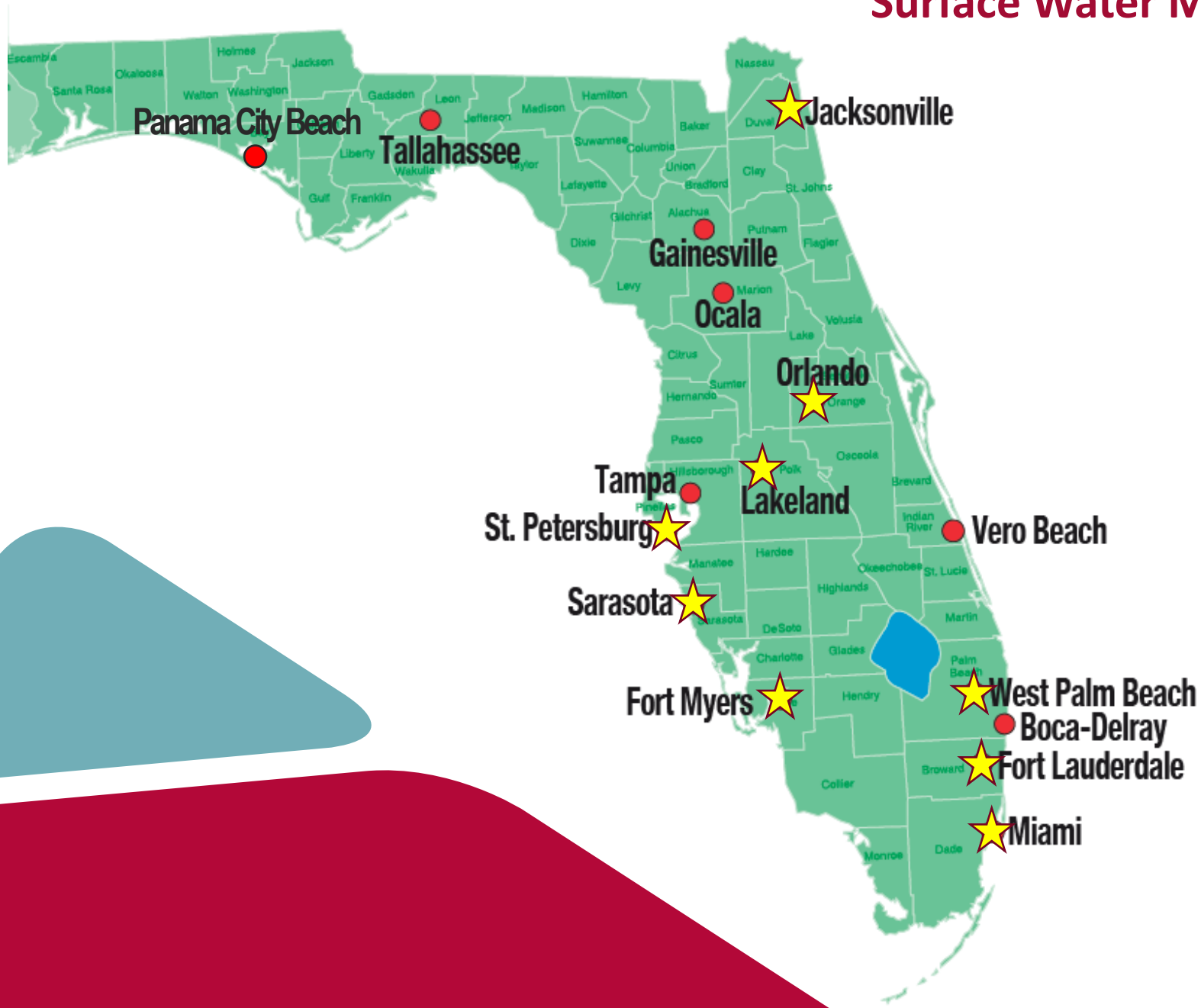
H&H Modeling & Surface Water Practice

Lunch & Learn

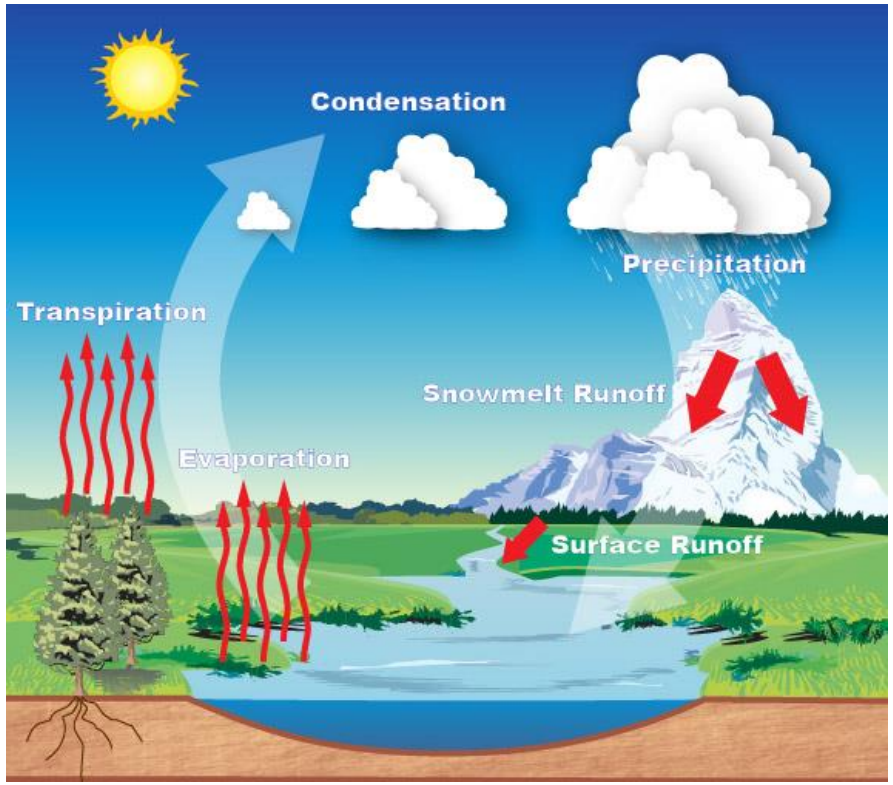
Matt Brosman, P.E., CFM

- B.S. University of Florida, 2013
- 4 years at KH Dallas
- 4 years at KH Ft. Lauderdale
- Practice area
  - Surface water modeling
  - Floodplain management
  - Stormwater master planning
  - Community resilience

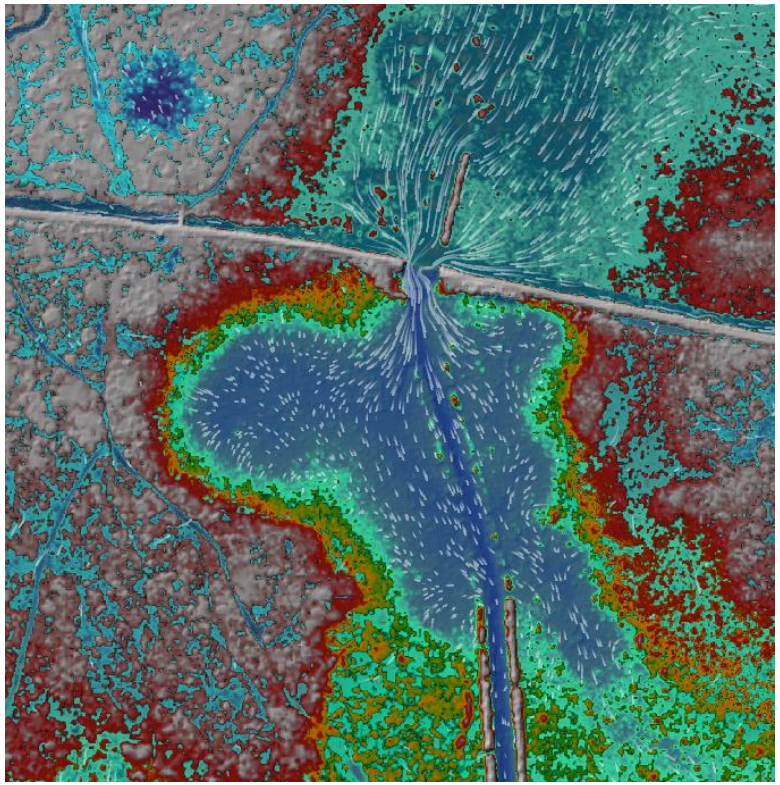
Surface Water Modeling Partners



Hydrology & Hydraulics



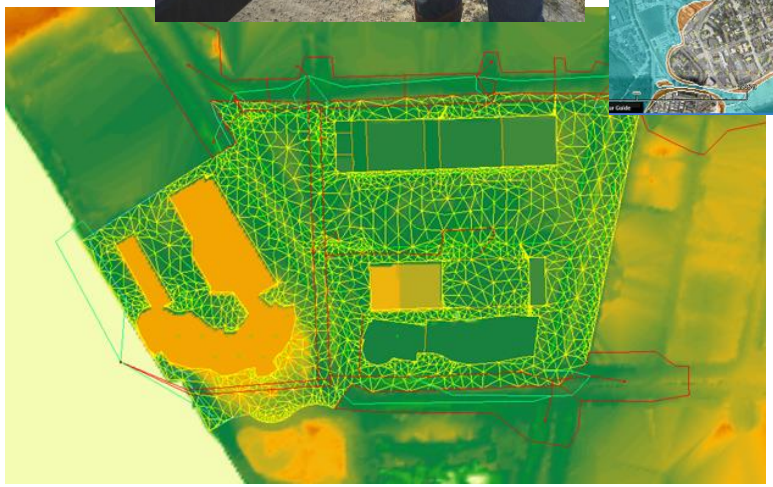
“How does water enter and leave our environment?”



“How does water move through our environment?”

Typical Project Types

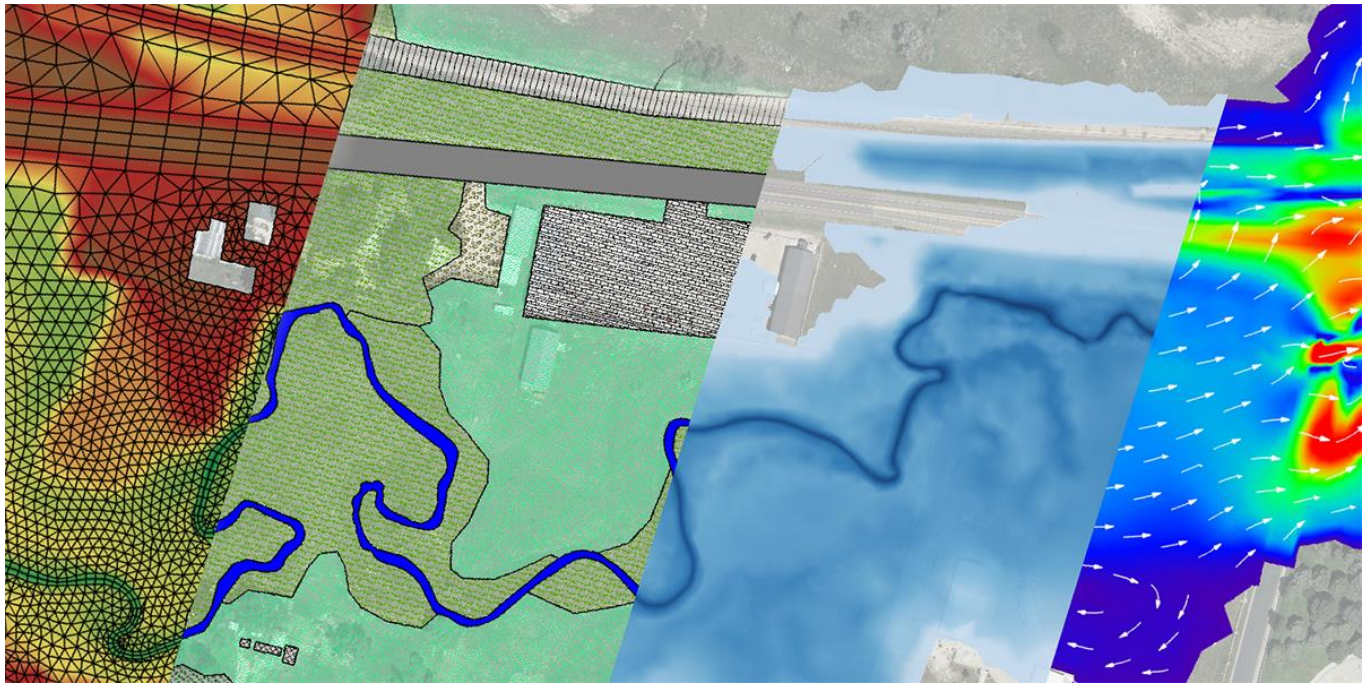
- Stormwater Due Diligence
- Site Stormwater Facility Design
- Water Quality Design & Monitoring
- FEMA Map Revisions
- Stormwater Master Planning
- Watershed Management Plans
- Community Vulnerability & Resiliency Assessments



Hydrologic & Hydraulic Modeling

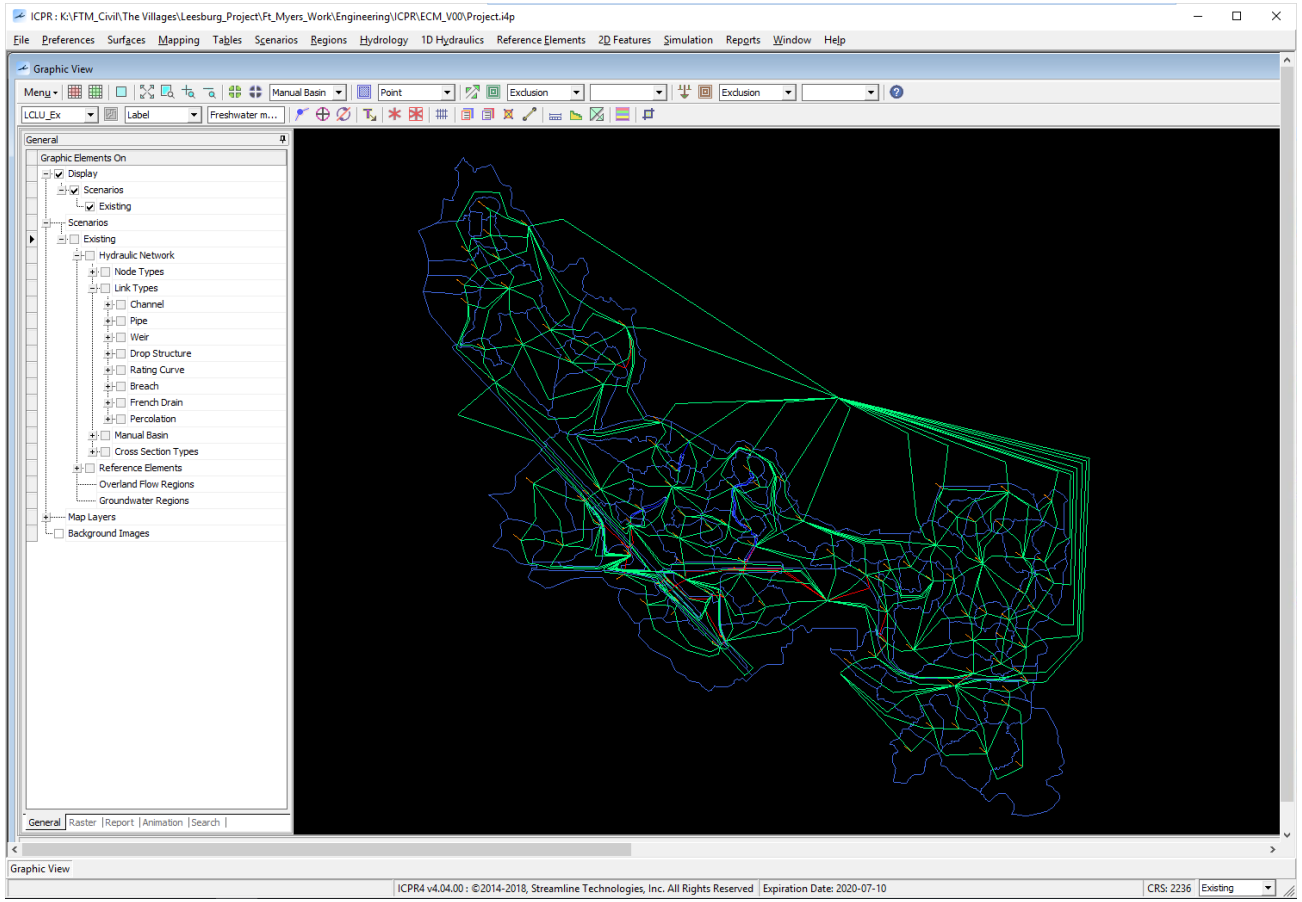
Why do we need an H&H model?

- Predict flooding & protect the community
- Select & implement flood reduction projects
- Models juggle a lot!
  - Dozens of parameters
  - Hundreds of elements
  - Thousands of timesteps…
  - Computationally intense



What is ICPR?

- Interconnected Channel and Pond Routing Model
- Program used to model drainage on nearly any scale
- Most used H&H model in FL
- Model within a GIS-based environment

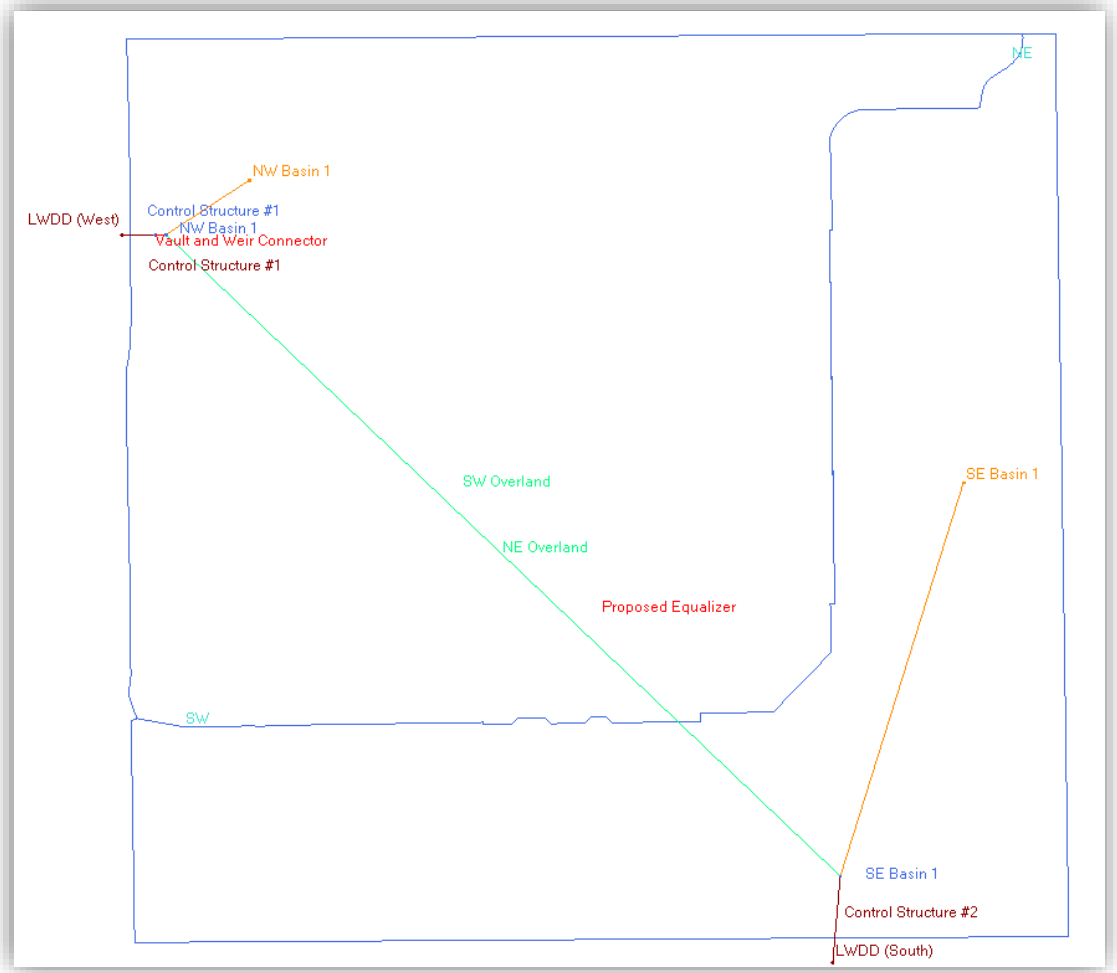


What is ICPR?

- Surface water in FL often moves between ponds as shown
- Connected via a series of pipes and control structures
- Stormwater quality & quantity control, velocity control, wetland mitigation, etc.
- Basins shown in red
- Flows A → E → F → G → H…

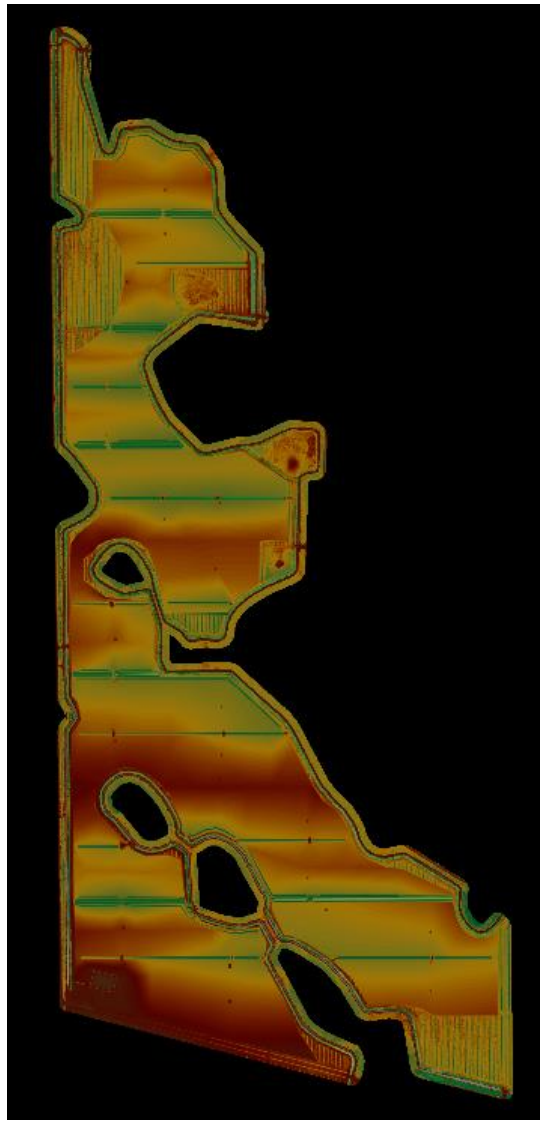
Typical Elements

- Nodes
  - Represent physical points where water collect
  - Inlets, manholes, ponds
- Links
  - Get water from one place to another
  - Pipes, channels, pumps, etc.
- Basins
  - Receive rainfall, hydrologic routine, generate runoff
  - Connected/applied to a node



Typical Elements

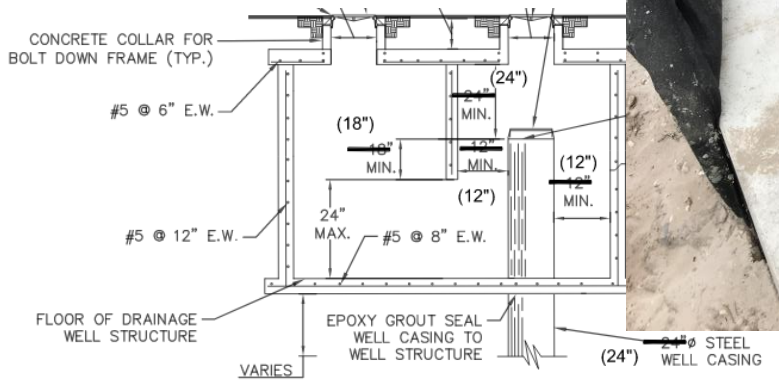
- Underlying Layers
  - Elevation
  - Land Cover
  - Soils
  - Groundwater
- Tabular Data
  - Boundary Stages
  - Rating Curves
  - Land Cover/Impervious properties

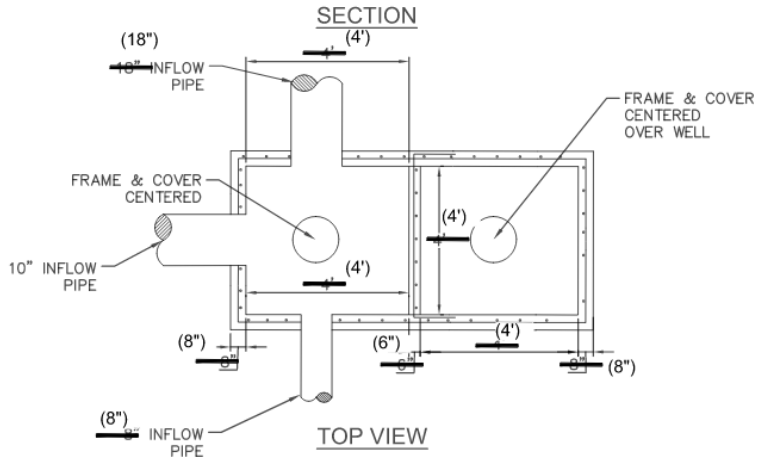


Example Applications

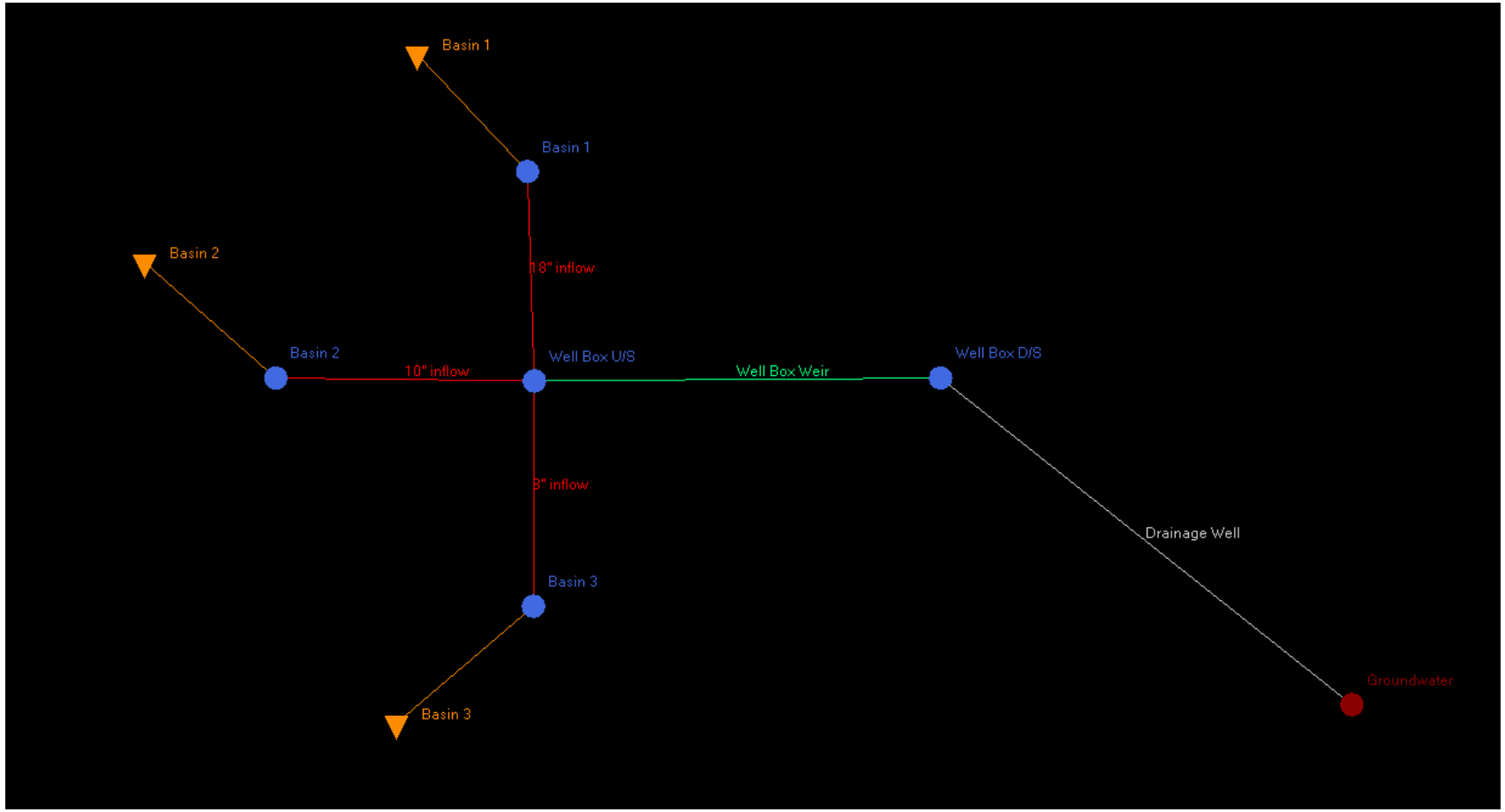
Tiny Scale – Drainage Well

- Small site discharges into a well box
- Well discharges approx. 150 feet below grade
- Rating curve defined by FDOT standards
- Ensure state water quality & quantity standards are met



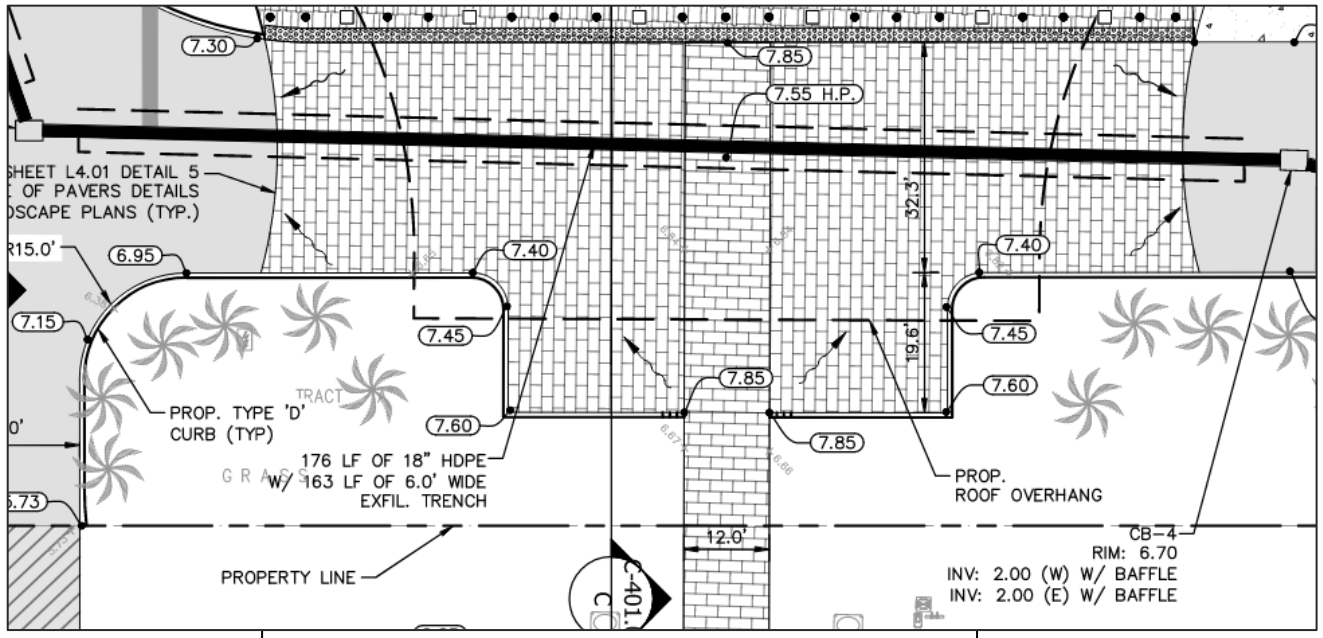


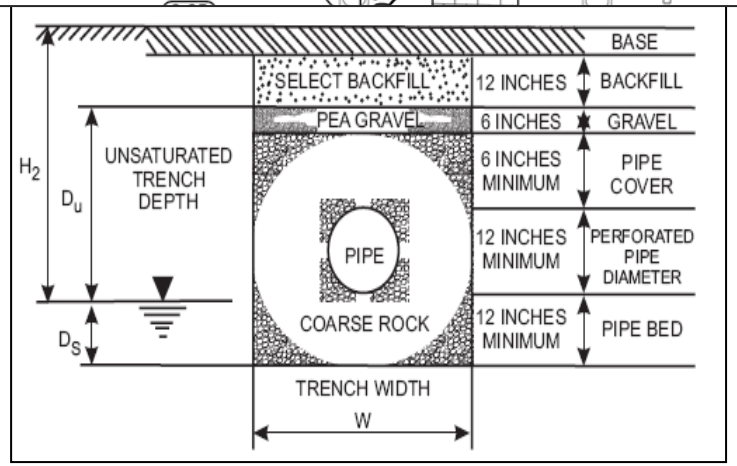
Tiny Scale – Drainage Well



Small Scale – Exfiltration Trench

- Exfiltration trench link represents trench storage
- Percolation link allows water to slowly leave system
- Ensure site draws down sufficiently quickly
- Ensure site meets state water standards





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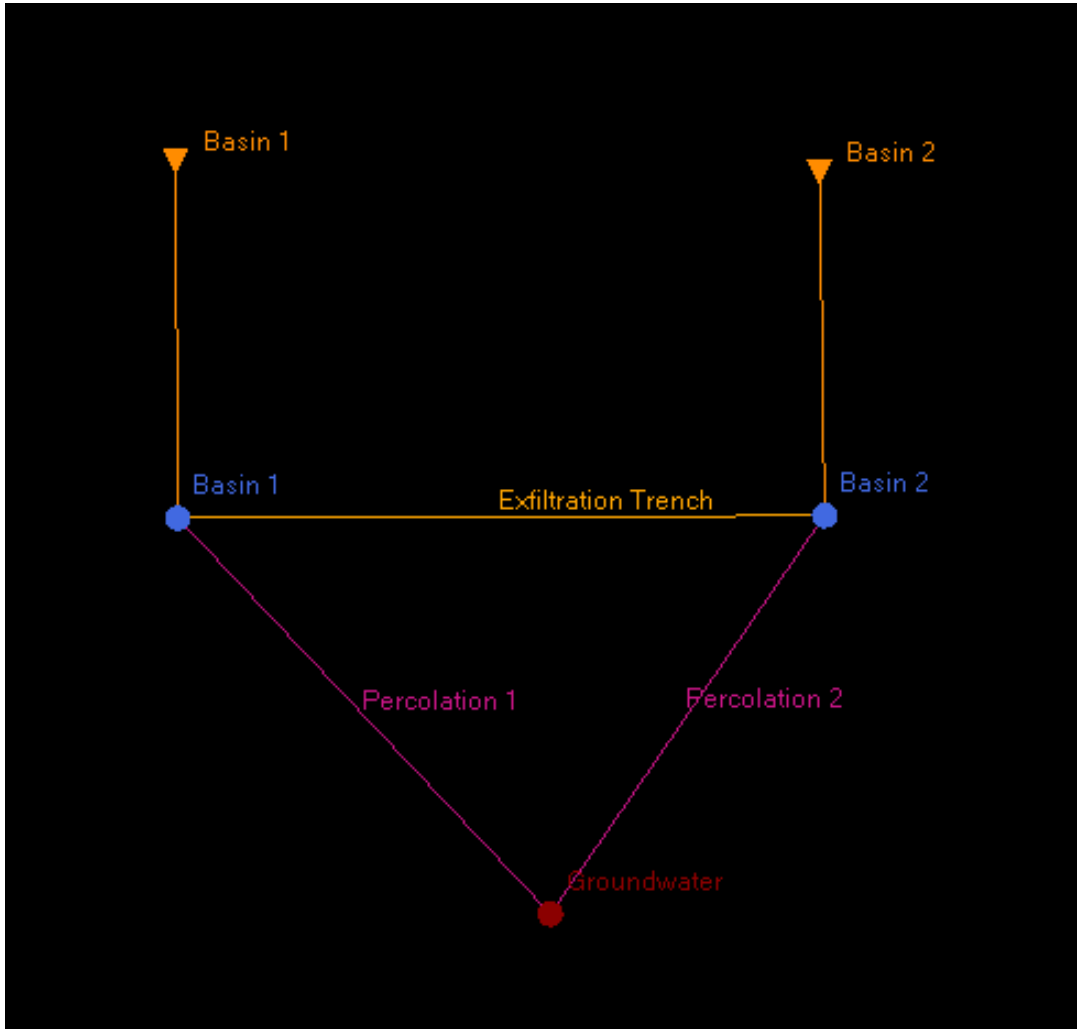
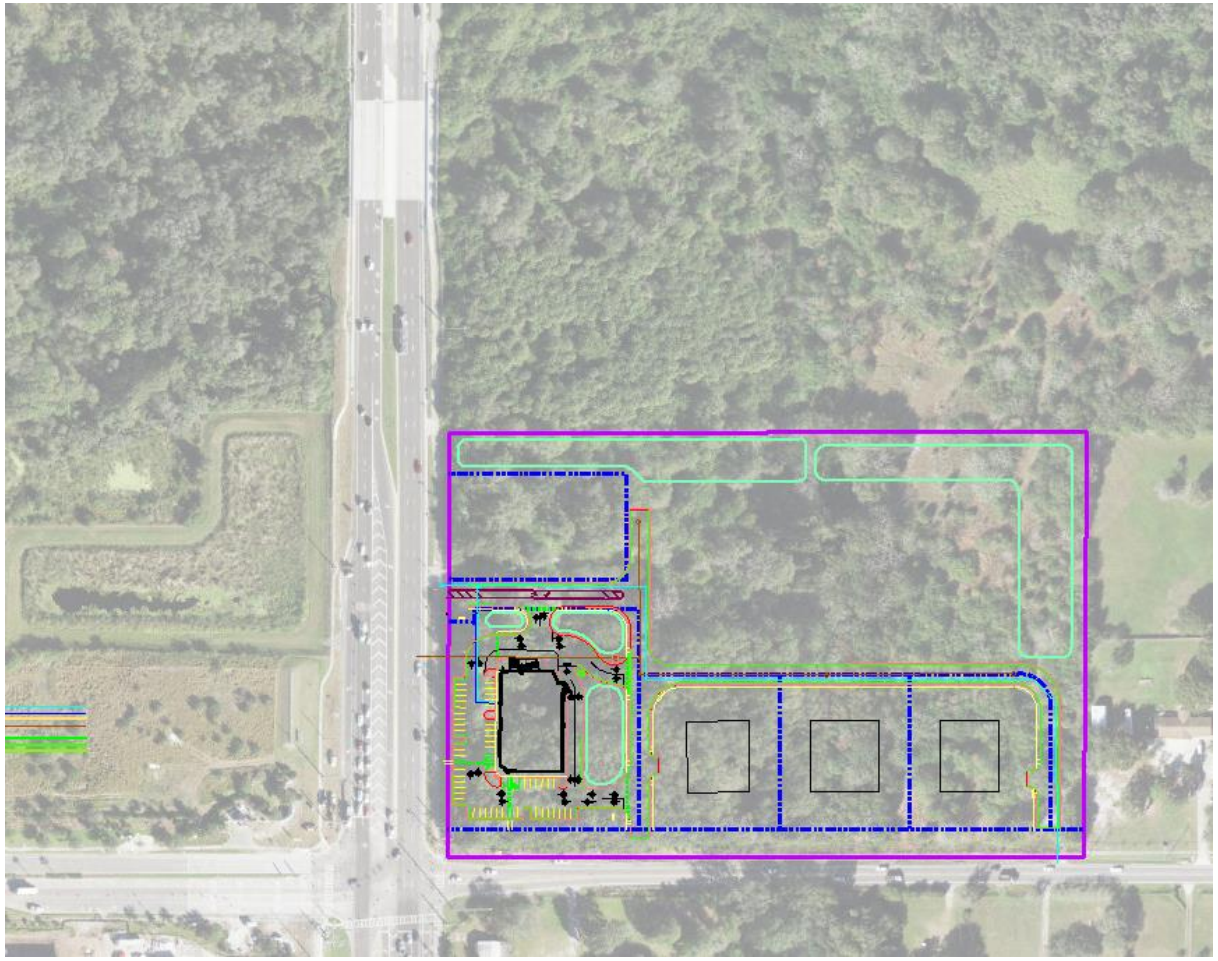


Medium Scale – Commercial Site

- Commercial site with two ponds, discharge to
- Control structures hold back smaller storm events
- Comparison vs. pre-development to ensure improvement
- Results establish minimum building, parking lot elevations



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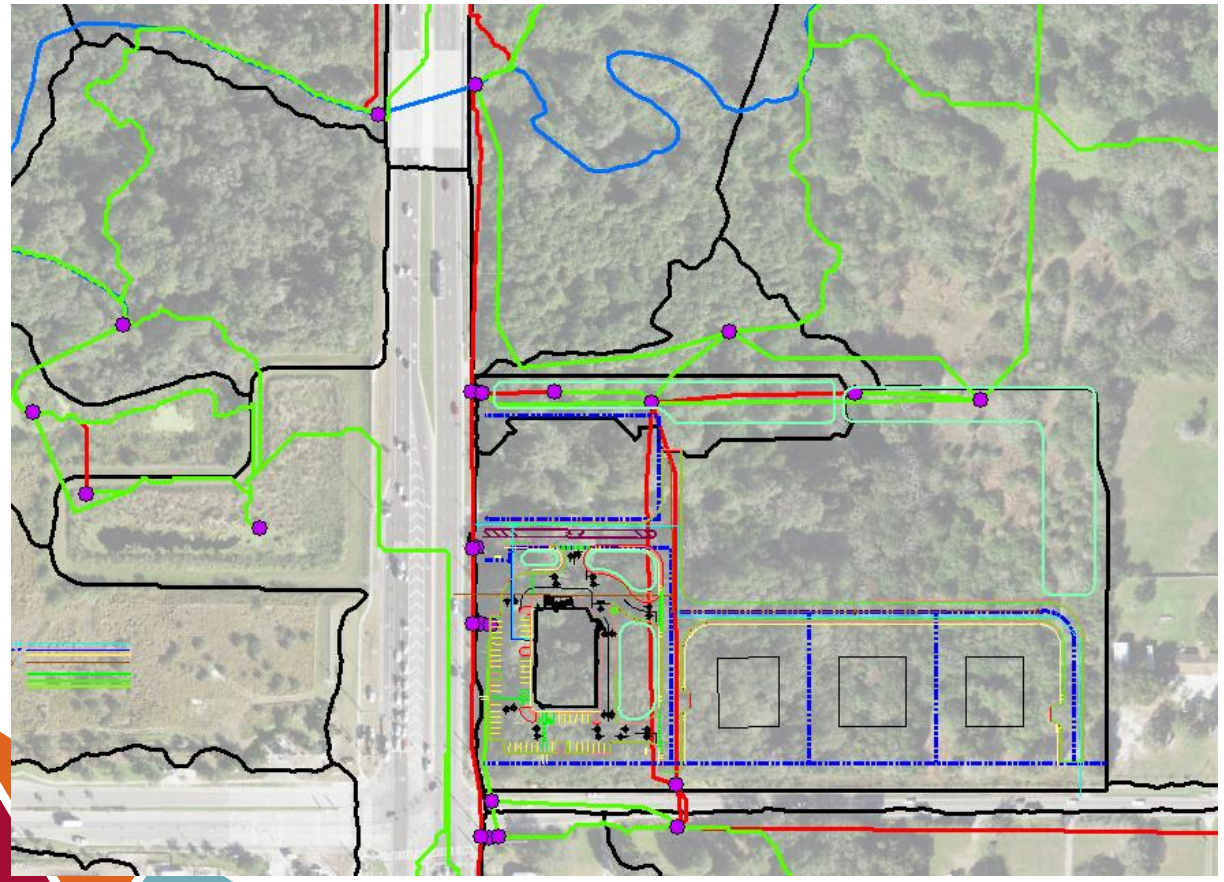
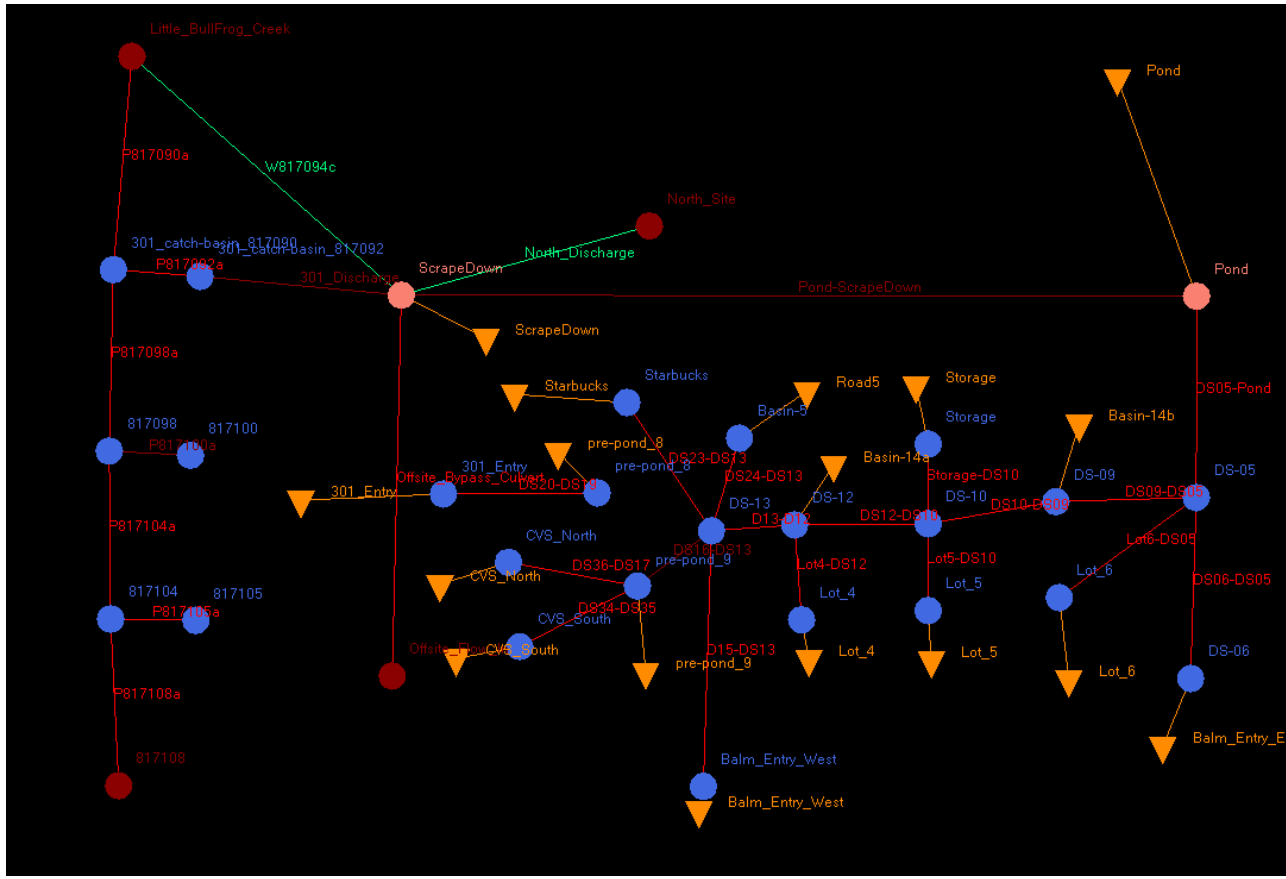
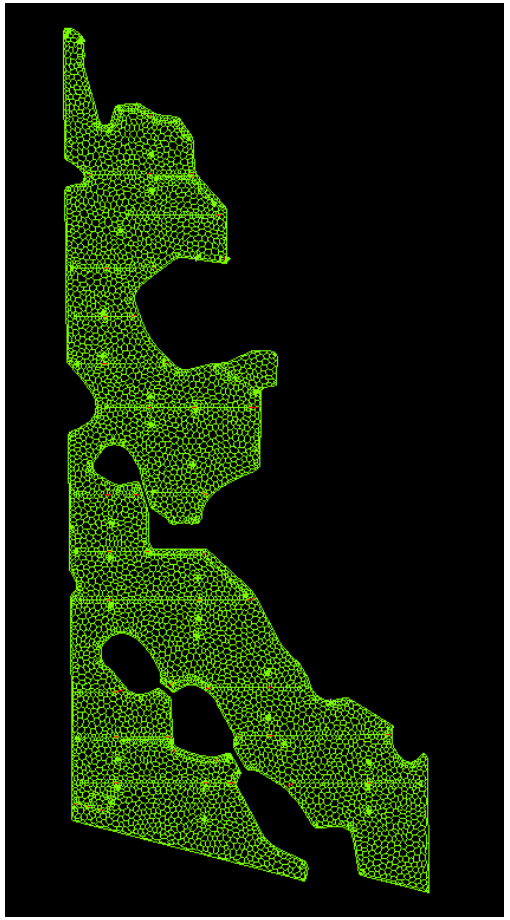
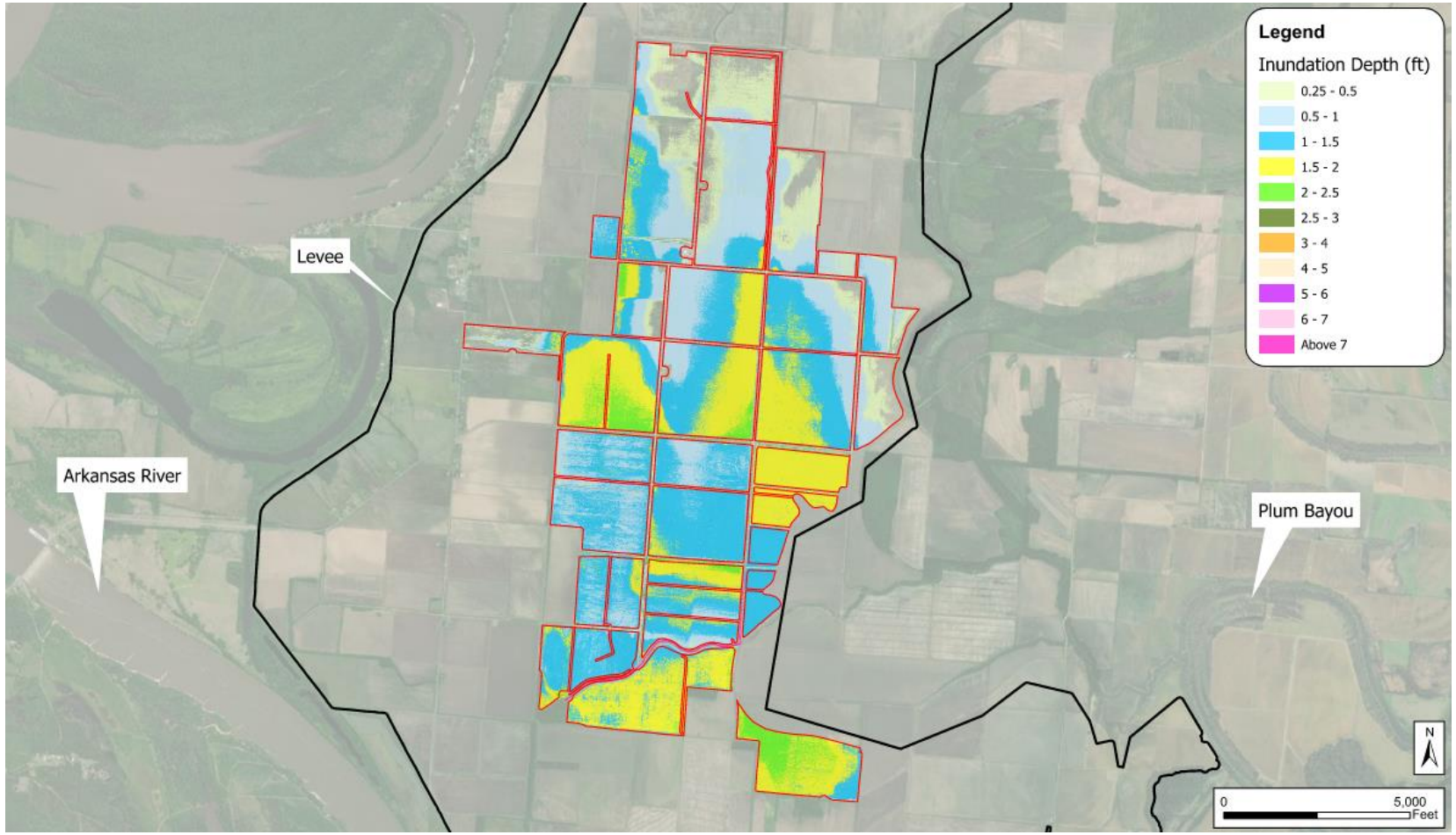




Large Scale – Solar Energy



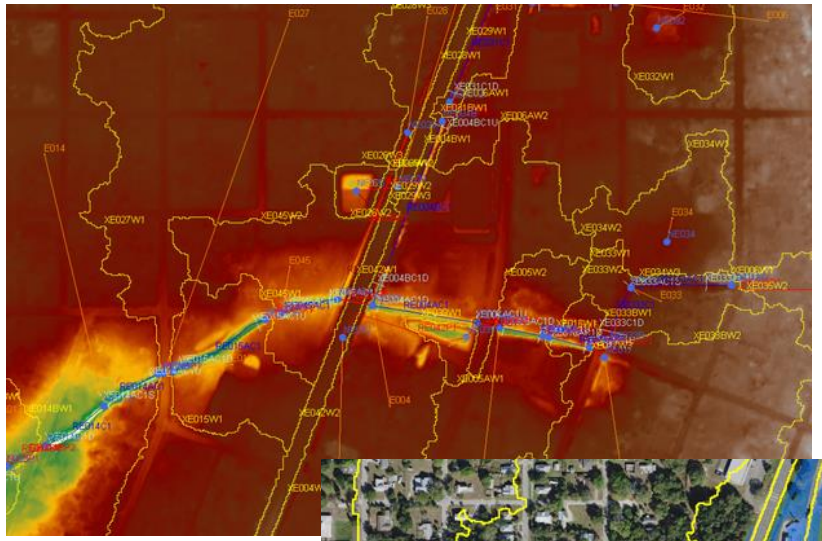


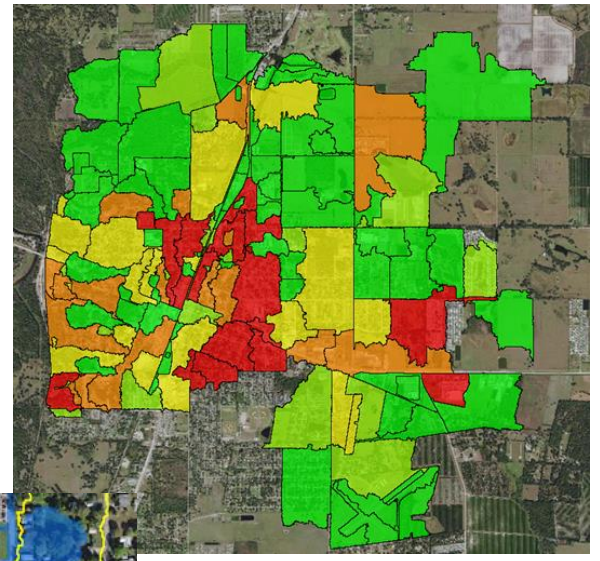
Large Scale – Solar Energy

- Photovoltaic Facility
- 74.5 MW, 300k panels, 15k homes
- Two-dimensional model to determine optimal rack location and pile heights
- Scour (erosion) considerations
- Overland sheet flow from array fields into canals

Larger Scale – Watershed Management Plan

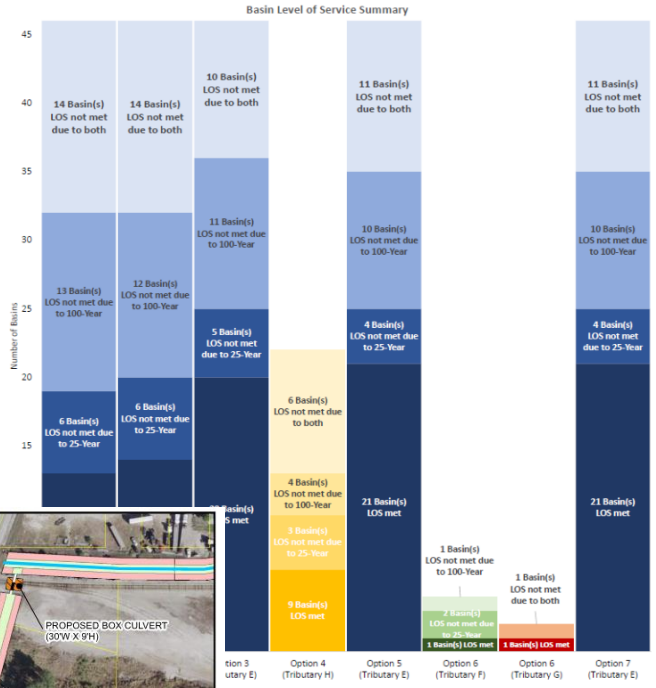
- Watershed Management Plan
- Calibrated to Hurricane Irma
- Evaluation of watershed Level of Service (LOS)
- Evaluation of proposed projects

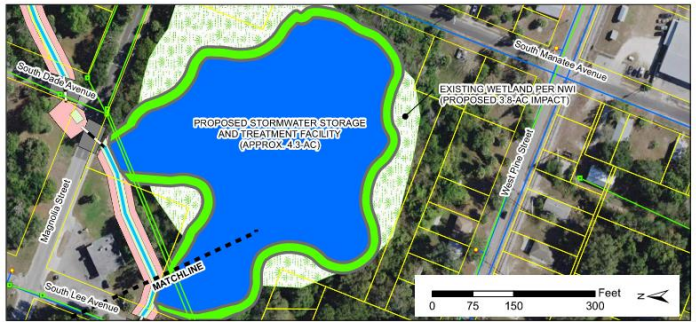




Watershed Management Plan
Future Project Identification

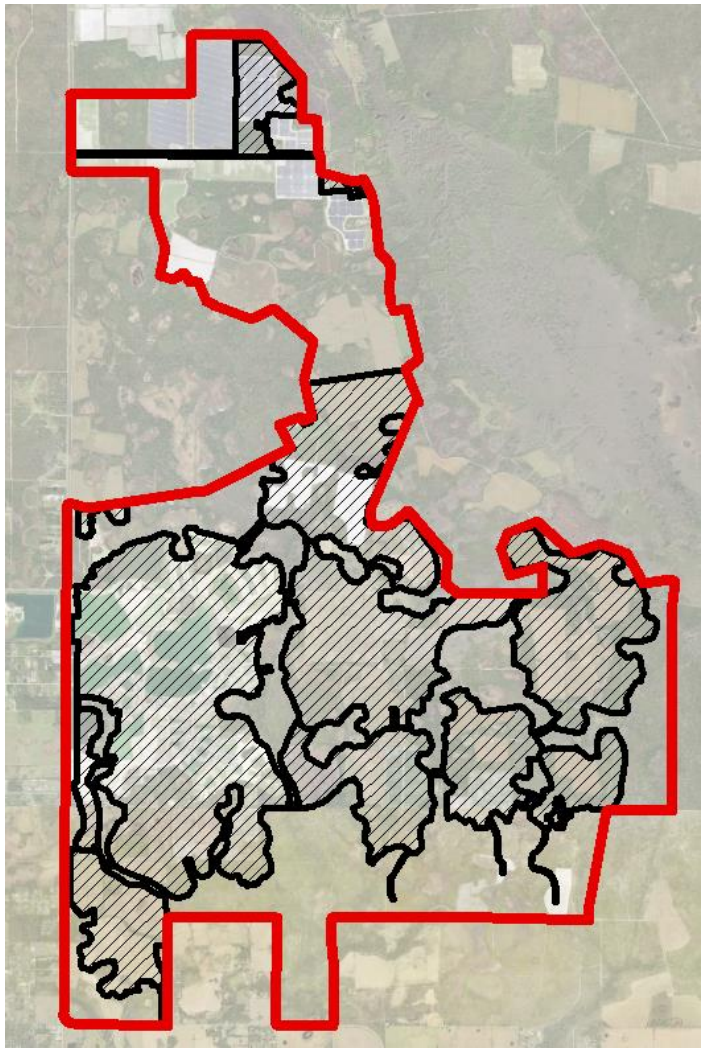
- Identification & validation of problem areas
- Conceptual design scenario analyses
- Spatial prioritization and decision matrix

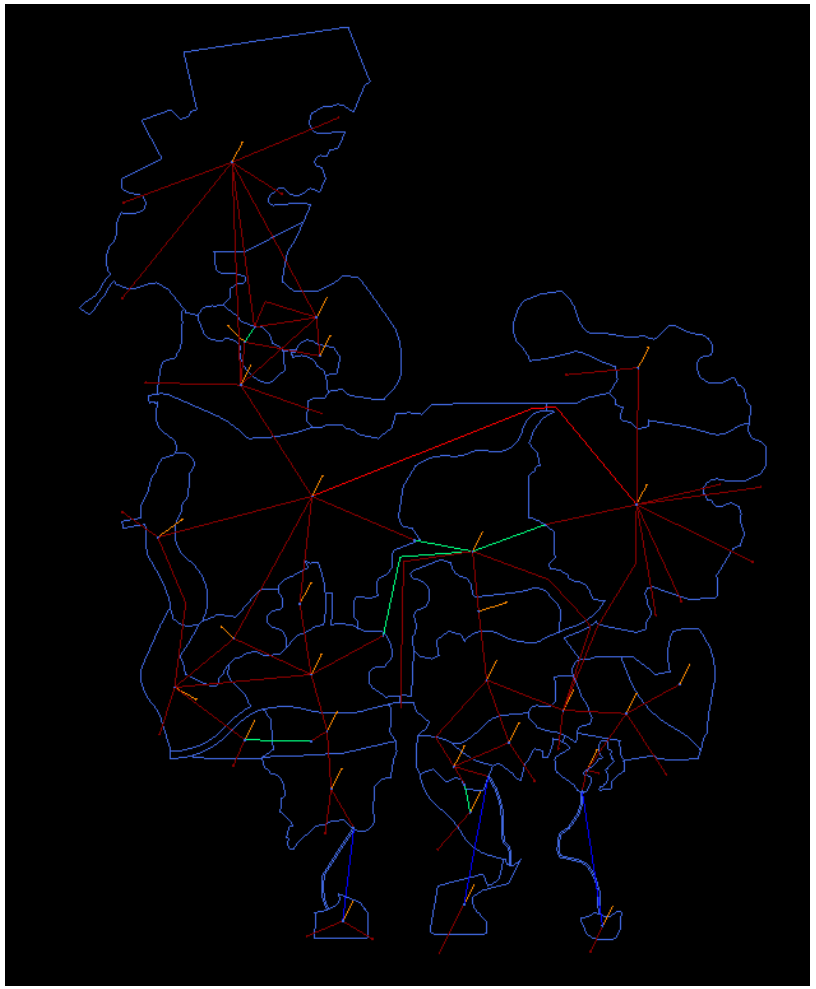




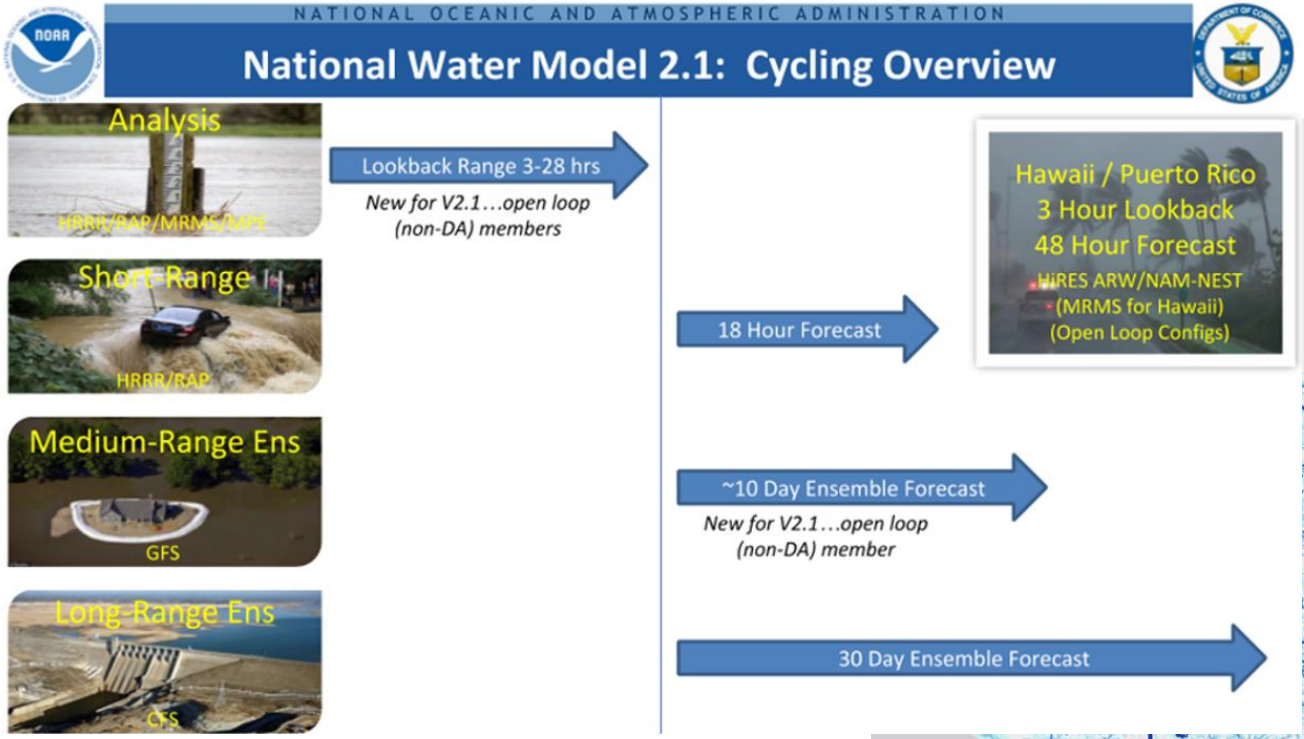
Even Larger Scale – Master Planned Communities

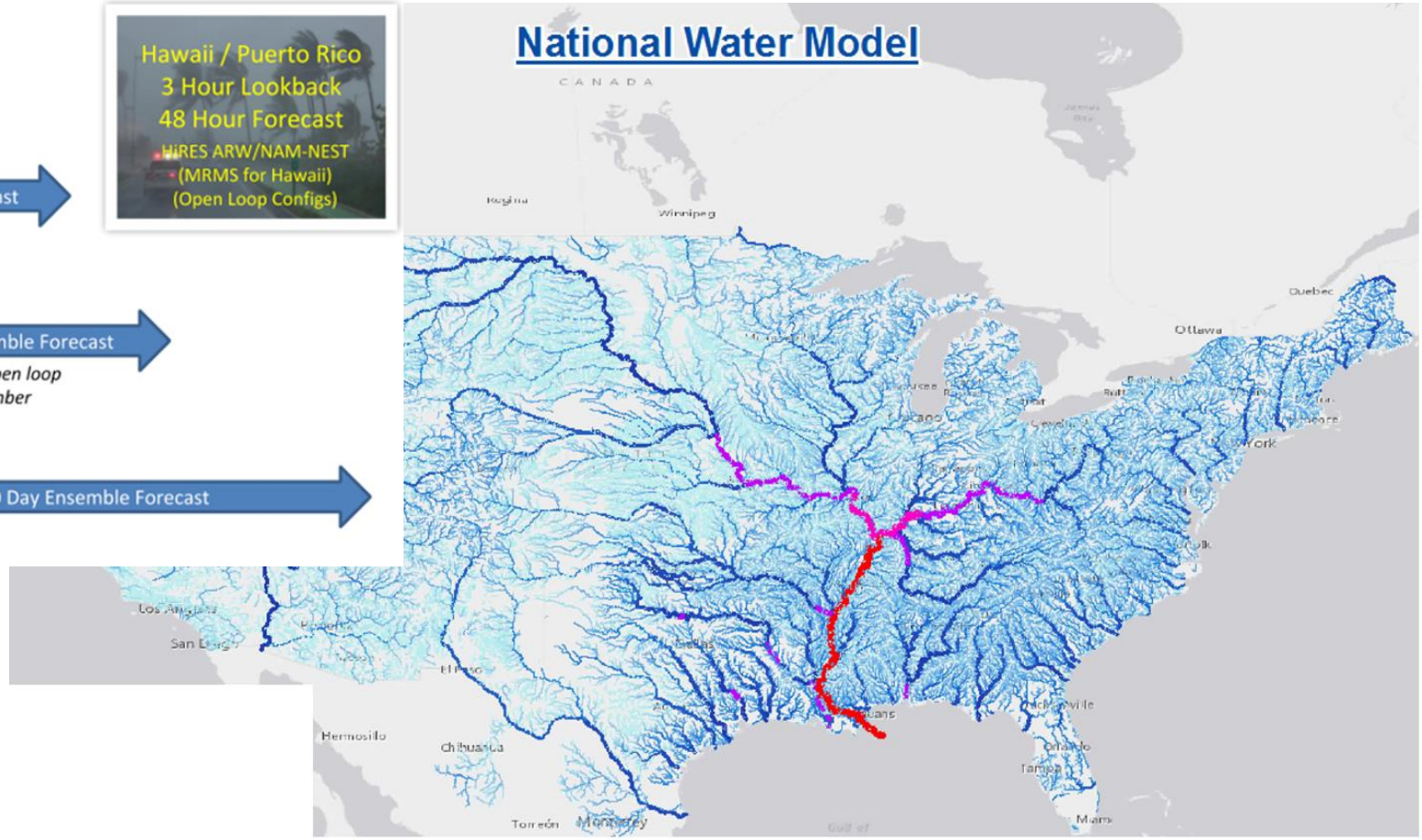
- 18,000+ acre property
- Stormwater system designed to mimic natural conditions
- Conceptual permitting with SFWMD
- Multiple FEMA flood map revisions





And Beyond…


NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION
National Water Model 2.1: Cycling Overview
Analysis
HRRR/RAP/MRMS/MPE
Short-Range
HRRR/RAP
Medium-Range Ens
GFS
Long-Range Ens
CFS
Lookback Range 3-28 hrs
New for V2.1…open loop
(non-DA) members
18 Hour Forecast
Hawaii / Puerto Rico
3 Hour Lookback
48 Hour Forecast
HiRES ARW/NAM-NEST
(MRMS for Hawaii)
(Open Loop Configs)
~10 Day Ensemble Forecast
New for V2.1…open loop
(non-DA) member
30 Day Ensemble Forecast


National Water Model
CANADA
Winnipeg
Ottawa
Quebec
Hermosillo
Chihuahua
Torreón
Monterrey
Tampa
Miami

Questions?

Let's connect!
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