De-Bugging a HEC-RAS Unsteady Flow Model

Presented by:
Jennifer Maercklein, P.E., CFM
V3 Companies
Presentation Agenda

- Goals
- Model Errors Before Simulation Begins
- De-bugging Initial Conditions
- De-bugging Runtime Errors
- Resources for Help
- Questions
Presentation Goals

• Tips to get started with de-bugging
  – Useful HEC-RAS tools for debugging
  – Tips to find sources of error

• De-bugging ideas presented here do not represent an exhaustive list of de-bugging techniques

• Presentation Assumptions
  – Familiarity with HEC-RAS
  – Familiarity with Unsteady Flow Modeling
Model Errors Before Simulation Begins

- Model Errors – Before Simulation Begins
  - Cross Section Location Errors
  - Unsteady Flow Inflow Errors
Model Errors Before Simulation Begins

- Cross Section Locations

- Two XS d/s of each structure
- Two XS between internal boundary and confluence
Model Errors Before Simulation Begins

- Unsteady Flow Inflow Errors

  - Uniform Lateral Inflow
  - Can’t Span Structures
  - Uniform Lateral Inflow
  - Can’t End at D/S End of Reach
De-bugging Initial Conditions

- Model crashes at beginning of simulation
- Problem with Initial Conditions
  - Flow too low, reaches go “dry”
  - Flow u/s of confluence ≠ flow d/s
  - Supercritical
- Computational Time Step
De-bugging Initial Conditions

- Initial flow too low, reaches go “dry”
- Animate Profile
De-bugging Initial Conditions

- Keep Reaches “Wet”
  - Check Initial Flows
  - Check Minimum Flows
  - Add Dummy Flow to Emergency/Diversion Channels
De-bugging Initial Conditions

- Flow upstream of confluence not equal to flow downstream of confluence
De-bugging Initial Conditions

- Supercritical Flow, Model Unable To Converge To Solution
- Review Summary Output Tables
De-bugging Initial Conditions

• Computational Parameters
  – May need shorter computational time step to allow HEC-RAS to converge
  – May need shorter output time step to enable user to see results at time of failure
De-bugging Runtime Errors

- Identify Source of Model Crashes
  - Note time and location of model crash
  - Find problematic XS and consider HEC-RAS suggestions

- Heed Model Extrapolation Warnings
De-bugging Runtime Errors

- Identify Source of Model Crashes
  - Note time and location of model crash

  **Matrix Solution Failed**
  Minimum error exceeds allowable tolerance at 12SEP2008 0214
  NBCR West Fork US N Navy 23529.47

- Review detailed output tables
- Find problematic cross section and consider HEC-RAS suggestions
- Often, just need more cross sections
De-bugging Runtime Errors

• Heed Model Extrapolation Warnings
  – Adjust Hydraulic Table (HTab) Parameters
  – Adjust Storage Ratings
Summary

• Start with Good XS Locations, Good Unsteady Flow Input Locations

• Use HEC-RAS Graphical & Tabular Tools
  – Review .txt file to find time & location of error
  – Animate Profile
  – Review Summary Output Tables
  – Review Detailed Output Tables

• Pay Attention to:
  – Initial Flows
  – Supercritical Flow
  – Cross Section Spacing

• Consider HEC-RAS Warnings
Resources for Help

- Resources for Help
  - HEC-RAS Help
  - ASCE HEC-RAS Unsteady Flow Class and/or Class Manual
Model Runs! Success!

Questions?