ORANGE COUNTY UTILITIES

Leveraging Real-Time Flood Forecasting Predictive Modeling in Utilities Storm Preparations and Recovery

Florida Water & Climate Alliance

Ed Torres, M.S., P.E., LEED AP

June 20, 2025

Background: OCU Infrastructure

Orange County Utilities provides water resources and solid waste recovery services to protect and enrich the lives of the citizens and guests of Orange County

Population Served

- Water: 855,000
- Wastewater: 1,098,000
- Reclaimed Water: 415,000
- Solid Waste: 660,000

Service Area

- Over 660 Square miles

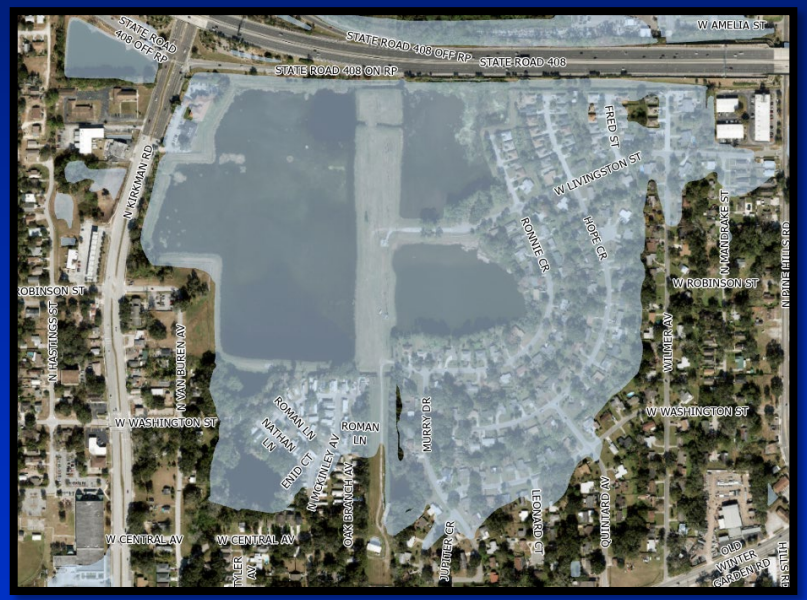
Major infrastructure

- 12 Water Treatment Plants
- 4 Regional Water Reclamation Facilities
- 870+ Wastewater Pump Stations
- Landfill and 2 Solid Waste Transfer Stations

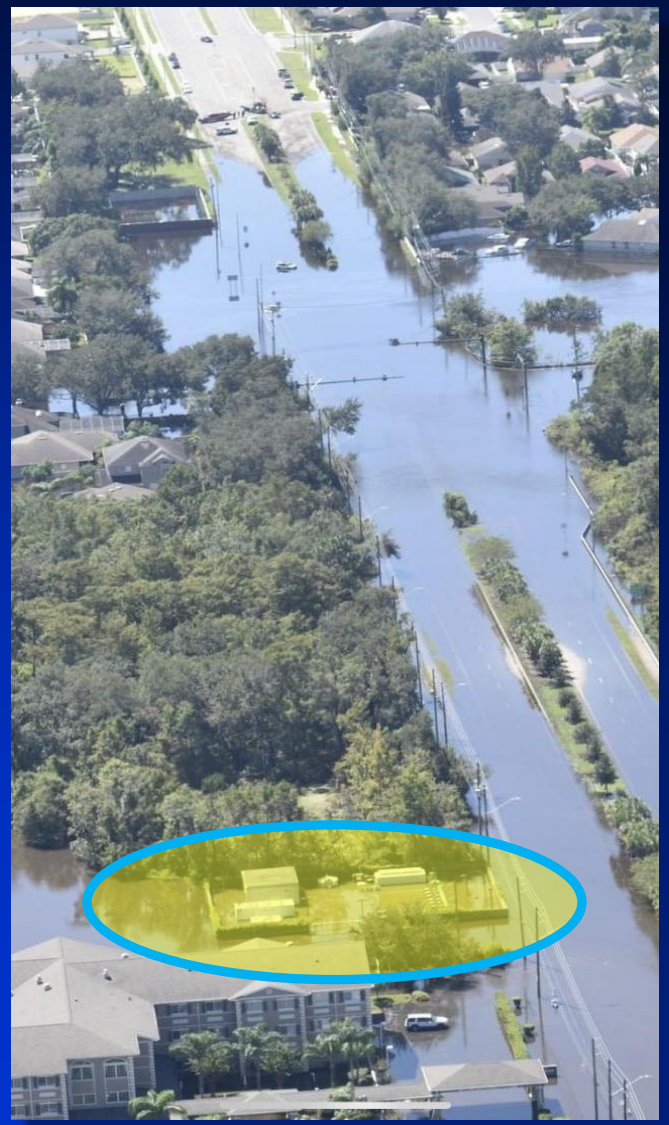
OCU Storm Preparations & Recovery

- Goal of providing continuity of services and avoiding sanitary sewer overflows (SSOs)
- Orange County Utilities storm preparations and recovery involve <u>deploying and staging resources</u> throughout a large service area

Orange County Storm Damage & Recovery



Orange County Storm Damage & Recovery



FlaWARN Participation

Hurricane Helene Mutual Aid Team – 9/2024

- Locations: Cedar Key, Chiefland, Tallahassee, Suwannee Water &Sewer District
- Equipment: F550, Trailers, Generators in Tow for each truck
- Staff: 14 electricians, mechanics, SCADA, field specialists

FlaWARN Participation

Hurricane Milton Mutual Aid Team – 10/2024

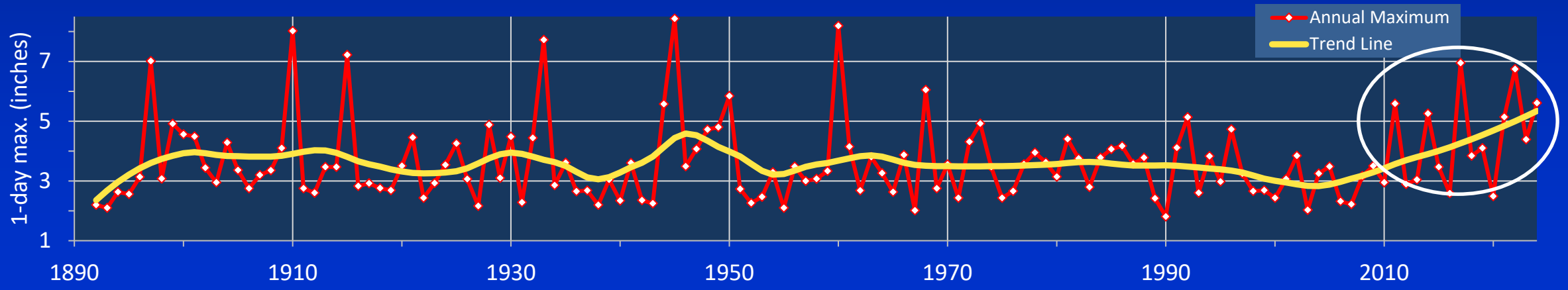
- Location: Hillsborough County Utilities
- Equipment: F550, Trailers, Generators in Tow for each truck
- Staff: 8 electricians, mechanics, SCADA, field specialists

Sheldon Rd Force Main Mutual Aid Team –2/2023

- Location: Hillsborough County Utilities
- Equipment: 5 tanker trucks and drivers

Changing Rainfall Patterns to Date

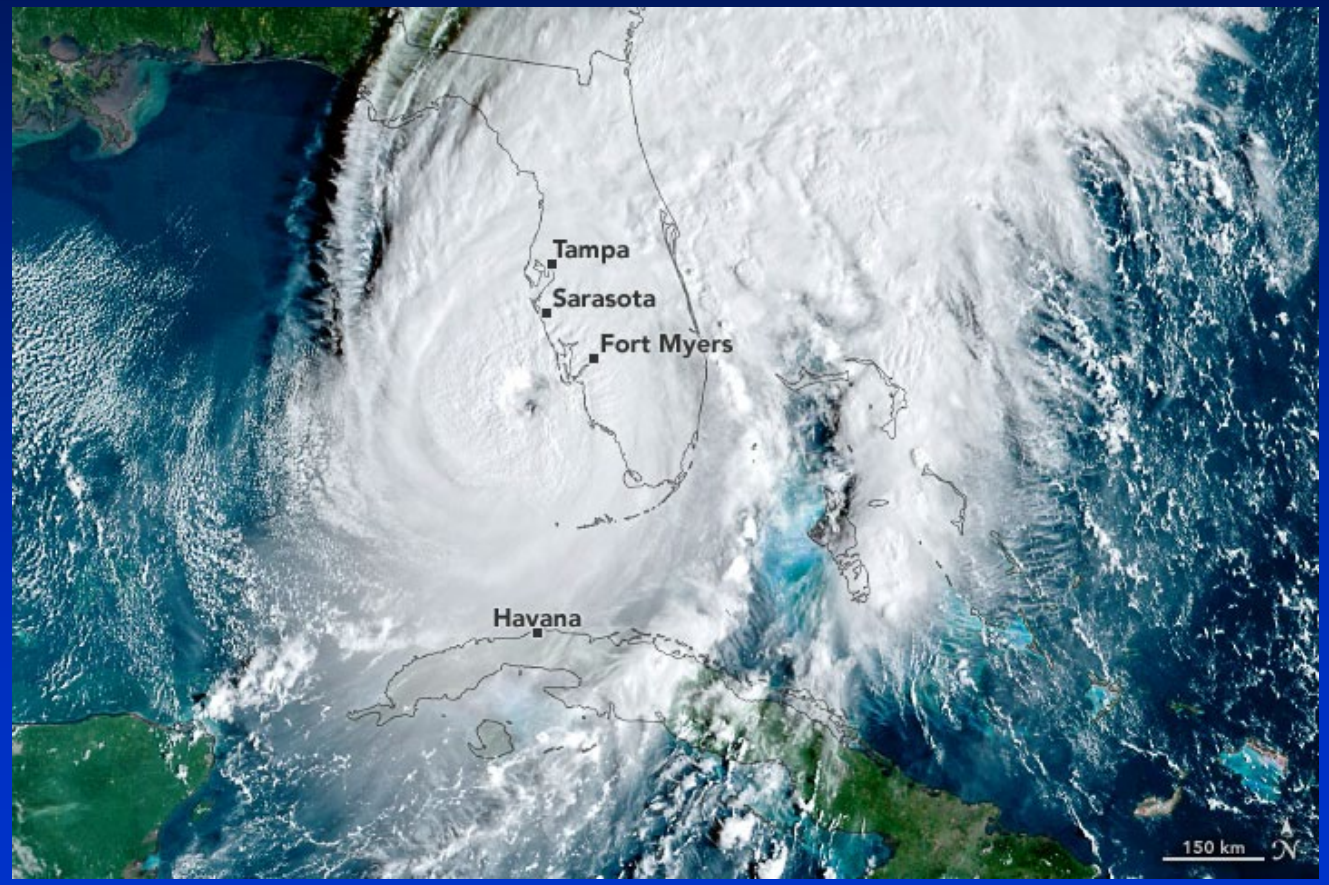
- SFWMD: *Adoption of Future Extreme Rainfall Change Factors for Flood Resiliency Planning in South Florida*
- Orange County: Evaluated over 130 years of historical rainfall data
- Several large storm events have occurred in recent years
- Experts expect this trend to “statistically” change over the next 75 years
- Data since 2010 shows a general increase in rainfall maximums



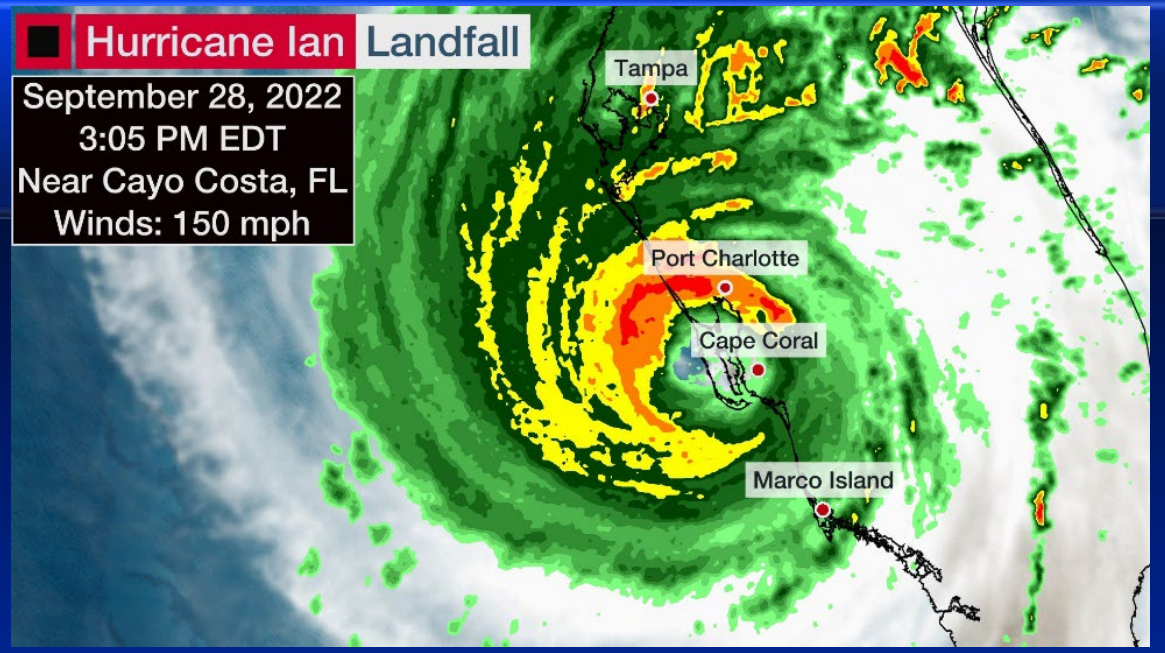
Rainfall Trend Analysis

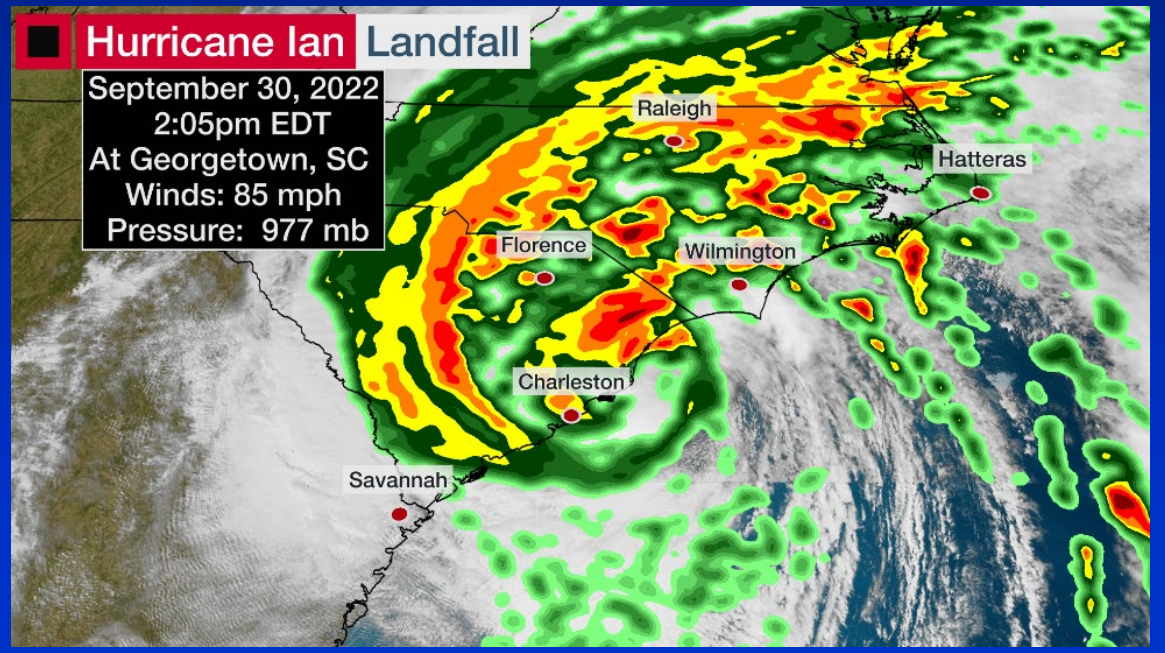
Hurricane Ian

September 2022, Cat 4, 1



Source: NASA Earth Observatory

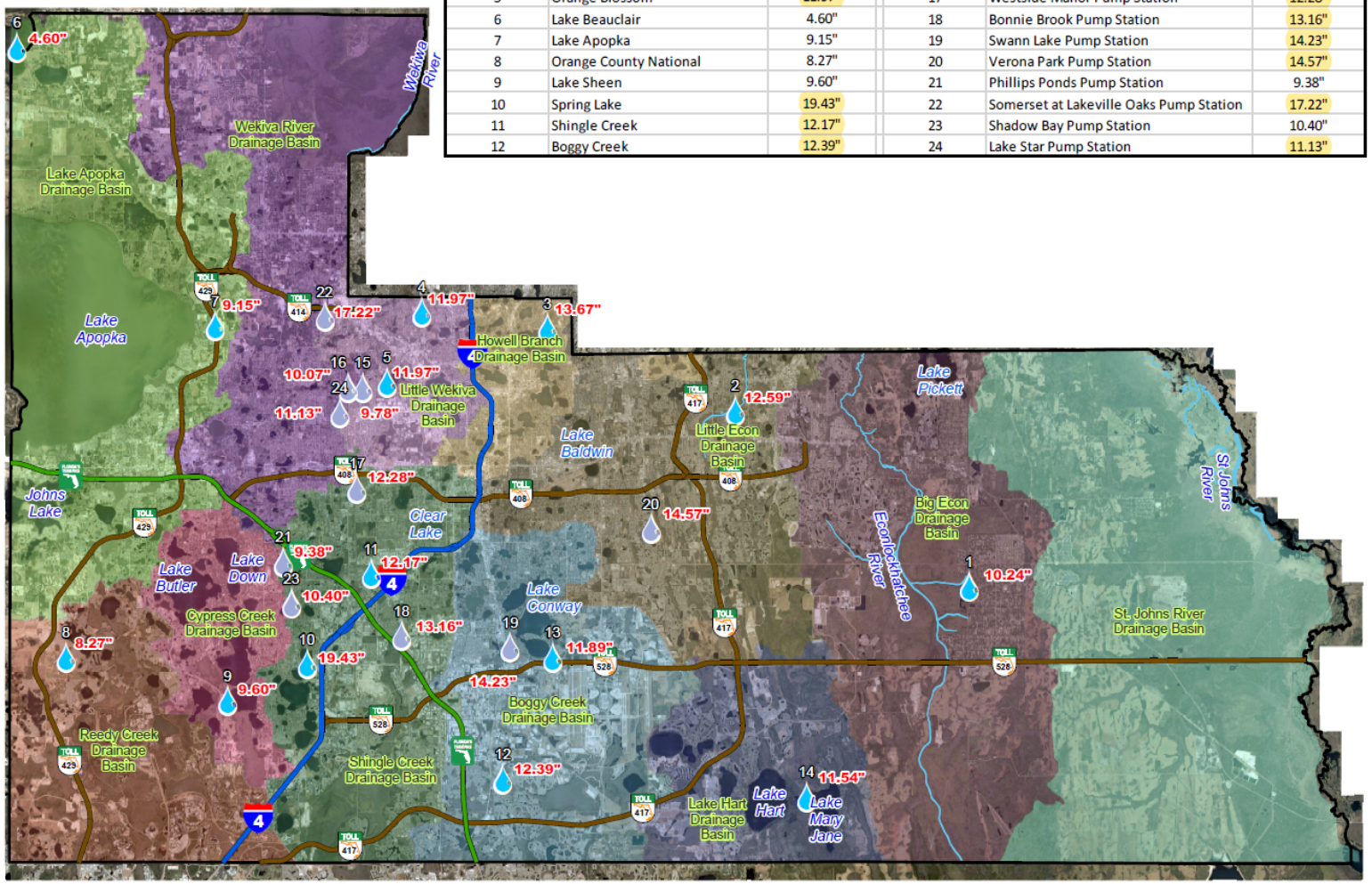




Source: Weather.com

Hurricane Ian Rainfall Totals

- Almost 20” rainfall in a 24 - hour period in parts of Orange County
- 4.6” in other parts
- Not your uniform design storm!
- Flooding in areas outside the floodplain



STATION ID	STATION NAME	TOTAL RAINFALL (24-HR PERIOD)	STATION ID	STATION NAME	TOTAL RAINFALL (24-HR PERIOD)
1	Hal Scott	10.24"	13	Lake Conway	11.89"
2	Michael's Dam	12.59"	14	Lake Hart	11.54"
3	Lake Maitland	13.67"	15	White Heron Pump Station	9.78"
4	Riverside Acres	11.97"	16	Dwarf Lake Pump Station	10.07"
5	Orange Blossom	11.97"	17	Westside Manor Pump Station	12.28"
6	Lake Beauclair	4.60"	18	Bonnie Brook Pump Station	13.16"
7	Lake Apopka	9.15"	19	Swann Lake Pump Station	14.23"
8	Orange County National	8.27"	20	Verona Park Pump Station	14.57"
9	Lake Sheen	9.60"	21	Phillips Ponds Pump Station	9.38"
10	Spring Lake	19.43"	22	Somerset at Lakeville Oaks Pump Station	17.22"
11	Shingle Creek	12.17"	23	Shadow Bay Pump Station	10.40"
12	Boggy Creek	12.39"	24	Lake Star Pump Station	11.13"

Orange County Rainfall Stations Hurricane Ian 24-Hour Period

September 23, 2022

N W E S

0 20,000 40,000

1" = 20,000'

Disclaimer:
Data is provided "as is" without warranty of any representation of accuracy, timeliness or completeness. The burden of determining accuracy, completeness, timelines, merchantability and fitness for or the appropriateness for use rests solely on the requester. The County makes no warranties, express or implied, as to the use of Data. There are no implied warranties of merchantability or fitness for a particular purpose.

The requester acknowledges and accepts the limitation of the Data, including the fact that the data is dynamic and is in a constant state of maintenance, correction and update.

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Produced by:
Orange County Public Works
Stormwater Management Division

January 10, 2023

ORANGE COUNTY GOVERNMENT FLORIDA

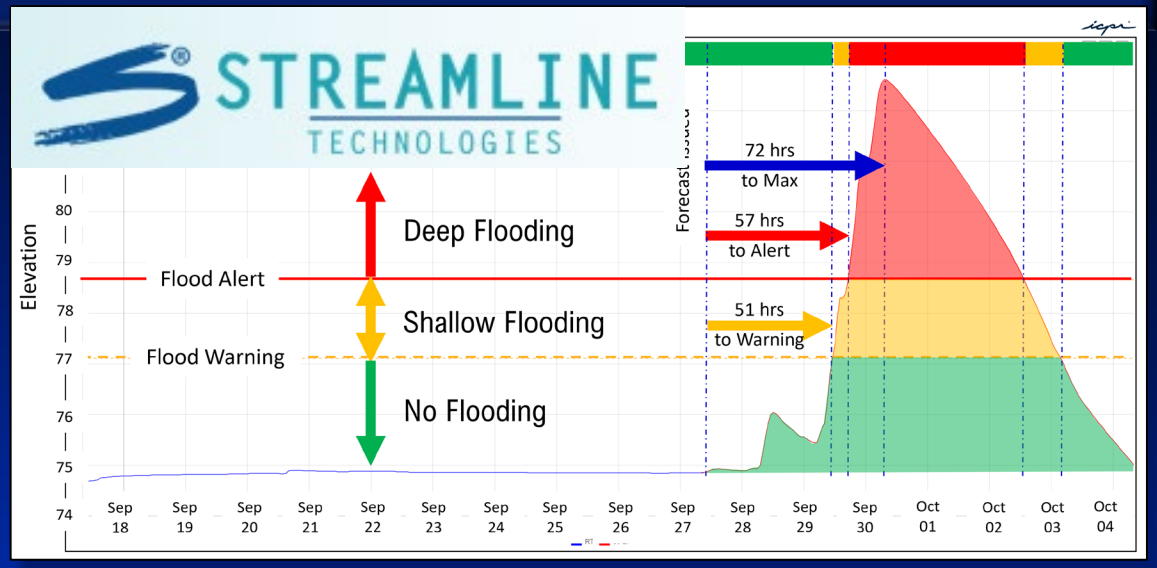
OCU Storm Preparations & Recovery

- Goal of providing continuity of services and avoiding sanitary sewer overflows (SSOs)
- Orange County Utilities storm preparations and recovery involve <u>deploying and staging resources</u> throughout a large service area
- **Is there a better way?**

Real-Time Flood Forecasting (RTFF) Predictive Modeling

FloodWise Flood Forecasting

- Real-Time: Indicating what's happening right now based on surface and groundwater modeling
- Flood Forecasting: Predicting flooding up to 3 days in advance of storms based on forecasted rainfall
- Tied to NOAAs forecast and to Surge and Tidal Operational Forecast System (STOFS)
- Flooding at Street Level: Flood depths and durations at streets, homes, buildings, and critical infrastructure



- Identified "Risk Points" & critical elevations
  - 870 pump stations
  - 12 water supply facilities
  - 4 regional water reclamation facilities
  - 4 storage/repump & booster pumps

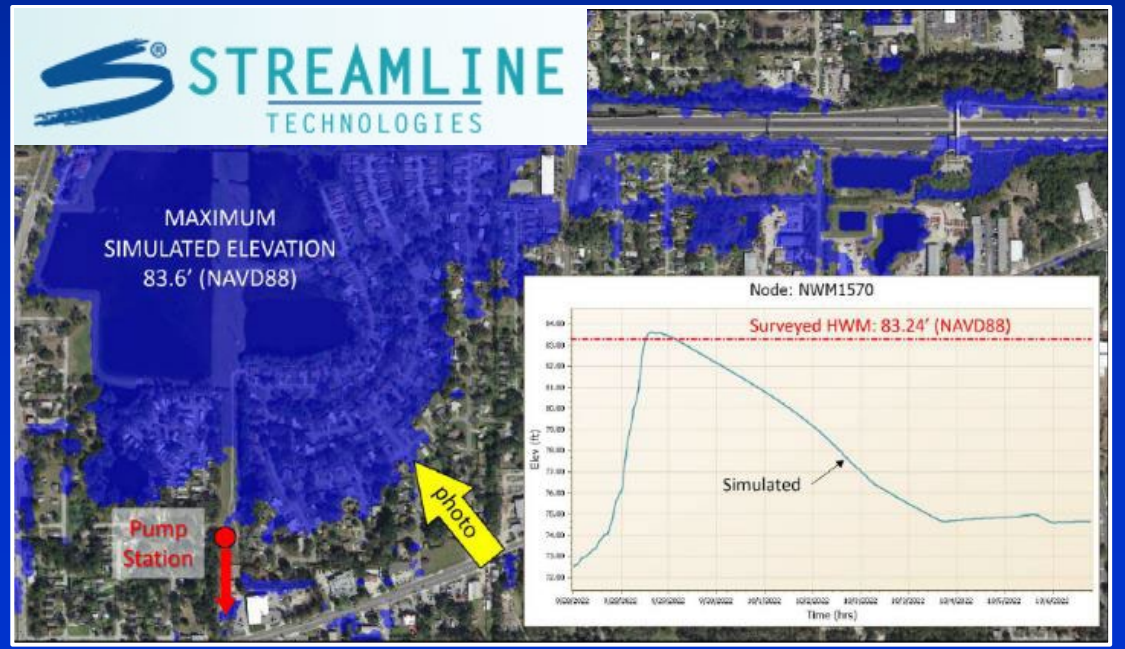
Real-Time Flood Forecasting (RTFF) Predictive Modeling

Leveraging the Forecast – Sending Resources Where They Are Needed!

- **Prepare:** Allows us to be more specific about emergency management preparation prior to the storm event, including staging generators and deploying staff and resources to areas where critical infrastructure flooding is forecasted

- **Mitigate:** Advance actions to minimize risks, consequences, and damage, including protecting pump stations, control panels, treatment components, and other assets by installing temporary dams, elevating or relocating infrastructure

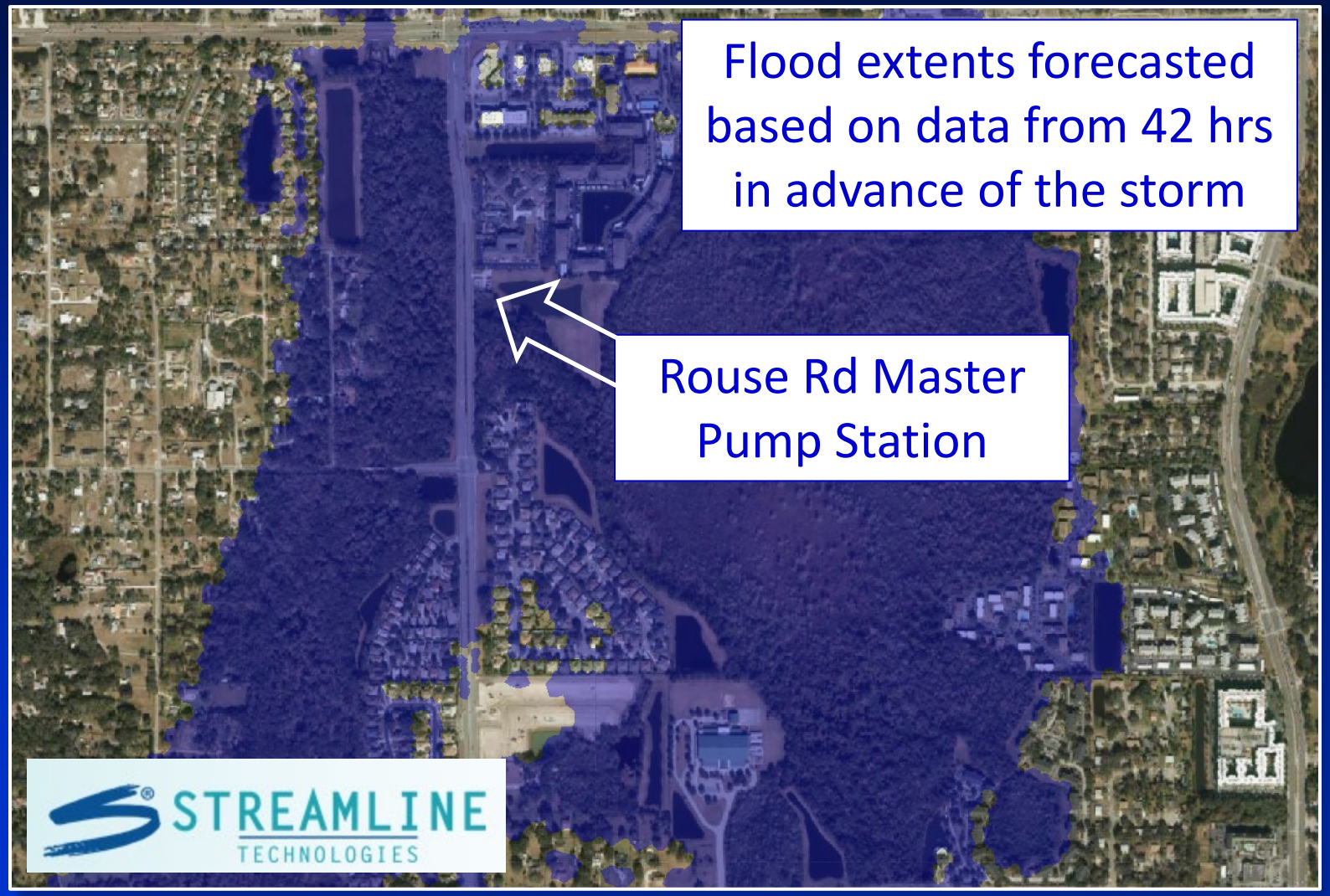
- **Recover:** Accelerate recovery by initiating specific coordination efforts earlier based on forecasted flood duration



Real-Time Flood Forecasting (RTFF) Predictive Modeling

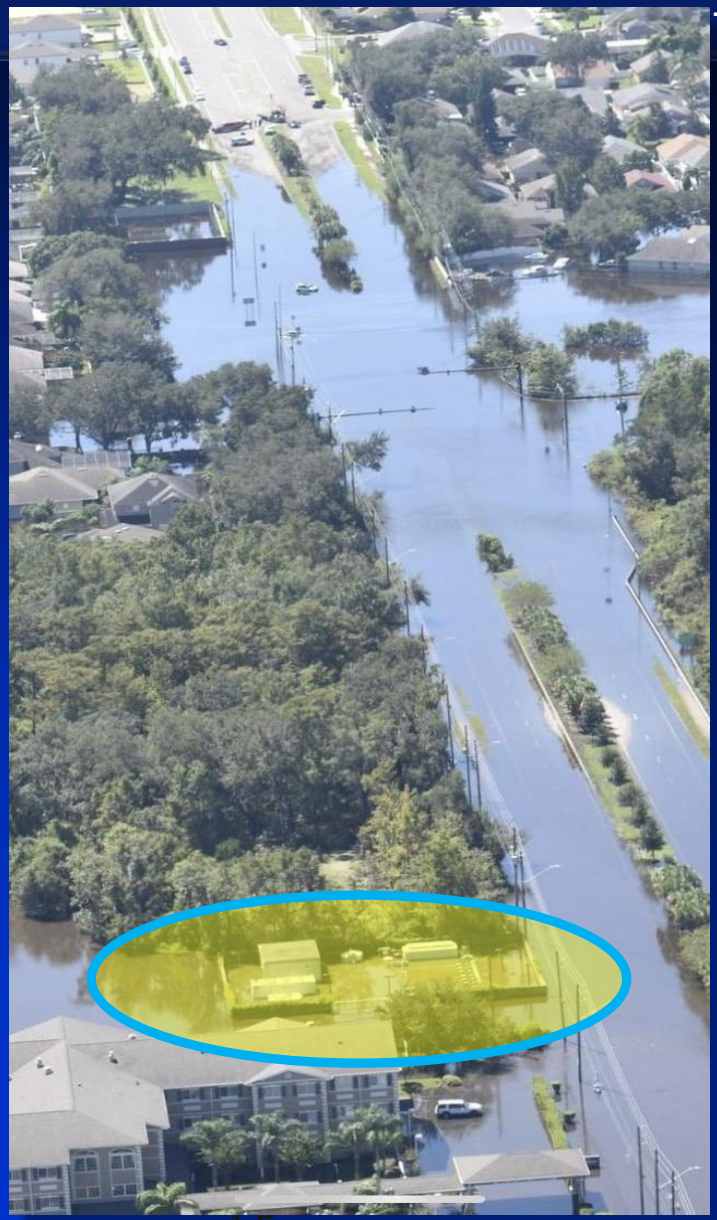
Fiscal Benefits Example

- The Rouse Rd Master Wastewater Pump Station sustained about $7 million in damage during Hurricane Ian
- If RTFF models had been in place, the pump station could have been protected with a tiger dam and the damage prevented or mitigated

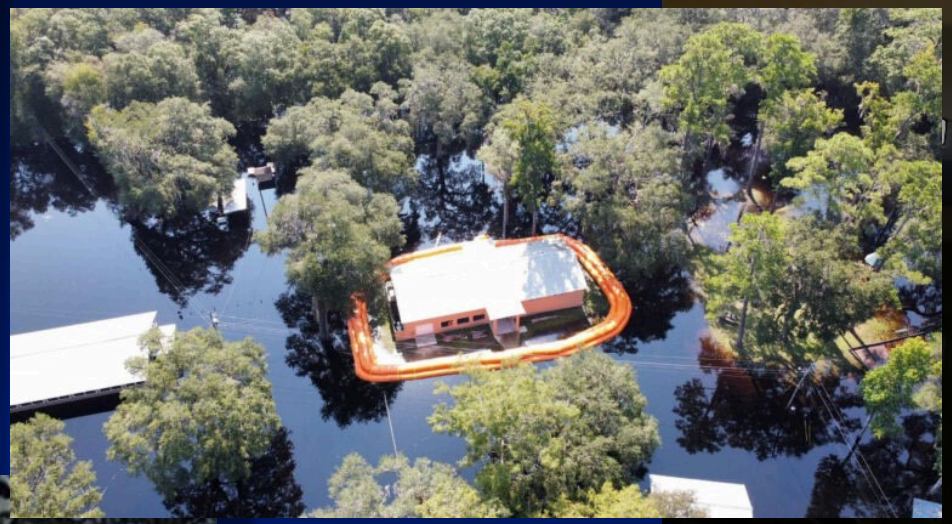


Rouse Road Master Pump Station

Flooding damage



Plan Emergency Preparedness



Next Steps

A Countywide predictive flood forecasting model is currently being developed

- Predict flooding up to 72 hours in advance of major storm events
- Determine areas for evacuation orders ahead of major storms
- Protect or relocate assets 2-3 days ahead of major storm
- Plan emergency response priorities during a major storm, including prioritization of staff resources
- Support proactive analysis and resiliency planning for a variety of types of storm events

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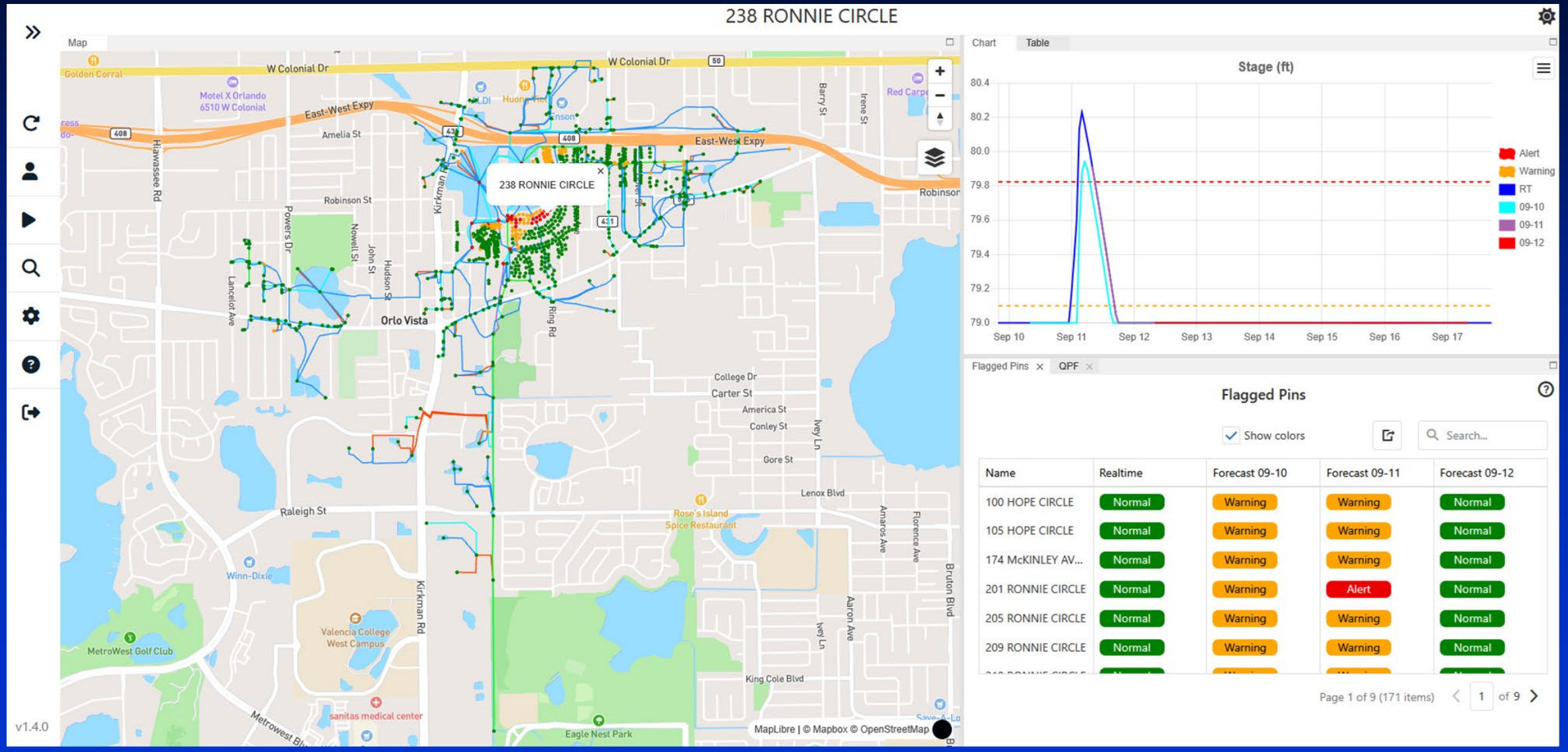
238 RONNIE CIRCLE
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Robinson St
Orlo Vista
Raleigh St
College Dr
Carter St
America St
Conley St
Gore St
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King Cole Blvd
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Kirkman Rd
Powers Dr
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John St
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Golden Corral
Motel X Orlando 6510 W Colonial
Rose's Island Spice Restaurant
Winn-Dixie
Valencia College West Campus
MetroWest Golf Club
sanitas medical center
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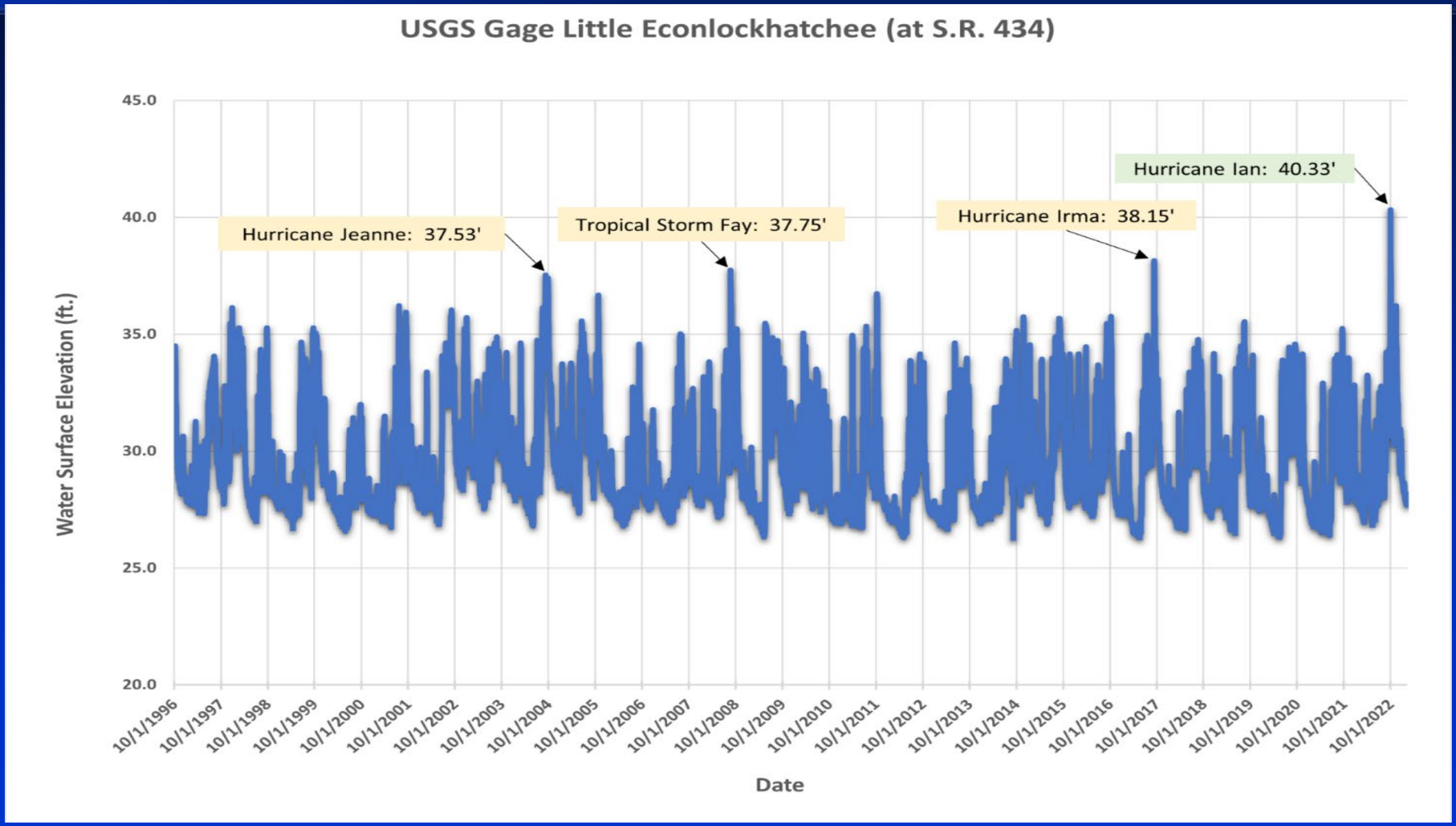
Hurricane Ian



Climate Variability/ Changes in Rainfall Intensity

- SFWMD released a Technical Memorandum in April 2022 titled "Adoption of Future Extreme Rainfall Change Factors for Flood Resiliency Planning in South Florida"
- The report developed factors to apply to the design storms to take into effect increases in rainfall intensity due to climate change
- This is one study (prior to 2022 storms), but highlighted need to review local data and models

FlaWARN Participation