

Palm Beach County Water Utilities Department

Climate Change Impacts and Infrastructure Adaptation

**Maurice Tobon, P.E. Director of Engineering
Stephen McGrew, P.E., Manager Plant Design**

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AWWA Statement on Climate Change

- **The American Water Works Association recognizes that global climate changes will have major impacts on the hydrologic cycle and, therefore, have the potential to significantly affect water supplies.**



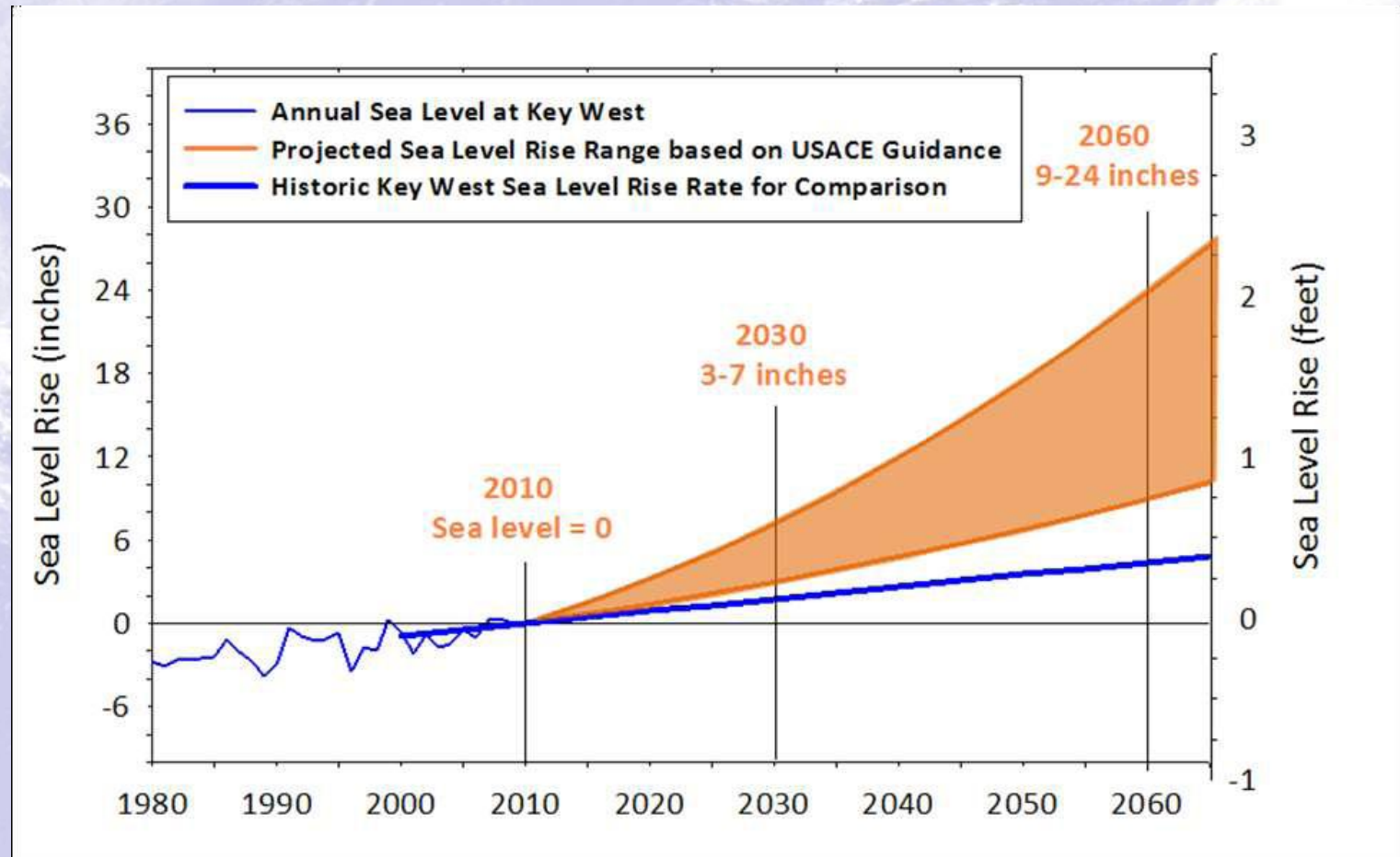
Global Climate Change Affects

South Florida will be most affected by these climate change impacts:

- **Sea Level Rise**
 - Salt Intrusion
 - Flooding
 - Inflow & Infiltration
- **Tropical Storm Activity**
 - Storm Frequency
 - Storm Intensity
- **Precipitation Patterns**
 - Wetter wets, dryer dries
- **Future Demand Forecast**
 - Population Growth/Loss



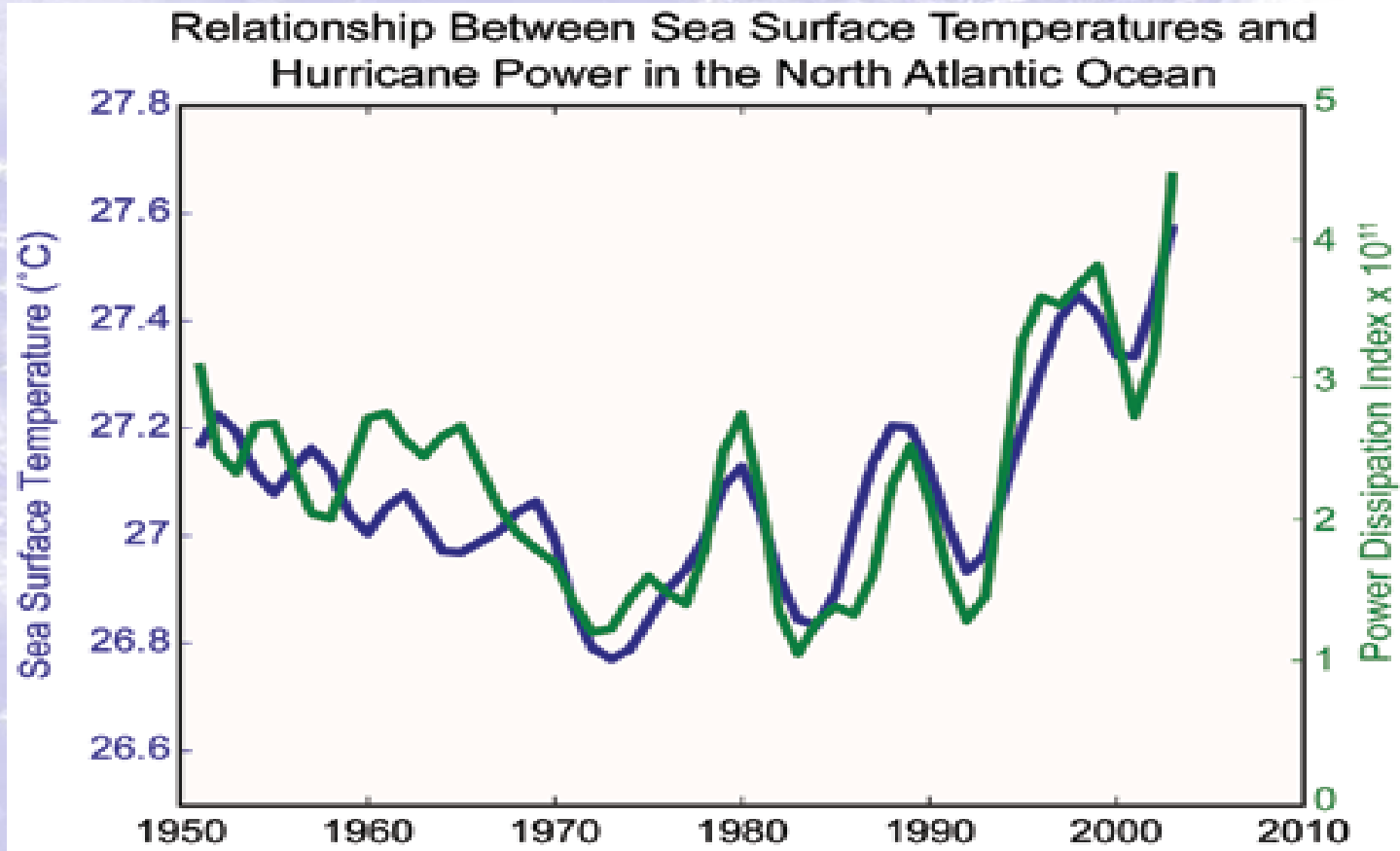
Sea Level Rise



Source: A Unified Sea Level Rise Projection for Southeast Florida, Southeast Florida Regional Climate Change Compact Counties April 2011



Increased Tropical Activity

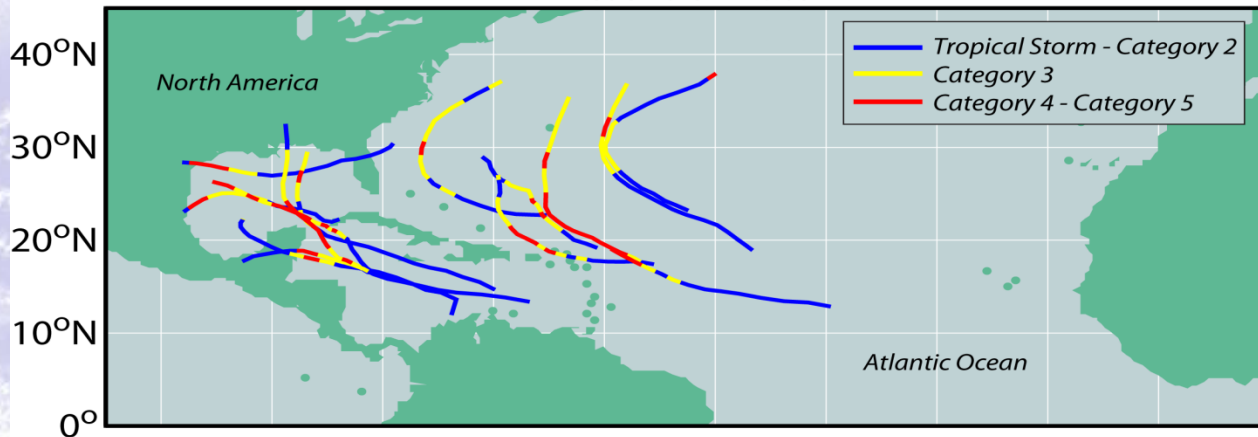


Emanuel, 2007 “Power Dissipation Index” (PDI) of tropical cyclones, defined as the sum of the cubed estimated maximum sustained surface wind speeds at 6-hour intervals accumulated over each Atlantic tropical cyclone from the late 1940s to 2003.

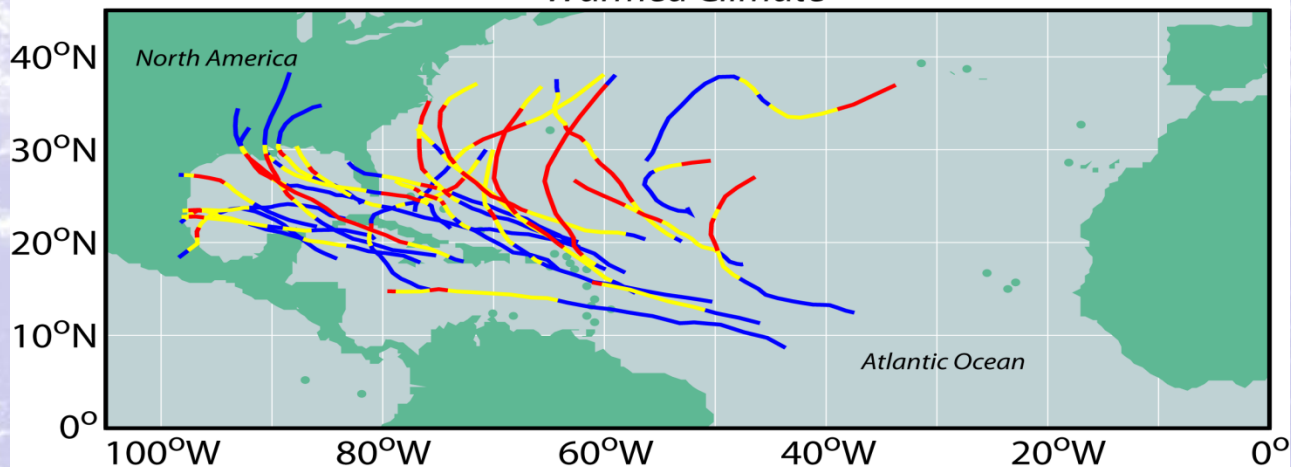


Increased Tropical Activity

Modeled Category 4 & 5 Hurricane Tracks
Present Climate



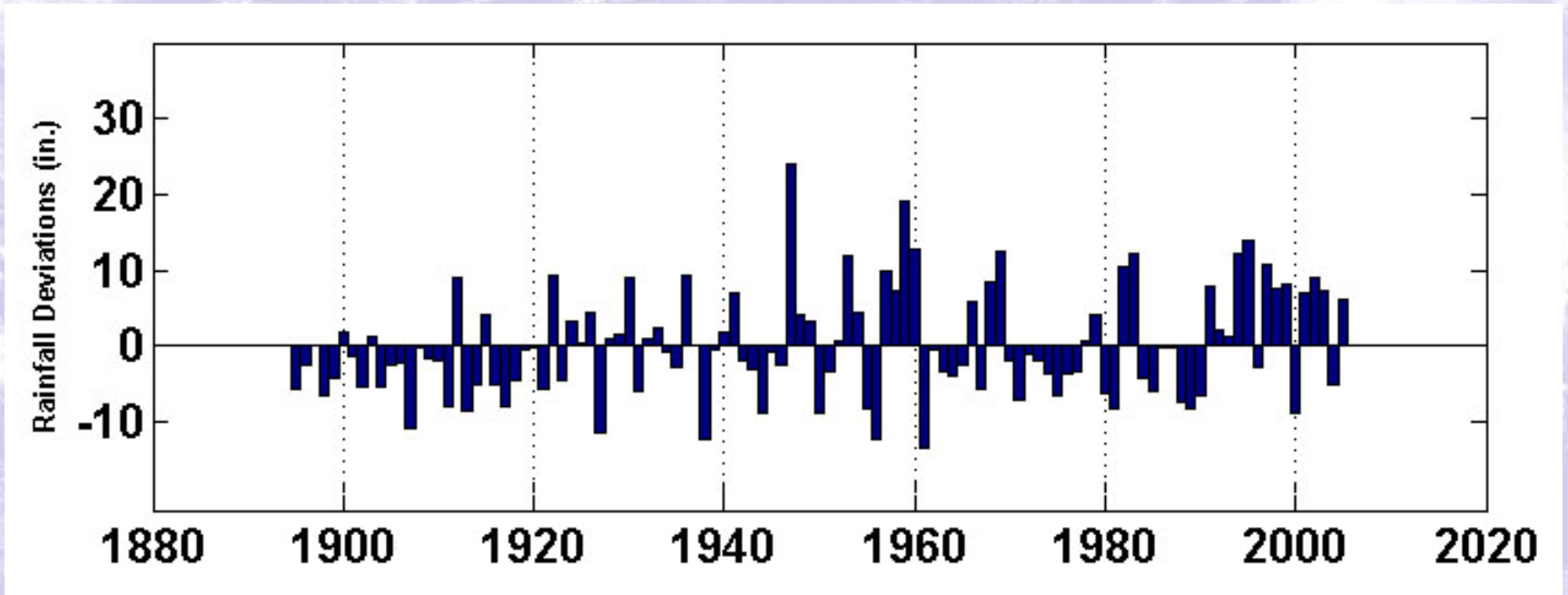
Warmed Climate



Modeled Impact of Anthropogenic Warming on the Frequency of Intense Atlantic Hurricanes
Morris A. Bender, Et al. 2010



Greater Rainfall Variability



Source: Climate Change & Water Management, SFWMD Nov, 2009



Utilities Infrastructure Adaptation

- **Diversification of Water Resources**
 - (Lack of Regional Storage and Herbert Hoover Dike Repair at Lake Okeechobee)
- **Hurricane Hardening and Disaster Recovery**
- **Salt Water Intrusion/Inland Supply**
- **Facility Planning**
- **Reducing Infiltration/Inflow**

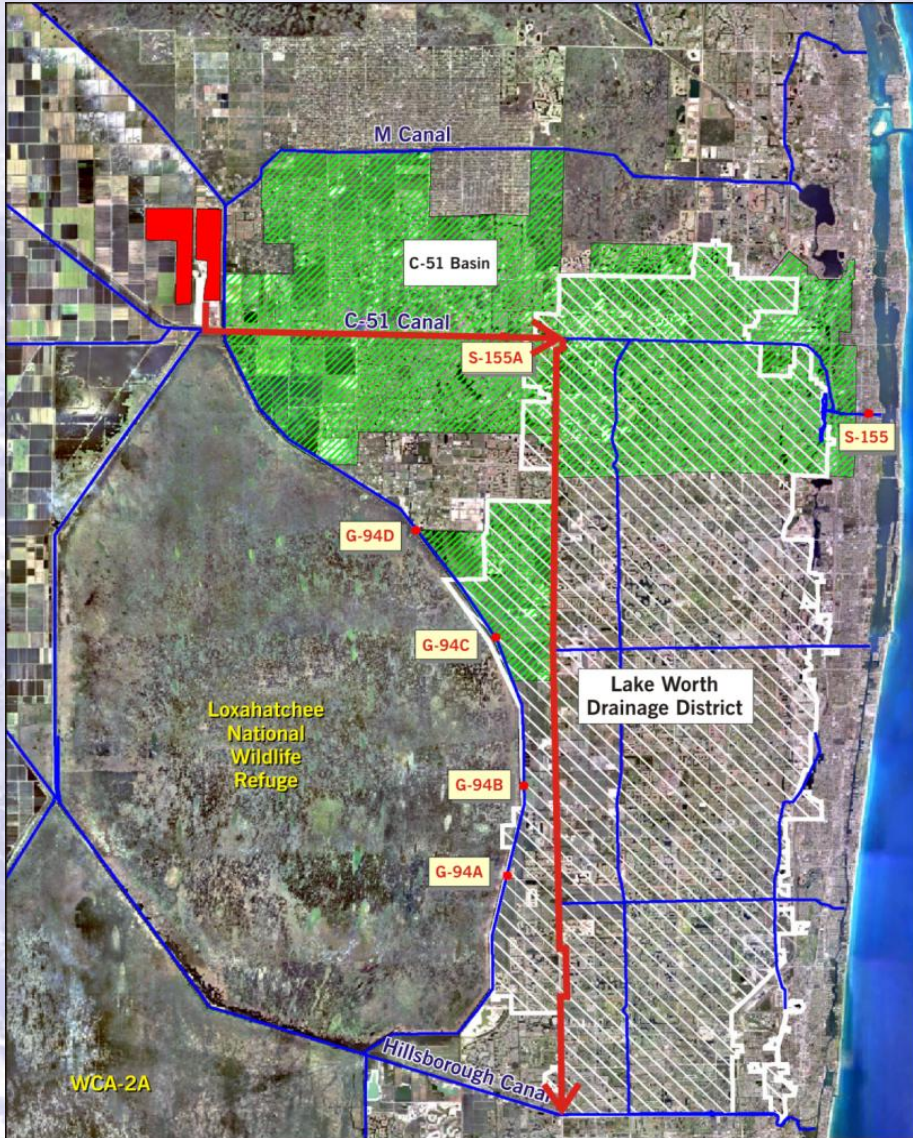


Diverse Water Resources

- ASR (Aquifer Storage and Recovery)
- C-51 Reservoir (surface water storage)
- Wastewater Reuse (supplement local groundwater, multiple use water)



C-51 Reservoir

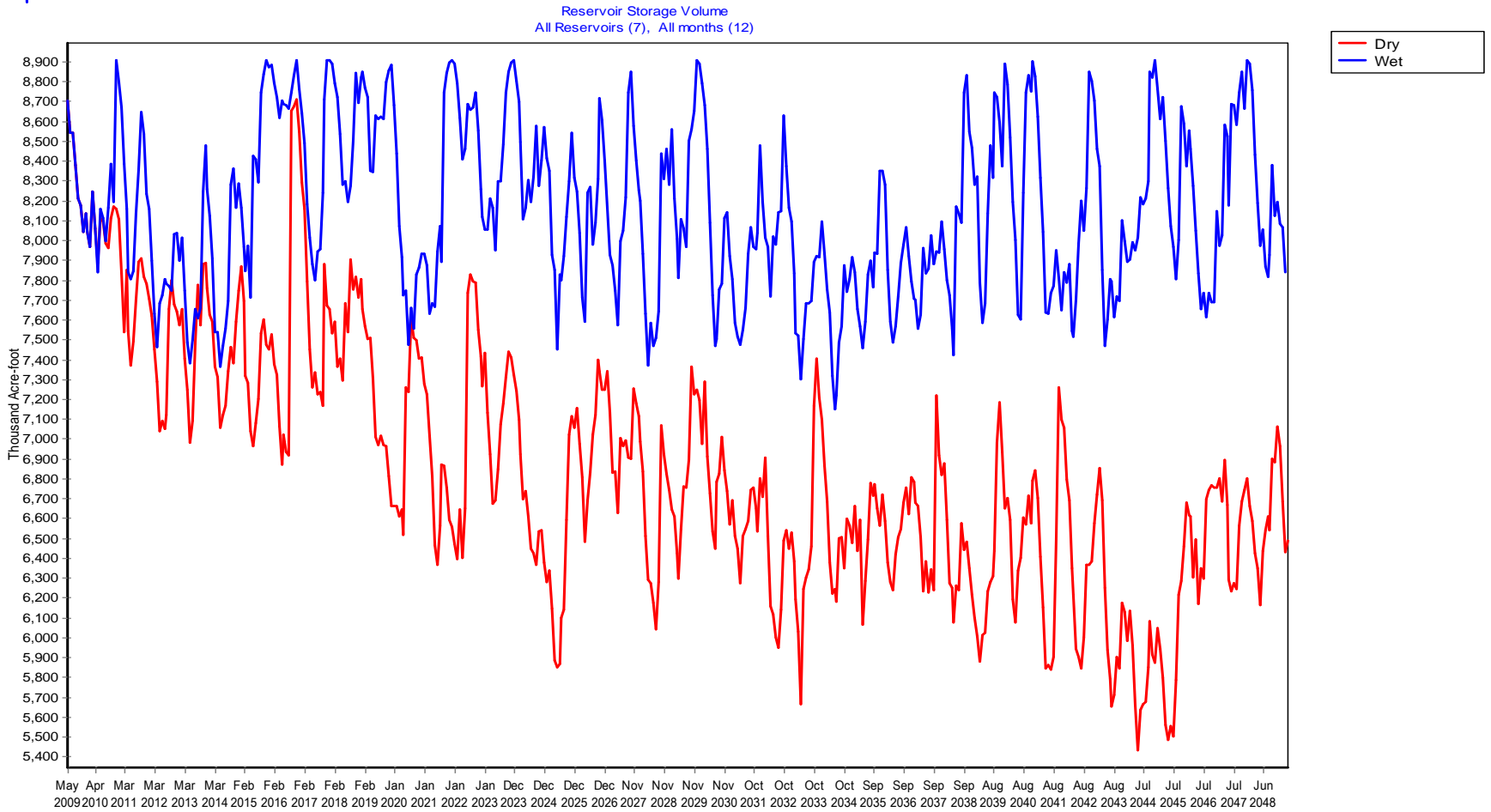


WEAP Model

- Created a Dynamic Decision Support System (D2S2) in conjunction with Water Research Foundation (WRF) UF, and the National Center for Atmospheric Research (NCAR) and PBS&J
- Used Water Evaluation and Planning Tool (WEAP) platform, developed by the Stockholm Institute
- Includes 112 climate change projections
- High level planning model, calibrated with over 20 years of past climate data and canal levels
- Incorporates population projections and the PBC WUD Capital Improvement program



WEAP Model Results Reservoir Storage



Includes: Kissimmee Lakes, Lake Okeechobee, C-51, L-8



Alternative Water Supply

- **Reclaimed Water – 25 MGD**
- **Created Wetlands – 5 MGD**
- **Industrial Cooling Water Reuse for the FP&L West County Energy Center- 27 MGD**
- **Palm Beach County Water Utilities Water Conservation Leader in South Florida – over 13 billion gallons/year**



Wakodahatchee Wetlands



Hurricane Preparedness

- **Hardening of Facilities**
 - Water and Wastewater Plants
 - Regional Pump Stations
 - Operations Centers
 - Designing Cat 5 Communications and Server Rooms
- **Post Disaster Recovery**
 - FlaWARN - Mutual Aid
 - Design-Build Contract for Emergency Rebuilding



Hurricane Hardening Treatment Facilities



Hurricane Hardening Treatment Facilities



Removing Older Shutters and
Installing Impact Windows



Hurricane Hardening Treatment Facilities



Intake Wall to Block Wind Blown Rain



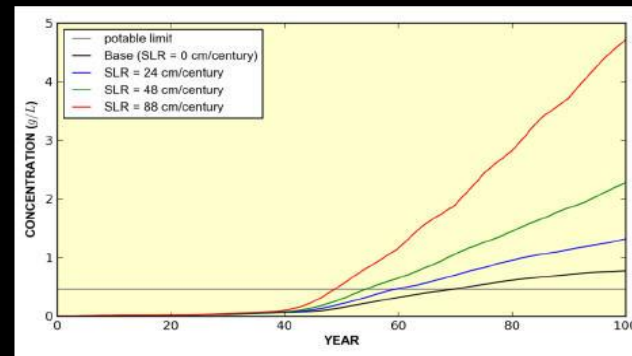
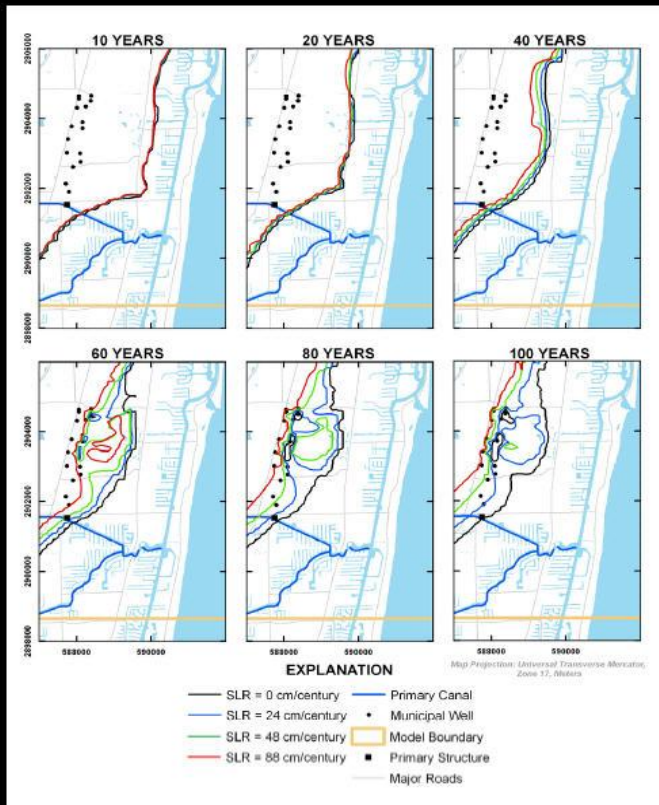
Salt Water Intrusion/Inland Supply

- Salt water intrusion will limit water supplies to the coastal communities.
- Maintain excess water treatment capacity to allow supply of coastal communities with potable water.
- Salt Water Intrusion will affect Reclaim Water Quality due to Inflow and Infiltration

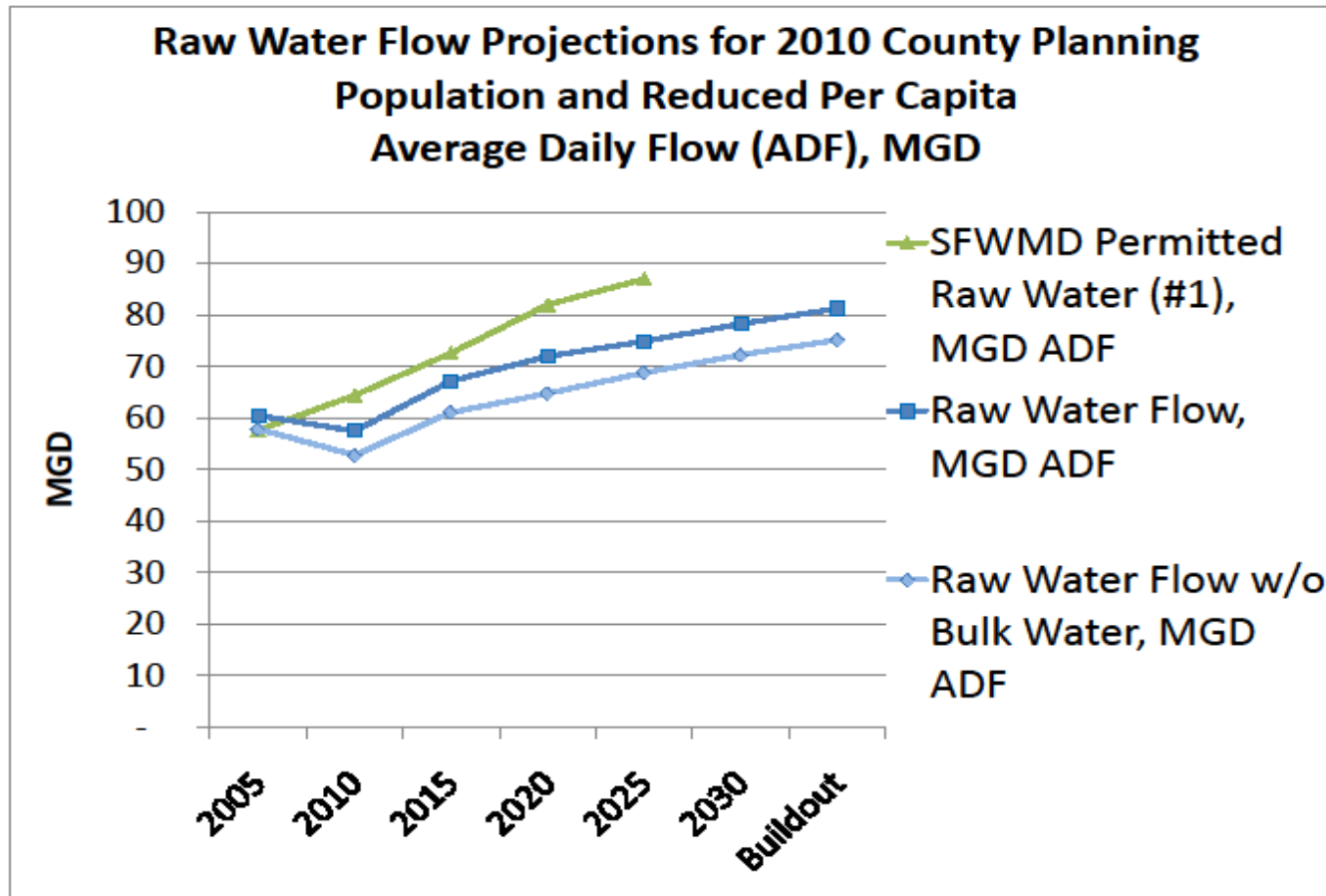


Salt Water Intrusion

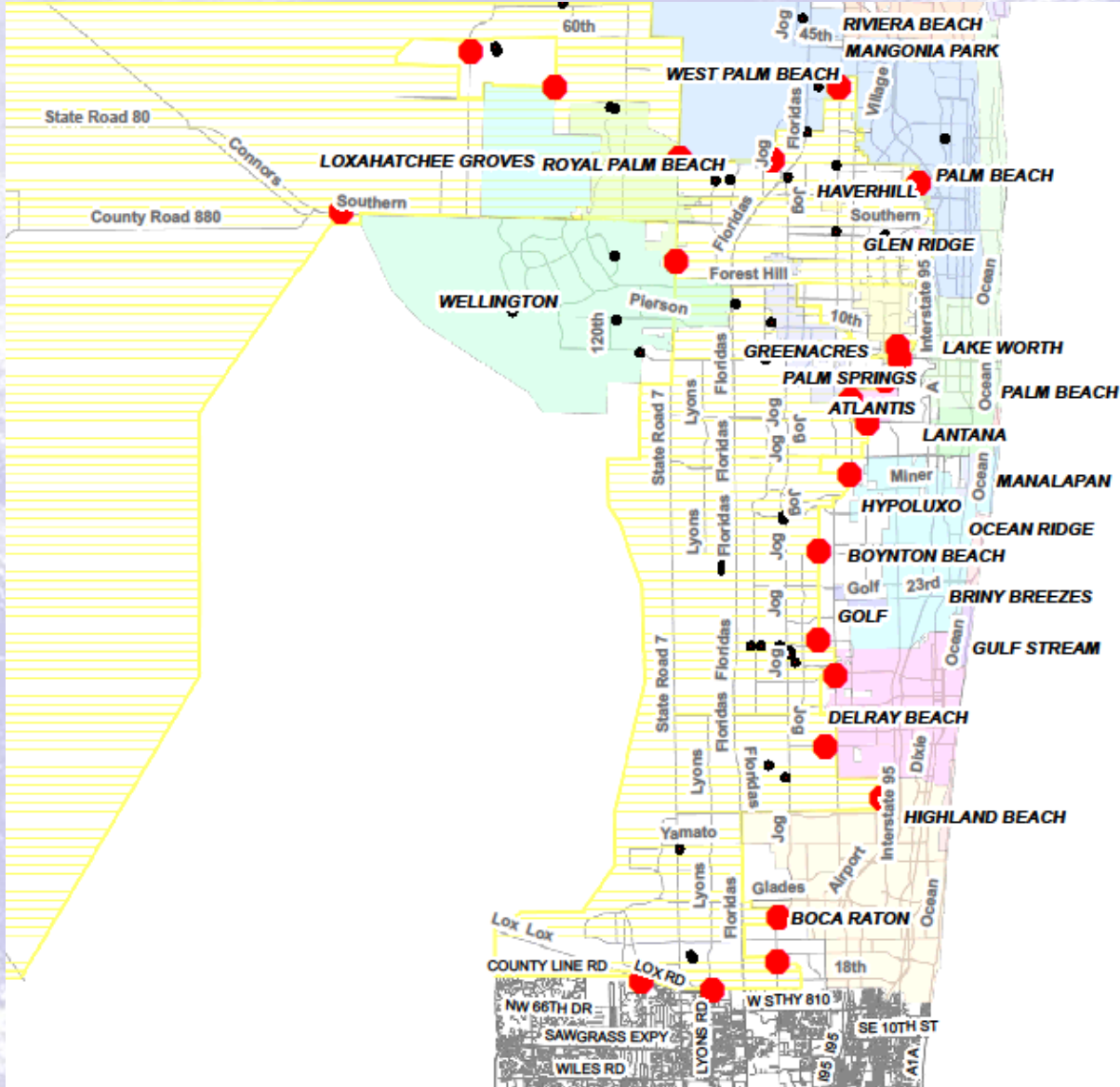
Broward County – sea-level rise analysis



Excess WTP Capacity

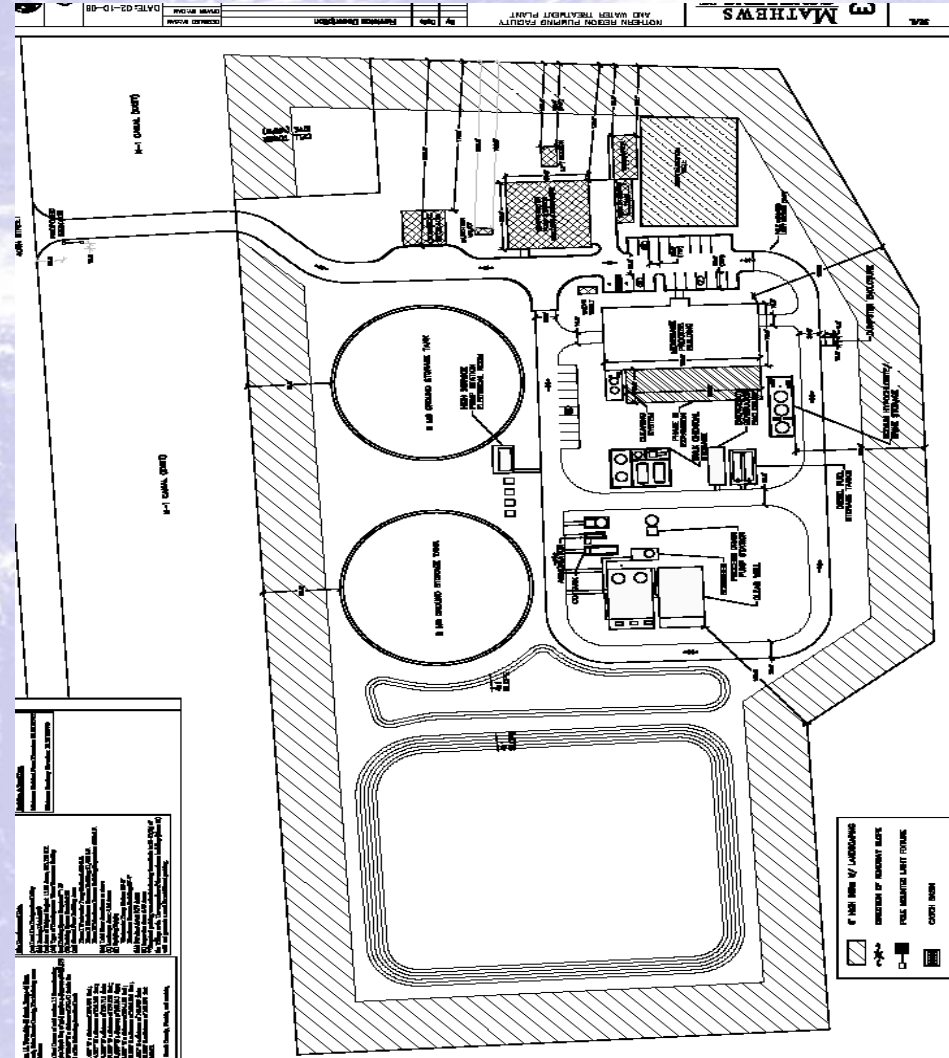


Water Interconnects



Facility Planning

- Have a plan to address rapid increase in population.
 - *Future Northern Region WTP, site plan approved.*



Reducing Infiltration/Inflow

- Increase in Infiltration/Inflow in to the sewer systems caused by higher GW levels and more intense rainfall.
- In some areas up to 50 percent of the wastewater flow is caused by infiltration/inflow. As GW levels and storm intensity increase this will worsen.



Infiltration/Inflow Reduction



Gravity Sewer Lining



Manhole Lining





**Best Water, Best Service,
Best Environmental Stewardship**

