



CITY OF
ST AUGUSTINE
EST. 1565

Westbrook Council of Beach Associations

“Stormwater and Resiliency Program Update”

June 7, 2021

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Chief Resilience Officer & Stormwater Engineer





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Presentation Outline

- ❖ Background of the City – Flood Perspective
- ❖ Resiliency Planning
- ❖ Project Implementation





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Background



- St. Augustine is the oldest continuously occupied settlement of European and African-American origin in the United States
- 6 million visitors each year; \$1 Billion in tourism
- City population, less than 15,000 past 50 years = small tax base



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Flooding is not new to the City



Background



However, the frequency of “sunny day” flooding is on the rise



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Background

Current City Challenges (stormwater):

- Aging infrastructure
- Undersized collection system
- Low-lying and coastal location (within a flood zone)
- Highly developed (high impervious area)
- **Subject to flooding – both from rainfall and tidal influence**

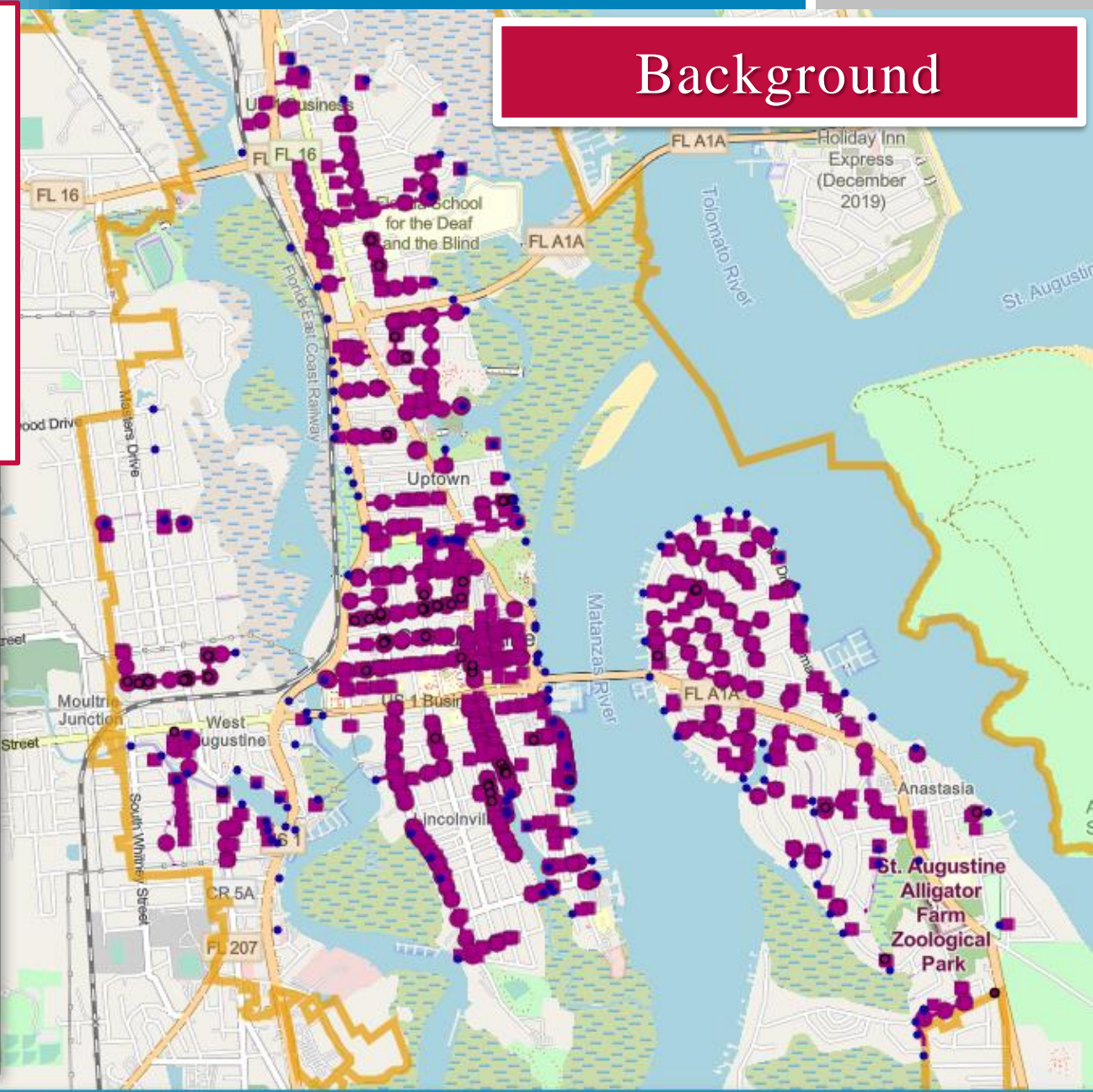


Stormwater Infrastructure:

- 103 Outfalls Tidally Influenced (not including FDOT)
- 949 Storm Inlets
- 20 miles of pipe

Background

- ✓ PublicWorks - swDischargePoint
- ✓ PublicWorks - swCulvert
- ✓ PublicWorks - swFitting
- ✓ PublicWorks - swInlet
- ✓ PublicWorks - swGravityMain
- ✓ PublicWorks - swManhole

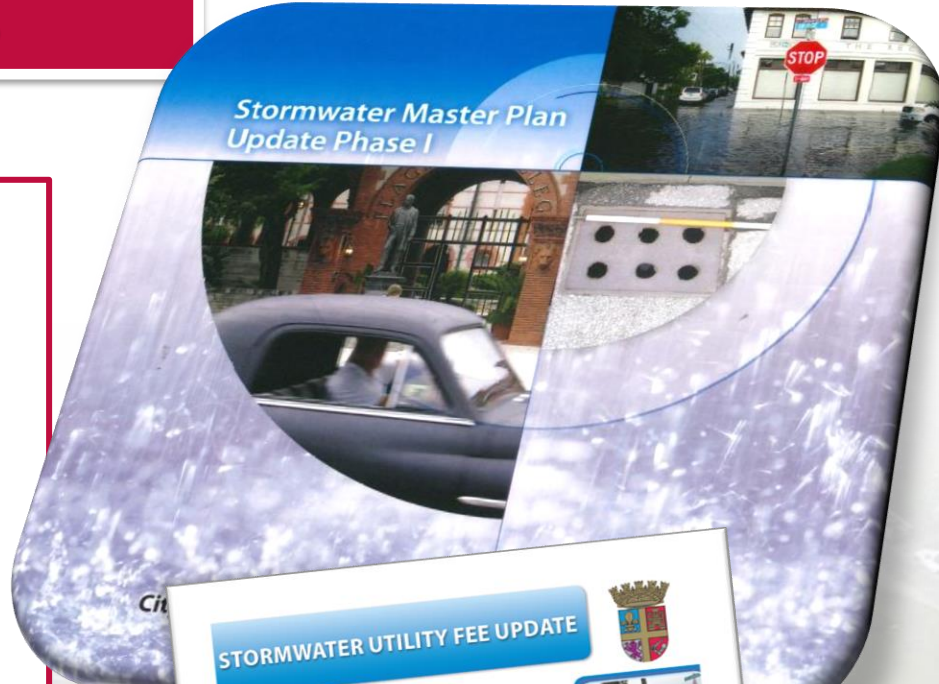




Planning Efforts

➤ Stormwater Master Plan Update – February 2013

- ❑ Developed Watershed Models to Evaluate Options
- ❑ Defined Level of Service
- ❑ Stormwater Utility Evaluation and Recommendations
- ❑ Updated Stormwater Utility Fee (effective March, 2014) – New fee structure based on actual impervious area; Discount for permitted stormwater treatment facilities
- ❑ 3 Pilot Projects Featured:
 - ✓ Lake Maria Sanchez Stormwater Management
 - ✓ South Dixie Highway
 - ✓ Sidney Street (completed 2016)



STORMWATER UTILITY FEE UPDATE

NEW STORMWATER RATES ON 2014 UTILITY BILLS
Stormwater rates will be changing. Some rates will be lower, some higher, depending on the size of your home or developed property.

Residential customers will pay a flat rate, while non-residential properties are computed based on developed, impervious area.

Small home (Impervious area less than 1,444 sq-ft)	\$3.84/month
Average home (Impervious area between 1,444 and 4,800 sq-ft)	\$7.00/month
Large home (Impervious area greater than 4,800 sq-ft)	\$11.20/month
Multifamily unit (condos, apartments, duplex, and other)	\$2.66/month
Mobile home	\$5.95/month
Non-residential customers	\$2.78/rolling unit/month

Why does the city need a stormwater fee? The fee goes to cover the cost of maintaining and improving the City's stormwater collection and treatment systems.

What is an impervious area? An impervious area is any surface that does not allow soil infiltration of rainwater to occur, and includes roofs, driveways, patios, sidewalks, and other paved areas.

Where can I get more information? Placeholders for City Stormwater and FAQ webpages.

I think my fee is incorrect: what should I do? Remember that you need to consider driveways, patios, paved parking areas, and other impervious areas to estimate your fee. If you still feel that your fee needs an adjustment, please contact City Public Works at 904.825.1045, or visit our website at <http://www.ci.st.augustine.fl.us>

Our Mission
The Department of Public Works is responsible for operating, maintaining and improving infrastructure to meet the criteria of the permit administered by the Florida Department of Environmental Protection. Your fees pay for repairs of roadway drainage, new projects, equipment, and administration of the programs.

For more information on stormwater and other water resource services, please visit www.ci.st.augustine.fl.us or contact us at 904-825-1045

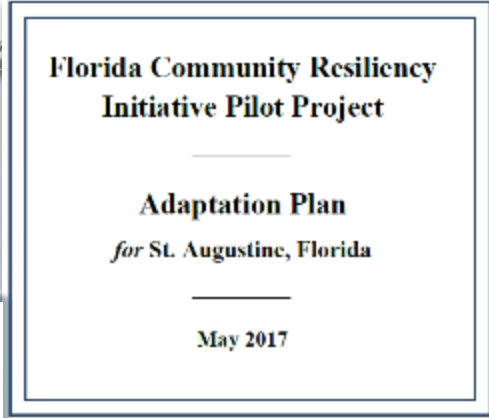
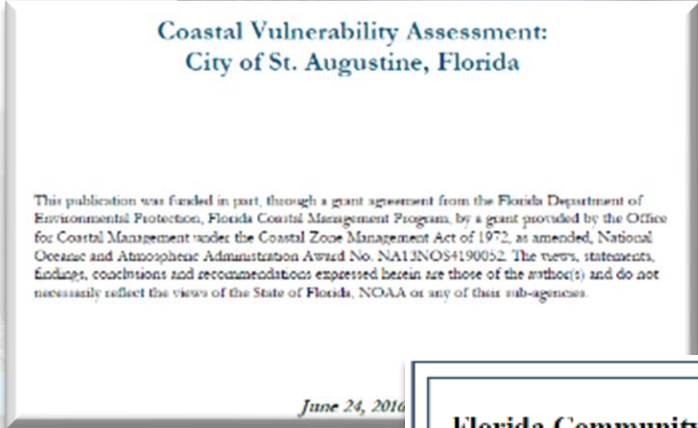
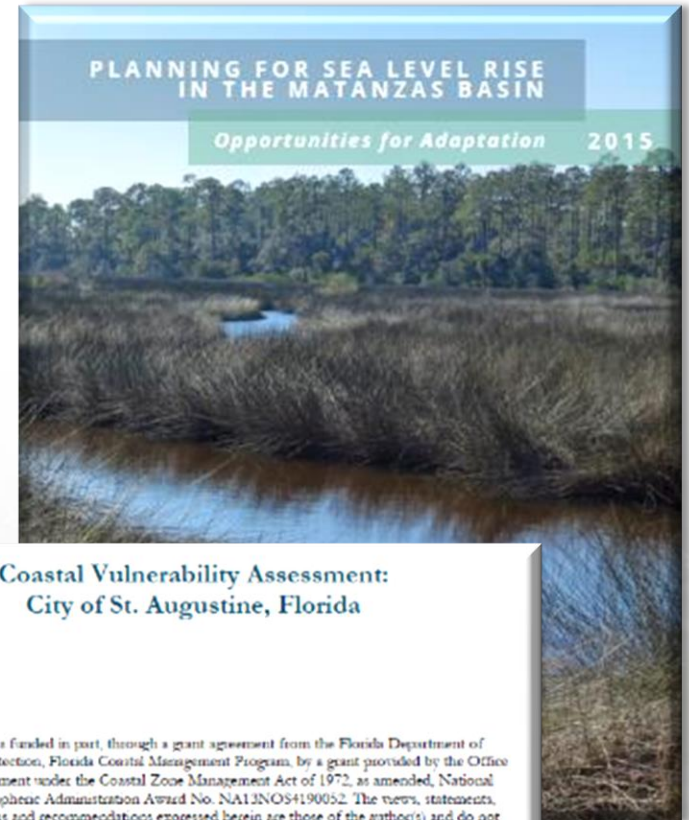
January 2014



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Planning Efforts

- **Planning for Sea Level Rise in the Matanzas Basin (2015)¹**
- **Community Resilience Initiative – Pilot Project (2016 – 2017)**
 - ❑ Coastal Vulnerability Assessment ²
 - ❑ Strategic Adaptation Plan ³



UF UNIVERSITY of FLORIDA



NATIONAL ESTUARINE
RESEARCH RESERVE SYSTEM
SCIENCE COLLABORATIVE



Planning Efforts



Coastal Vulnerability Assessment

- Evaluated total area flooded, roads, bridges, buildings, 2,550 historic and archeological resources, water and wastewater plants, groundwater supply
- **3 Scenarios:**
 - Mean Higher High Water – daily inundation about 2' NAVD88
 - Nuisance Flooding – 12-17 times per year, 3.75' NAVD88
 - 1% annual chance flood event – 26% chance in 30 years, 6-10' NAVD88

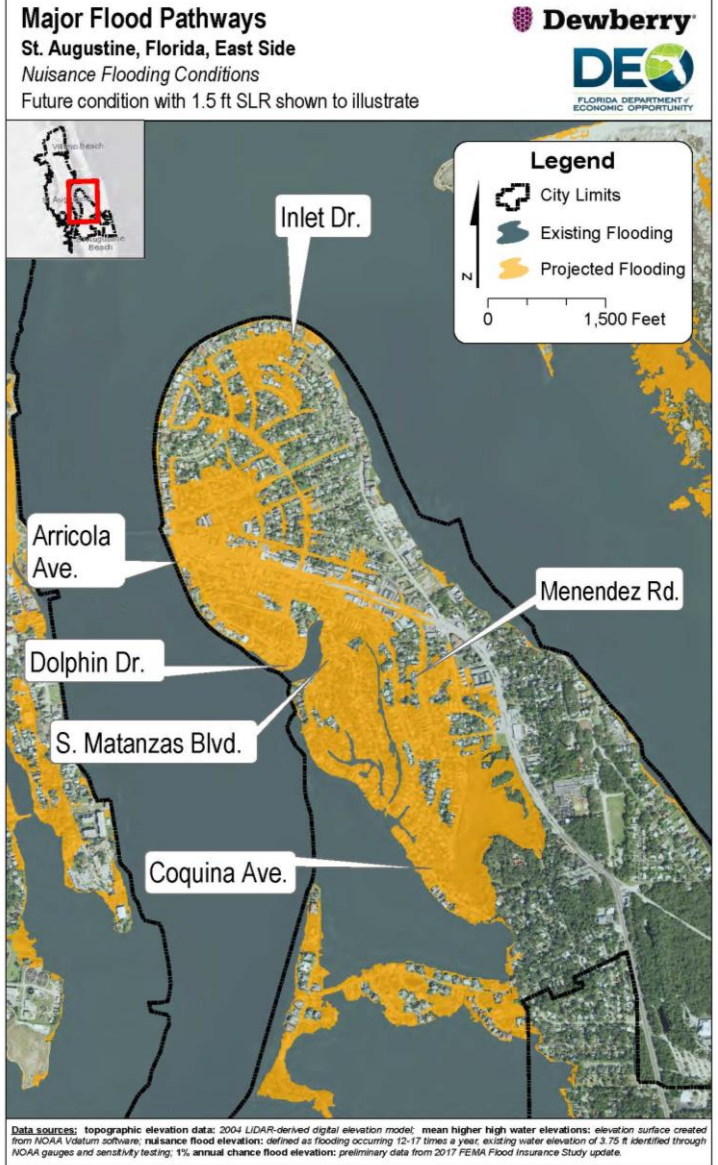


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Strategic Adaptation Plan:

- ✓ Educate the public about SLR & policy responses
- ✓ Develop baseline budgets
- ✓ Adopt policies that limit spending in areas where retreat or re-design are more effective
- ✓ Base decisions on FEMA's updated FIRMs
- ✓ Install LID/Green infrastructure
- ✓ **Targeted upgrades to City's stormwater system**
- ✓ WWTP options
- ✓ FDOT roadway improvements for resiliency
- ✓ Historic Preservation Comprehensive Plan

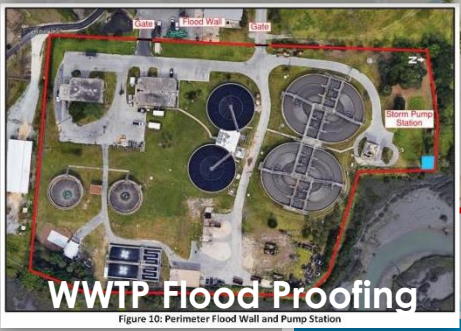
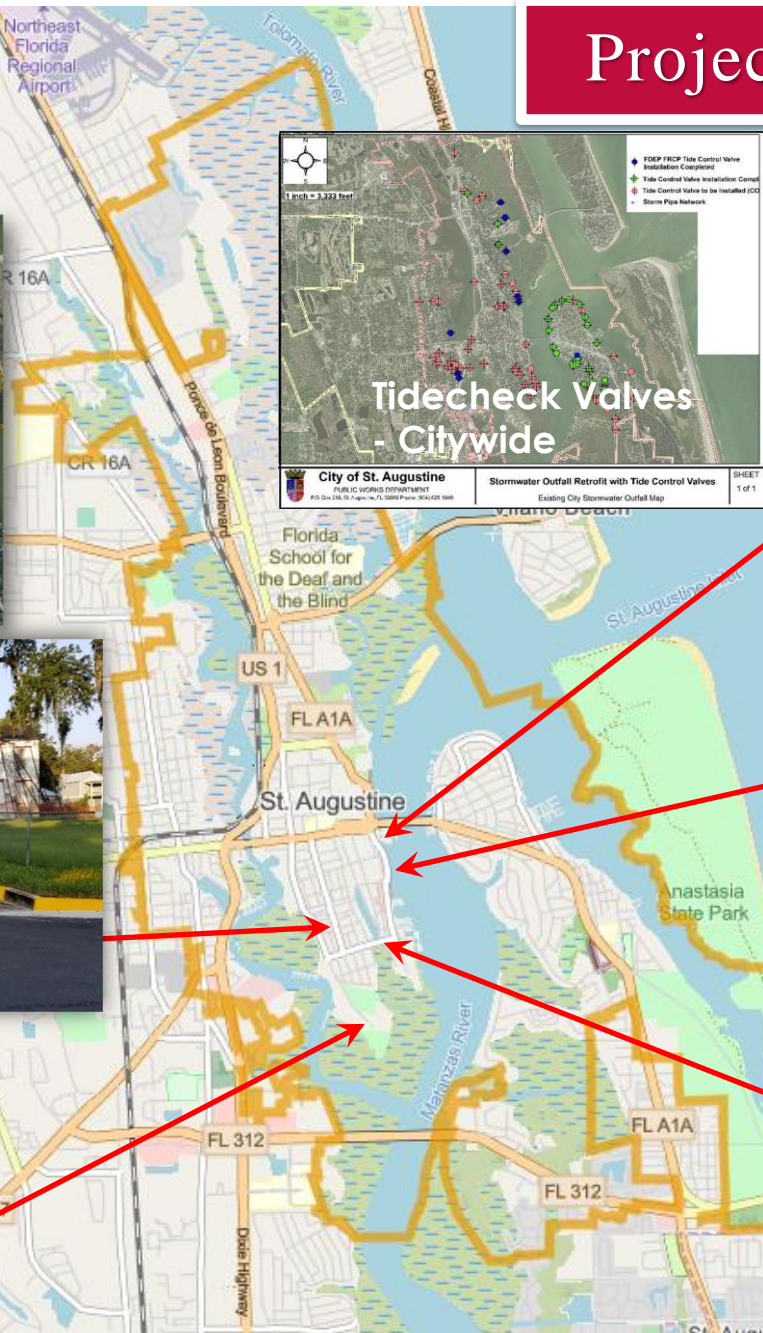
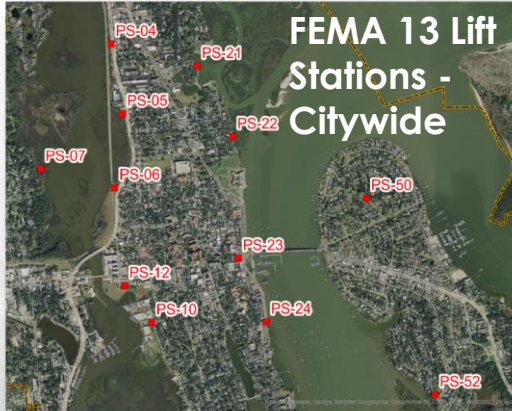
Planning Efforts





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Project Implementation

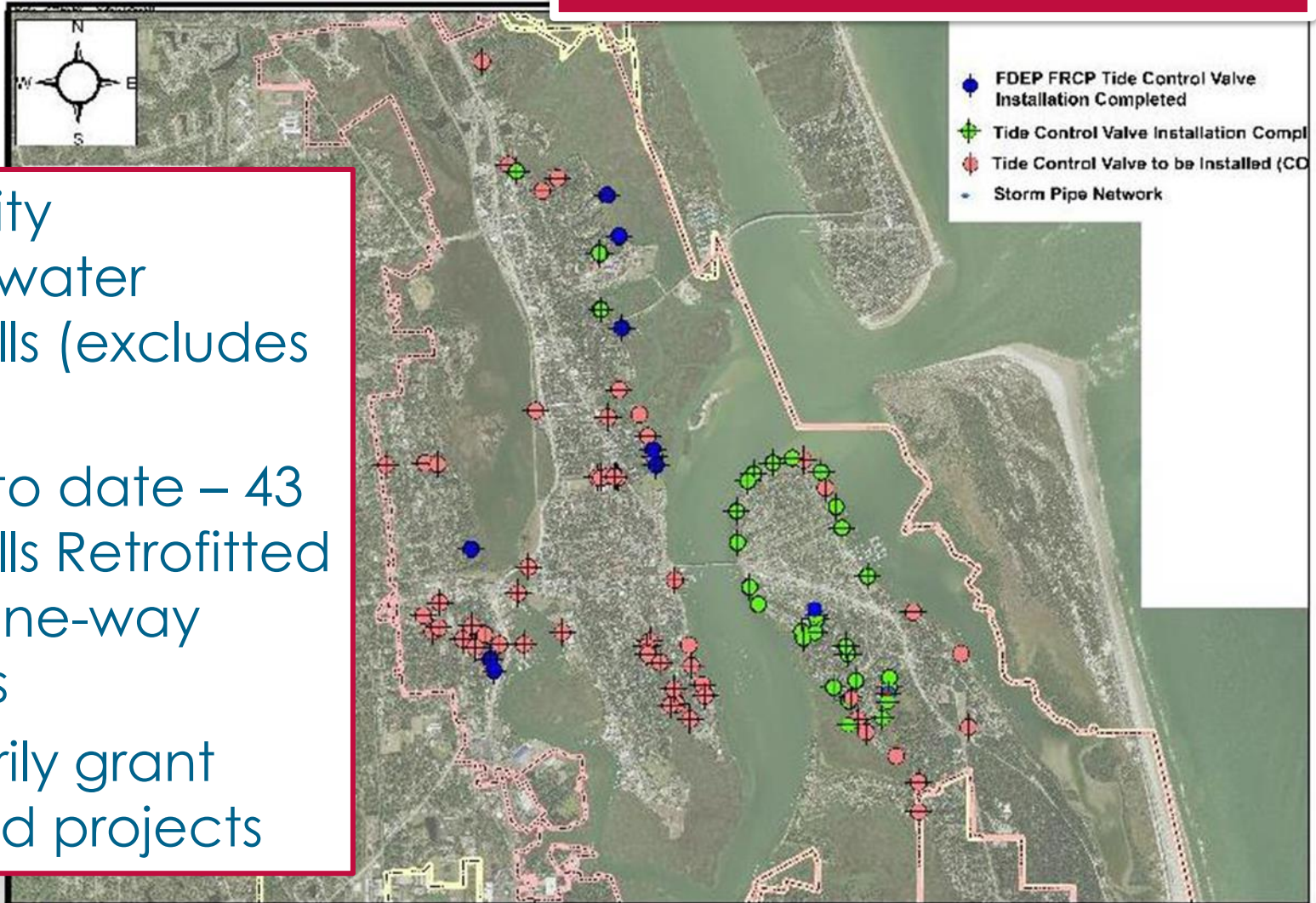




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Tide Check Valves

- ❖ 103 City Stormwater Outfalls (excludes FDOT)
- ❖ As of to date – 43 Outfalls Retrofitted with one-way valves
- ❖ Primarily grant funded projects



City of St. Augustine

PUBLIC WORKS DEPARTMENT
P.O. Box 210, St. Augustine, FL 32085 Phone: (904) 625 1040

Stormwater Outfall Retrofit with Tide Control Valves

Existing City Stormwater Outfall Map

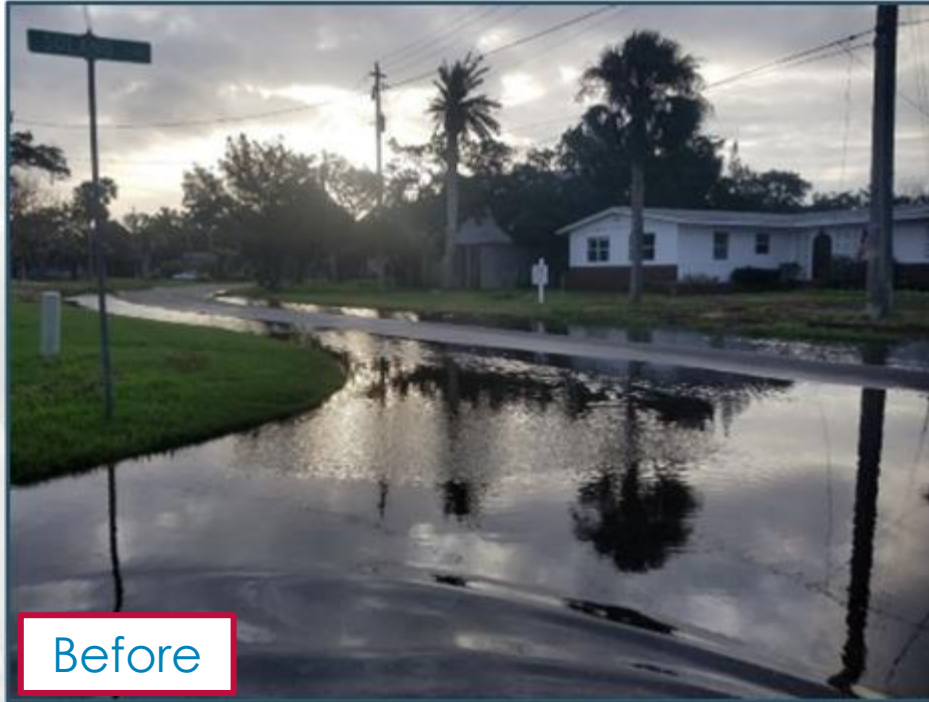
SHEET

1 of 1



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Tide Check Valves



Davis Shores – 27 Outfalls Retrofitted with Tideflex Checkmate³ and WaPro WaStop⁴ Inline Check Valves

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Tide Check Valves



- Pre-cleaned and flushed the pipe
- Installed partial plug in pipe
- Desilted outfall area
- Valve installation

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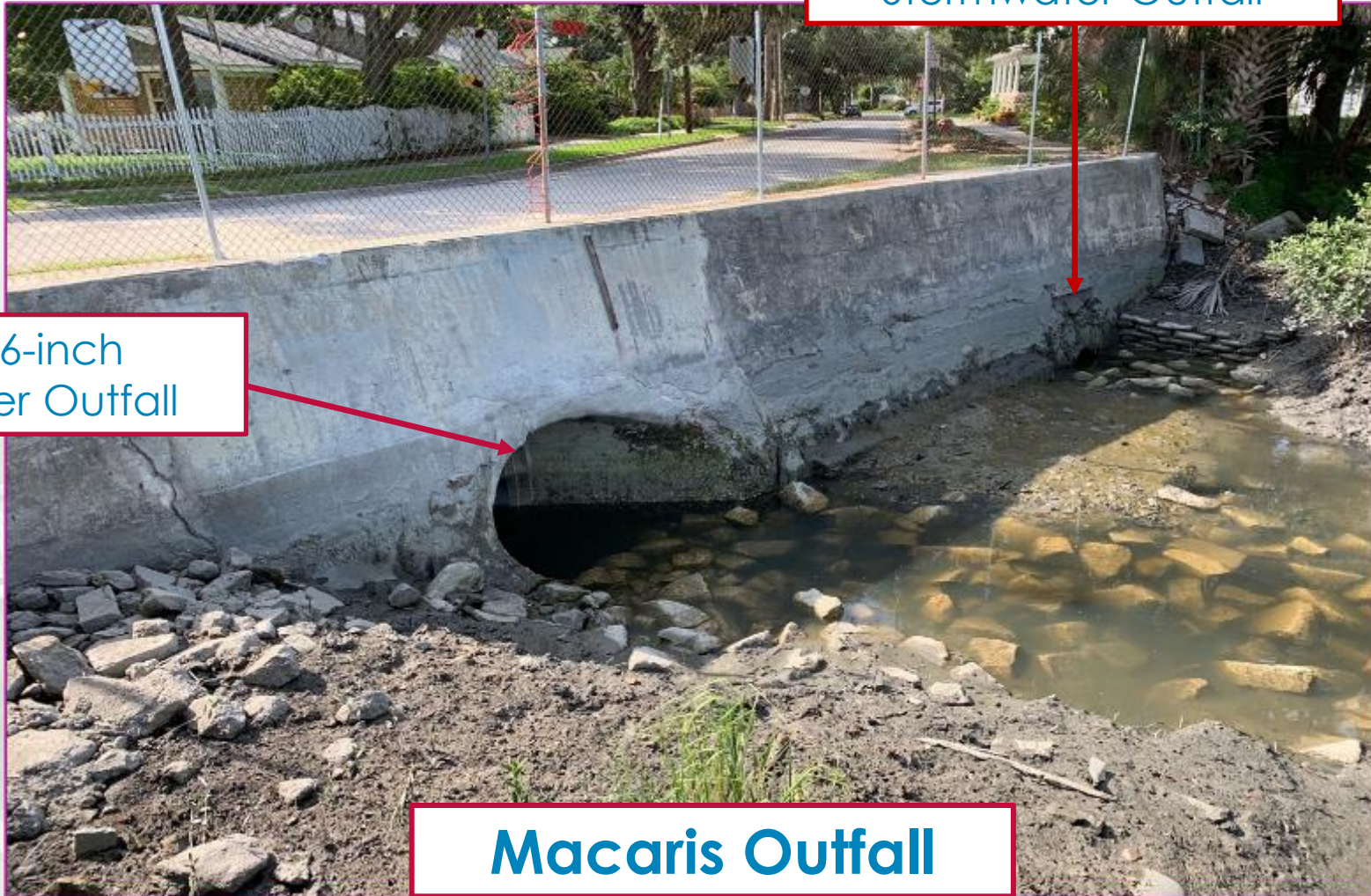


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Tide Check Valves

After: 30-inch
Stormwater Outfall

After: 66-inch
Stormwater Outfall



Macaris Outfall

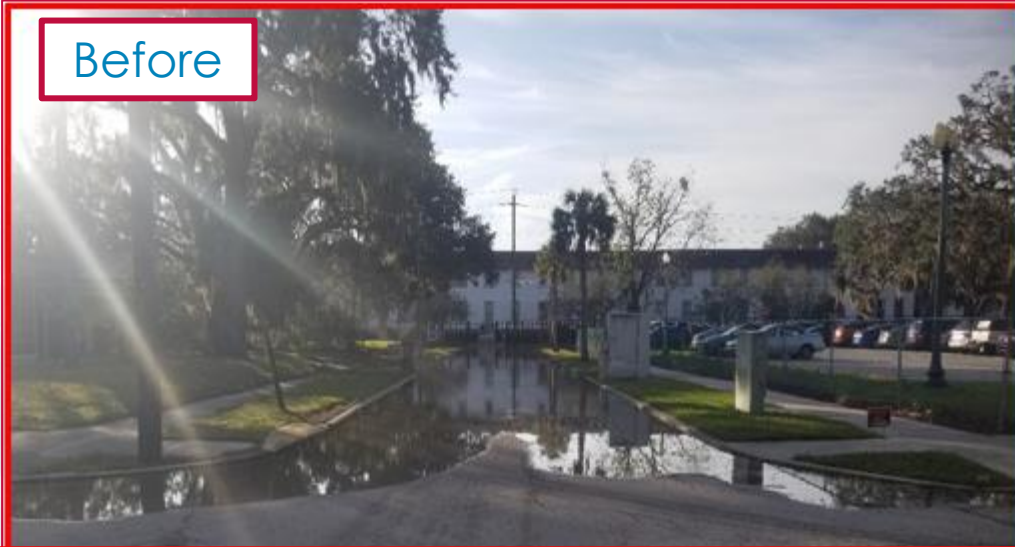


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Macaris Outfall

Tide Check Valves

Before



After



Before



After



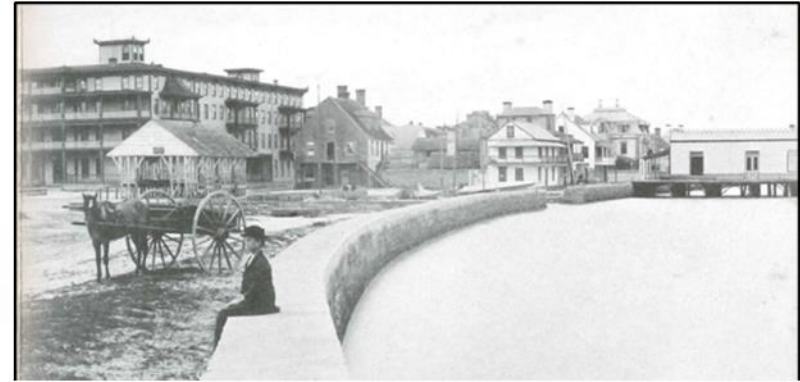


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Avenida Menendez Seawall

Completed 2013

- Suffered storm damages
- Required consensus building
- Encapsulated the original seawall
- Walking promenade
- Stormwater treatment
- Environmental mitigation
- Elevated to 7 feet NAVD
- FEMA/HMGP funding



FEMA



TAYLOR ENGINEERING, INC.



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Avenida Menendez Seawall - Connectivity

- Reinforce existing seawall to support new wall
- Replace failing section of seawall
- Elevate a section of seawall to tie into north and south elevations to “close the gap”
- Awarded HMGP funding – Phase 1 design in 2021





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- Completed in 2018
- Elevated existing seawall to 7 feet NAVD
- Installed drainage system
- Pedestrian walkway to connect historical seawall to the Bridge of Lions
- Florida Inland Navigation District (FIND) funded
- City contracted with DiMare Construction

Bayfront Park



M
MATTHEWS
DESIGN GROUP

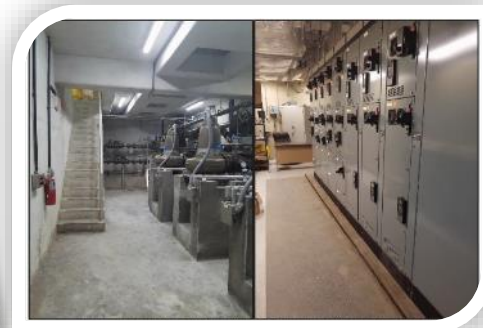
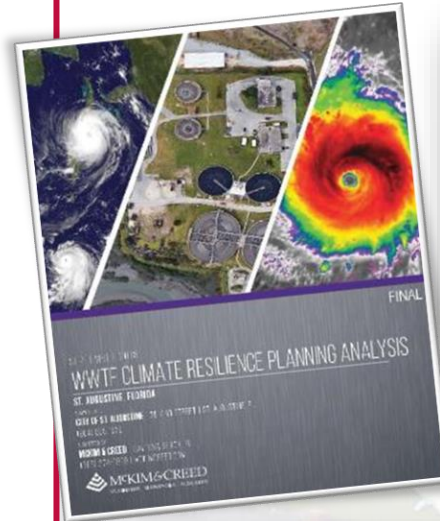




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Wastewater Treatment Plant Options for Resiliency

- Initially identified in the coastal vulnerability assessment as critical infrastructure at risk now
- Evaluated existing infrastructure to assess vulnerability of flooding from storm surge and projected Sea Level Rise



MCKIM & CREED
ENGINEERS SURVEYORS PLANNERS



Figure 10: Perimeter Flood Wall and Pump Station

Perimeter Wall and Pump Station Estimated Costs at Multiple Heights for Year 2030 (2018 dollars)

Type of Wall	Top Elevation (feet NAVD)	Average Height of Wall (feet)	Protection Cost	Category of Hurricane Protection Level (2030)	Preventable Damage Cost	Benefit/Cost Ratio
Sheet Pile	18	11	\$ 3,700,000	3	\$16,000,000	4.3
	20	13	\$ 4,200,000	4	\$21,000,000	5.0
	25	18	\$ 5,300,000	5	\$21,000,000	4.0



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Wastewater Treatment Plant Options for Resiliency

- Alternative lower cost solution
- Protection to 12 feet (plant is at \approx 7 feet NAVD 88)
- Most critical infrastructure protected
- Total cost \approx \$148,000

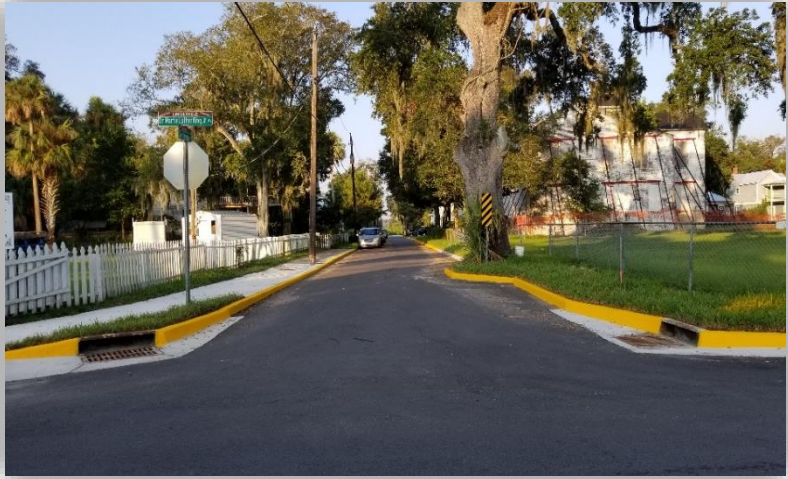




Lincolnville Utility Rehab and Drainage Improvement Project

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❖ Lincolnville Utility Rehabilitation Project is Completed !



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PUBLIC WORKS DEPARTMENT
P.O. Box 210, St. Augustine, FL 32085 Phone: (904) 825-1065

Lincolnville Region - Utility Rehabilitation
Proposed Project Map

SHEET
1 of 1



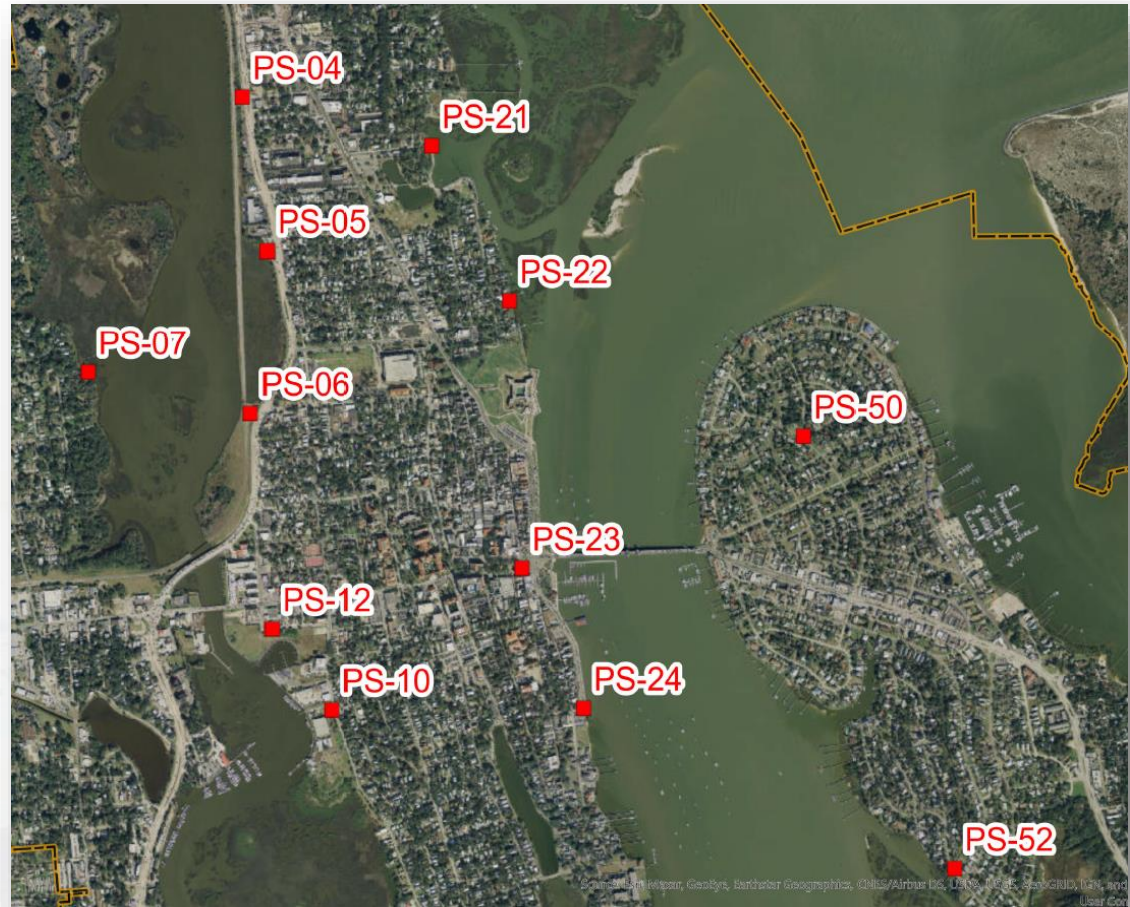
St. Johns River
Water Management District





FEMA 13 LIFT STATIONS REHABILITATION

- ❖ Bidding Complete
 - ❖ First 10 of 13 Stations
- ❖ Guaranteed maximum price for entire project \$13.8 M
- ❖ Notice to Proceed issued January 4, 2021
- ❖ Construction duration ≈ 2 years
- ❖ List of 13 Lift Stations to be Rehabilitated or Replaced:
 - ❖ LS-4, 5, 6, 7, 10, 11, 12, 21, 22, 23, 24, 50, and 52
- ❖ Arricola Ave. Force Main
- ❖ www.citystaug.com/FEMA13





Lake Maria Sanchez Flood Mitigation and Drainage Improvement Project

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- ❖ Hurricane Matthew 2016– Federal Funding Available for Hazard Mitigation Projects
- ❖ City re-visited the Downtown Drainage Improvement project:
- ❖ Increased scope
- ❖ Address future vulnerabilities
- ❖ Address current flooding
- ❖ Make the City more resilient
- ❖ The City applied in June 2017 for Federal funding for this project - #1 ranked project
- ❖ FEMA notified City of funding award, design initiated in September 2018



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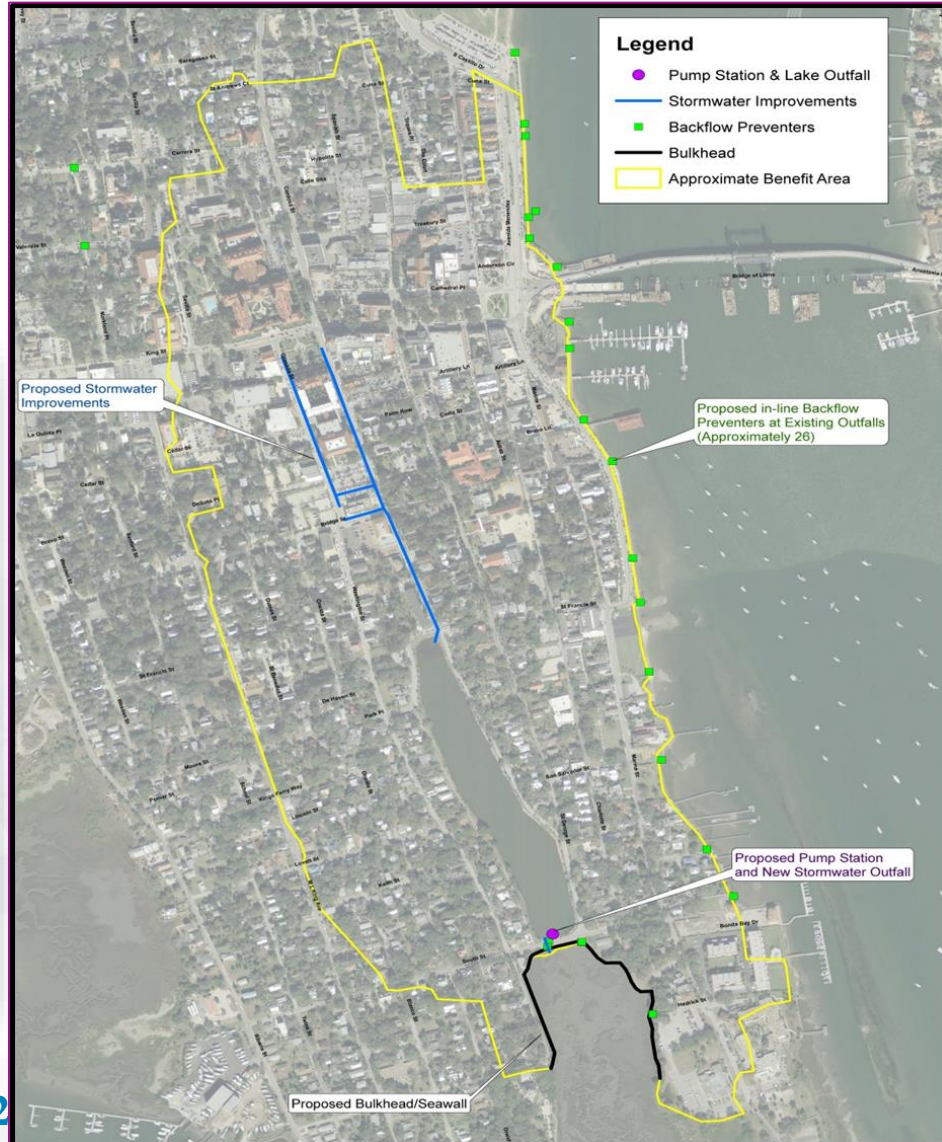
Lake Maria Sanchez Flood Mitigation and Drainage Improvement Project

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- ❖ Lake Maria Sanchez Flood Mitigation and Drainage Improvement Project is under design



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Lake Maria Sanchez Flood Mitigation and Drainage Improvement Project

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❖ Flood Protection (Structures)

- ✓ Estimated 200 Acre Benefit Area
- ✓ 25-Year Storm Event + 2050 Sea Level Rise (6.4 Feet Storm Surge)
- ✓ Protect 186 Structures (Currently at Risk)



❖ Flood Protection (Roadways)

- ✓ 10-Year, 24-Hour Rainfall Event Level of Service (7.6 inches)
- ✓ Protected from Coastal Flooding
- ✓ Reduces both Depth and Duration of flooding



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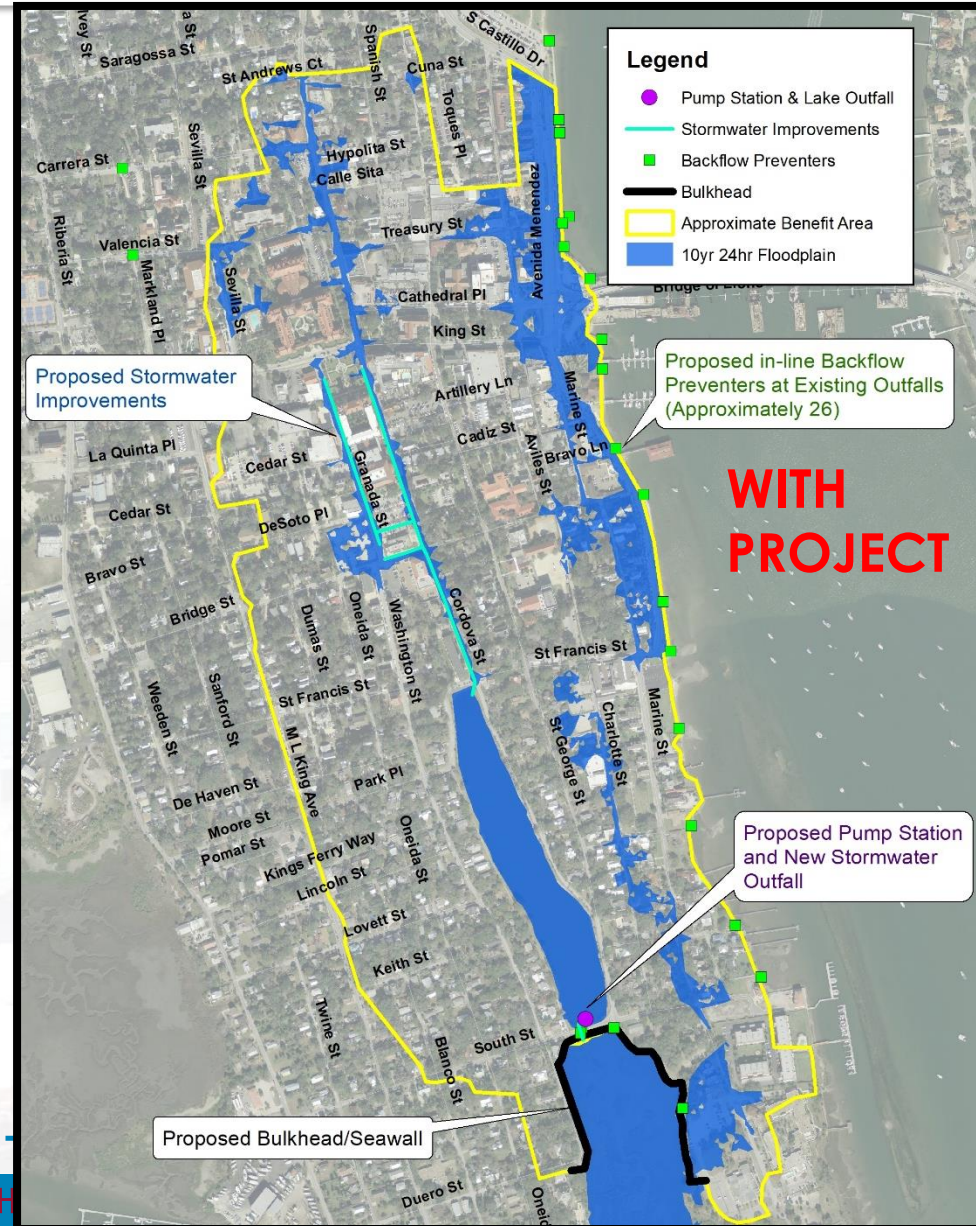


Lake Maria Sanchez Flood Mitigation and Drainage Improvement Project





Lake Maria Sanchez Flood Mitigation and Drainage Improvement Project





Lake Maria Sanchez Flood Mitigation and Drainage Improvement Project

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❖ Flood Wall - Rendering





Lake Maria Sanchez Flood Mitigation and Drainage Improvement Project

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❖ Pump Station - Rendering



**LAKE MARIA SANCHEZ
PUMP STATION BLDG**

Proposed
FENCE + LANDSCAPE

CITY OF ST AUGUSTINE EST. 1565 | MCKIM & CREED | Kimley»Horn





Lake Maria Sanchez Flood Mitigation and Drainage Improvement Project

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❖ South Street Facing East - Rendering





Lake Maria Sanchez Flood Mitigation and Drainage Improvement Project

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❖ Moving Forward:

- ❑ Design proceeding – estimated to be completed in 2021
- ❑ Submit to the State and FEMA, allow for their review of the project design – 2022
- ❑ Pending FEMA approval to proceed to Phase 2 (Construction), initiate bidding – 2022-2023
- ❑ Construction – 2023-2024 (approximately 2 years to construct the entire project)

❖ Project Information:

- ❑ www.citystaug.com/LakeMariaSanchez
- ❑ Submit your comments/questions at stormwater@citystaug.com or (904) 825-1040

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Moving Forward

❖ Current Flood Mitigation Investments ≈ \$36,133,000 (\$27,611,932 grant funded):

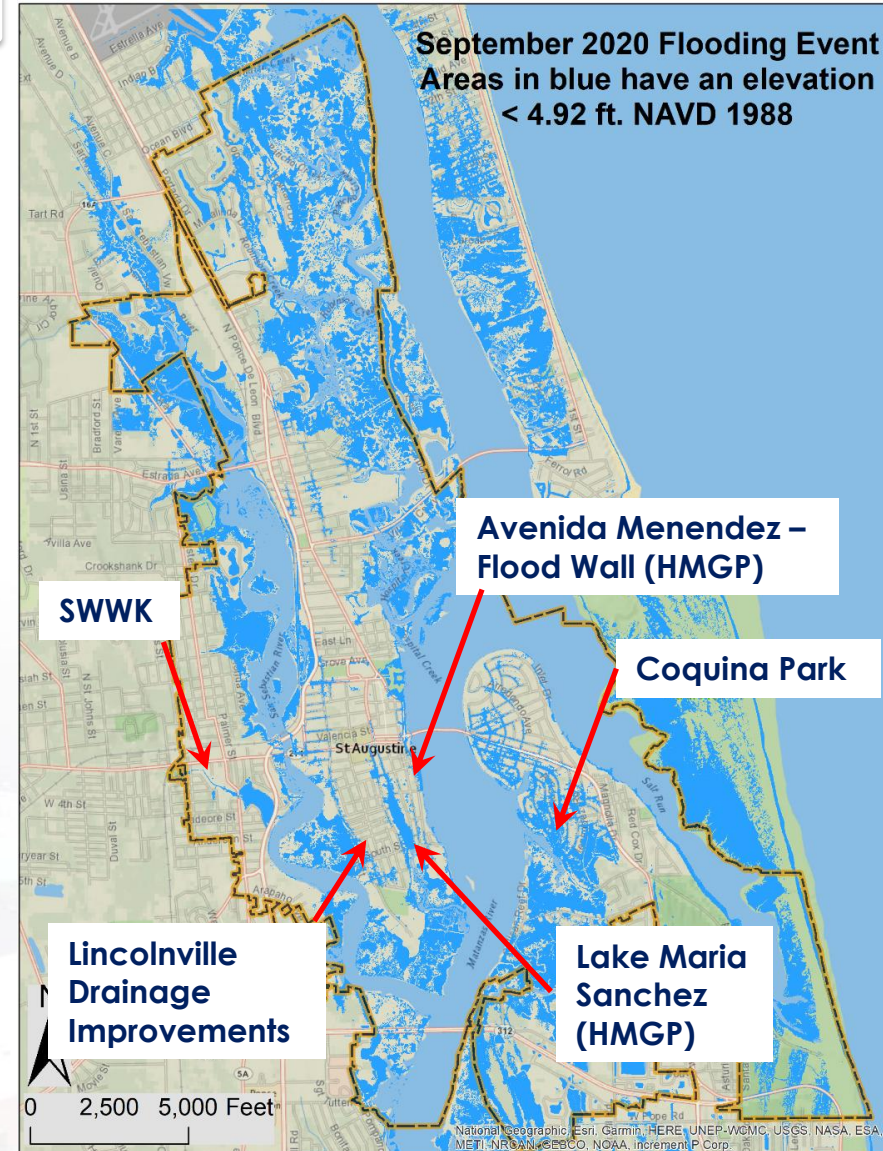
- ❑ Lake Maria Sanchez*
- ❑ Avenida Menendez Flood Wall*
- ❑ Installed tide check valves (43 Citywide)**
- ❑ Coquina Park
- ❑ South Whitney/West King (SWWK) Flood Mitigation*
- ❑ South Dixie Highway Culvert Replacement**
- ❑ Lincolnville Utility and Drainage Improvements*, **
- ❑ FEMA 13 Lift Station Hardening and Flood Proofing*

❖ Additional Flood Mitigation Projects planned &/or in progress:

- ❑ South Davis Shores Resiliency Master Plan
- ❑ Septic Tank Vulnerability Assessment to SLR
- ❑ Stormwater Outfall Resiliency Master Plan
- ❑ Oyster Creek Flood Mitigation project
- ❑ Other Neighborhood Resiliency projects

*Denotes Federally Funded Project (FEMA -PA, HMGP; HUD/DEO-CDBG-NR)

**Denotes State Funded Project (SJRWMD, FDEP)





References and Recognition

1. Stormwater Master Plan Update - Phase 1: City of St. Augustine. February 2013. CDM Smith.
2. Planning in the Matanzas Basin: Opportunities for Adaptation. Kathryn Frank, Ph.D.; Michael Volk, MLA; Dawn Jourdan, Ph.D., Esq.; August 2015.
3. Coastal Vulnerability Assessment: City of St., Augustine, FL. June 2016.
<https://www.citystaug.com/570/Coastal-Vulnerability>
4. Florida Community Resiliency Initiative Pilot Project: Adaptation Plan for St. Augustine, FL. May 2017.
<https://www.citystaug.com/570/Coastal-Vulnerability>
5. Tideflex Technologies - Tideflex Checkmate Ultraflex Slip-in Inline Check Valves.
<http://www.redvalve.com/tideflex/tideflex-products/checkmate-inline-check-valve/>
6. Wapro - Wastop Inline Check Valve.
<http://www.wapro.com/en-us/content/wastop-inline-check-valve>
7. Photo credits: Alamy Stock Photo – Sean Pavone (bridge at sea), Rob Clement (Castillo de San Marcos), AP Photo – John Bazemore (flooding at bayfront/fort),
8. St Johns River Water Management District Cost Share Programs – Lou Donnangelo, Program Director, Email: ldonnangelo@sjrwm.com
<https://www.sjrwm.com/localgovernments/funding/>
9. Florida Department of Environmental Protection Florida Resilient Grant Program – Whitney Gray, Program Administrator, email: Whitney.Gray@FloridaDEP.gov





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Questions and Discussion