



**Davis Shores
Tide Check Valve Program –
Project Status Update**

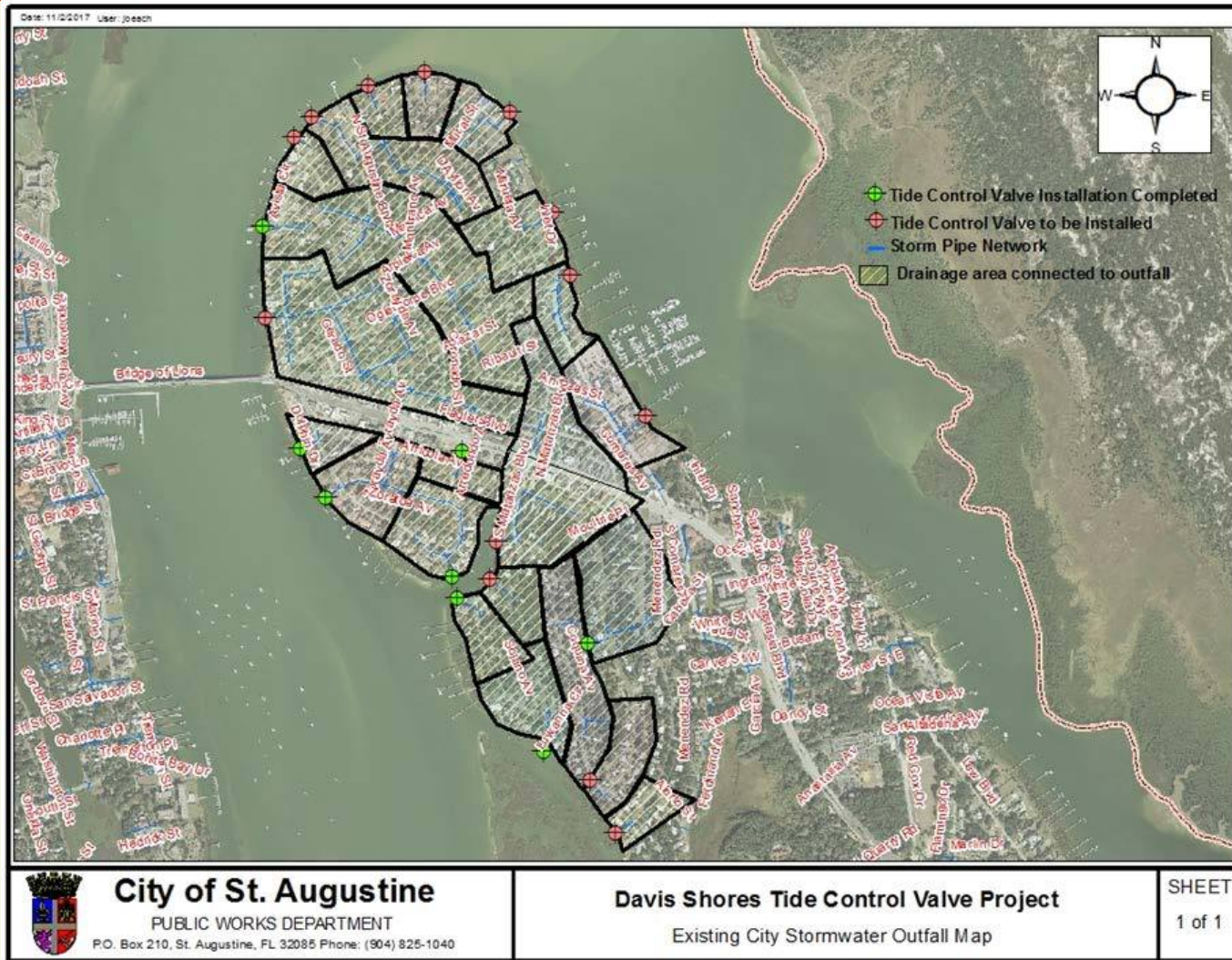
**Presented to: SANDS
February 13, 2018**

**Presented by:
Jessica L. Beach, P.E.**



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Existing Stormwater Outfall Map for Davis Shores



- 21 total outfalls (represented by green and red dots)
 - 17 outfalls as part of SJRWMD cost share
- “Blue” lines are storm pipe network
- Cross-hatched areas represent drainage areas connected to outfalls



Example of Existing City Outfall – High vs. Low Tide

- The City's stormwater system will gravity discharge through its underground pipe network and into the Matanzas Inlet or Salt Run when the tides are low (or below) the bottom of the outfall pipe. As the tide rises, especially during higher than normal tide events, the salt water can back up and into the pipe network, and in extreme conditions, cause street flooding.



Stormwater
Outfall Pipe
(submerged
during high tide)



Same
stormwater
outfall pipe
exposed during
low tide

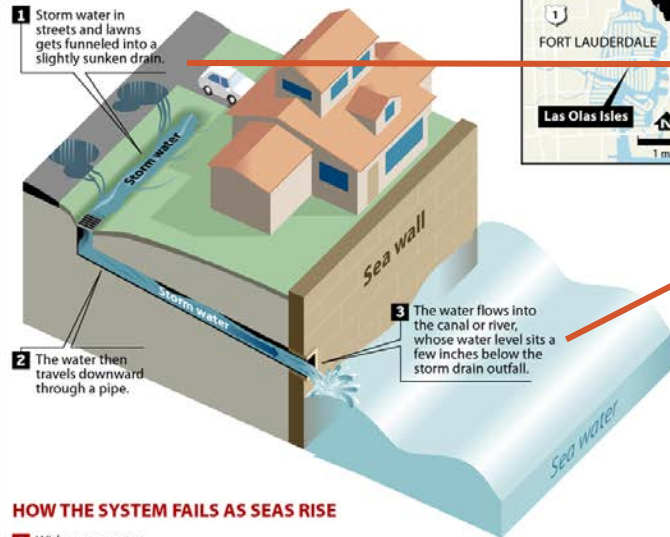


Schematic showing how the City Drainage System Works [3]

Surging Seas Inundate Ft. Lauderdale's Drainage System

Ft. Lauderdale's 165 miles of canals and rivers once functioned reliably as the city's drainage system. But rising seas and heavier floods are rendering it useless—overwhelming the infrastructure and causing backflooding in the streets.

HOW IT WAS DESIGNED TO WORK

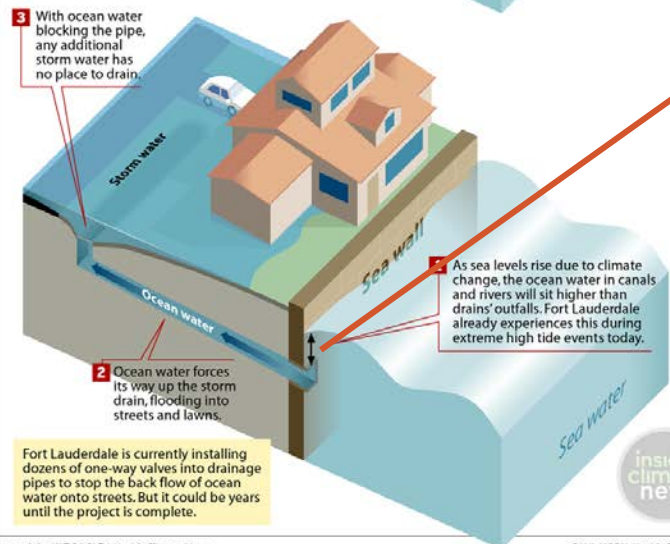


The City of St. Augustine's drainage system functions similarly to the City of Ft. Lauderdale's system.

During rainfall events, stormwater is collected within the streets either through a drainage swale or drainage inlet.

Under low tide conditions, stormwater can gravity discharge through the existing pipe and into the Matanzas River or Salt Run.

HOW THE SYSTEM FAILS AS SEAS RISE



Fort Lauderdale is currently installing dozens of one-way valves into drainage pipes to stop the back flow of ocean water onto streets. But it could be years until the project is complete.



During high tide events, sea water can enter into the pipe network and cause street flooding. If rainfall also occurs during this time, it becomes "trapped" and cannot gravity drain until the tide falls, this can worsen street flooding conditions.

Source: Inside Climate News [3]



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Recent Nor'easter + “King Tide” Effects

- In addition to tidal flooding events, if weather conditions persist concurrently with tidal flooding (such as rainfall or Nor'easter winds), this can significantly amplify the flooding effects. It is not uncommon during these Nor'easter events, that the winds push tide water further up into the storm water collection system, resulting in more extensive road flooding.



Documented King Tide + Nor'easter Conditions – October 2017



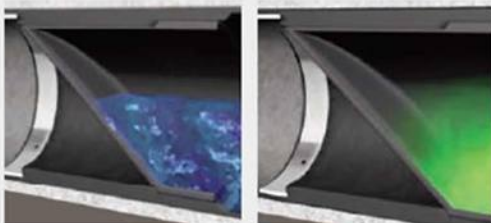
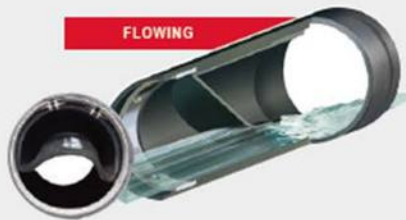
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Example of Non-functioning Outfall Valve

- The City has several locations where there are non-functioning valves
- Once these valves reach their life expectancy, they must be replaced
- Documented tidal street flooding where either there is no valve or a non-functioning valve
- New design option – valve that is located inside the pipe (or “in- line”)
- Two types of in-line valves the City is testing



Types of Valves being Tested to Reduce Nuisance Flooding



For an animated demonstration of the CheckMate® in operation, please visit: <http://www.tideflex.com/checkmate>

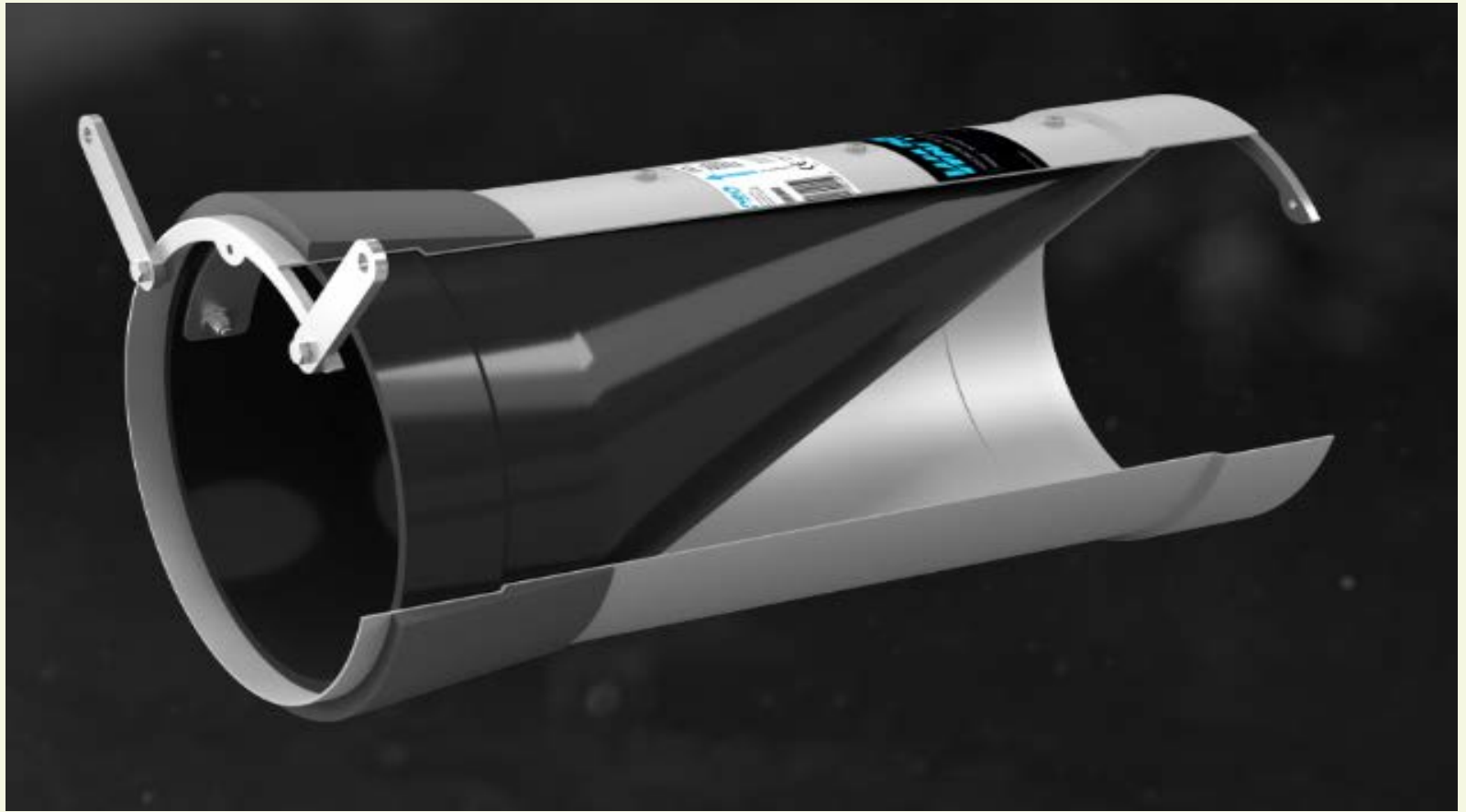


One type of tide check valve, Tideflex CheckMate Inline Check Valve^[6] will allow stormwater to drain out under lower tide conditions. During high tide, the valve will prevent sea water from backing up into the stormwater pipe network.



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Types of Valves being Tested to Reduce Nuisance Flooding

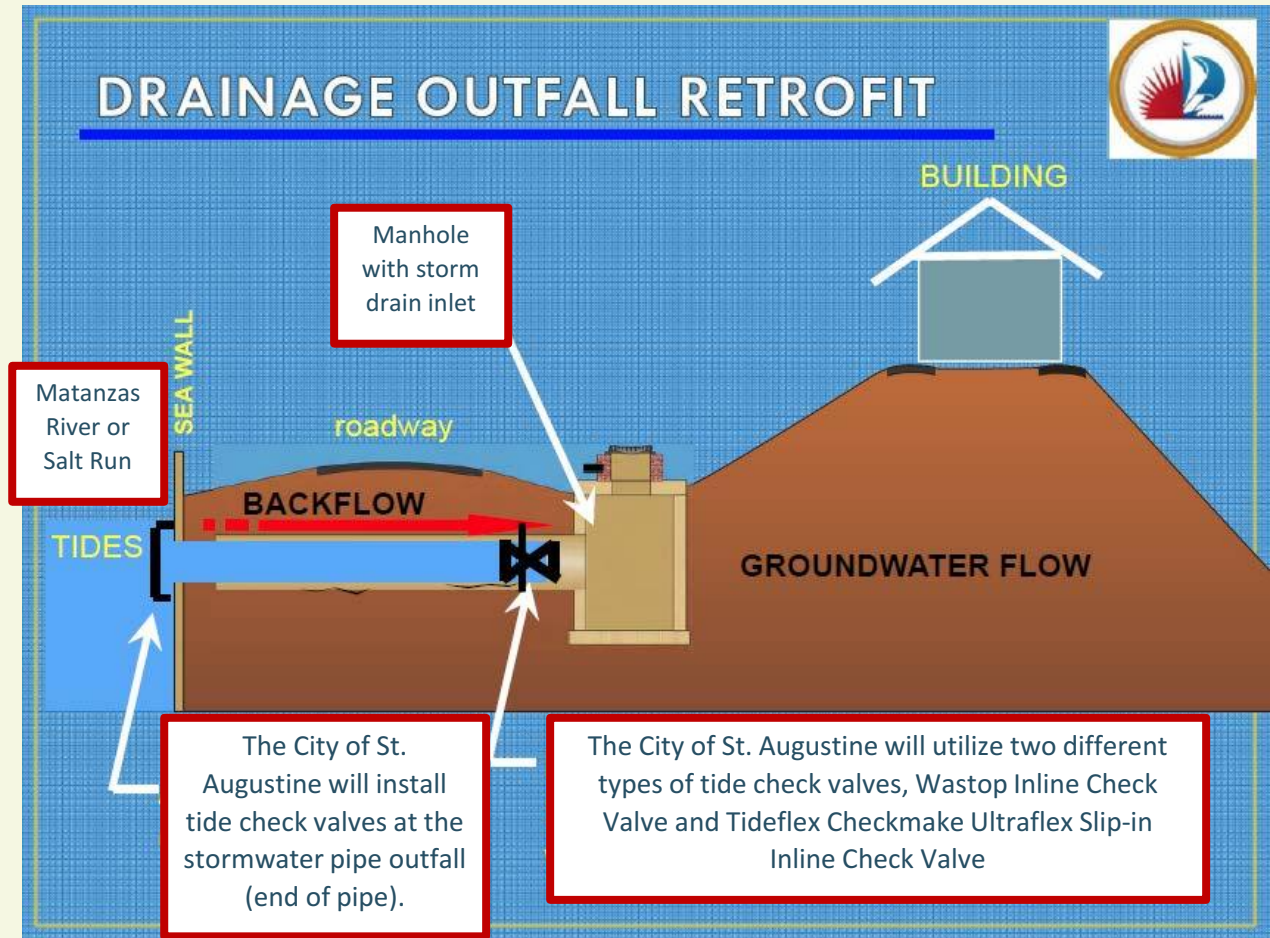


Another type of tide check valve, WAPRO Wastop Inline Check Valve^[5] functions similarly to the Tideflex but is manufactured out of different material and has a lower head loss differential.



How the valves will help reduce nuisance tidal flooding

- Valves will be installed at existing storm pipe outfalls
- Valves will prevent tidal waters from entering the storm drain system and reduce street flooding
- This addresses tidal flooding but does not prevent storm surge due to a Hurricane or Tropical Storm



Drainage Outfall Retrofit Schematic provided by the City of Ft. Lauderdale^[4] and adopted by the City of St. Augustine.



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Installed Valves – Dolphin Drive – Non SJRWMD Cost Share Valves

- Before SJRWMD Cost Share Funding became available, the City has installed (4) Tideflex Checkmate Ultraflex Slip-in Inline Check Valves (3 on Dolphin Drive; 1 on Arricola Ave), which were monitored during the king tide event + Nor'easter in October. It was noted that the streets where these valves were installed were dry, whereas other areas that did not have a valve or a non-functioning valve had flooding.

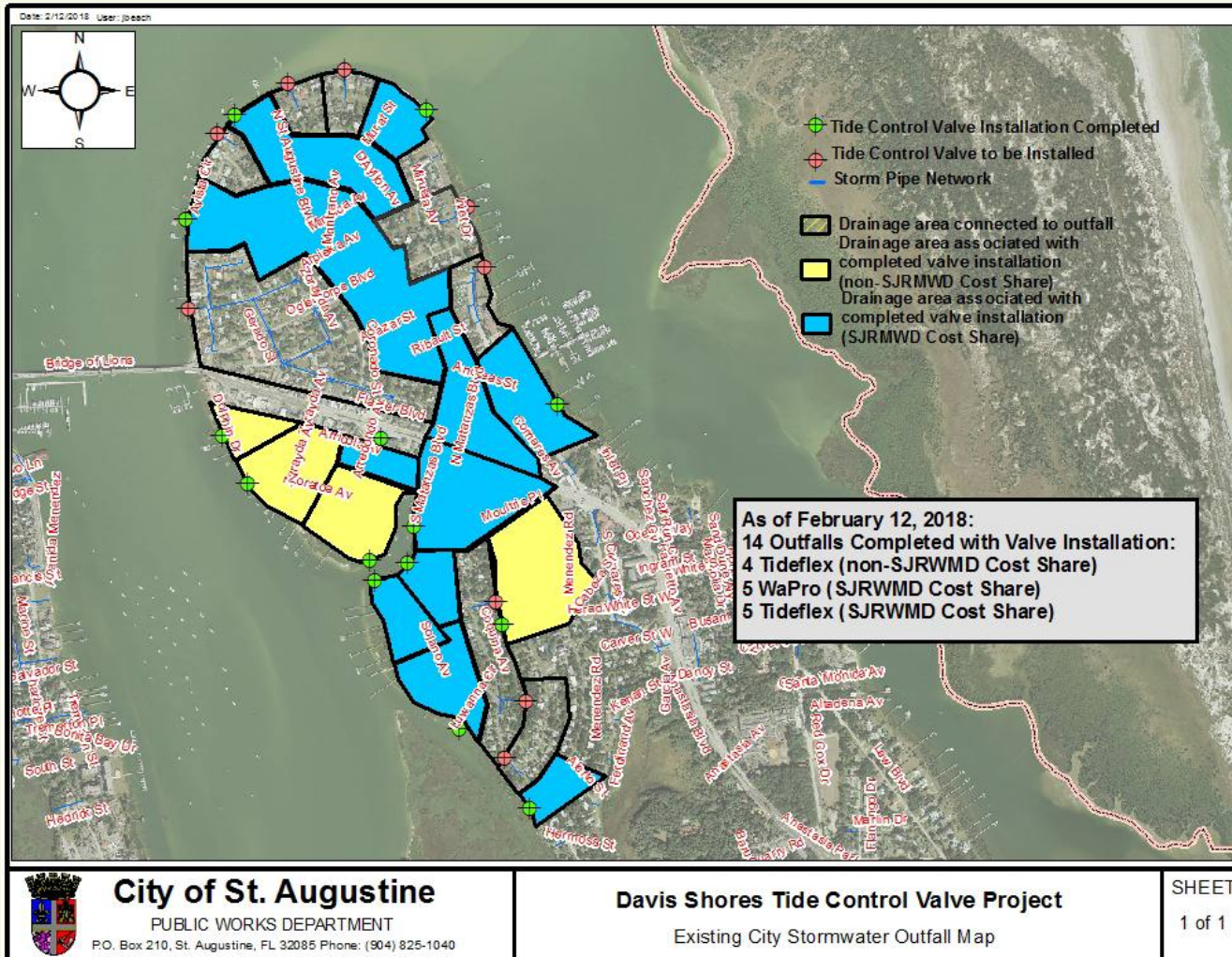


Dolphin Drive during King Tide + Nor'easter Conditions –
October 2017 (with valves installed)



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Installed Valves To Date – Project Map



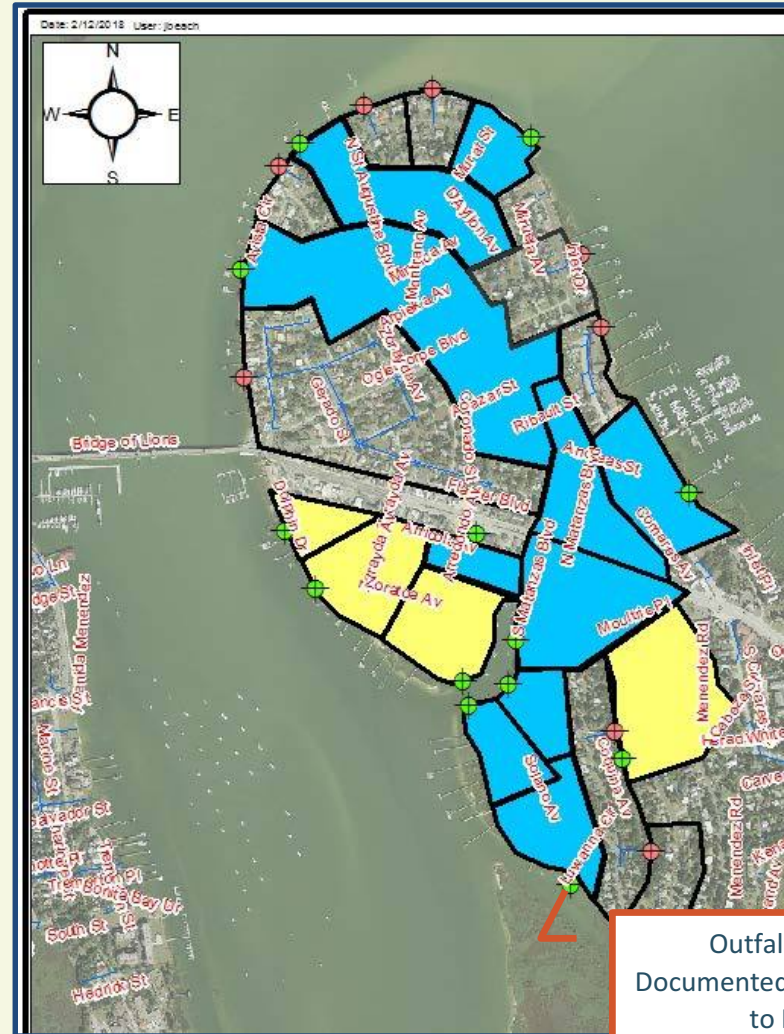
- As of February 12, 2018, the City has installed a **total of 14 valves**
 - 4 non SJRWMD Cost Share
 - 10 SJRWMD Cost Share
- 3 more scheduled for installation within the next 2 weeks
- 6 more valves to be ordered to complete the project (more complicated outfalls)

Map showing currently installed valves and drainage areas served by that valve



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Installed Valves – Stormwater Crew in Action



Outfall ID# OF-0117
Documented Road Flooding Due
to High Tides



Installed Valves – Before and After



Installed Valves – Before and After



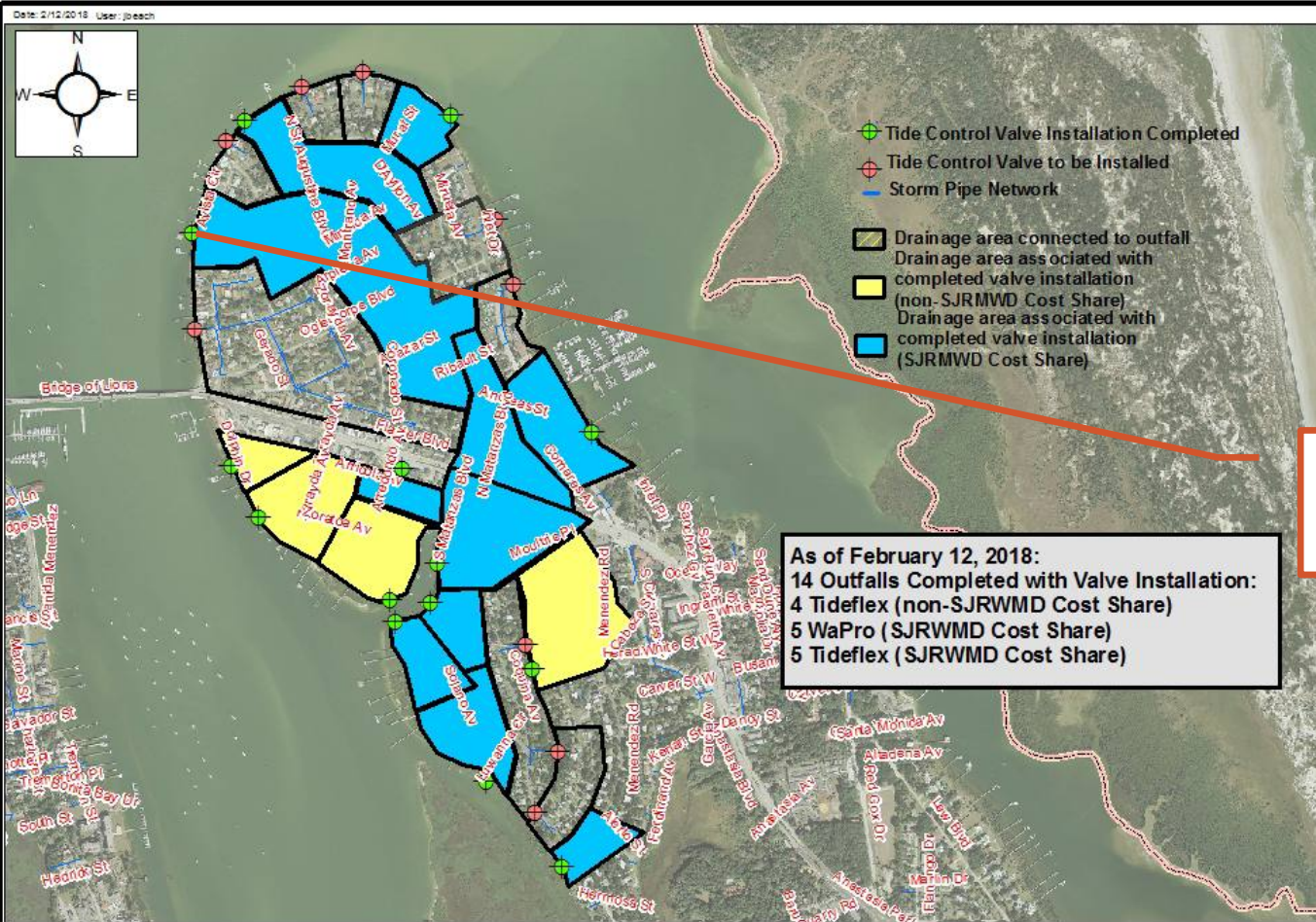
OF-0117 (Before): street flooding during King Tide event (October 2017) due to non-functioning valve



OF-0117 (After): no street flooding during King Tide event (December 2017) - tidal flooding eliminated



Installed Valves – Stormwater Crew in Action



City of St. Augustine

PUBLIC WORKS DEPARTMENT
 P.O. Box 210, St. Augustine, FL 32085 Phone: (904) 825-1040

Davis Shores Tide Control Valve Project

Existing City Stormwater Outfall Map

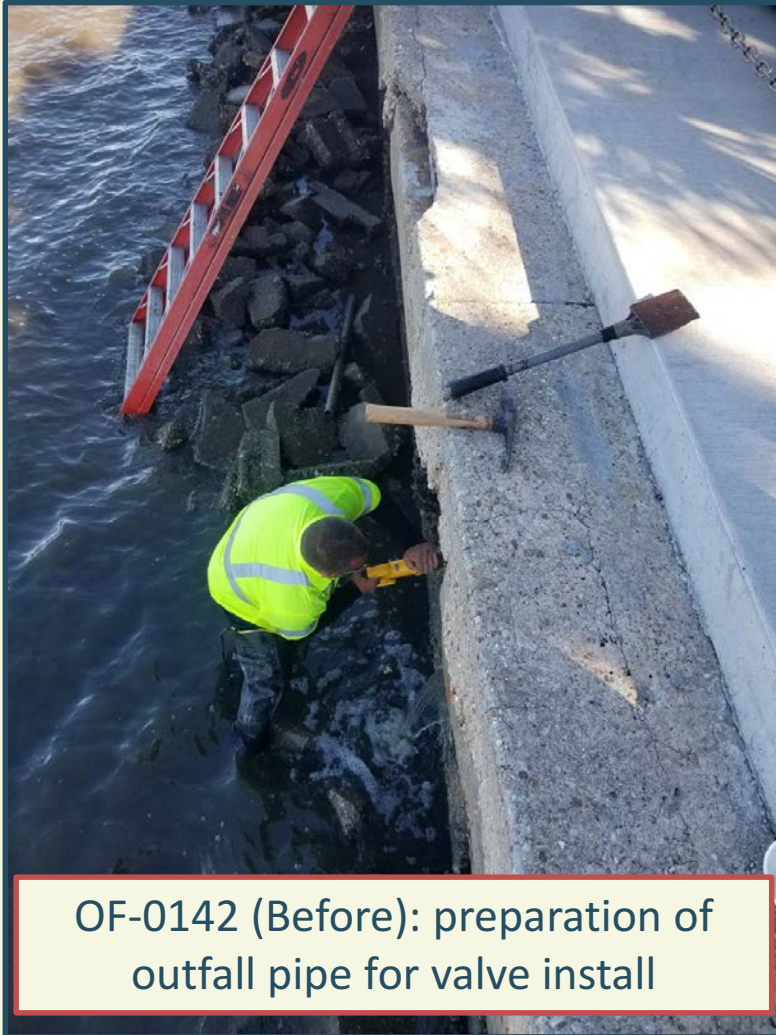
SHEET

1 of 1



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Installed Valves – Stormwater Crew in Action



OF-0142 (Before): preparation of outfall pipe for valve install



OF-0142 (Before): 30-inch WaPro WASTOP inline Check Valve



Installed Valves – Stormwater Crew in Action



OF-0142 (After): valve has to be secured and lowered to outfall pipe for installation



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Installed Valves – Stormwater Crew in Action



OF-0142 (After): valve inserted into outfall pipe



OF-0142 (After): completing valve installation



Installed Valves – Before and After



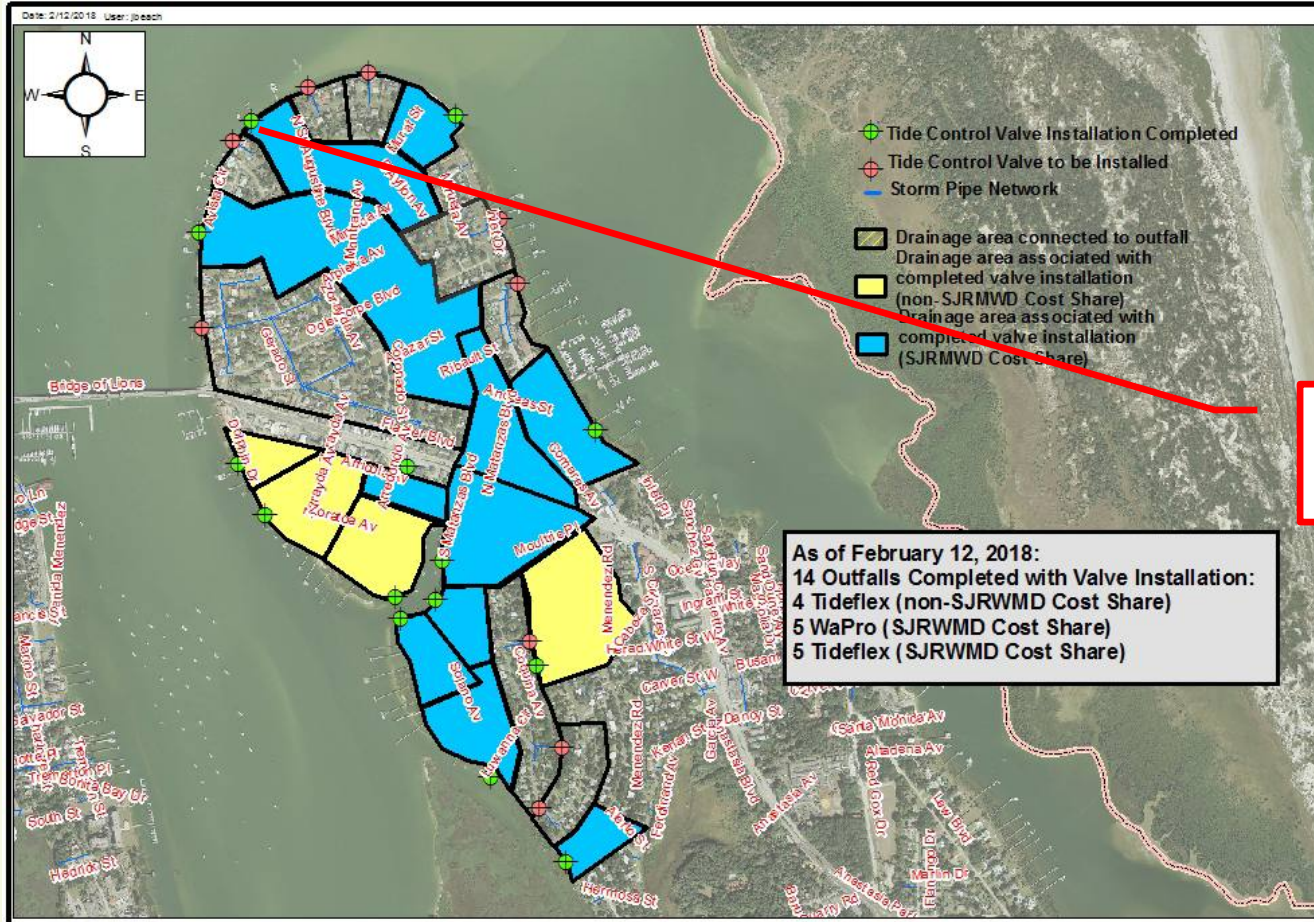
OF-0142 (Before): street flooding during King Tide event (October 2017) due to no valve in outfall



OF-0142 (After): no street flooding during King Tide event (December 2017) - tidal flooding eliminated



Installed Valves – Stormwater Crew in Action



As of February 12, 2018:
 14 Outfalls Completed with Valve Installation:
 4 Tideflex (non-SJRWMD Cost Share)
 5 WaPro (SJRWMD Cost Share)
 5 Tideflex (SJRWMD Cost Share)

Outfall ID# OF-0139 Documented Road Flooding Due to High Tides

Installed Valves – Stormwater Crew in Action



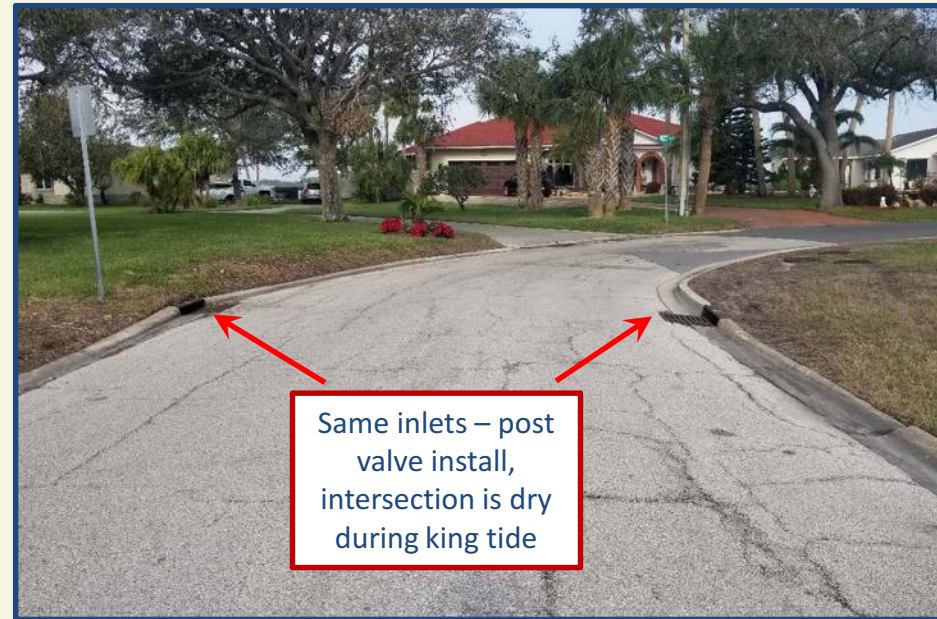
OF-0142 (After): Crew installing valve into outfall pipe



OF-0142 (After): Crew securing valve with straps onto outfall pipe



Installed Valves – Before and After



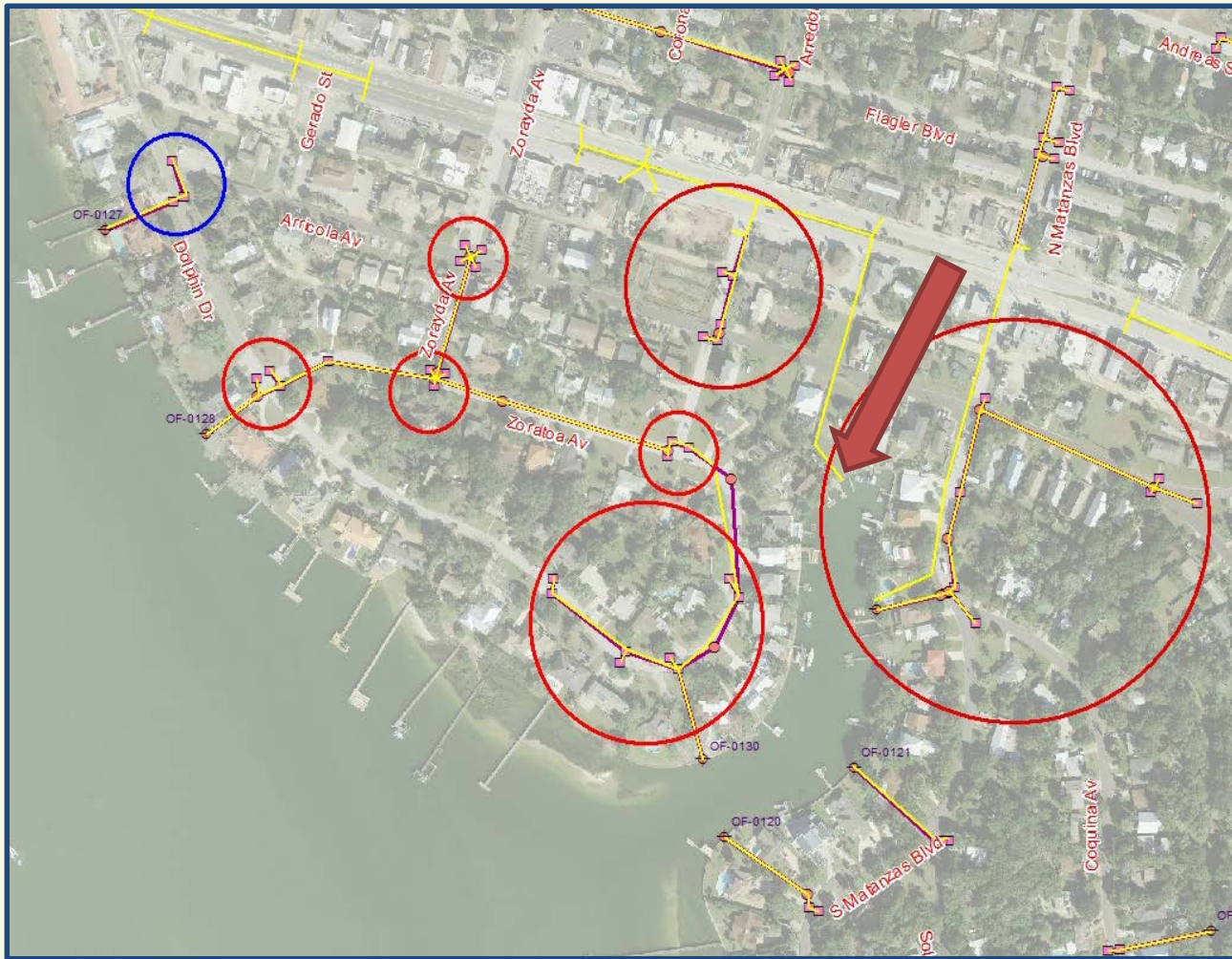
OF-0139 (Before): street flooding during King Tide event (October 2017) due to no valve in outfall

OF-0139 (After): no street flooding during King Tide event (December 2017) - tidal flooding eliminated



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Limitations of the Tide Check Valves



If the system is “breached” there will be street flooding:

1. Overtopping of the bulkhead or lowest elevation
2. Entry into storm system where there is no valve
3. Once it enters the streets, it flows to other areas

Example shown here: street was dry (blue circle) where it was isolated; streets were flooded (red circle) where there was entry through an outfall with no valve (FDOT Outfall, red arrow).



Limitations of the Tide Check Valves



King Tide + Nor'easter Conditions – January 2, 2018

- High tide at 5.8 feet (City Docks)
- Winds – sustained 20 + mph
- Added **2-feet** to high tide elevation



Limitations of the Tide Check Valves



Limitations of the Tide Check Valves - City system connects with FDOT Outfalls



- The City (purple lines) connects to FDOT storm system (yellow lines)
- The FDOT outfall is not owned/controlled by the City
- Cooperatively working with FDOT to address problematic flooding areas:
 - South Davis Shores – flooding caused at Arredondo/Arricola
 - Bayfront – North of Bridge of Lions (under way right now)



References and Recognition

1. Erik Bojnansky (March 9, 2017). "Sea levels are rising, so developers and governments need to band together: panel". The Real Deal. Retrieved March 10, 2017.
2. "What is nuisance flooding?". National Oceanic and Atmospheric Administration. Retrieved December 13, 2016.
3. "Rising Seas Pull Fort Lauderdale, Florida's Building Boomtown, Toward a Bust: The Venice of America is expecting its population to grow by a third, but it already can't handle the impacts of climate change.". By Katherine Bagley, InsideClimate News. March 3, 2016.
<https://insideclimatenews.org/news/01032016/ft-lauderdale-climate-change-global-warming-rising-sea-level>
4. "Coastal Flooding – the Fort Lauderdale Tidal Valve Program". A presentation provided by Elkin Diaz, MBA, PE, PMP LEED Green Associate Senior Project Manager. Public Works Department, City of Fort Lauderdale.
5. Wapro - Wastop Inline Check Valve.
<http://www.wapro.com/en-us/content/wastopr-inline-check-valve>
6. Tideflex Technologies - Tideflex Checkmate Ultraflex Slip-in Inline Check Valves.
<http://www.redvalve.com/tideflex/tideflex-products/checkmate-inline-check-valve/>

The Public Works Department would like to recognize the following entities associated with this project:

- St Johns River Water Management District – Cost Share Funding
- Geosyntec Consultants
- Red Valve Company – Tideflex Technologies
- WaPro – Wastop Inline Check Valve
- City of Ft. Lauderdale
- City of St. Augustine Staff:
 - Stormwater crew (Freddy Torres, Daryl Wiervba, Sheppard Raines)
 - Rick Stevens and Steve Wright (Solid Waste)
 - Paul Williamson and Melissa Wissell (Public Affairs)
 - Merin Dunn (City Clerk Office)
 - City of St. Augustine - Municipal Marina





Questions Regarding this Project:

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Also information available on the City's website at:
www.citystaug.com



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