

TOWN OF GOLDEN BEACH



OCTOBER 2019 HIGH TIDE EVALUATION REPORT

OCTOBER 8, 2019

PREPARED BY



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SECTION 1 – SUMMARY OF WORK

On behalf of the Town of Golden Beach, Craig A. Smith & Associates (CAS) has prepared an October High Tide Evaluation Report. CAS responded to the Town's request to observe the impacts to the existing stormwater system from the October or "King" tides. A field visit was performed by CAS staff on Tuesday, October 1, 2019 to observe the tidal impacts to the system (i.e. stormwater inlets, manholes, pump stations and outfalls) and to make recommendations to offset the impacts from the high tides. A second inspection was performed on Thursday, April 3, 2019 regarding Pump Station No. 1 (Tweddle Park) issues.

Refer to Exhibit D for Town-wide evaluation map.

SECTION 2 – HIGH TIDE IMPACTS

The Town of Golden Beach being a low-lying community located on a barrier island between the Intracoastal Waterway and the Atlantic Ocean is vulnerable to tidal activities. The King tides, occurring during the new moon cycles in the spring and fall seasons, are the highest predicted high tides of the year and can cycle some three feet above normal levels. Warmer ocean temperatures and seasonal wind and weather patterns can drive water levels even higher. Gusty easterly trade winds over South Florida will generate waves that act to further the flood threat in low-lying coastal areas.

Recorded winds on September 30 and October 1 were out of the northeast at 15 to 20 miles per hour with gusts as high as 25 miles per hour. On Monday, September 30th, according to Dr. Nancy Gassman, assistant Public Works Director for the City of Fort Lauderdale, "The elevations that we're seeing today are in the range of 10-12 inches above what was predicted and so when that happens we do end up seeing a greater level of tidal flooding throughout various low lying areas..."

On September 25, 2019 the United Nations Intergovernmental Panel on Climate Change released a report on the climate change effect on oceans that indicated global sea levels rose nearly six inches in the last century and are rising at accelerated rates. Future sea level rising will increase the frequency of extreme sea-level events such as high tides and storms.

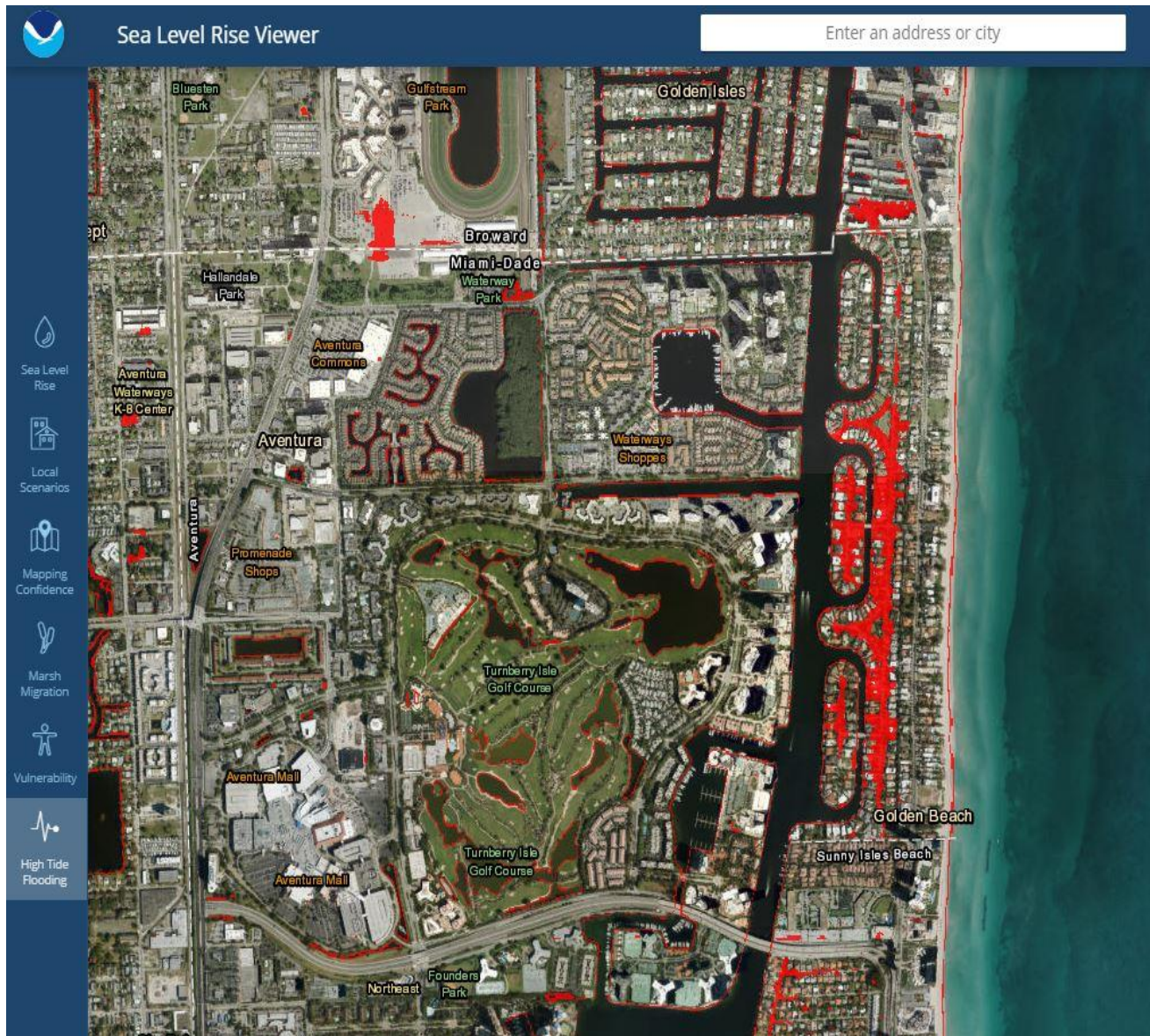


Exhibit A - National Oceanic and Atmospheric Administration Areas Vulnerable to High Tide Flooding.

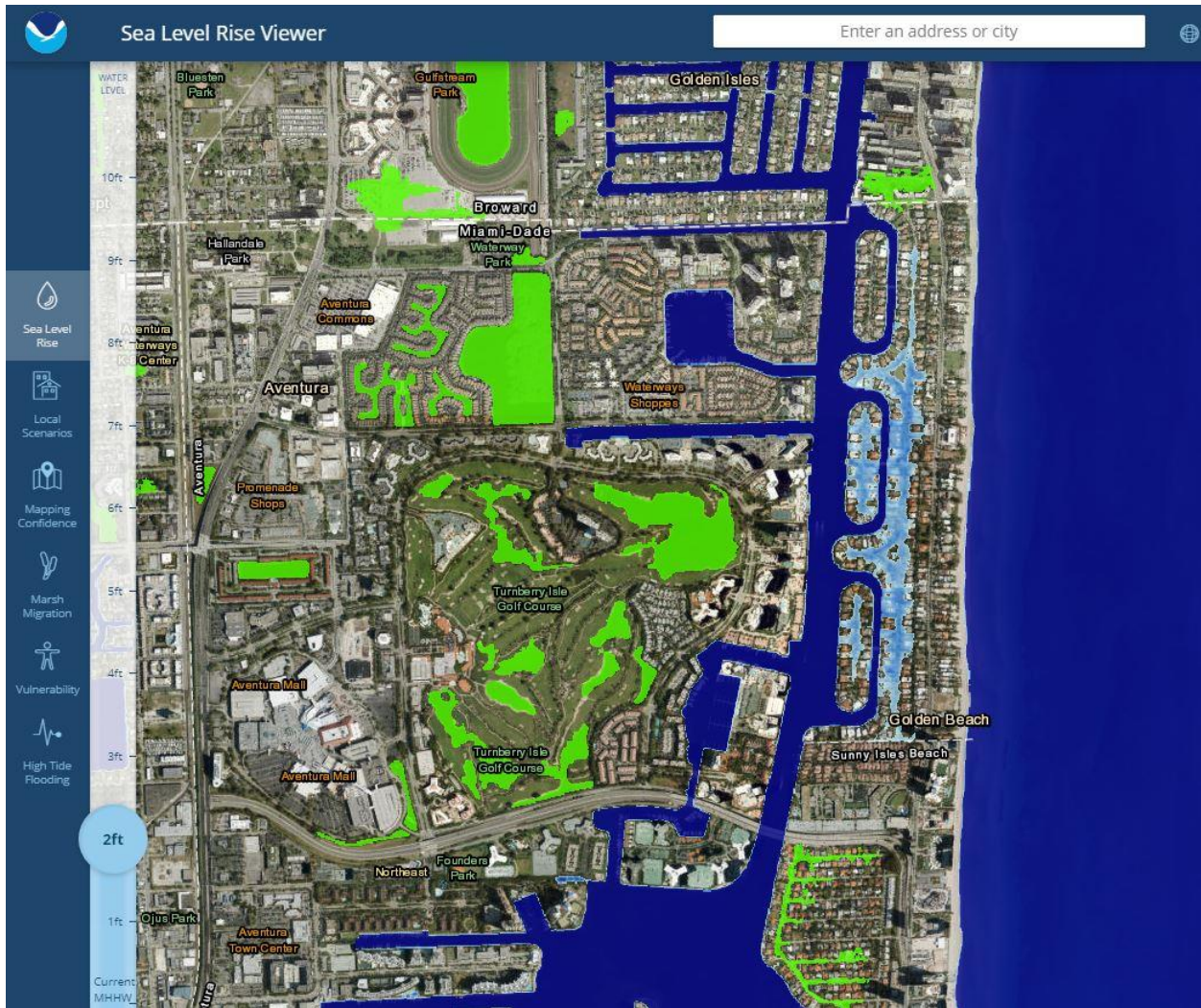


Exhibit B - NOAA Areas Prone to 2-Foot Sea Level Rises (Relative to Historical Mean Higher High Water Datum).

SECTION 3 –SITE OBSERVATIONS

During the observation of the stormwater system, CAS took several physical measurements at various existing inlets within the Town to determine the rate of rising water levels. Over a three-hour period, water levels rose between 21-inches and 24-inches. The last readings occurred two and a half hours before the estimated peak high-water level for that day.

Exhibit C indicates the Tidal Predictions and Preliminary Data at the South Port Tidal Station for September 30, 2019 to October 2, 2019. The South Port station is the closest NOAA station; located approximately 8 miles north of the Town. Over the three-day period the preliminary data indicated that the high tide event peaked at elevation 4.18 (NGVD) at 3:00 PM on October 1, 2019. The peak high tide was approximately 1.2 feet higher than the predicted high tide stage. This is maybe related to warmer ocean temperatures and gusty trade winds.

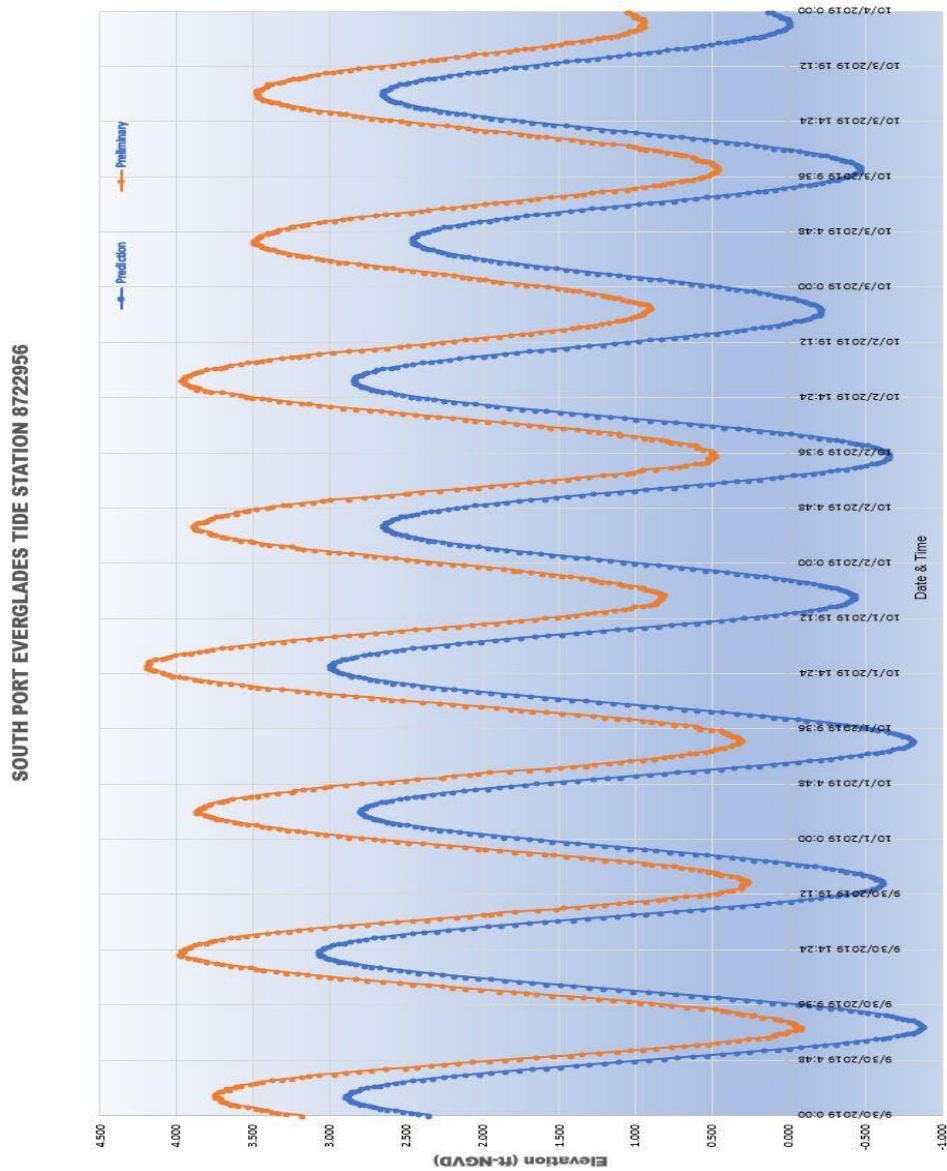


Exhibit C – NOAA Tidal Predictions for Sept. 30, 2019 - Oct. 2, 2019

During the course of investigating the existing stormwater network, CAS reviewed the following issues:

PUMP STATION No. 1 (Tweddle Park):

- CAS and Town staff investigated an exfiltration issue at the Tweddle Park pump station. When the pumps at the station were initiated, a surge of water was forced out of the manhole covers at the well discharge pipe on the north side of the pump station. A second inspection was performed on Thursday, October 3, 2019 to determine the exact cause of the issue also observed the possibility of leakage from the north face of the existing pump station weir chamber (Refer to Exhibit E – Observation Report). Through a series of tests on the entire outfall pipe it was determined that the surge issue was back pressure caused by the extreme high tide. Refer to Exhibit D and photograph 1 in Exhibit F.
- King high tides also inhibit drainage well performance where discharge can only occur during higher elevations due to the mounding effect caused by density differential between fresh and saltwater.

STORMWATER SYSTEM/ INLETS

Due to the Town's existing geographical and geological condition (i.e. low-lying area with high groundwater tables) the stormwater systems (inlets, manholes, pipes and outfalls) were designed and constructed as a water-tight system. This was in an effort to allow surface water from entering the system and deter groundwater intrusion. An additional design safeguard was to install flap gate devices at all force main and gravity outfalls to eliminate water from the Intracoastal from entering into the "sealed" system. This allowed the stormwater pipe network and pump stations to function as intended.

- During the evaluation of the stormwater system it was evident that as the tide rose the ocean water (Intracoastal water) would seek a path of least resistance. Intracoastal

water was observed entering the east side of structure number 30A (Exhibit D), across from town hall. This was caused by a failure in the integrity of the sealing of the top slab to the walls of the structure.

- Intracoastal water was also observed discharging from a group of Florida Power and Light handhole covers located in the sidewalk at the southwest corner of Golden Beach Drive and Verona Avenue. (Exhibit F, Photo 2)
- At 330 South Parkway Intracoastal water was observed seeping out at the lots lowest point; where the concrete drive connected with the front green area. This property is one of the oldest developed lots in the area, constructed in 1946, and has existing lot grades ranging from 2.8 to 3.4 NGVD. (Exhibit F, Photo 3)

OUTFALL PIPES

- During the field investigation, CAS observed the rising water levels at the two existing outfall structures on Center Island. These open grate structures are at the lowest elevations on the island at 1.91 feet NGVD (north) and 2.14 NGVD (south). Within two hours the water elevation had risen between 6-inches and 10 inches above the outfall grate elevations. CAS is currently processing a State Revolving Fund (SRF) loan application with the Florida Department of Environmental Protection (FDEP) to provide flood relief to Center Island, during a storm event occurring during a normal high tide event.

The project, which includes the installation of a stormwater pump station and new force main configuration, is currently designed and permitted with an anticipated construction start date in February of 2020.

- CAS investigated the northernmost stormwater gravity system that includes an existing 30-inch outfall pipe located at 670 Golden Beach Drive. Water level in the pipe and structure system appeared to rise at the same rate as the tide, indicating that tidal

water infiltration was occurring either at the outfall to the Intracoastal or within one of the pipes or structures within the network. It would appear that the existing 30-inch flap gate that is attached to the seawall was not sealing properly.

- During the evaluation of the stormwater system CAS discovered that an existing backflow prevention device within structure number 80, located at the southwest corner of Navona Avenue and Golden Beach Drive, was not functioning properly. The backflow prevention device is designed, like a flap gate, to prevent unwanted backflow from a water body that can cause surcharging and flooding.

SECTION 4 – RECOMMENDATIONS

Based on the inspection findings during the October 2019 high tide event CAS recommends that the following stormwater related items be addressed:

PUMP STATION No. 1 (Tweddle Park):

- After observing the surge conditions at the pump station, CAS coordinated with Shenandoah Construction to have the pipe televised and cleaned as necessary. Since no new obstruction in the outfall pipe was discovered, CAS concluded that the surge issue was due to back pressure caused by king high tides. CAS recommends that the existing stormwater pump station and the entire gravity outfall pipe (from the pump station to the sea wall) be evaluated to determine the feasibility of replacing or converting this pipe run with a pressure pipe. If the feasibility analyses support the tidal surge acting against the discharge through an actual force main, CAS will recommend the replacement of the stormwater discharge wells and convert the existing gravity outfall to a force main discharge.

- The feasibility analyses will also demonstrate whether or not the existing stormwater pumps can operate under higher head pressure conditions caused by the conversion of the gravity pipe to a pressure pipe. If not, the pumps may need to be replaced as well which could also have an affect on the size of the existing pump station wet well.
- In order to address erosive velocities (greater than 2-3 feet per second) at the sea wall, a minimum twenty-foot segment of the existing outfall pipe may need to be upsized accordingly.
- CAS also recommends that a further investigation of a possible leak at the pump station weir chamber. If it is determined to be leaking, the weir chamber needs to be repaired and sealed on both the interior and exterior side of the chamber wall.
- For future considerations, CAS recommends the replacement of this existing stormwater pump station and drainage well system with a pump station system similar to those installed in the North and South Parks.

STORMWATER SYSTEM/ INLETS

- CAS recommends that Structure 30A, located near Tweddle Park, be properly sealed to prevent groundwater intrusion. To sufficiently repair this structure, it will require that the existing concrete flume be removed, and replaced, in order to seal both the inside and outside of the structure. The estimated cost for this work is \$3,000.
- During construction of the Town's Capital Improvement Project new Florida Power and Light and Bell South Utility handholes and pull boxes were installed under the current west sidewalk when all utilities were placed underground. There is little that can be done to eliminate Intracoastal water infiltration and create a water-tight seal on the utility boxes and vaults.

OUTFALL PIPES

- The Town is committed to installing a stormwater pump station system on Center Island to provide flood relief during a storm event occurring during a high tide event. This project is anticipated to begin construction in February of 2020.
- CAS recommends the removal of the existing 30-inch flap gate at the 670 Golden Beach Drive outfall pipe and replace it with an in-line Tideflex Checkmate Ultraflex Check Valve. This backflow prevention device is a more reliable device, is less obtrusive and requires less head to open than a standard flap gate. The estimated cost for this work is \$24,500.
- CAS also recommends the removal of the existing 24-inch backflow prevention device in structure number 80 located at the southwest corner of Navona Avenue and Golden Beach Drive and replace it with an in-line Tideflex Checkmate Ultraflex Check Valve. The estimated cost for this work is \$20,300.

While these recommendations will ensure the functionality of a water-tight stormwater system, impacts from tidal seepage through low lying areas, or unsealed utility boxes, will not be prevented. These conditions are anticipated to get worsen as sea level rise become more apparent.

SECTION 5 – CONCLUSIONS

As previously mentioned, the Town is generally located in a very low-lying community. Over the past 20 years it has invested heavily in reducing overall Town surface flooding. While there have been tremendous improvements for storm events, the Town continues to battle tidal flooding. Measures have been taken to reduce tidal flooding during normal conditions by installing various backflow devices. However, during extreme conditions, such as the king tides, these devices may be circumvented by seepage from low-lying land.

When the tidal water/Intracoastal water reaches an elevation higher than existing ground levels, that water eventually seeps through the soil and migrates into the yards and streets as demonstrated in Exhibit F, photos 2 and 3. In areas where this occurs, the water will remain until the tide recedes.



0 10 20 40
HORIZONTAL GRAPHIC SCALE
SCALE: 1" = 20'-0"

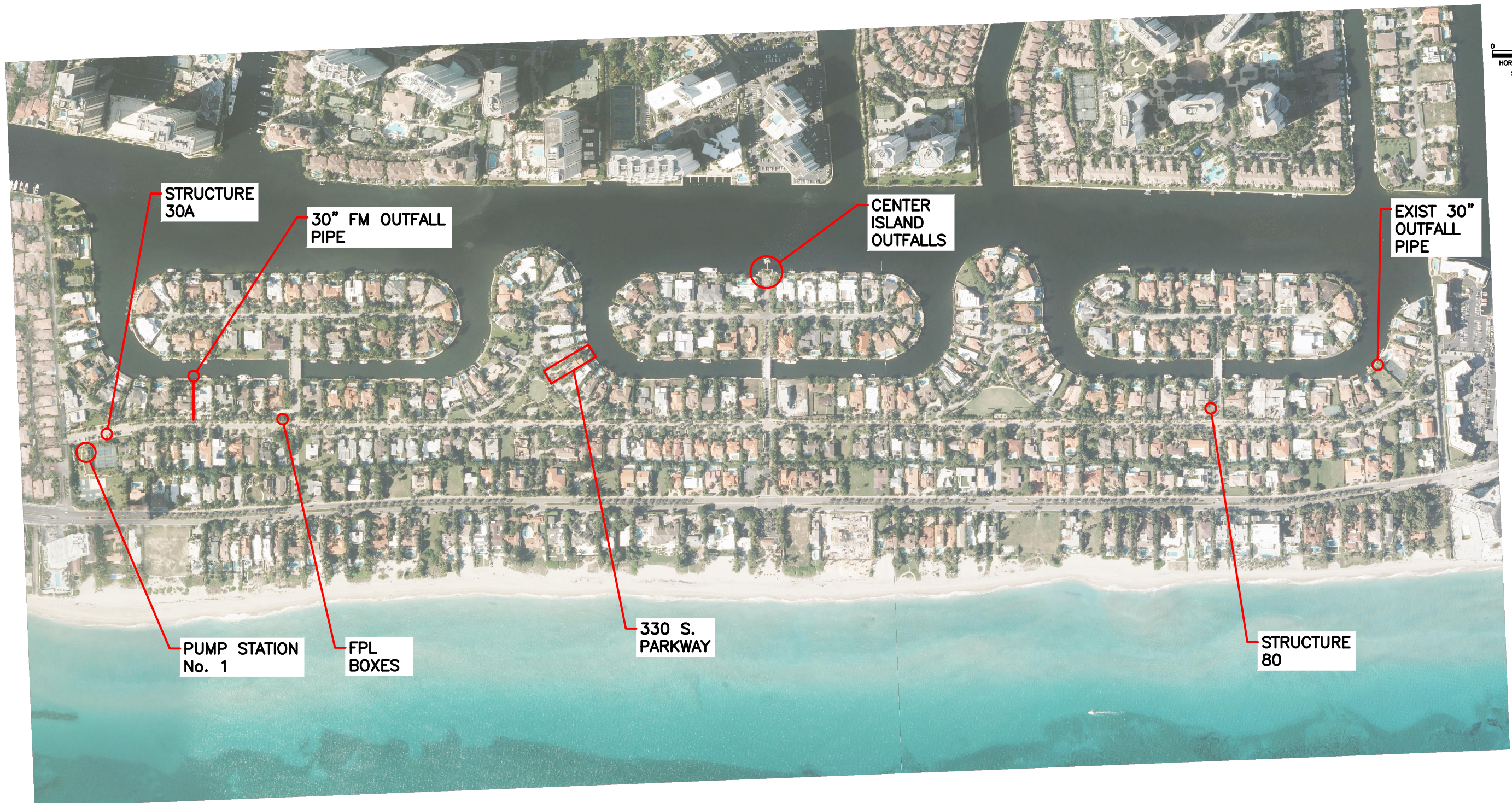


EXHIBIT D

HIGH TIDE
EVALUATION MAP



\\cas-depot\Projects\Cities_Villages_Towns\Golden_Beach\17-1971-ICP-Ima-Fema-Assistance\09-Plans\EXHIBITS\0-1971-EXH-A-HIGH-TIDE-MAP.dwg, 10/9/2019 9:14:59 AM, mrodriguez, 1:2

EXHIBIT E



CRAIG A. SMITH & ASSOCIATES

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MEMO

TO: Stephen C. Smith, P.E., Senior Vice President

FROM: Tony Gomes, Senior Field Representative

Cc: Orlando A. Rubio, P.E.

DATE: October 4, 2019

**RE: FIELD INVESTIGATION AT PUMP STATION, PS-1
GOLDEN BEACH DRAINAGE SYSTEM
CAS PROJECT NO. 16-0944**

As requested, on 10/03/19, with the help of Golden Beach personnel (Kenny + 1) we researched the backflow issue of pump station no. 1. We found that the water being pumped out to the canal is not coming out of the 30" outfall pipe.

At this time of the year we have a 'king high tide' condition that fills the drainage system via ground seepage including the two deep wells at the pump station.

The 30" outfall pipe needs to be investigated (tv inspected) from structure no. 46A to the discharge end at the sea wall for any blockage and/or damage.

Please see attached field notes.

CRAIG A. SMITH & ASSOCIATES

ENGINEERS • SURVEYORS • UTILITY LOCATORS • CONSTRUCTION MANAGERS

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PROJECT Old, Bch. (General Services)

PROJECT NO. 16-0944 SHEET NO. of

CALCULATED BY Tony Gomez DATE 10/3/19

CHECKED BY DATE

DESCRIPTION Find Blockage (PS-1) in system,

Field NOTES

1 pm - 3:30 pm

Tony CAS
 Renny Old, Bch. (+1)

1:00 pm co-ord. with Old, Bch. Personnel

2:00 pm Took measurements of water levels inside the Pumpstation well chamber's and the near by man holes and C. Basins.

2:10 pm Removed the 2 m.H. Lids on #46 A Flap Gate Structure

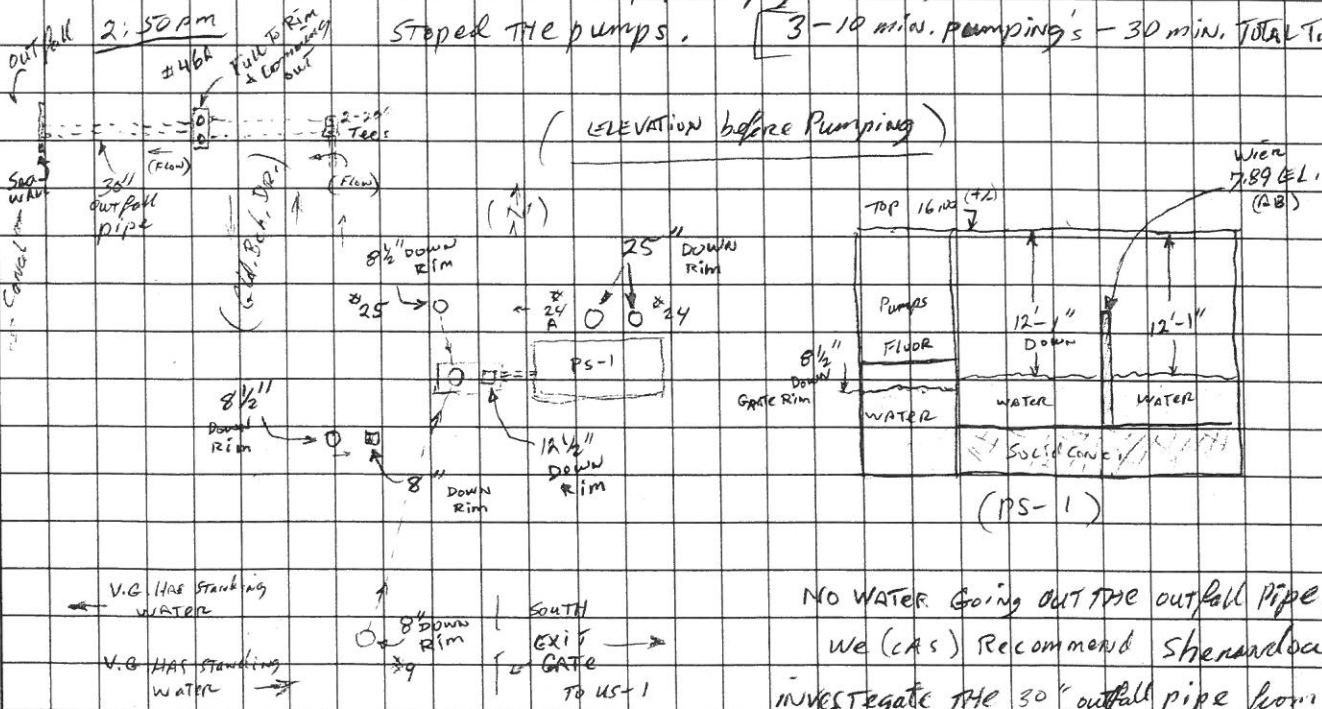
2:15 pm City Turned on the pump (#1).
 Water took 37 sec's, to build up and spill over the weir wall and another 38-40 sec's, to come out of the 2-m.H. Lids at #46 A (Flooding the yard, sidewalk & street), NO water coming out of the outfall pipe from #46A.

High Tide
 2:15 pm

2:35 pm

2:46 pm NOTE:

Replaced the lids on #46A and the 2-m.H. Lids "24 & 24 A" at the P.S. "popped-up", Flooding the Tennis Courts, Stopped the pumps. [3-10 min. pumping's - 30 min. total time]



NO WATER GOING OUT THE outfall Pipe.
 We (CAS) Recommend Shenandoa T.V. Truck investigate the 30" outfall pipe from the #46A structure to the sea wall outfall end for blockage &/or any damages.

(King High Tide Fills the Drainage System.)

V.G. HAS STANDING WATER
 V.G. HAS STANDING WATER
 (TRACINA AVE)

EXHIBIT F

OCTOBER 2019 HIGH TIDE EVALUATION PHOTOGRAPHS



Photo 1 : (10-1-19) Manhole covers for stormwater force main at Pump Station No. 1.

EXHIBIT F

OCTOBER 2019 HIGH TIDE EVALUATION PHOTOGRAPHS



Photo 2: (10-1-19) Tidal Seepage at FPL Electric Box.



Photo 3: (10-1-19) Tidal seepage at 330 South Parkway.