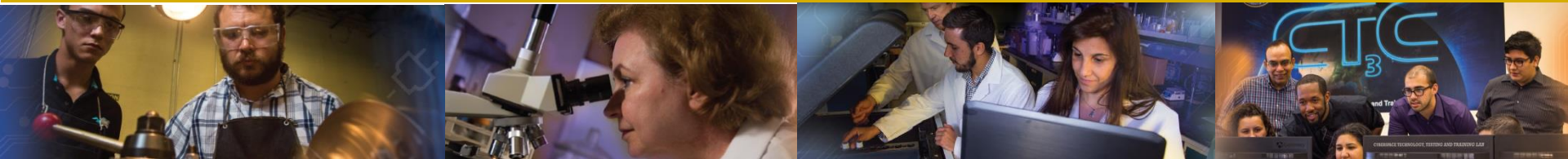




Field Research to Support Contaminant Transport Modeling of Tims Branch Watershed – Savannah River Site

DOE-FIU Science and Technology Workforce Development Program
Applied Research Center
Florida International University



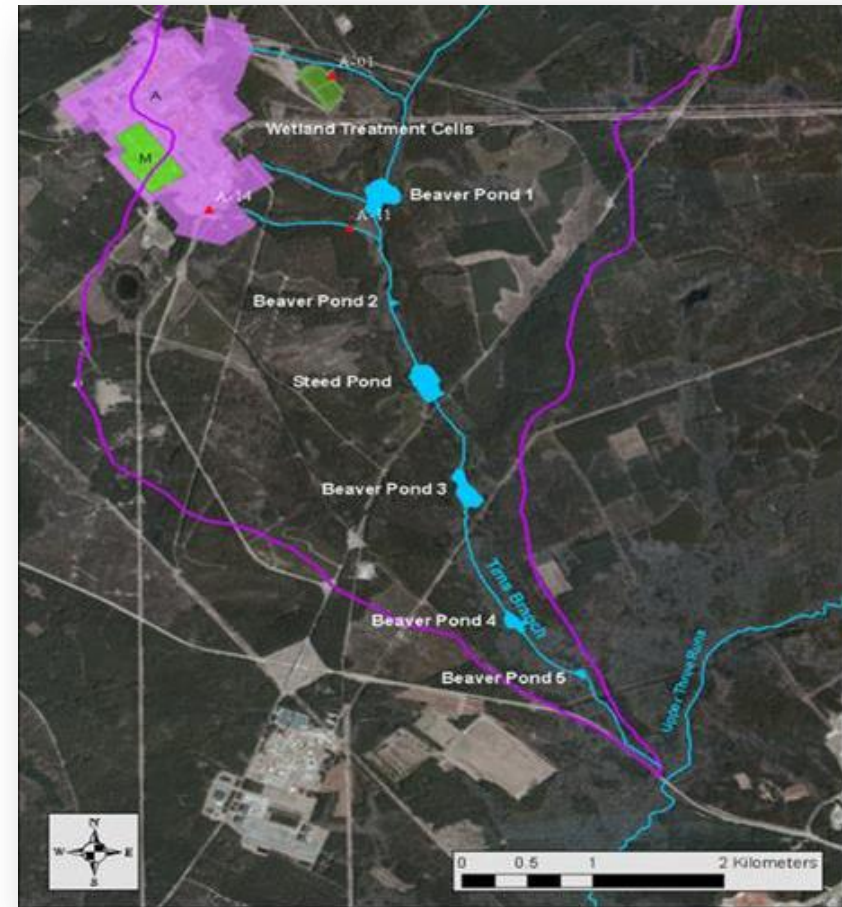


Project Background

FIU

 Applied Research
Center

- **Study Location:** Tims Branch Watershed, Savannah River Site, Aiken, SC
- Heavy metal & radionuclide discharges into Tims Branch from SRS A/M Area
 - e.g., 43,500 kg of uranium released into A-014 outfall tributary into Tims Branch.
- Surface water hydrology modeling, particularly simulation of extreme rainfall events, crucial in understanding fate and transport of contaminants
- Good prediction and long-term monitoring tool
- Challenge finding observed/measured timeseries data
- Field data collected to fill data gaps and support model calibration and validation





Field Research: Water Sample Collection

- Collected water samples along A-014 OF tributary and main Tims Branch stream
 - (Sn, Na, Mg, Al, Ca, Mn, Fe, Ni, Cu, Zn, As, Se, Pb, U)



Sample collection at the A-014 outfall



Sample preparation at SREL



Field Research: Remote Monitoring Stations



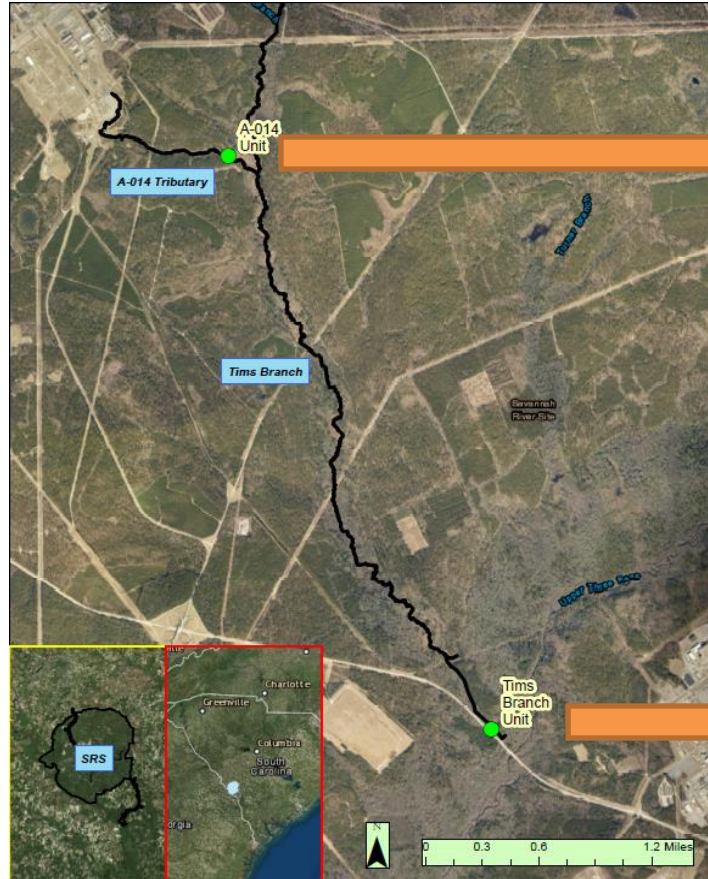
Installed two remote monitoring stations:

- A-014 OF tributary
- Tims Branch

Units currently log water levels only

Flexible support for broad range of sensors:

- e.g., Leaf Wetness, Light Intensity, Rainfall, Rel. Humidity, Soil Moisture, Temp., Volatile Organic Comp

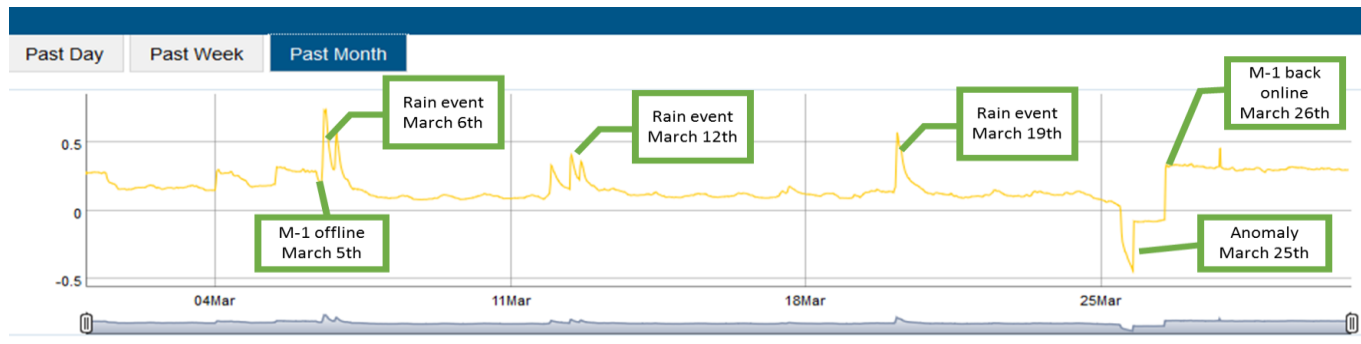




Water Level Data Collection

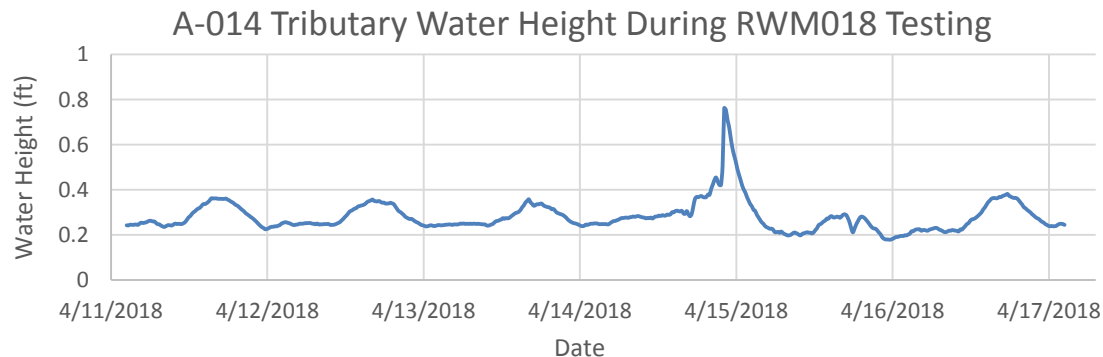
Collecting data since February 2018

- Luck: M-1 Air Stripper offline from March 6 – 23
 - Baseline data



Data collection for A-014 Unit – March 2018

- RWM018 tested on April 16 for aquifer properties





M-1 Air Stripper Online vs. Offline



A-014 with M-1 online

Date	A-014 water height (ft)
3/26/2018 13:00	0.3008
3/26/2018 13:15	0.3179
3/26/2018 13:30	0.3304
3/26/2018 13:45	0.3387



A-014 with M-1 offline for a few hours

Date	A-014 water height (ft)
3/25/2018 0:00	0.0811
3/25/2018 0:15	0.0828
3/25/2018 0:30	0.0813
3/25/2018 0:45	0.0782



Model Development: A-014 Outfall Tributary



A-014 OF tributary

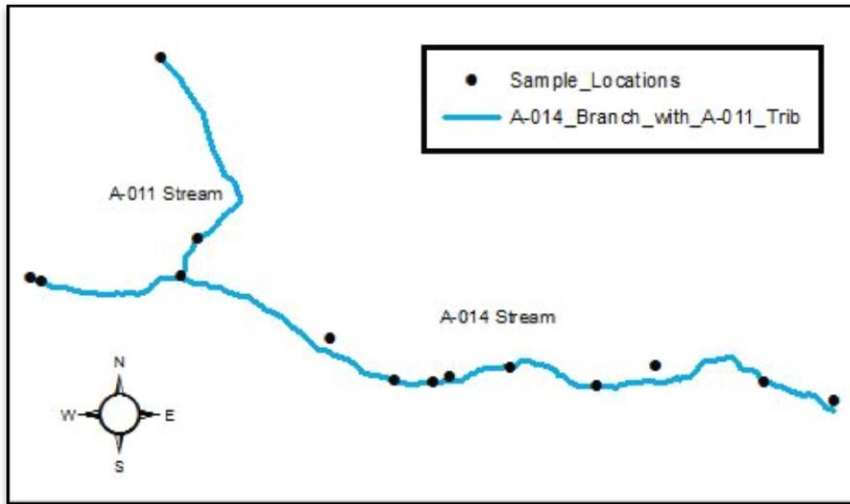
- Smaller and simpler

1. Developed shapefile for stream network
2. Developed MIKE 11 1-D stream network
3. Coupled with MIKE SHE OL flow model
4. Tested with data from 1993

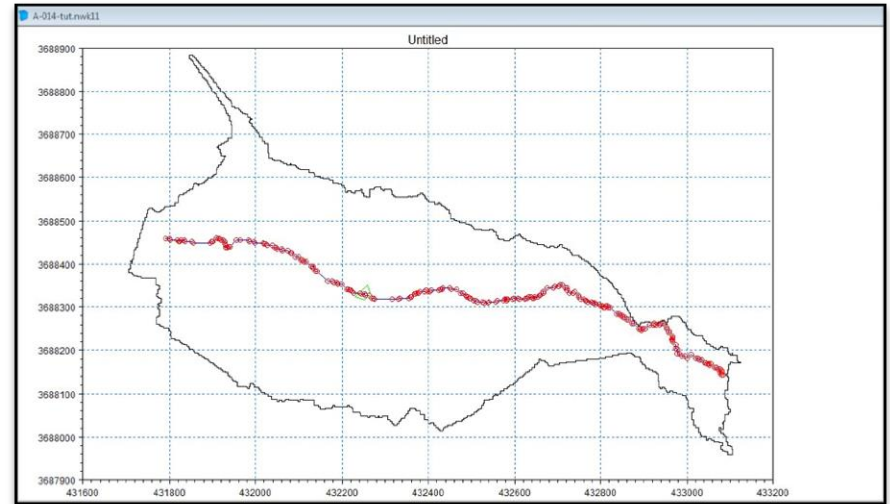




Model Development: A-014 Stream Network



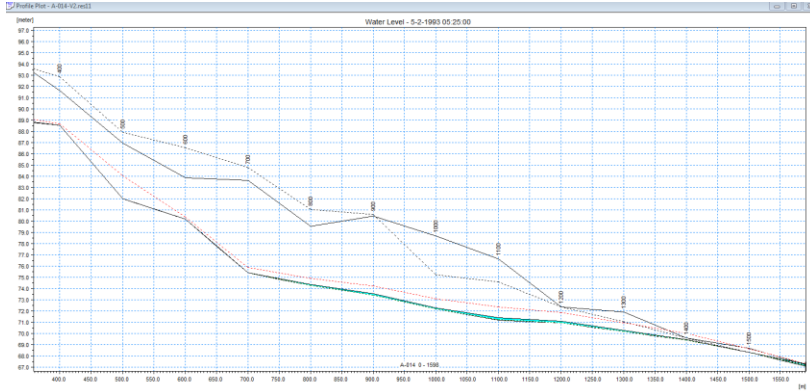
Stream Network Simplification in ArcGIS



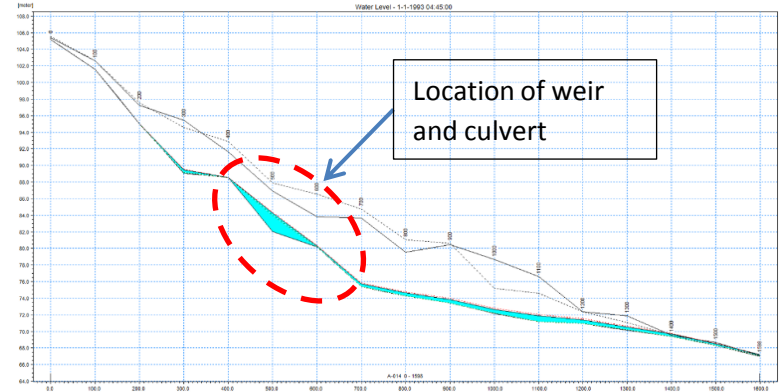
Generating Stream Network in MIKE 11



Model Development: A-014 Model Coupling and Testing



A-014 OF tributary without engineering control structures



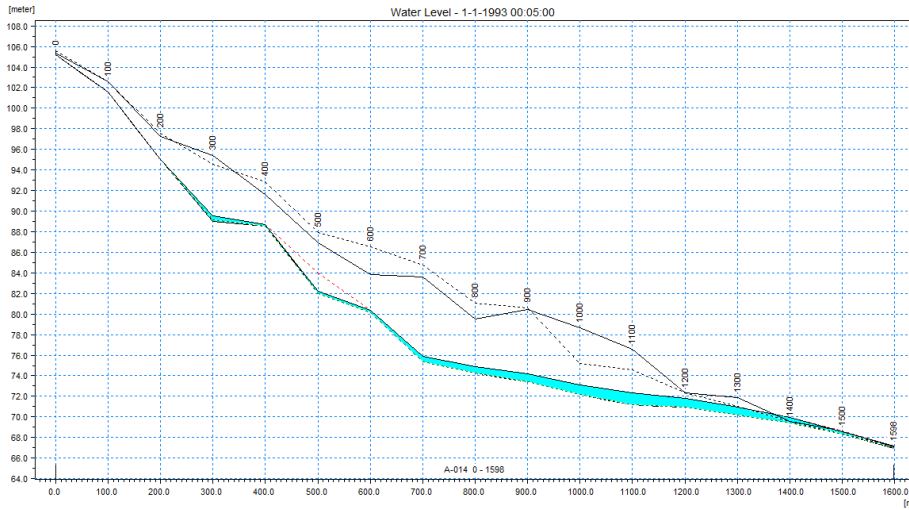
A-014 OF tributary with engineering control structures



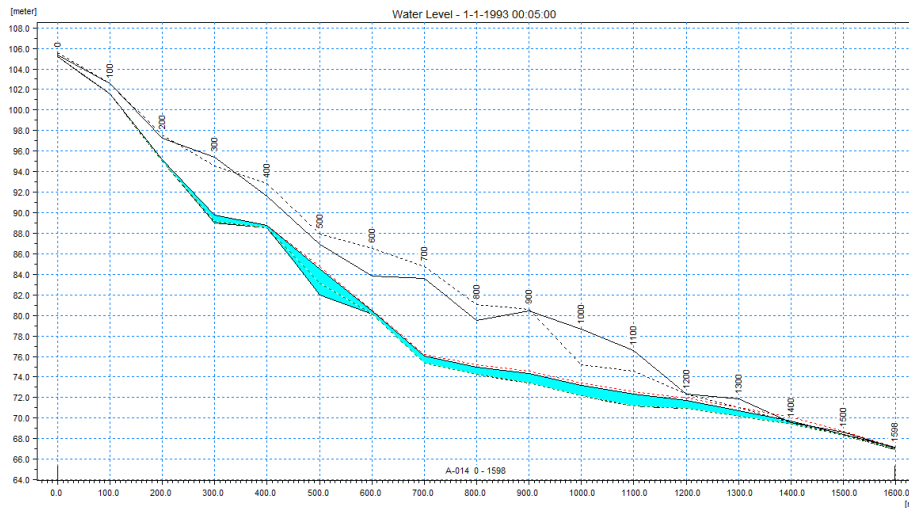
Weir and culvert



Model Simulation Comparison: Control Structures vs. No Control Structures



A-014 without culvert and weir



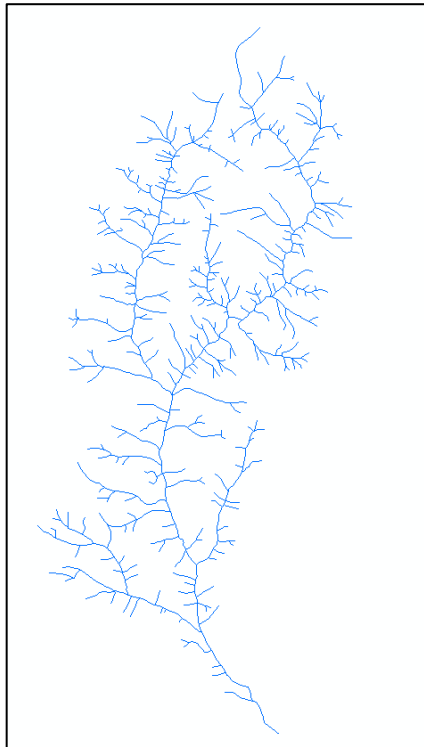
A-014 with culvert and weir



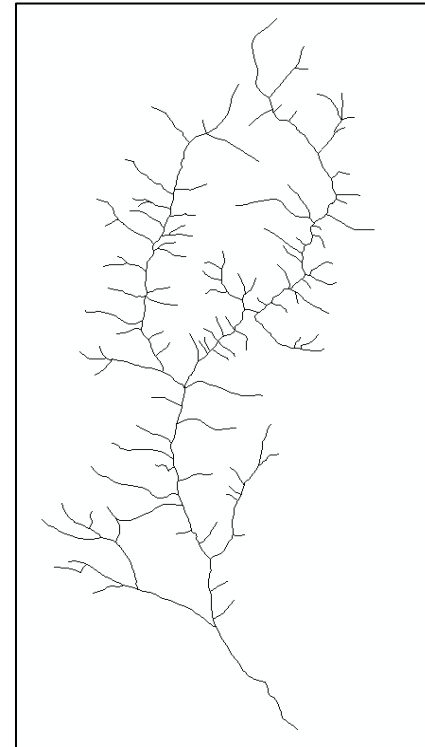
Model Development: Tims Branch



- Simplified Tims Branch stream network using ArcGIS tools
 - Decreased the features from approximately 500 to 100



Original TB shapefile

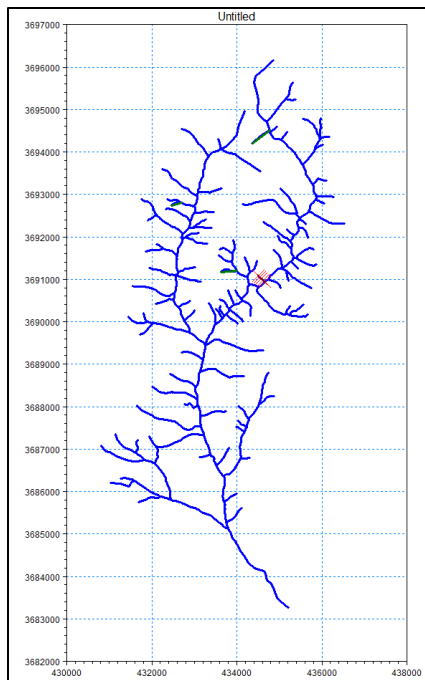


Simplified TB shapefile

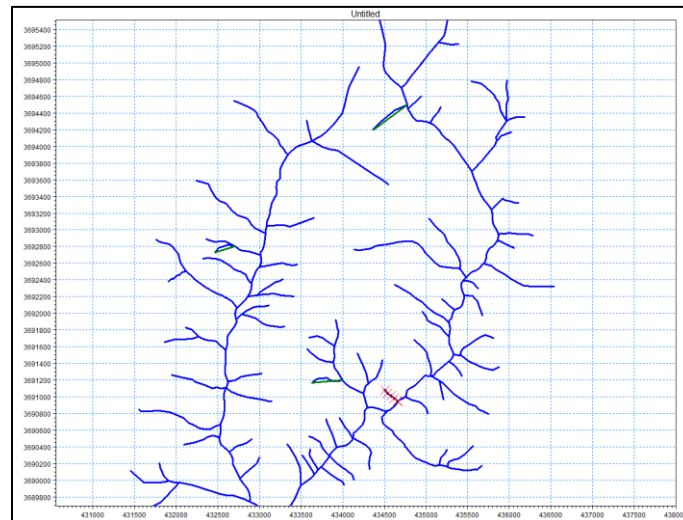


Model Development: Tims Branch Stream Network

- Currently developing stream network and generating cross-sections in MIKE11



Stream network in MIKE11



Upstream section of TB with three “negative” chainages and one tributary with generated cross-sections



Future Work

1. Collect flow data and track storm events
2. Complete Tims Branch stream flow model
 - Build stream network in MIKE11
 - Couple with A-014 and MIKE SHE
 - Implement timeseries flow data being collected in model
 - Begin development of advection-dispersion model using MIKE ECO Lab for heavy metal and radionuclides transport
3. Model effects of:
 - Constant flow vs. no flow
 - Control structures vs. no control structures
 - Storm events



Acknowledgements



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 - Ms. Angelique Lawrence
 - Modelling and Simulation Team
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Thank You



Questions?