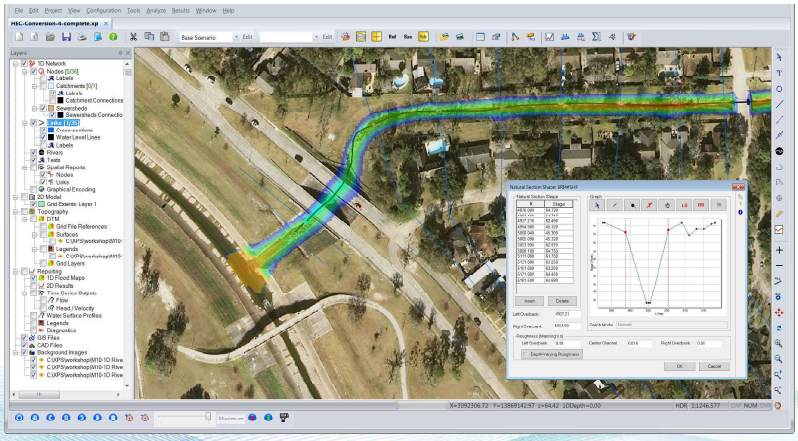
1D River Modeling



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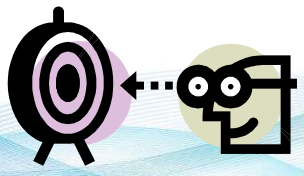
Workshop No. 10 Objectives

- Review SWMM 1D River Hydraulics Theory
- Import Cross-sections from HEC RAS
- Build a 1D River model
- River and Bridge Links
- 1D Flood Maps



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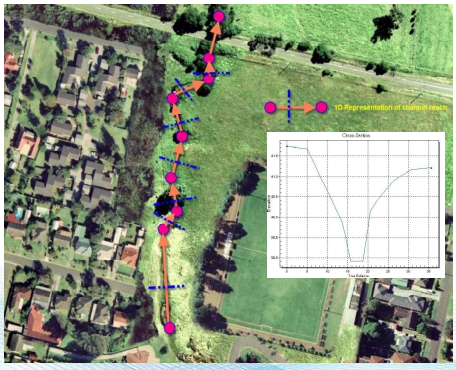
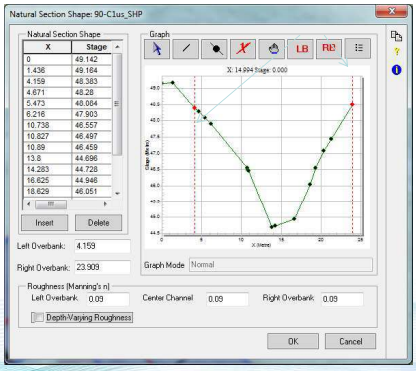
1D Representation of Channels

- Each river reach (link) represented by one cross-section
- Prismatic (same geometry u/s to d/s)





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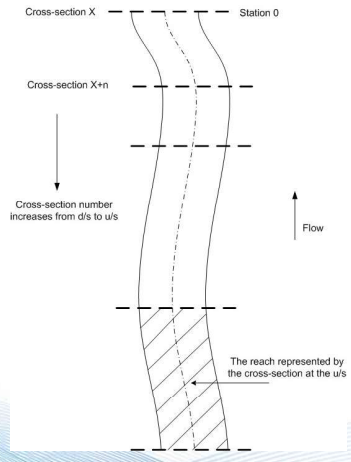
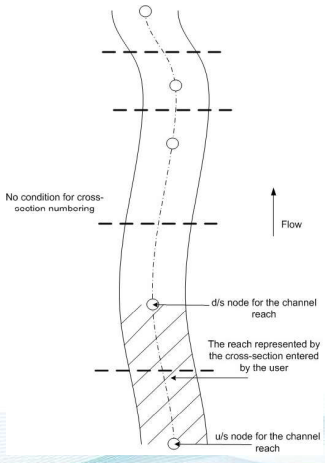
HEC RAS vs SWMM representation





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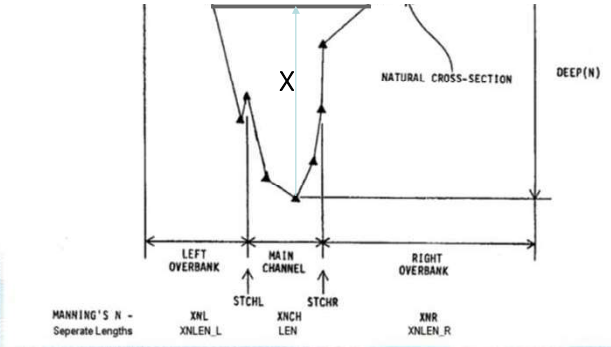
Natural Channel Definition



A vertical wall is created when max depth = 0 and:

1) when one side is lower
2) when top of channel is less than node ground elevation
3) No vertical wall when max depth = X and X is less than full channel depth

Note: Vertical walls are not created when max depth = X or configuration parameter VERT_WALLS=OFF

1) Sometimes used to model flow under a bridge

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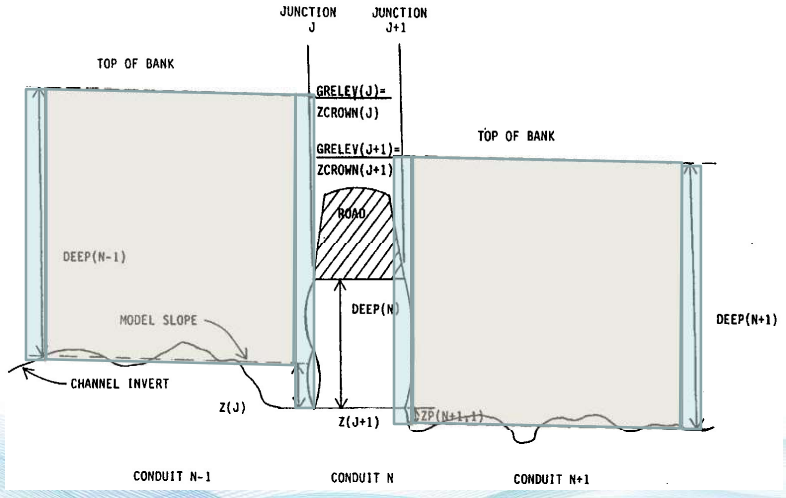
Open Channel Elevations



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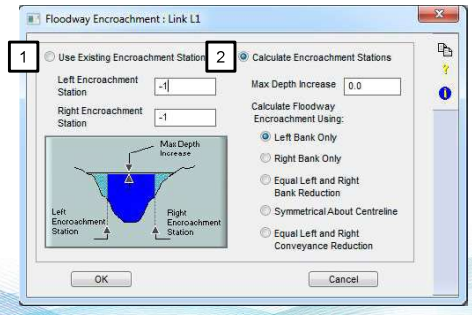
Floodway Encroachment

1. Option1: Water level increase can be calculated by entering the encroachment stations
2. Option2: Encroachment stations can be calculated by entering the maximum depth increase and method



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FHWA Inlet Control Equations

- The head under inlet control may be significantly greater than that estimated assuming outlet control
- xp uses Inlet Control equations from the FHWA's "Hydraulic Design of Highway Culverts"

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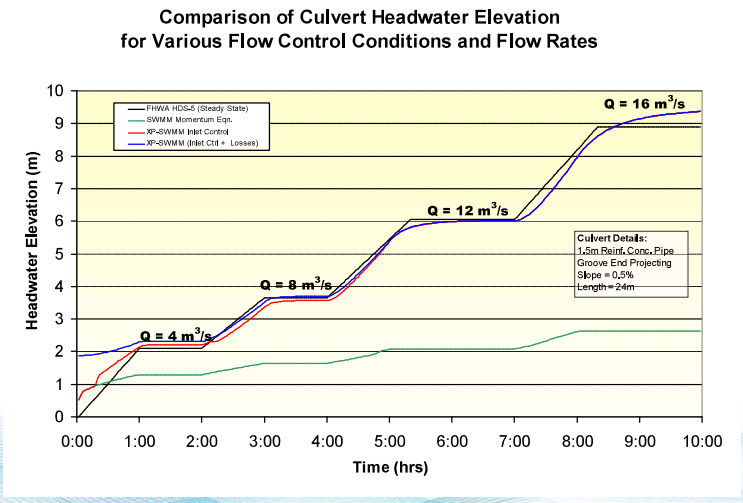
Inlet Control



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Most Important Hydraulic Results

- HGL
- Velocity (weighted average for the link)
- Flow in links
- Losses (losses at maximum reported in Table E13)
- Volume through and maximum for links and nodes

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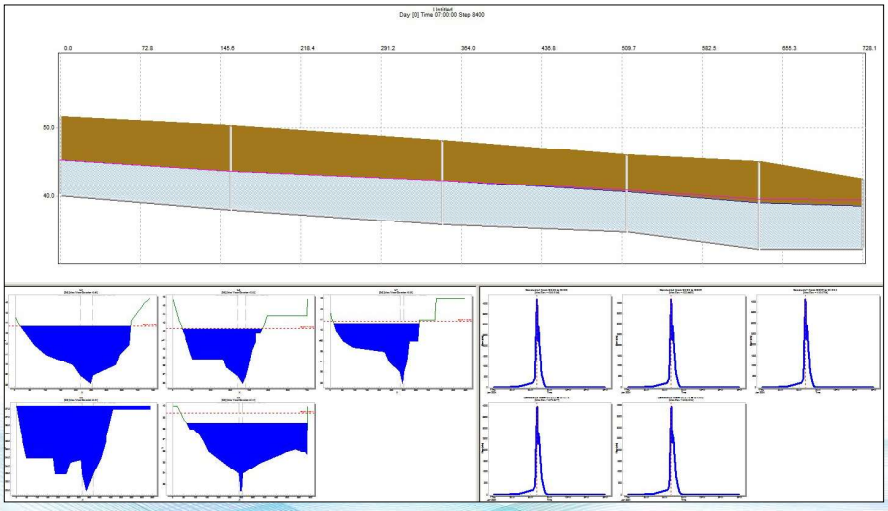
Hydraulic Results - Gradeline



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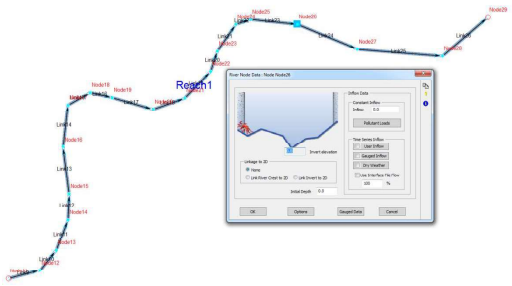
River Links

- Designed for Modeling Natural Channels
- Nodes Automatically Generated at Vertices
- Dialogs Similar to HEC RAS
- Default for HEC RAS Imports
- Each River Reach is Displayed in the Layers Panel



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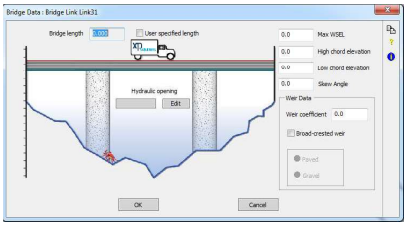
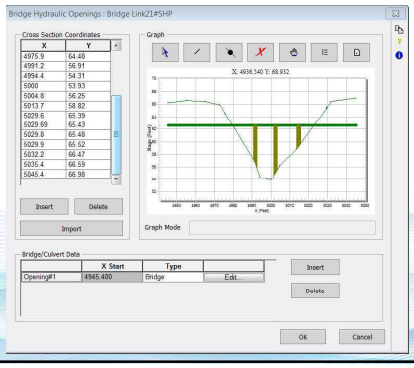
Bridge Links

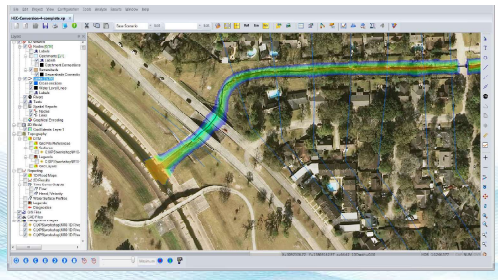
- Simplified Bridge Modeling
- Represent Numerous Hydraulic Openings – Bridges, Culverts
- Hydraulic Openings stored in Global Database
- Skew Angle
- Piers





Workshop Example Preview

- Load Background Images, and DTM
- Import River model from HEC RAS
- Complete the 1D River model including hydrographs
- Utilize River and Bridge Links
- Generate 1D Flood Maps



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