A Presentation for

2017 Floodplain Management Association Conference

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By

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Overview

- FHWA’s role in floodplain management
- FHWA’s primary 2D hydraulic modeling interests
- Current activities and resources
- Current modeling capabilities and features
- Further advancements
FHWA’s Roles in Floodplain Management

- Directed by: 23 CFR 650 A / EO 11988 / EO 13690 to:
  - Avoid significant encroachments
  - Minimize impacts of flooding
  - Restore or preserve floodplain values
  - Consider risk

- Ensure that DOT’s are using the best available tools
- Develop and deliver training
- Develop and deploy new technology
- Communicate policy
FHWA’s Primary 2D Modeling Interests

- Transportation related hydraulics
- Complex bridge hydraulic analysis and design
- Bridge scour evaluation
- Sediment transport
- Erosion and scour countermeasure design
- Evaluation of floodplain impacts and permitting
- Assessment of habitat impacts
FHWA Activities & Advancements

Current Activities and Resources

• Every Day Counts Initiative – EDC CHANGE

• 2D and 3D Modeling Research at Turner Fairbanks Hydraulic Research Center

• Training development

• Development of other tools and resources
Time for CHANGE!

Collaborative Hydraulics: Advancing to the Next Generation of Engineering

- FHWA Technology Deployment Program
- Focused on underutilized technology
- 2-yr program (2017-2018)
- Ongoing technology developments
- Training and support resources
Current Activities and Resources - TFHRC Research

- Ongoing sedimentation studies
- 2D model verification
- CFD (3D) modeling for verification, scour analysis and countermeasure design
• Hydraulic loading and soil resistance

Hydraulic Loading

Soil Resistance

Erosion Force

Estimated $y_s$

True $y_s$

Factored Resistance

Nominal Resistance

Hydraulic Engineering

U.S. Department of Transportation
Federal Highway Administration

Hydrology
Drainage
Culverts
Bridges
Scour
Coastal
Hydraulic loading and soil resistance

Hydraulic Loading

Soil Resistance

- Erosion Force
- Factored Resistance
- True $y_s$
- Estimated $y_s$
• Hydraulic loading and soil resistance
FHWA Activities & Advancements
Current Activities and Resources - Training

• NHI Course 135095 – 2D Hydraulic Modeling of Rivers at Highway Encroachments
• Web Based Training
  • Hydrology(135092), Hydraulic Toolbox(135093), HY-8(135094)
• Web Conference Training (Coming soon)
• Video Training Modules (Coming soon)
• Modeling Tutorials for SRH-2D
• Bi-monthly webinars on modeling techniques/topics

http://www.fhwa.dot.gov/engineering/hydraulics/
  (Training) (Videos & Webinars) (Software)
FHWA Activities & Advancements

Current Activities and Resources - Software and Tools

- FHWA Hydraulic Toolbox (includes Scour calculators)
  - Beta version with scour summary table and plotting tools
- HY-8 Culvert Analysis
- SRH-2D GUI in SMS

http://www.fhwa.dot.gov/engineering/hydraulics/ (Software)
FHWA Activities & Advancements

Current Modeling Capabilities and Features - SRH-2D

- USBR (Reclamation) model
  Developed by Dr. Yong Lai (2004)
- Thoroughly tested by Reclamation
- FHWA / USBR Partnership added hydraulic structure features
- Steady and unsteady flow
- Sub- and supercritical flows
- Multiple inflow/outflow boundary conditions
- Normal/critical depth boundary conditions
Current Modeling Capabilities and Features - SRH-2D

- Internal boundary conditions (source/sink)
- Linked boundary conditions
- Bridge pressure flow with overtopping
- Bridge piers
- Blocked obstructions
- Culvert hydraulics
- Gates and Weirs
- Depth dependent roughness
- Sediment Transport
FHWA Activities & Advancements

Current Modeling Capabilities and Features - SMS

- Custom Graphical Interface by Aquaveo
- Free community version available
- Terrain data preparation
- Data filtering and transformation
- 2D Mesh development
- Boundary condition assignment
- Materials (roughness) definitions
- Simulation execution
- Viewing and evaluating results
- Presentation 2D / 3D graphics and visualizations
FHWA Activities & Advancements

Current Modeling Capabilities and Features - SMS

- Sediment transport interface
- Differential surface plots for comparing results
- HEC-RAS 1D cross section import
- Hydraulic summary tables (for min., max., and avg. of all parameters)
- Data calculator to compute additional parameters
- Zonal classification for habitat assessment, floodplain delineation, and more

Hydraulic Engineering
FHWA Activities & Advancements

Further Advancements

- Bridge scour evaluation tool
- Improved floodplain delineation and mapping tools
- FEMA reference tools
- Simulation dashboard (multiple simulations and controls)
- Improved profile graphics
- Floodway delineation tool
FHWA Activities & Advancements

Further Advancements

• Guidance documents for 2D bridge and floodplain modeling
• Guidance for developing and reviewing 2D hydraulic modeling analyses and reports
• Scoping and policy guidance for state DOTs
• Improved online User’s Guide
• Workshops and peer exchanges
• Validation of 2D hydraulic model results
• Example applications (case studies)
• Advanced training
Thank You!

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