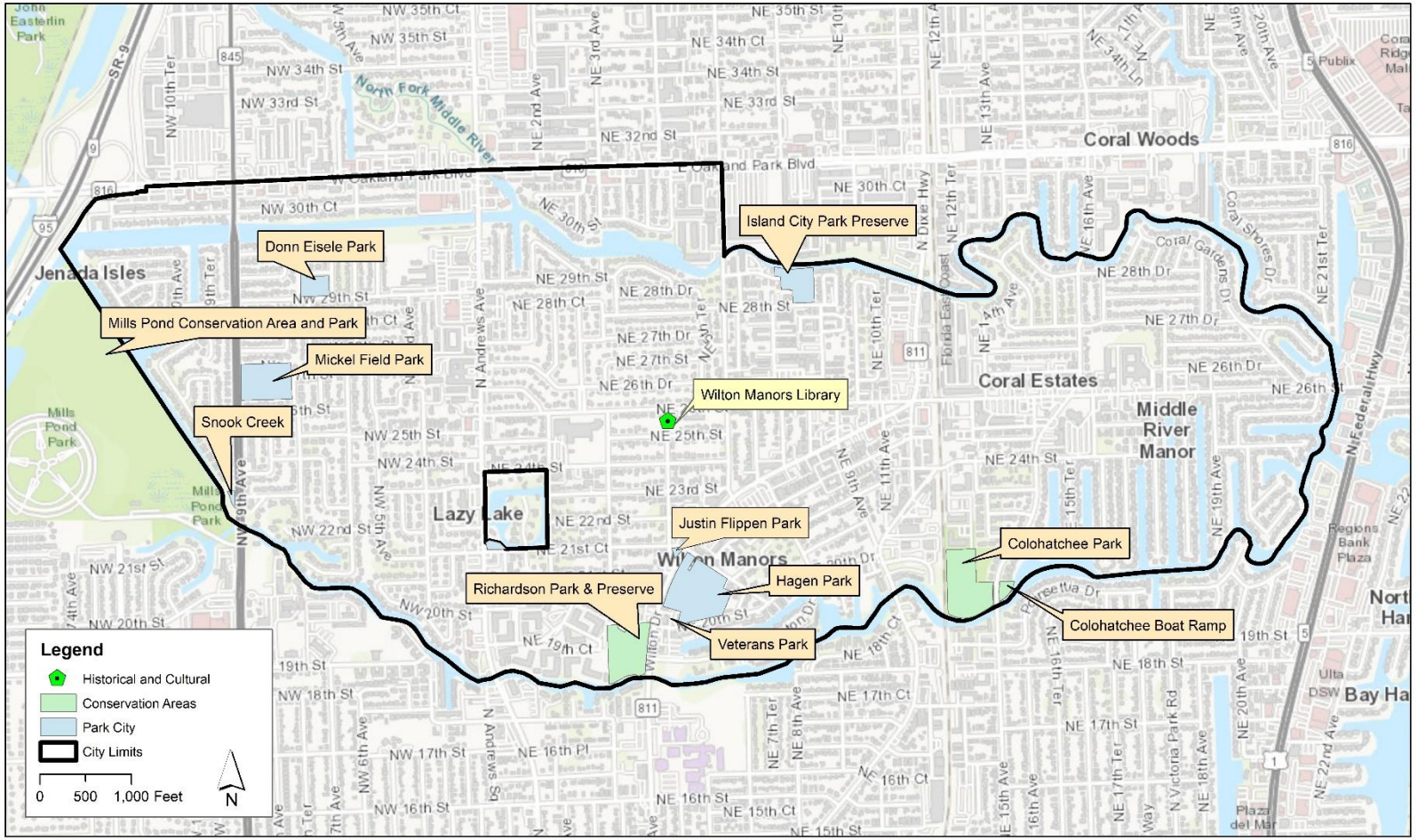
Schools and Daycares: 7

Medical Facilities: 6

Government Facilities: 4

Affordable Housing Facilities: 2

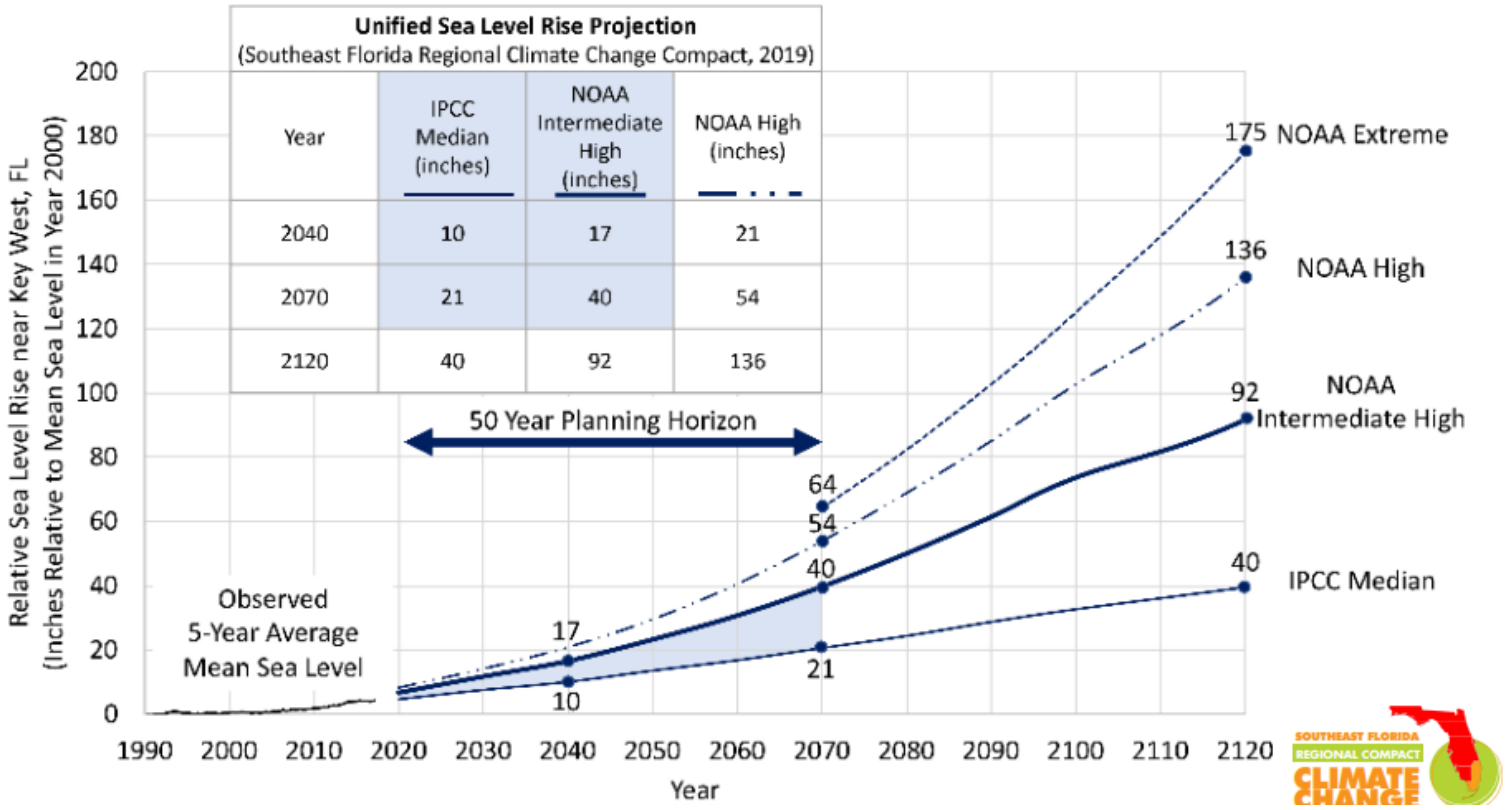
CRITICAL ASSETS
NATURAL, CULTURAL, HISTORIC



Conservation and Parks: 8

Historic and Cultural: 1

SEA LEVEL RISE PREDICTIONS



- 2040 & 2070
- Mean High
- King Tides
- Storm
  - 100-Year
  - 500-Year
  - CAT3

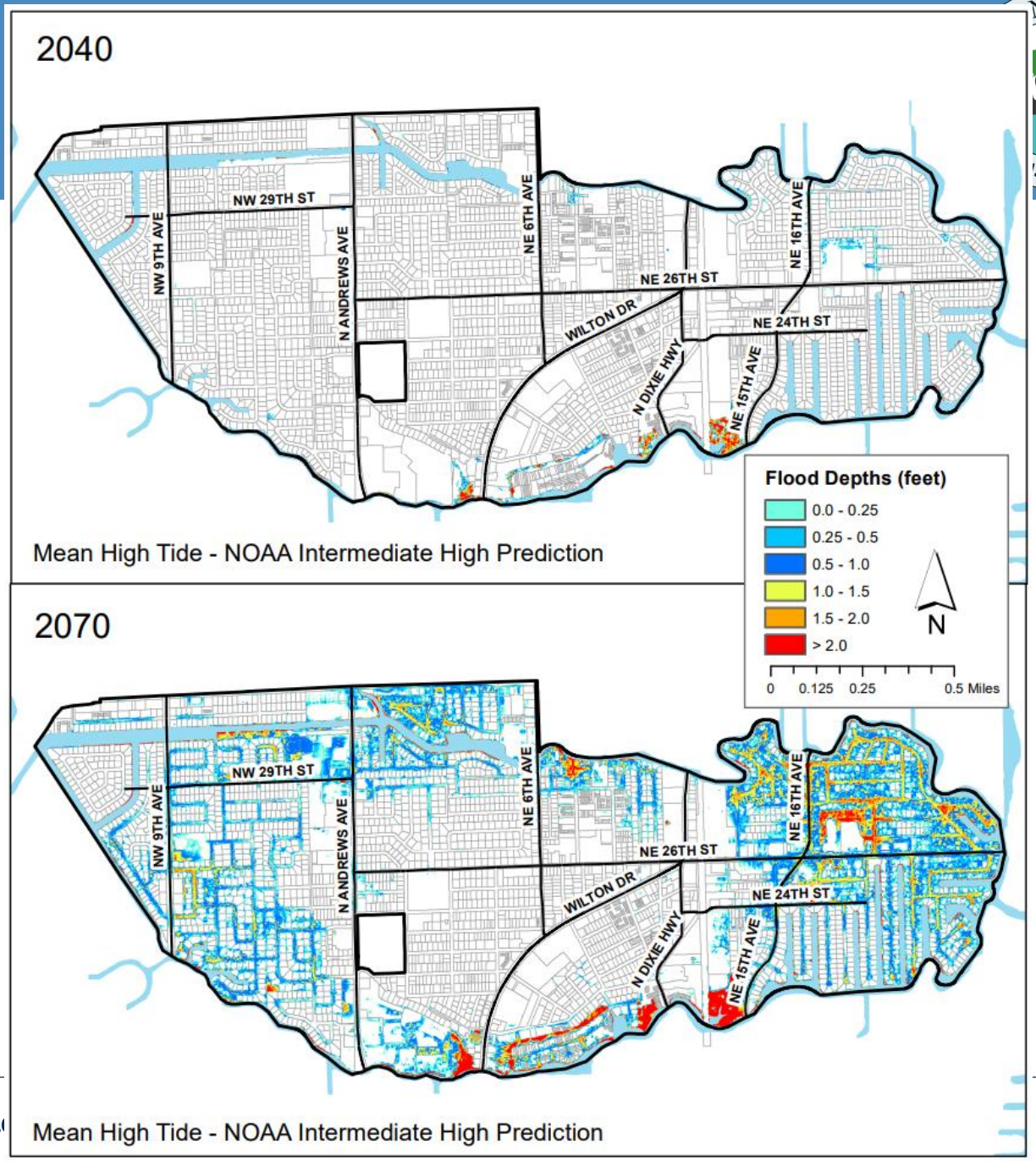
VULNERABILITY SCENARIOS

Scenario	Year	Storm	Tide	NOAA
1	2023	NA	Mean-High	NA
2	2040	NA	Mean-High	Inter-Low
3	2070	NA	Mean-High	Inter-Low
4	2040	NA	Mean-High	Inter-High
5	2070	NA	Mean-High	Inter-High
6	2023	NA	King	NA
7	2040	NA	King	Inter-Low
8	2070	NA	King	Inter-Low
9	2040	NA	King	Inter-High
10	2070	NA	King	Inter-High
11	2023	100Yr	Mean-High	NA
12	2040	100Yr	Mean-High	Inter-Low
13	2070	100Yr	Mean-High	Inter-Low

Scenario	Year	Storm	Tide	NOAA
14	2040	100Yr	Mean-High	Inter-High
15	2070	100Yr	Mean-High	Inter-High
16	2023	500Yr	Mean-High	NA
17	2040	500Yr	Mean-High	Inter-Low
18	2070	500Yr	Mean-High	Inter-Low
19	2040	500Yr	Mean-High	Inter-High
20	2070	500Yr	Mean-High	Inter-High
21	2023	CAT3	Mean-High	NA
22	2040	CAT3	Mean-High	Inter-Low
23	2070	CAT3	Mean-High	Inter-Low
24	2040	CAT3	Mean-High	Inter-High
25	2070	CAT3	Mean-High	Inter-High

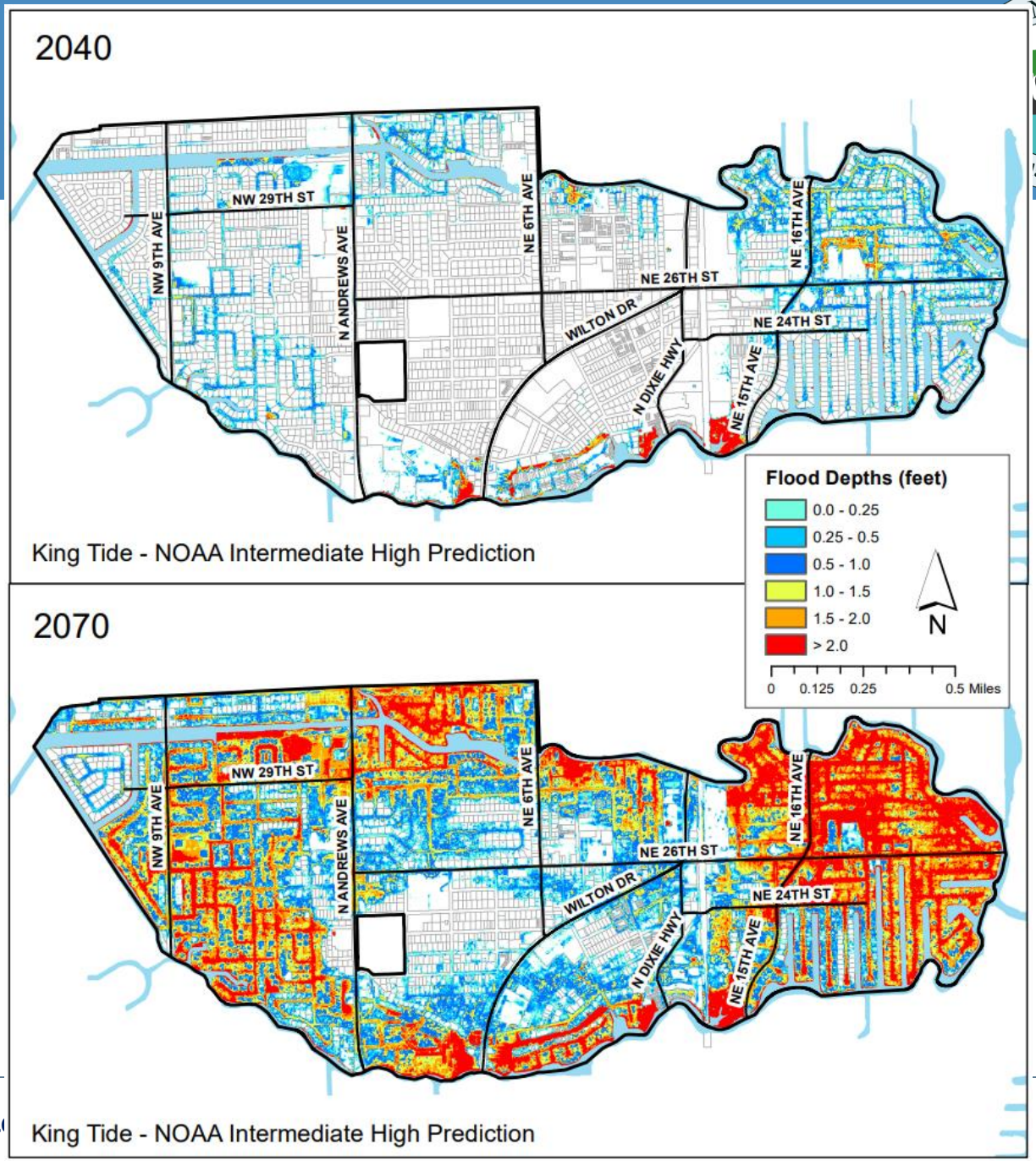
FLOODING ASSESSMENTS

- 2040 vs. 2070
- Mean High Tide
- NOAA Intermediate High Prediction



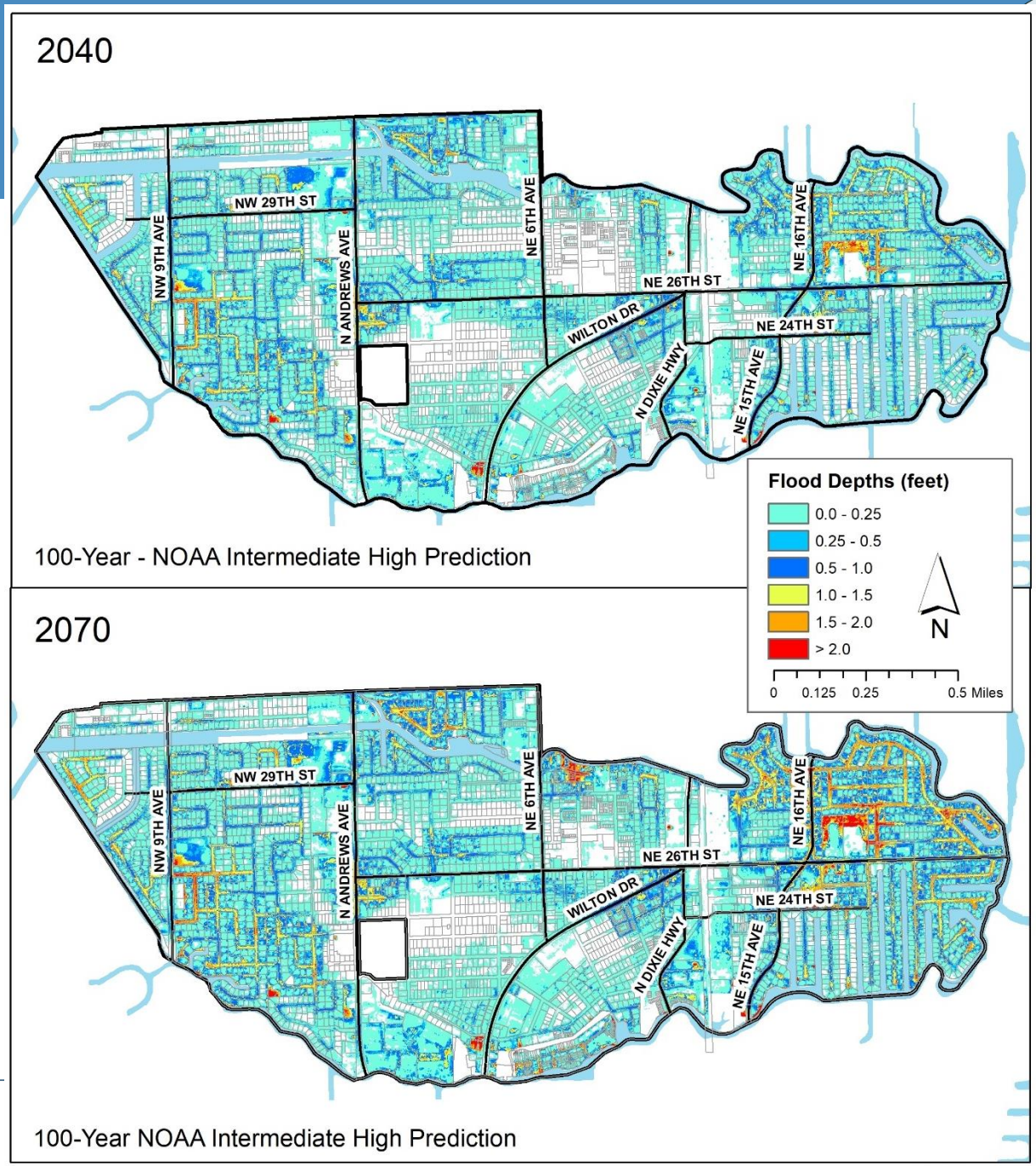
FLOODING ASSESSMENTS

- 2040 vs. 2070
- King Tide
- NOAA Intermediate High Prediction



FLOODING ASSESSMENTS

- 100-Year Storm
- 2040 vs. 2070
- Mean High Tide
- NOAA Intermediate High Prediction



ASSESSMENT RESULTS

Flood Depths at Sanitary Lift Stations

Scenario:	S1	S2	S3	S4	S5	S6	S7	S8	S9	S10	S11	S12	S13	S14	S15	S16	S17	S18	S19	S20	S21	S22	S23	S24	S25
Year:	2023	2040	2070	2040	2070	2023	2040	2070	2040	2070	2023	2040	2070	2040	2070	2023	2040	2070	2040	2070	2023	2040	2070	2040	2070
Storm:	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	100Yr	100Yr	100Yr	100Yr	100Yr	500Yr	500Yr	500Yr	500Yr	500Yr	CAT3	CAT3	CAT3	CAT3	CAT3
Tide:	MHT	MHT	MHT	MHT	MHT	King	King	King	King	King	MHT	MHT	MHT	MHT	MHT	MHT	MHT	MHT	MHT	MHT	MHT	MHT	MHT	MHT	MHT
NOAA:	NA	Low	Low	High	High	NA	Low	Low	High	High	NA	Low	Low	High	High	NA	Low	Low	High	High	NA	Low	Low	High	High
PS-1	--	--	--	--	-0.19	--	--	-0.27	-0.61	1.31	-0.04	-0.01	0.03	0.01	0.44	0.17	0.20	0.23	0.22	0.53	-0.47	0.03	0.95	0.61	2.53
PS-2	--	--	-0.63	-0.97	0.95	-0.55	-0.05	0.87	0.53	2.45	1.01	1.05	1.10	1.08	1.34	1.21	1.24	1.28	1.26	1.45	0.67	1.17	2.09	1.75	3.67
PS-3	--	--	--	--	--	--	--	--	--	0.24	--	--	--	--	-0.89	-0.92	-0.92	-0.91	-0.91	-0.80	--	--	-0.12	-0.46	1.46
PS-4	--	--	--	--	0.27	--	-0.73	0.19	-0.15	1.77	-0.80	--	-0.98	-0.99	0.39	1.57	1.57	1.57	1.57	1.59	-0.01	0.49	1.41	1.07	2.99
PS-5	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	0.02
PS-6	--	--	--	--	-0.14	--	--	-0.22	-0.56	1.36	0.34	0.37	0.39	0.38	0.52	0.55	0.57	0.58	0.58	0.67	-0.42	0.08	1.00	0.66	2.58
PS-7	--	--	--	--	-0.67	--	--	-0.75	--	0.83	--	--	--	--	-0.54	--	--	--	--	-0.52	-0.95	-0.45	0.47	0.13	2.05
PS-8	--	--	--	--	-0.84	--	--	-0.92	--	0.66	-0.48	-0.47	-0.47	-0.47	-0.47	-0.40	-0.39	-0.39	-0.39	-0.38	--	-0.62	0.30	-0.04	1.88
PS-9	--	--	--	--	0.58	-0.92	-0.42	0.50	0.16	2.08	0.55	0.58	0.59	0.59	0.73	0.77	0.79	0.80	0.80	0.89	0.30	0.80	1.72	1.38	3.30
PS-10	--	--	--	--	0.30	--	-0.70	0.22	-0.12	1.80	0.21	0.24	0.26	0.25	0.40	0.44	0.45	0.47	0.46	0.56	0.02	0.52	1.44	1.10	3.02
PS-11	--	--	--	--	0.28	--	-0.72	0.20	-0.14	1.78	0.51	0.53	0.57	0.56	1.00	0.69	0.71	0.74	0.73	1.05	--	0.50	1.42	1.08	3.00
PS-12	--	--	--	--	--	--	--	--	--	0.43	-0.60	-0.59	-0.57	-0.57	-0.29	-0.47	-0.46	-0.44	-0.44	-0.26	--	-0.85	0.07	-0.27	1.65
PS-13	--	--	--	--	-0.22	--	--	-0.30	-0.64	1.28	-0.60	-0.59	-0.57	-0.57	-0.29	-0.47	-0.46	-0.44	-0.44	-0.26	-0.50	--	0.92	0.58	2.50
PS-14	--	--	--	--	-0.13	--	--	-0.21	-0.55	1.37	--	--	-0.93	-0.97	-0.34	-0.86	-0.87	-0.81	-0.83	-0.33	-0.41	0.09	1.01	0.67	2.59

ASSESSMENT RESULTS
Flood Depths on Roadways – 2040

Scenario 9	Year: 2040	Storm: NA		Tide: King		NOAA: High	
Major Roads	Total (mi)	0.1 Ft	0.5 Ft	1.0 Ft	2.0 Ft	> 2.0	Total Flooding
N ANDREWS AVE	1.05	0.0%	0.0%	0.0%	0.4%	0.2%	0.6%
N DIXIE HWY	0.68	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
NE 15TH AVE	0.48	0.0%	12.4%	4.3%	0.0%	0.0%	16.8%
NE 16TH AVE	0.30	0.0%	13.8%	53.7%	19.1%	0.0%	86.6%
NE 24TH ST	0.51	0.0%	18.1%	14.2%	0.0%	0.0%	32.3%
NE 26TH ST	1.77	0.0%	2.0%	0.0%	0.0%	0.0%	2.0%
NE 6TH AVE	0.69	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
NW 29TH ST	0.62	0.0%	11.8%	0.5%	0.0%	0.0%	12.2%
NW 9TH AVE	0.71	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
WILTON DR	0.85	0.0%	0.2%	0.3%	0.3%	0.0%	0.8%
Total	**7.67**	**0.0%**	**4.0%**	**3.4%**	**0.8%**	**0.0%**	**8.2%**
Minor Roads	**35.68**	**0.0%**	**12.8%**	**14.9%**	**3.6%**	**0.0%**	**31.2%**

ASSESSMENT RESULTS
Flood Depths on Roadways – 2070

Scenario 10	Year: 2070	Storm: NA		Tide: King		NOAA: High	
Major Roads	Total (mi)	0.1 Ft	0.5 Ft	1.0 Ft	2.0 Ft	> 2.0	Total Flooding
N ANDREWS AVE	1.05	0.0%	14.1%	19.4%	35.1%	0.6%	69.2%
N DIXIE HWY	0.68	0.0%	42.1%	9.7%	0.0%	0.0%	51.8%
NE 15TH AVE	0.48	0.0%	0.8%	1.8%	73.9%	17.4%	93.9%
NE 16TH AVE	0.30	0.0%	1.4%	0.7%	3.1%	89.7%	94.8%
NE 24TH ST	0.51	0.0%	2.1%	13.0%	37.8%	33.3%	86.2%
NE 26TH ST	1.77	0.0%	19.4%	9.7%	39.2%	2.9%	71.3%
NE 6TH AVE	0.69	0.0%	24.4%	19.9%	10.4%	0.0%	54.7%
NW 29TH ST	0.62	0.0%	0.0%	4.4%	83.6%	11.6%	99.5%
NW 9TH AVE	0.71	0.0%	13.2%	29.0%	18.9%	0.0%	61.0%
WILTON DR	0.85	0.0%	17.5%	8.6%	0.1%	0.8%	27.0%
Total	**7.67**	**0.0%**	**15.7%**	**12.6%**	**30.7%**	**8.6%**	**67.6%**
Minor Roads	**35.68**	**0.0%**	**9.4%**	**11.8%**	**31.7%**	**32.3%**	**85.2%**

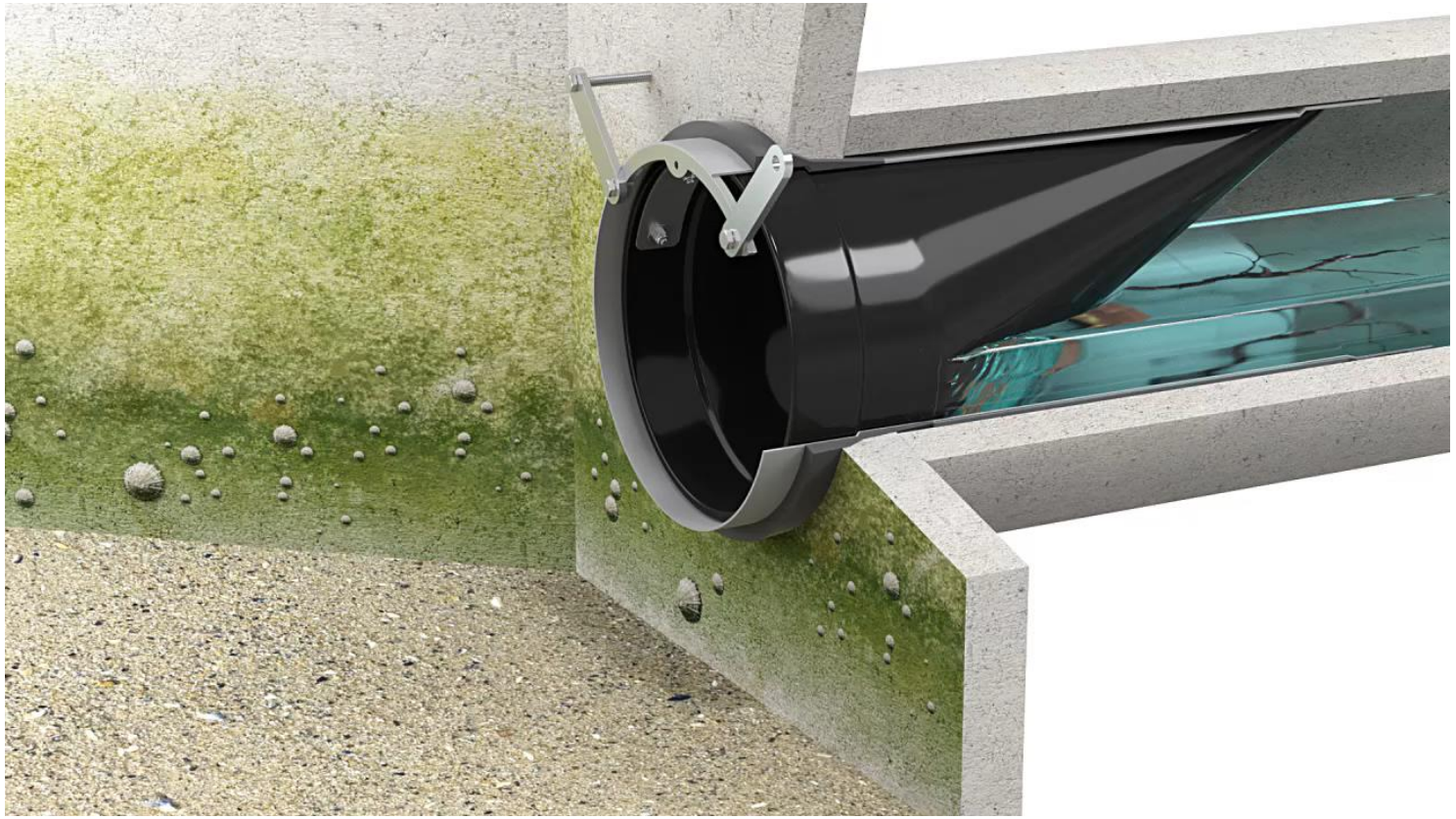
CONCLUSIONS

- **Overall, impacts in 2040 are minimal to the City**
  - Some impacts to southern and northeast portion of the City
- **Impacts are more severe in 2070**
- **Mitigation is needed prior to 2040**
  - Type of Mitigation Should be Phased
- **Mitigation responsibility is shared between the City, Homeowners, Businesses, and Developers**

RECOMMENDATIONS

- **Continue to Work with Neighboring Communities**
- **Monitor State and Federal efforts**
  - U.S. Army Corps of Engineers – South Atlantic Coast Study
- **Position the City for Grant Assistance**

MITIGATION STRATEGIES
In-Line Check Valves



MITIGATION STRATEGIES
Increase Discharge Capacity

- **Increase Pipe Sizes**
- **Consolidate Outfalls**
- **Consider Water Quality**
  - Swales
  - Exfiltration Trenches
  - Green Infrastructure
    - Bioswales and Swale Restoration
    - Rock Gardens
    - Native Plantings
    - Rain Gardens
    - Living Shorelines
    - Increase Park Space

MITIGATION STRATEGIES

Consider Modifications to City Code

Seawalls & Living Shorelines

Sec. 11-27. – Minimum elevations for coastal infrastructure within tidally-influenced areas

a. All new or substantially rehabilitated seawalls, seawall caps, canal banks or berms shall have a **minimum elevation of five (5) feet NAVD88**. Applications for new or substantially rehabilitated seawalls, seawall caps shall be constructed to have a minimum elevation of five (5) feet NAVD88.

Re-evaluate Codes and Policies for Future Development

https://library.municode.com/fl/wilton_manors/codes/code_of_ordinances

NEXT STEPS

- Fully Assess All Potential Mitigation Strategies
- Prioritize Higher Risk Areas for Near Term Mitigation
- Create Resilience Action Plan

QUESTIONS AND DISCUSSION