North Central Texas Council of Governments

Proactive Planning for a Resilient Future

Integrated Transportation and Stormwater Infrastructure (TSI) Study, 9/4/2025

Landon Erickson, PE; Sam Sarkar, PE; Jeremy Dixon, PE, CFM

Funded by the Texas General Land Office, Community Development Block Grant, Disaster Recovery Program.

Also Funded by the Texas Water Development Board and Texas Department of Transportation.

TSI Overview and Study Goals

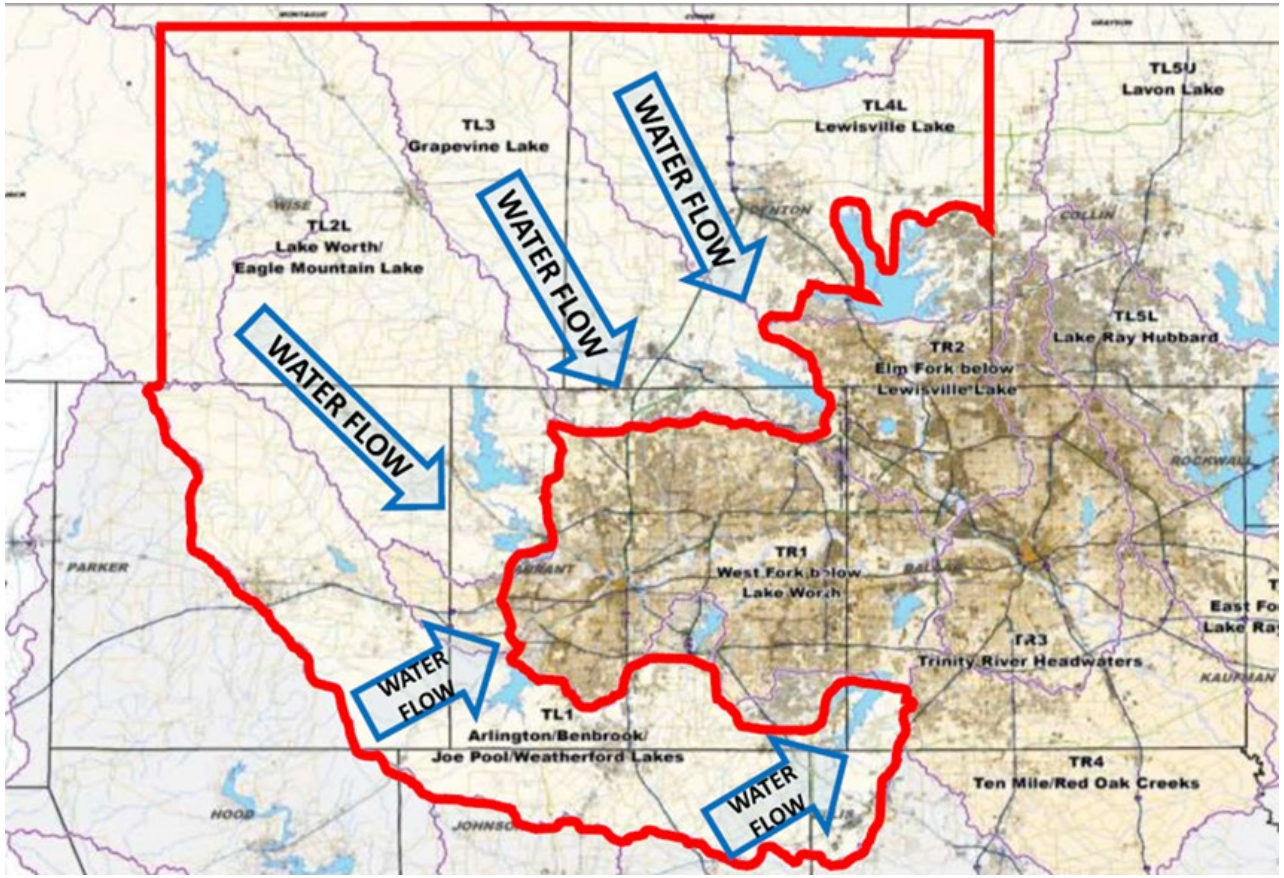
1. Demonstrate *proactive planning* that integrates transportation, stormwater, and environmental planning

2. *Reduce flooding within and downstream* from rapidly growing communities, including increasing the resiliency of infrastructure

3. Develop tools and resources, including policy recommendations, to *empower communities* to adopt higher floodplain management standards

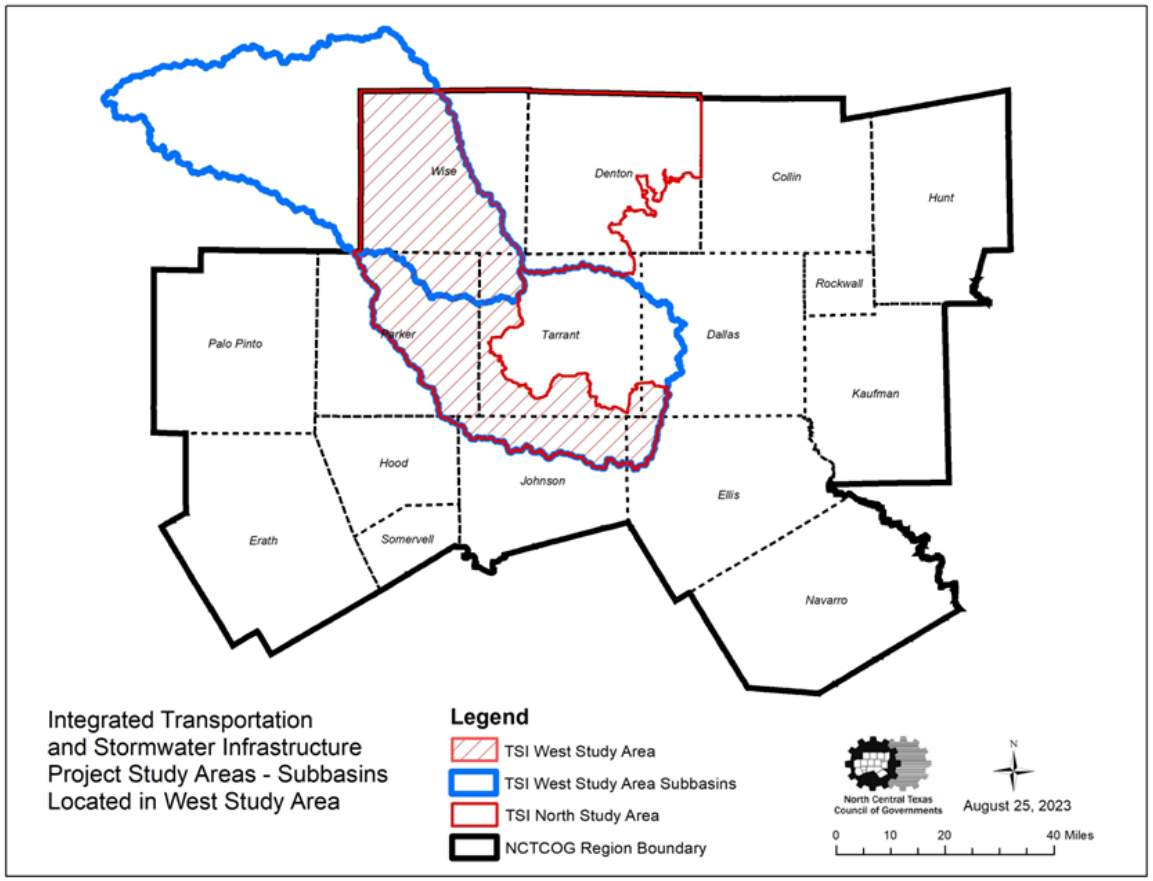
4. *Implement local-scale innovation* in hydrologic and hydraulic modeling and emergency management modeling

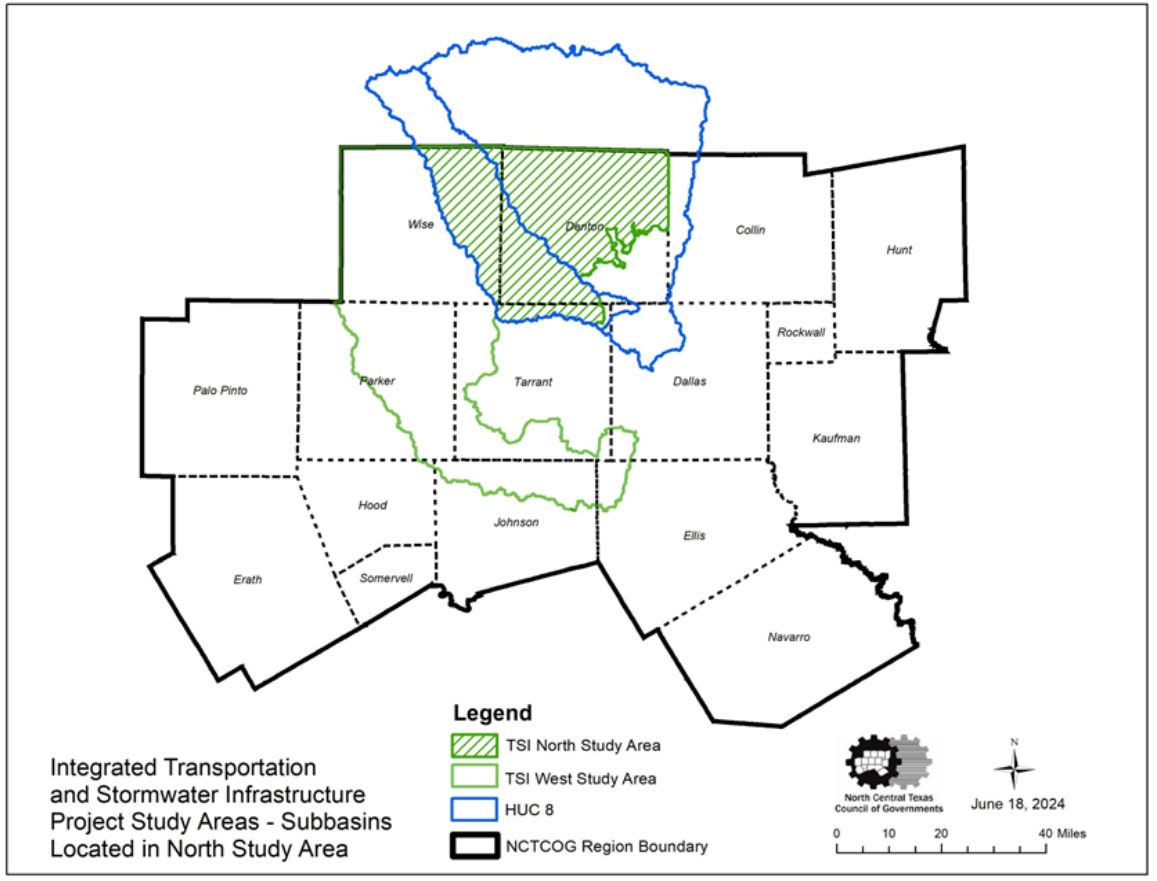
5. Produce *planning-level design* for transportation infrastructure and stormwater detention



integrating Transportation & Stormwater Infrastructure

West and North Study Area





integrating **Transportation & Stormwater Infrastructure**

Project Partners

West Study Area

North Central Texas Council of Governments
US Army Corps of Engineers
University of Texas at Arlington
Texas A&M AgriLife Extension Service
Tarrant Regional Water District
Freese and Nichols, Inc.
Halff Associates, Inc.

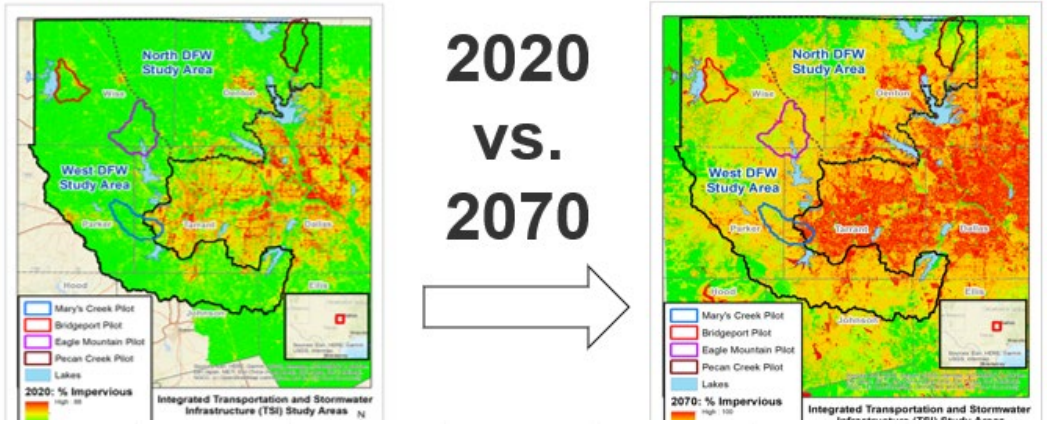
North Study Area

North Central Texas Council of Governments
Upper Trinity Regional Water District
Halff Associates, Inc.
Highland Economics, LLC
University of Texas at Arlington
Texas A&M AgriLife Extension Service

Funders

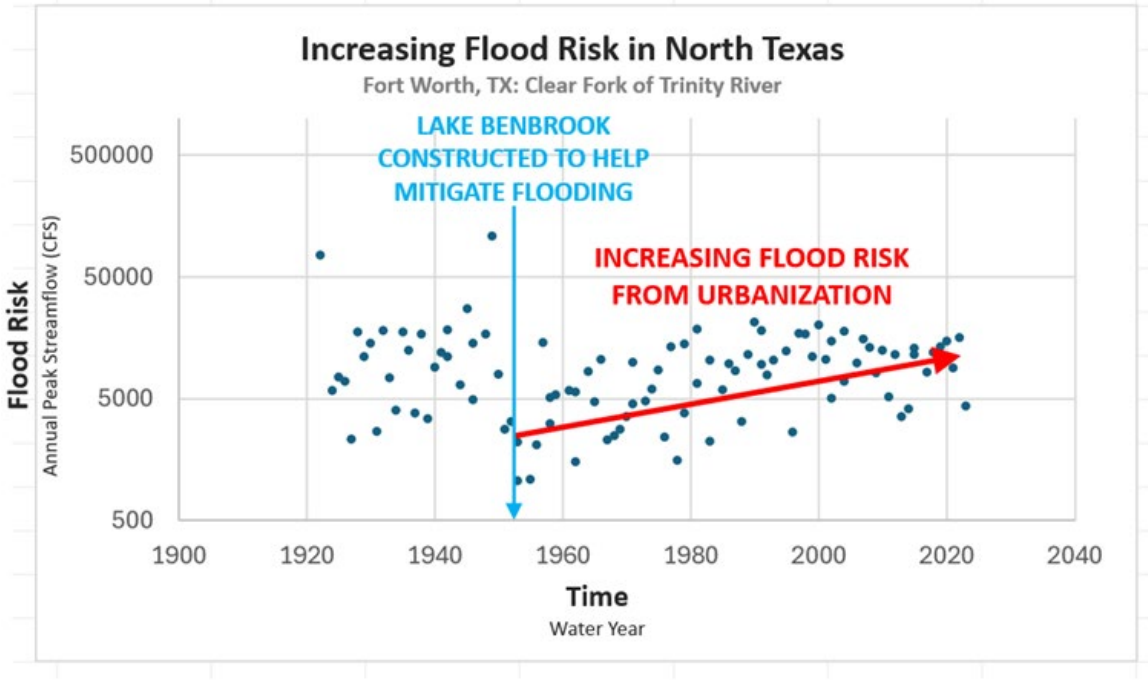
Texas General Land Office
Texas Water Development Board
Texas Department of Transportation
Federal Emergency Management Agency
US Army Corps of Engineers

Prevention vs. Response



Fort Worth – May 1949 (~11 inches of rain overnight):

- Levees breached, numerous deaths & millions in damages
- *1908, 1922,1936, and 1949 events led to extensive improvements to DFW flood control infrastructure*
- Water District (established in 1924)
- USACE Fort Worth District (established in 1950)



integrating **Transportation & Stormwater Infrastructure**

Ongoing Challenges

Urbanization Demands

- More people are moving to the study area every year
- More urbanization and development leads to more impervious surfaces

Stormwater Data

- No regionwide infrastructure data
- Piece-meal/lacks connectivity
- NOAA Atlas 14 updated rainfall estimates but only updated every 10 years

Transportation Funding

- Transportation spending is high and growing, including for asset management
- Rate of deterioration for transportation infrastructure increasing

Study Products

TSI outputs will empower engineers, local governments, and developers to reduce the threat to people, property, and infrastructure.

Collect and Analyze Data

Assess Hydrology and Hydraulics Scenarios

Identify Transportation Infrastructure Impacts

Conduct Environmental Planning

Evaluate a Real-Time Flood Warning System

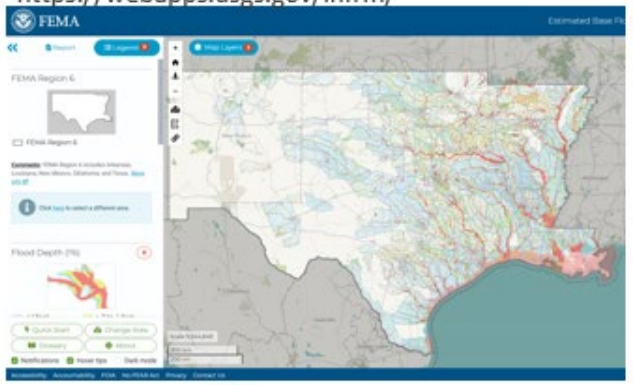
Support and Empower Communities

integrating **Transportation & Stormwater Infrastructure**

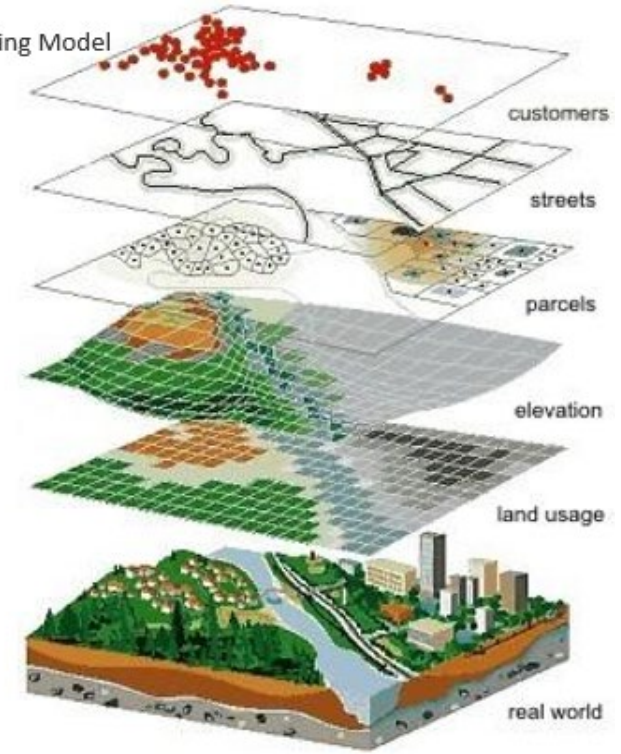
How Will We Accomplish This

- **Collect and Analyze Data**
  - Leverage existing flood information (FEMA BLE, InFRM WHA, FWS, etc)
- **Assess Hydrology and Hydraulics Scenarios**
  - Enhance existing flood information (Future Conditions, Structures, Flows, etc)
- **Identify Transportation Infrastructure Impacts**
  - At risk transportation facilities will be identified and mapped
- **Conduct Environmental Planning**
  - GIS stacking model of suitability parameters for GSI and NBS
  - Optimization study to model ideal location and sizing for flood control structures
- **Evaluate a Real-Time Flood Warning System**
  - Coordination with effort funded by Regional Transportation Council
- **Support and Empower Communities**
  - Inventory of existing codes, ordinances, and policies
  - Identification of incentives for conservation and preservation of floodplain

https://webapps.usgs.gov/infrm/



GIS Stacking Model



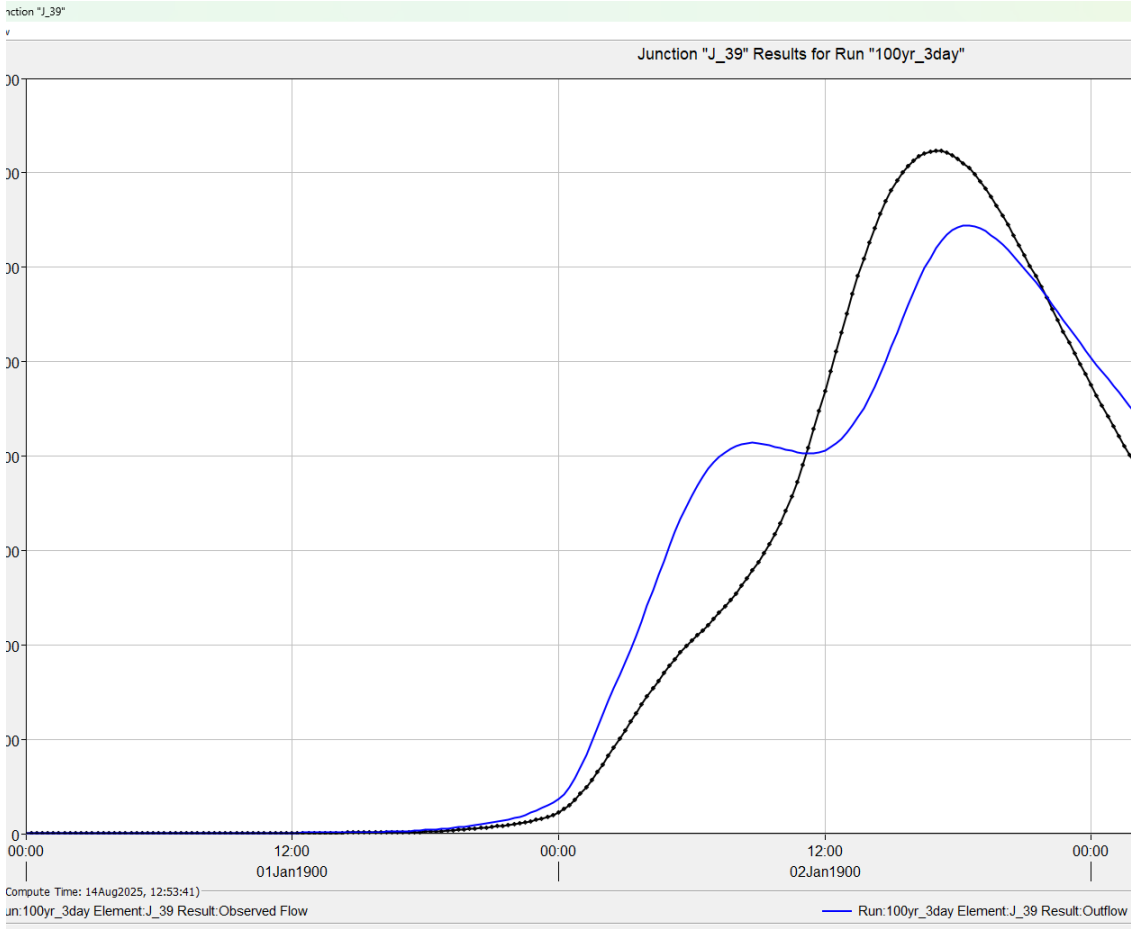
integrating **Transportation & Stormwater Infrastructure**

North Study Area

integrating **Transportation**
& Stormwater Infrastructure

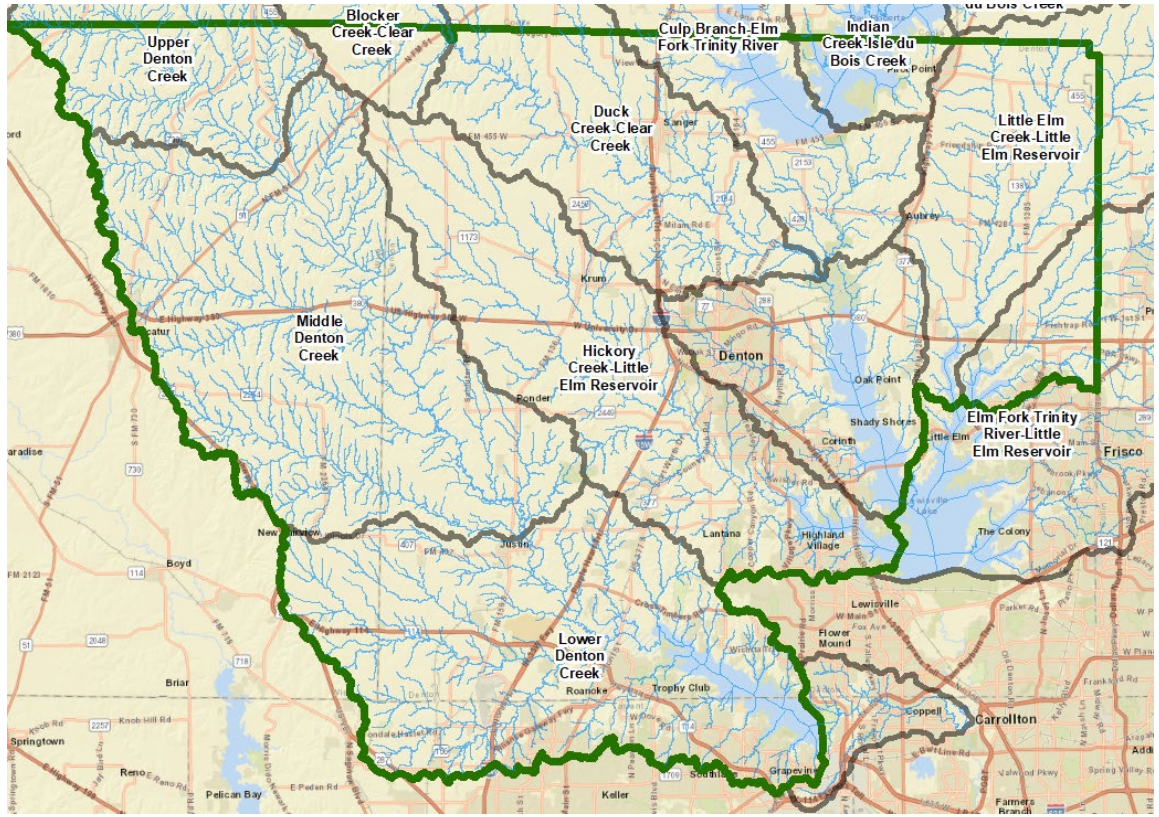
Hydrology Modeling

- Develop 2016 Conditions Model
- Calculate and Apply Initial HMS Parameters
- Calibrate to InFRM
- Update for Existing and Future Conditions (2020 & 2070)
- Storm Simulations
- Inform Optimization Analysis



integrating Transportation & Stormwater Infrastructure

Hydraulics Modeling

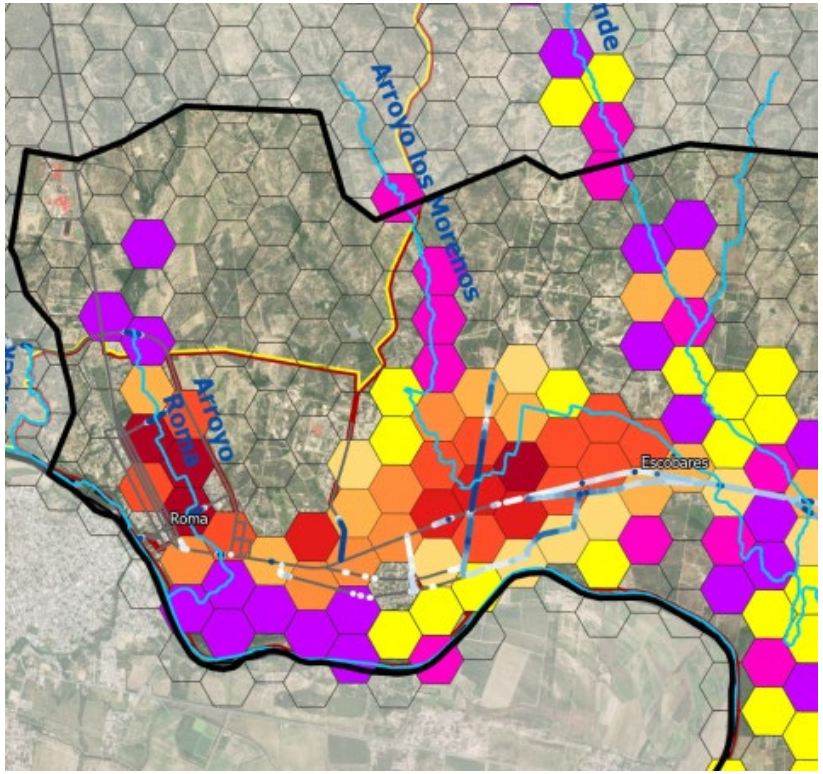


- Enhanced Geometry, Flow, and Plan Files
- Add Hydraulic Structures Using TxDOT As-Builts
- Existing and Future Conditions Streamflows
- Simulate Frequency Events
- Generate Existing and Future Conditions Floodplains

integrating **Transportation** & **Stormwater Infrastructure**

Flooding Hot Spots Identification

Identify infrastructure most susceptible to flooding under existing and future conditions



Residential Properties

Critical Facilities

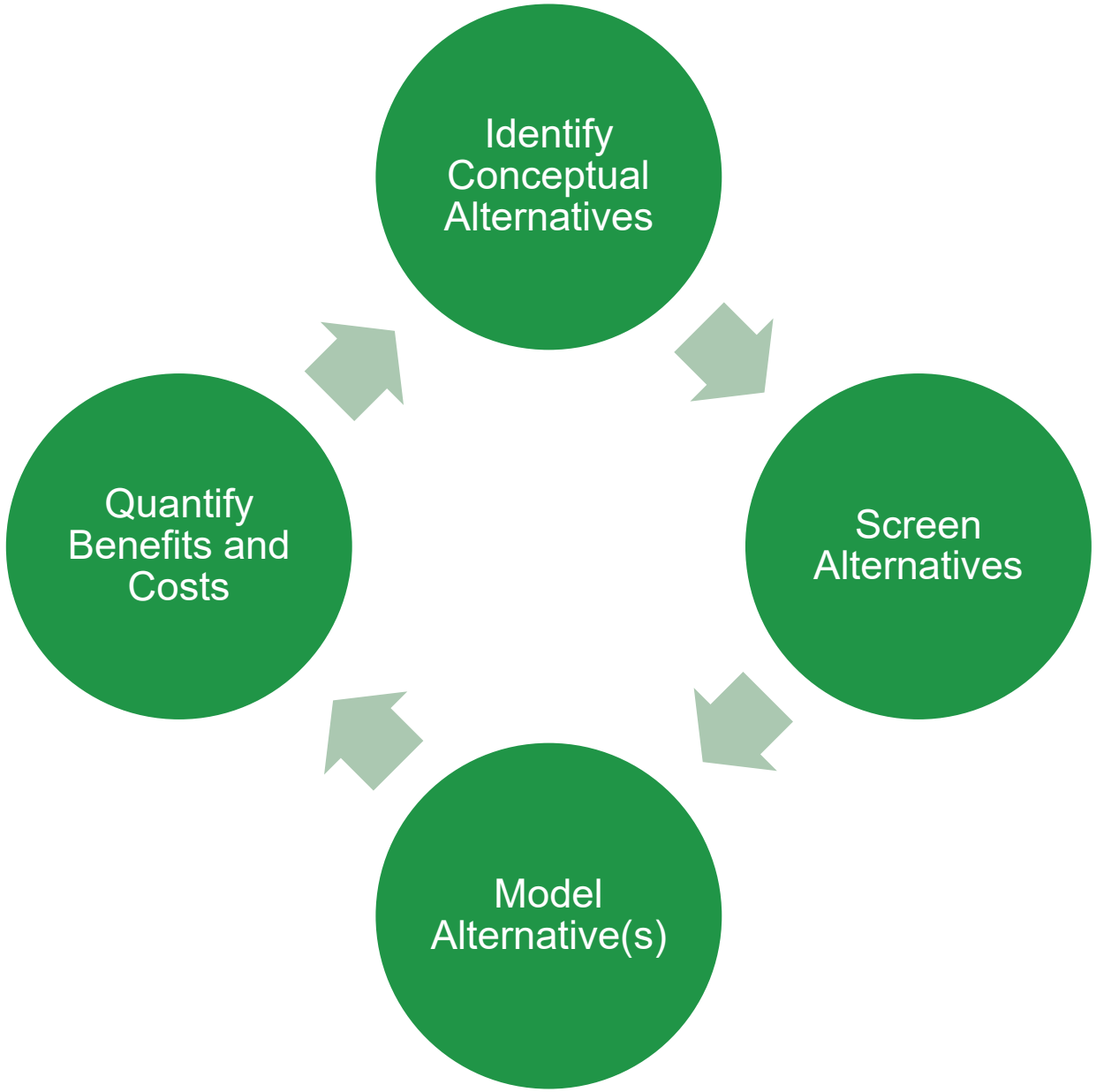
Roads

Future Infrastructure

integrating **Transportation & Stormwater Infrastructure**

Alternatives Analysis

Tailored solutions to mitigate flood risks today and in the future



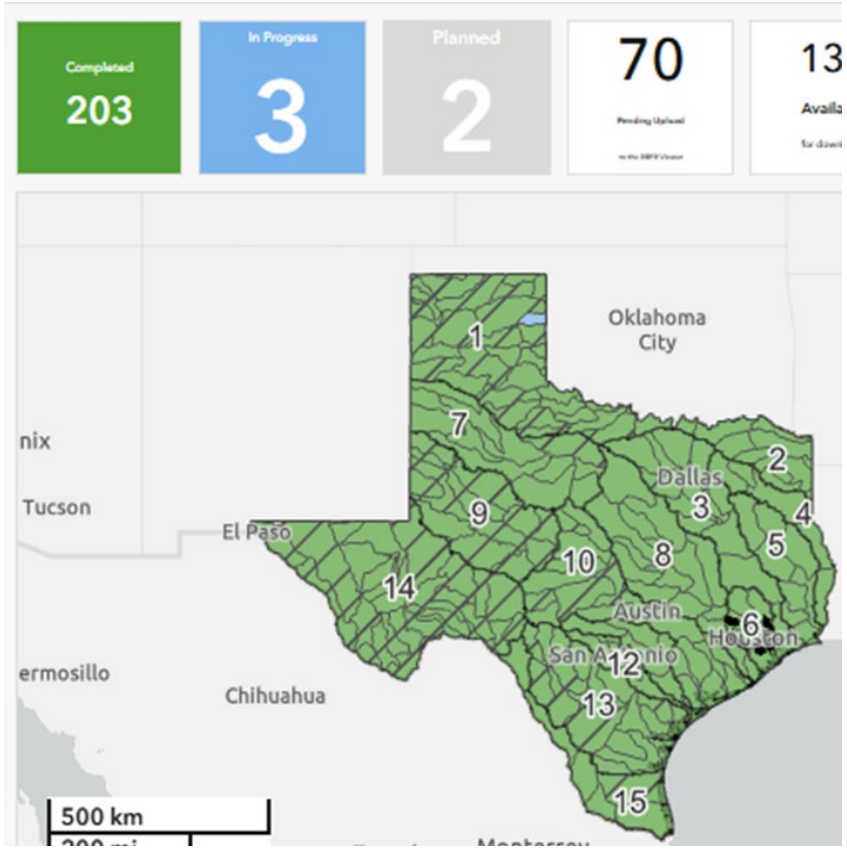
integrating Transportation & Stormwater Infrastructure

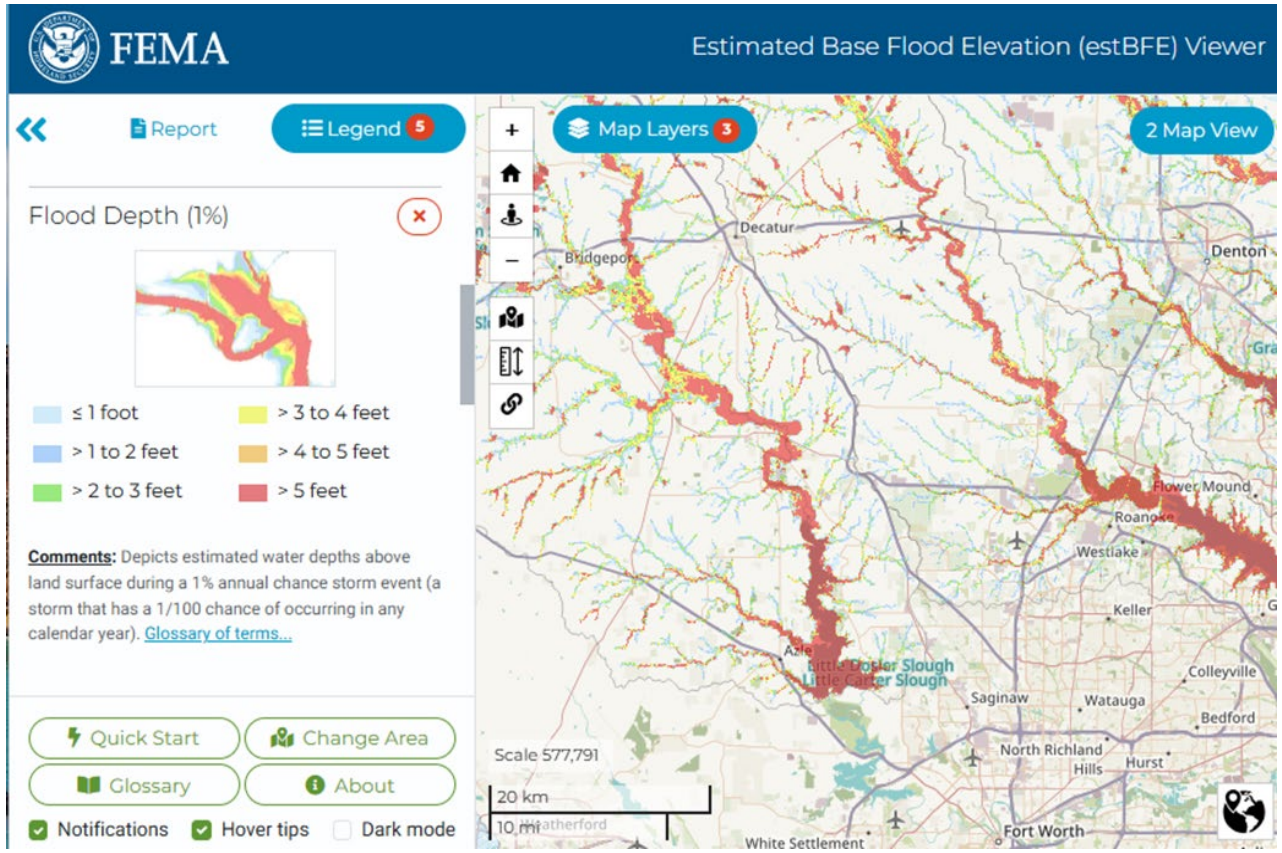
West Study Area

integrating **Transportation**
& Stormwater Infrastructure

Hydraulic Model Enhancements (1D)

- Base Level Engineering Hydraulic Modeling available for Texas



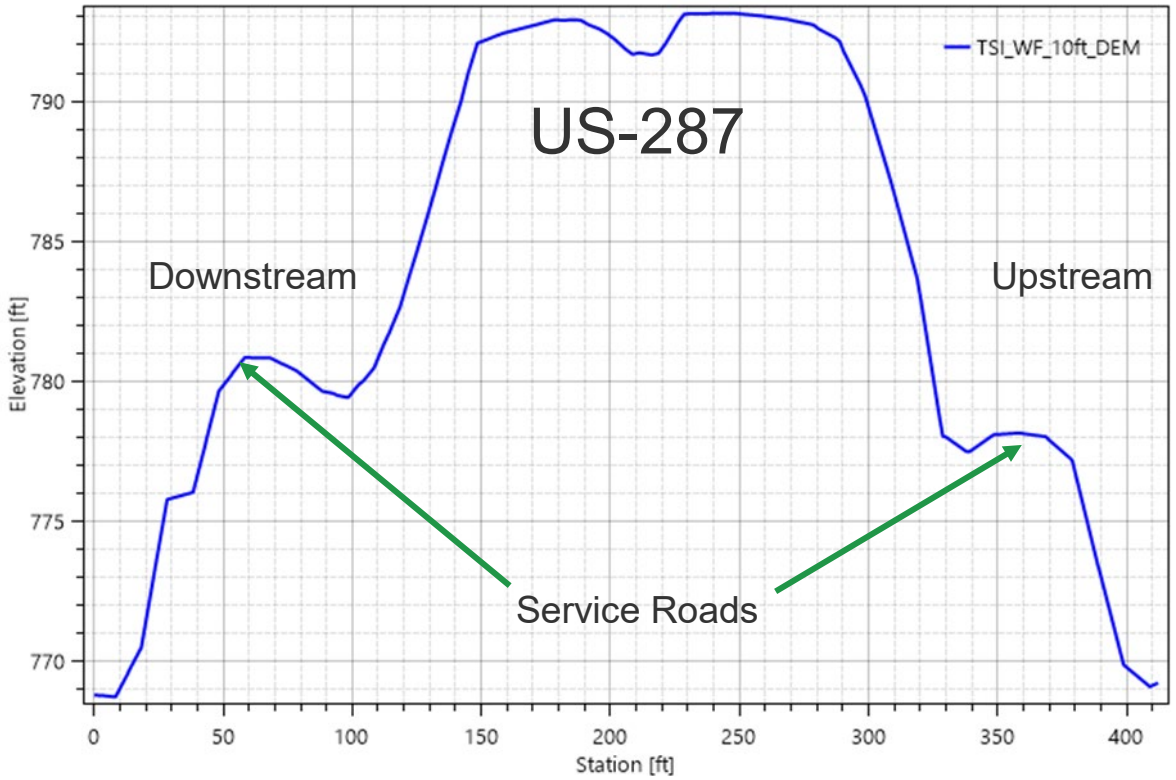


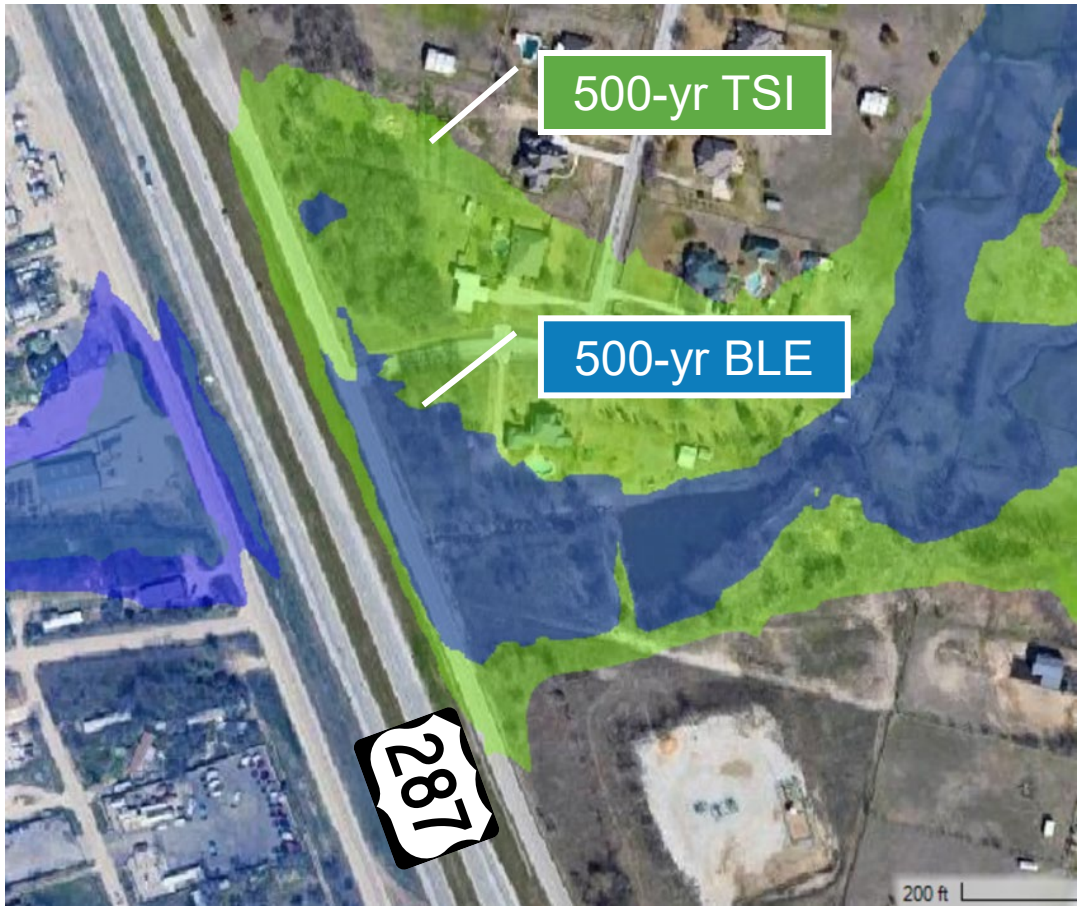
https://webapps.usgs.gov/infrm/estbfe/

integrating Transportation & Stormwater Infrastructure

Hydraulic Model Enhancements (1D)

- BLE – Does not include railroad/roadway crossings
- TSI – Includes railroad/roadway crossings

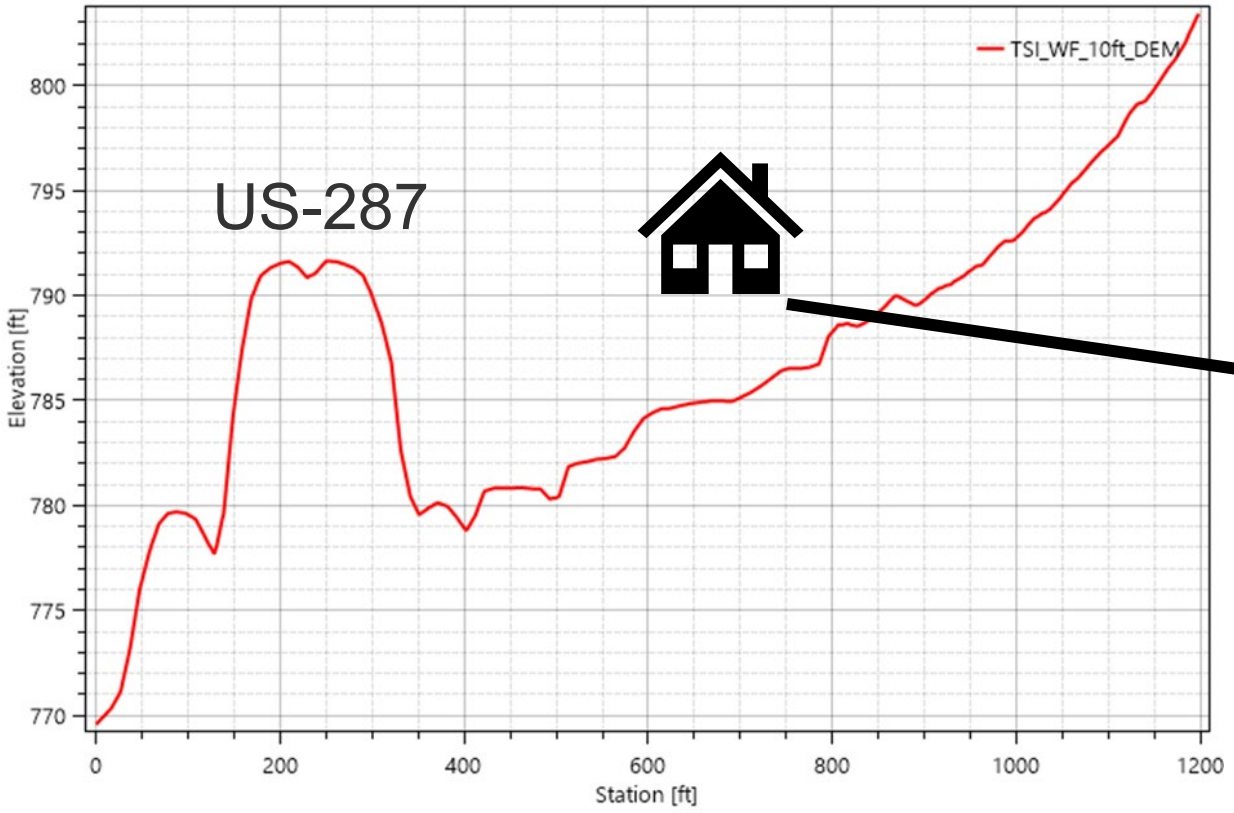


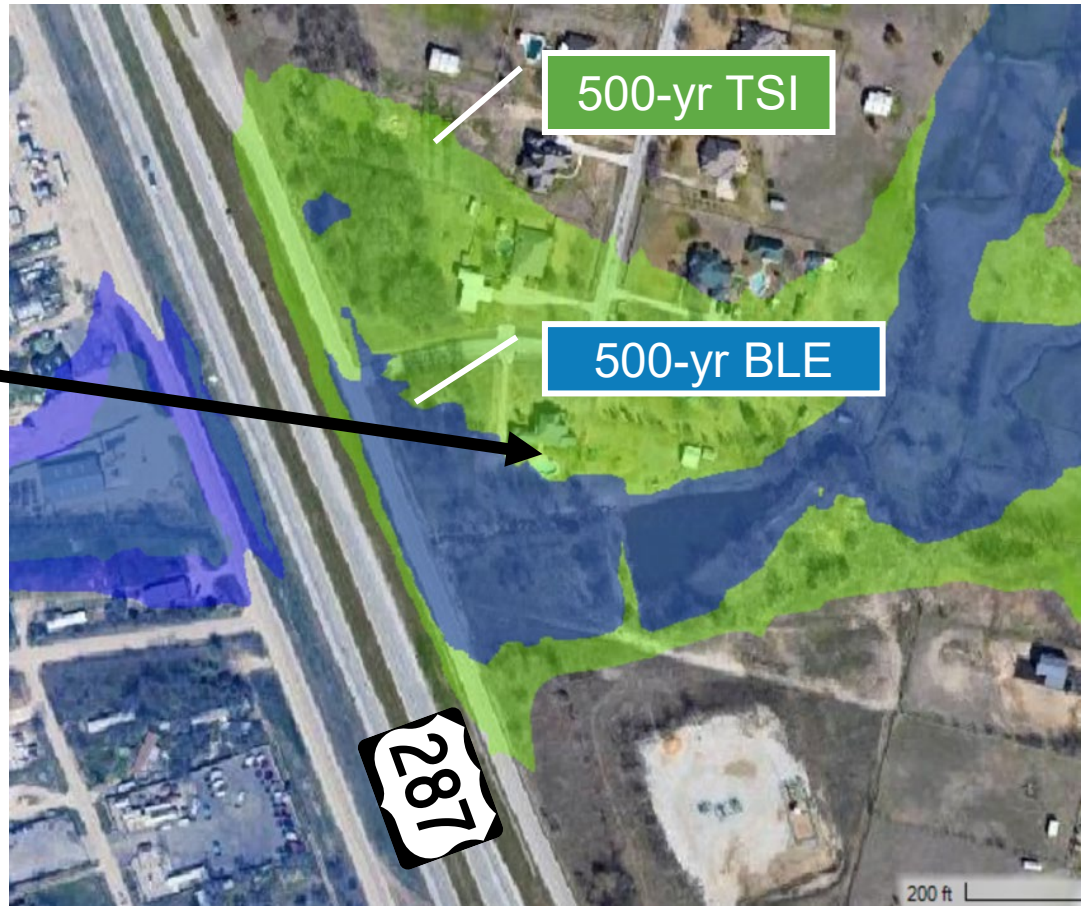


integrating **Transportation & Stormwater Infrastructure**

Hydraulic Model Enhancements (1D)

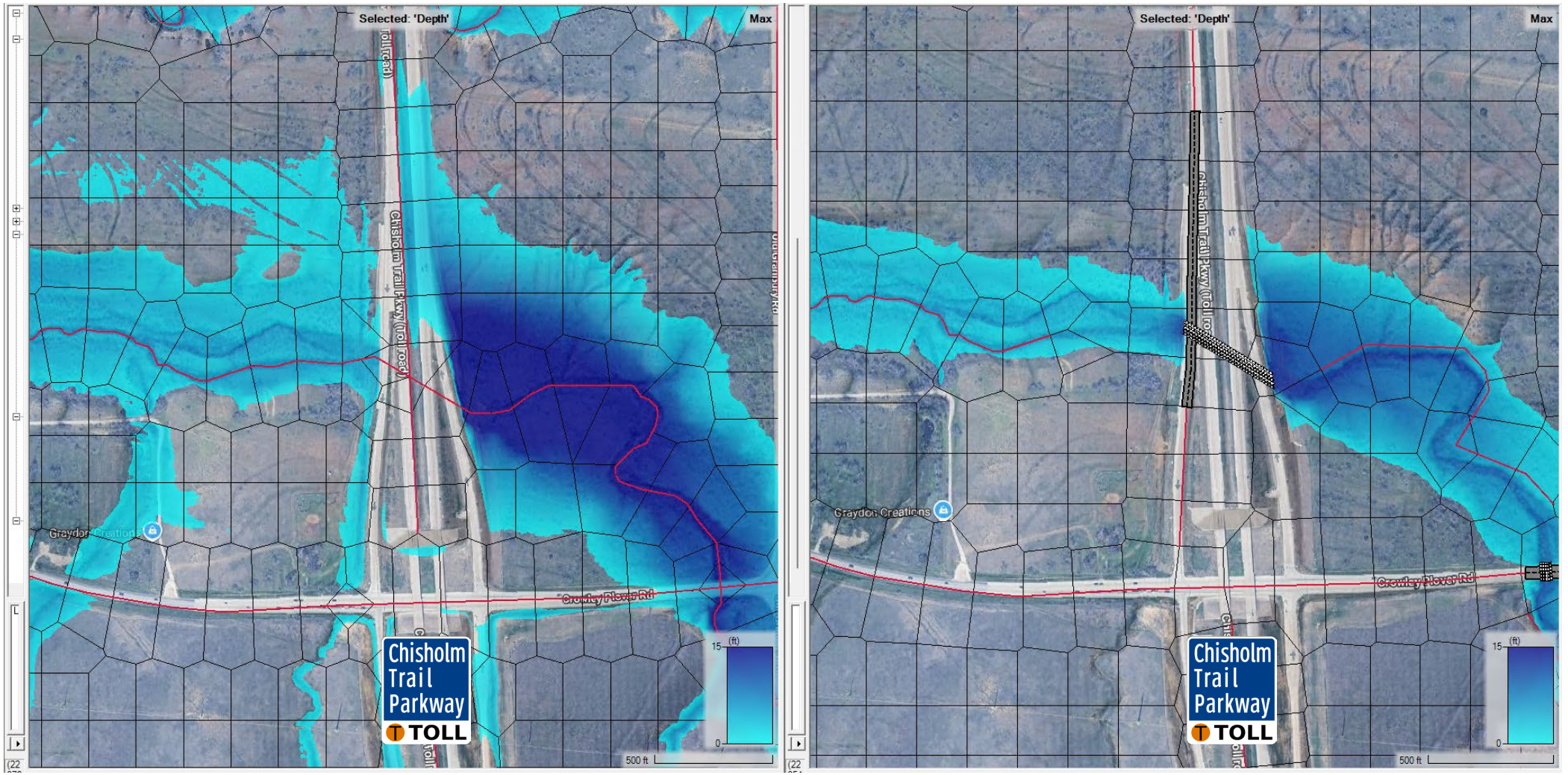
- BLE – Does not include railroad/roadway crossings
- TSI – Includes railroad/roadway crossings





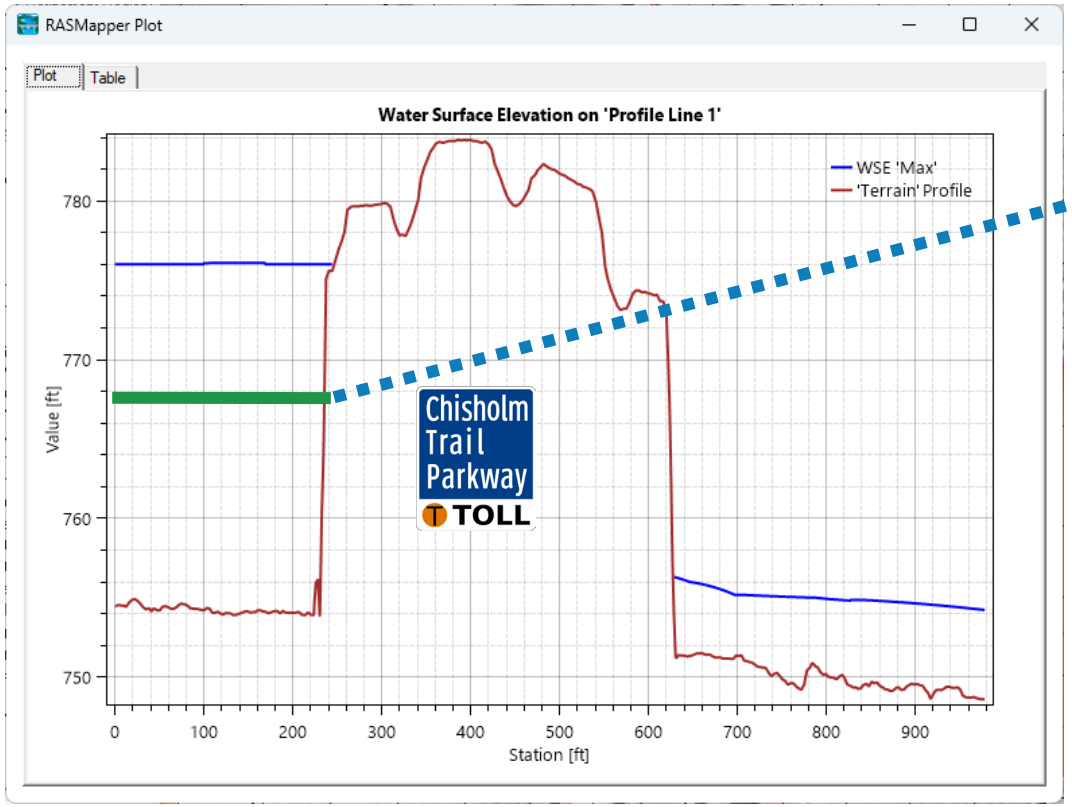
integrating Transportation & Stormwater Infrastructure

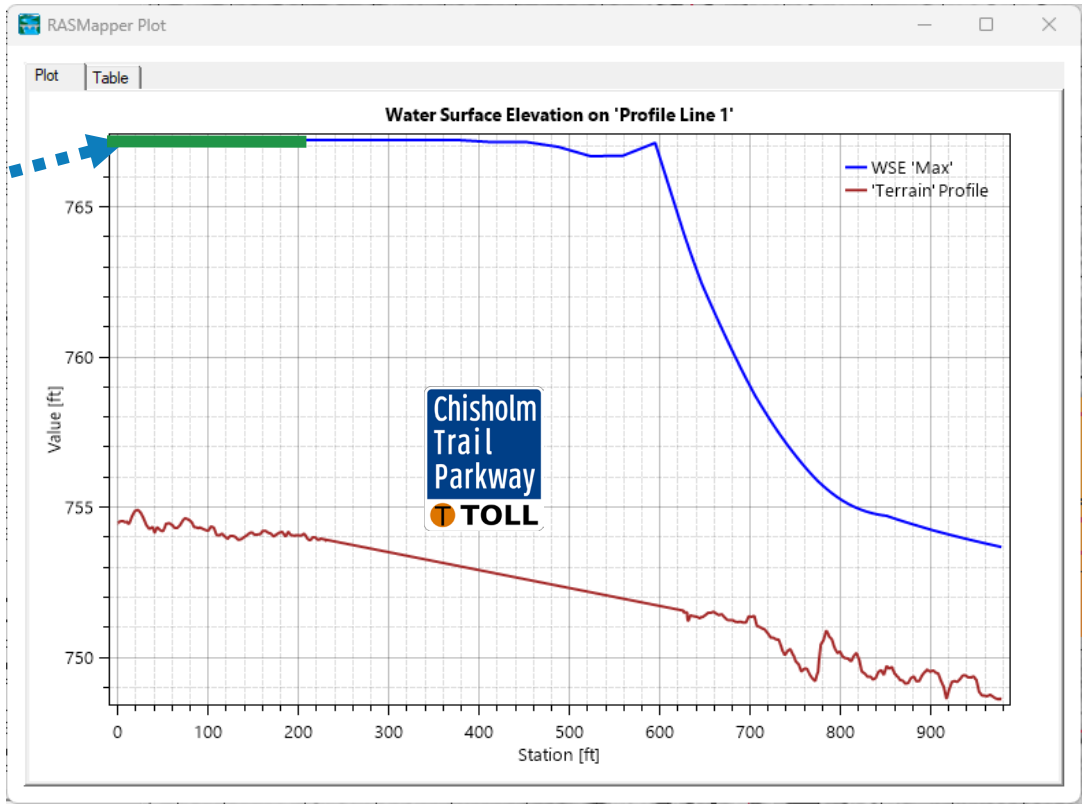
Hydraulic Model Enhancements (2D)



integrating **Transportation** & **Stormwater Infrastructure**

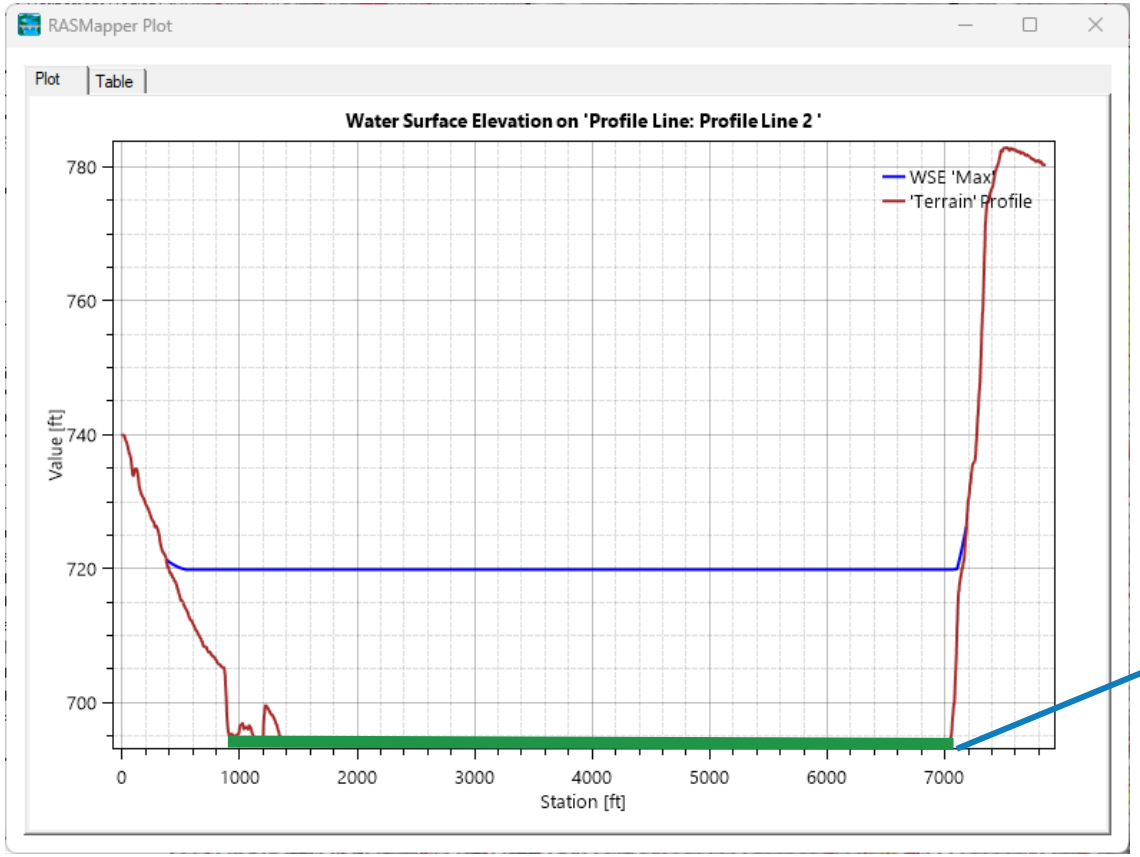
Hydraulic Model Enhancements (2D)

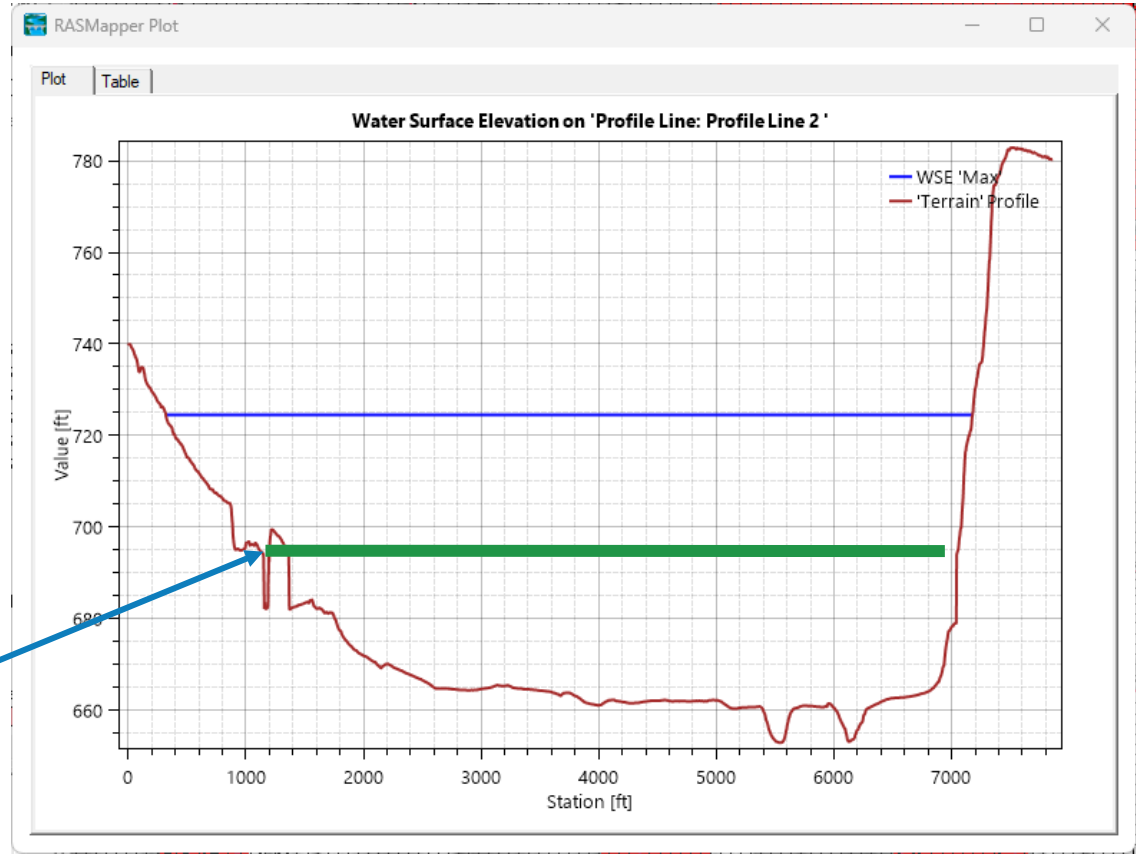




integrating **Transportation & Stormwater Infrastructure**

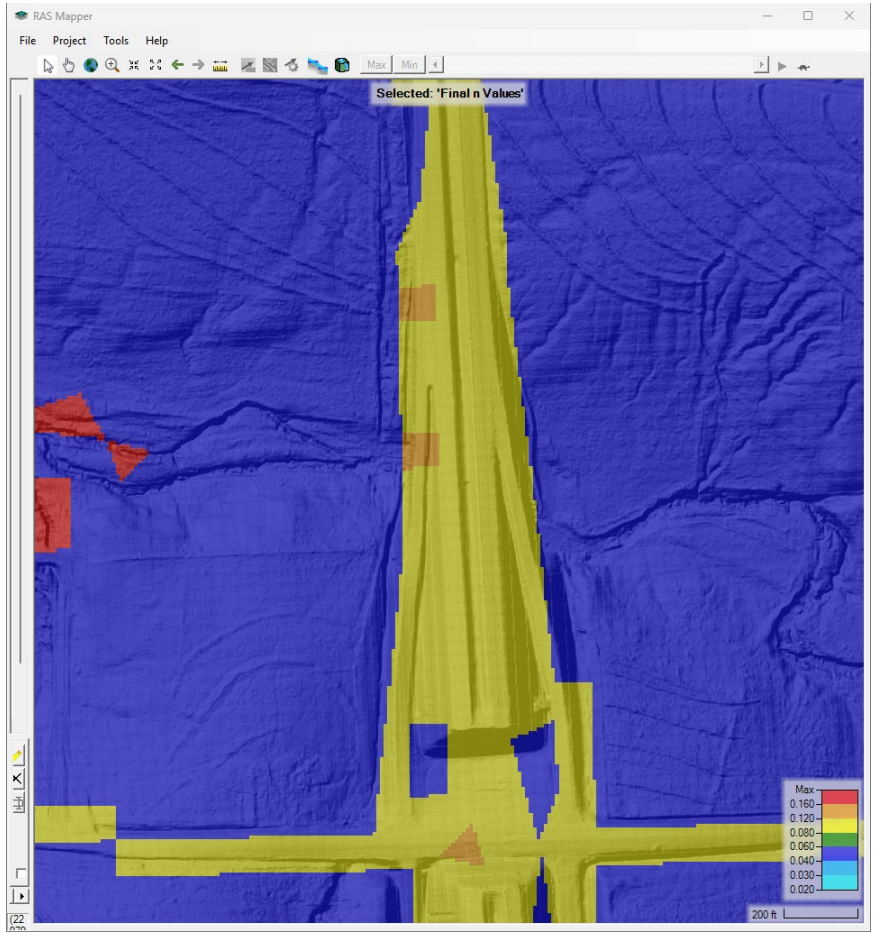
Hydraulic Model Enhancements (2D)

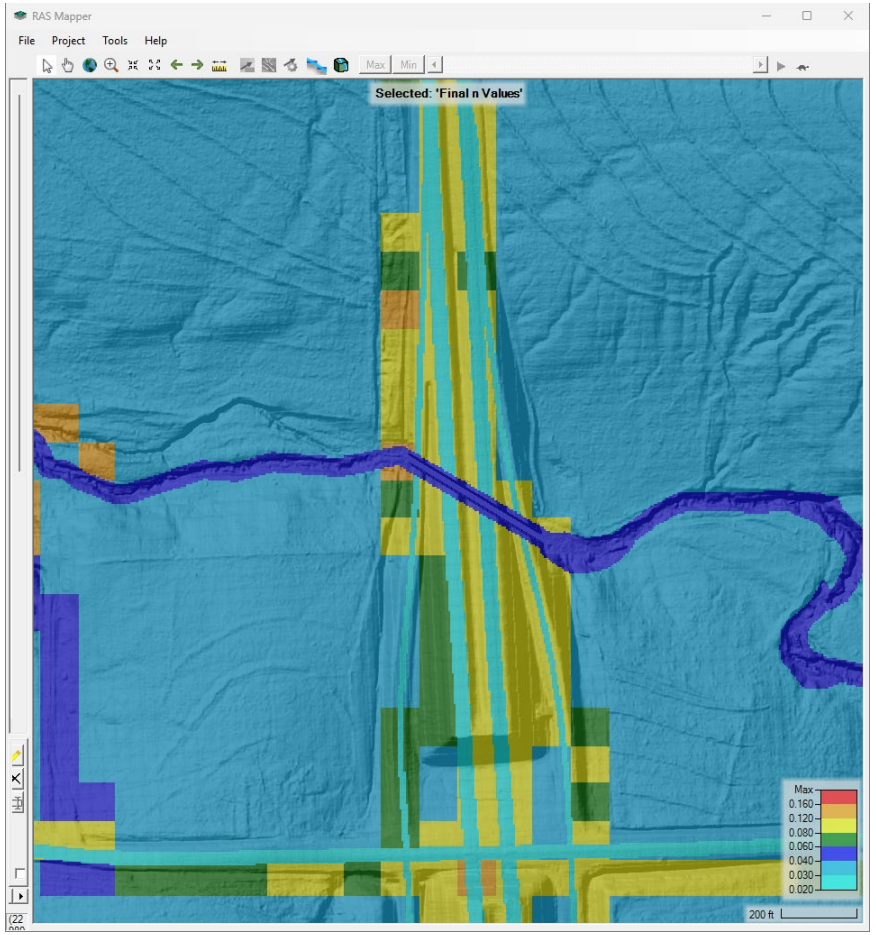




integrating **Transportation & Stormwater Infrastructure**

Hydraulic Model Enhancements (2D)





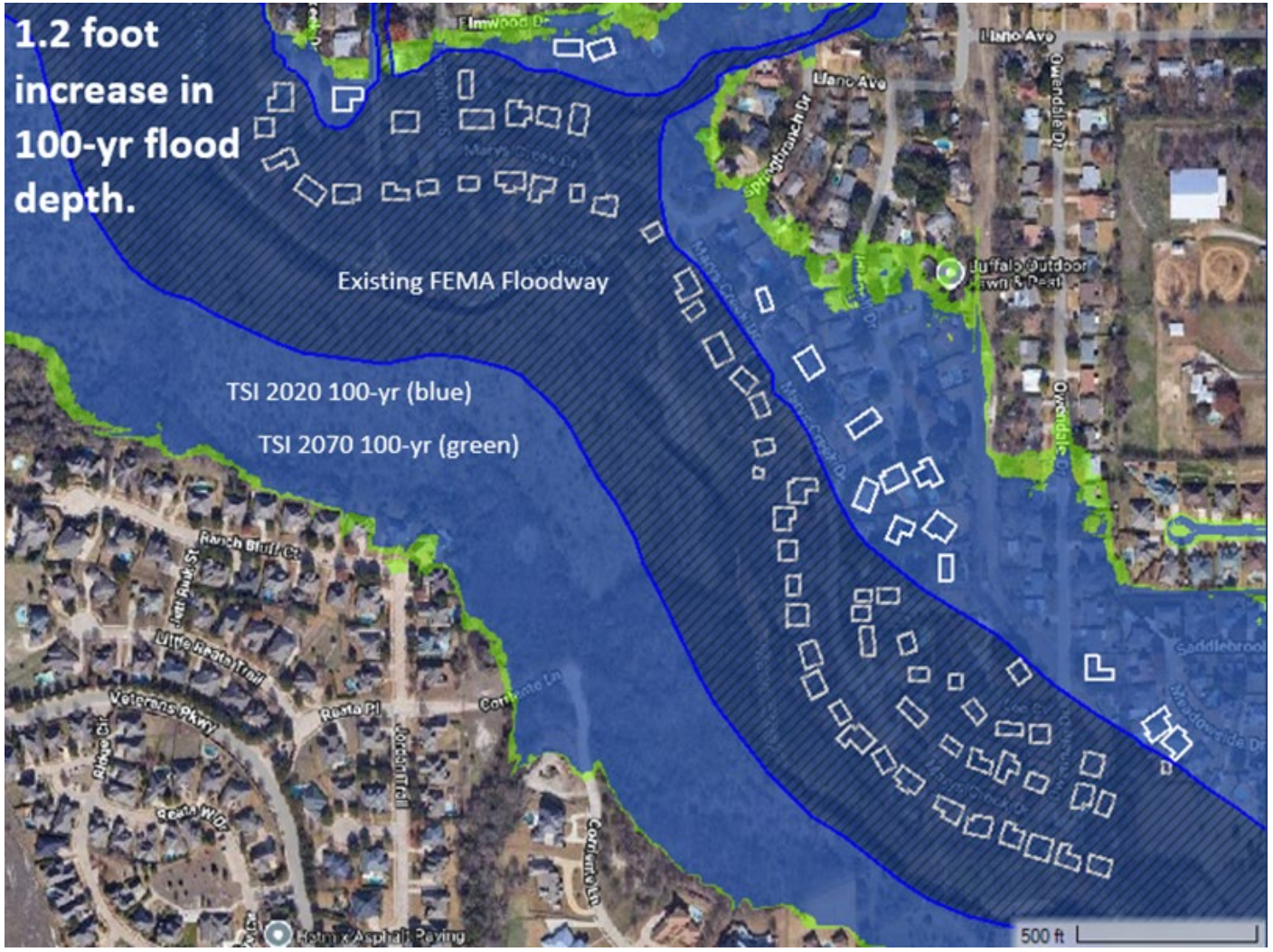
integrating Transportation & Stormwater Infrastructure

Enhanced Models, Now What?

What drives flood risk in our area?

- Percent Impervious
  - Less infiltration
  - Faster runoff
- Loss of Valley Storage
  - No attenuation

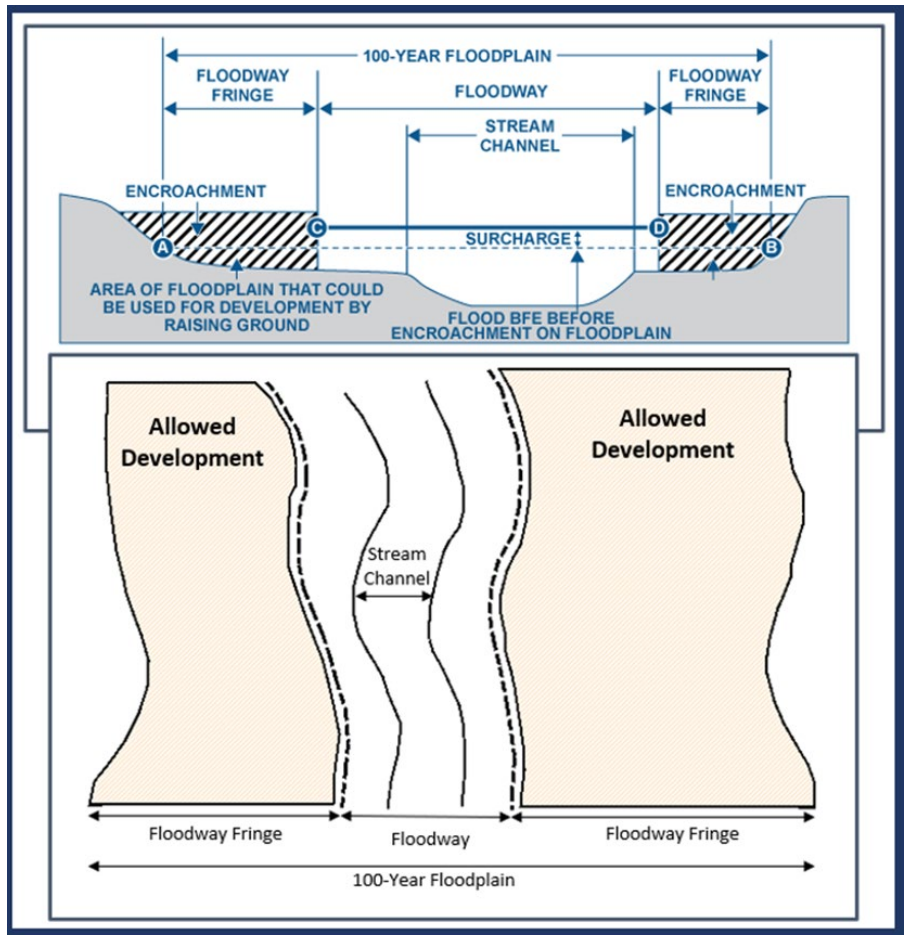
- Flows increase
- Velocities increase
- Flood depths increase



integrating **Transportation & Stormwater Infrastructure**

Preliminary Findings on Valley Storage

- **Definition** – the volume of water in a river's floodplain during a flood
- **Function** – flood water storage
- **Regulation** – FEMA NFIP
  - Development is allowed within Floodway Fringe
- Impacts of Valley Storage

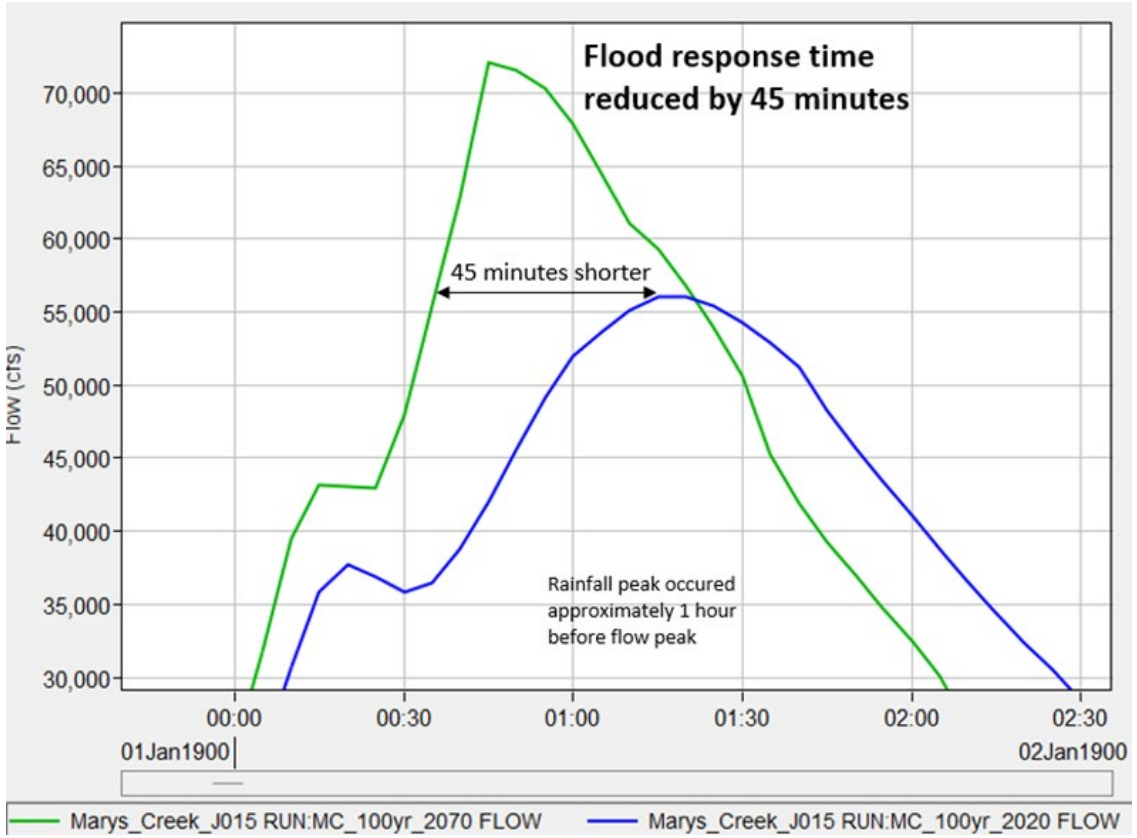


integrating Transportation & Stormwater Infrastructure

Preliminary Findings on Valley Storage

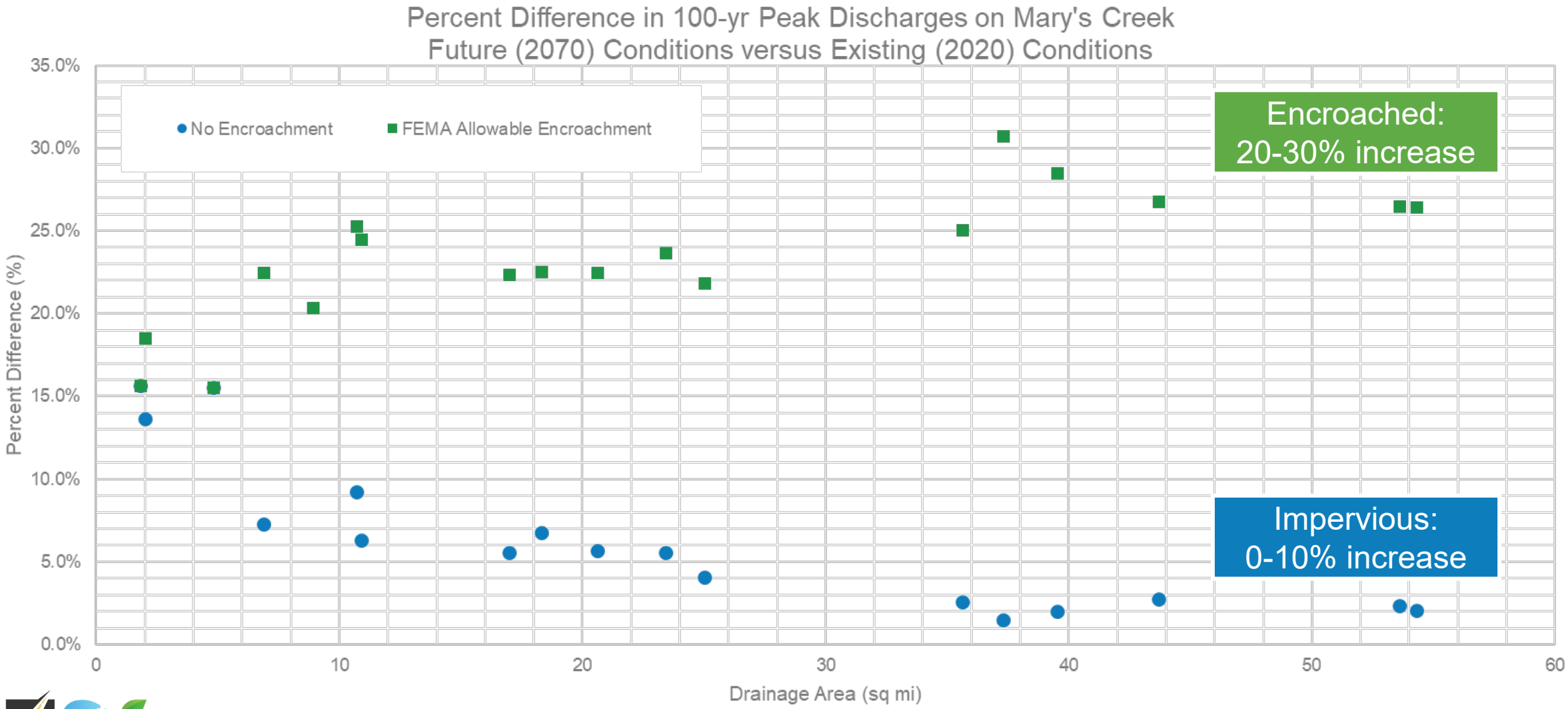
- Increased flows
- Increased stages
- Shorter flood response times

The infrastructure we've built may not have the same level of service intended...



integrating **Transportation & Stormwater Infrastructure**

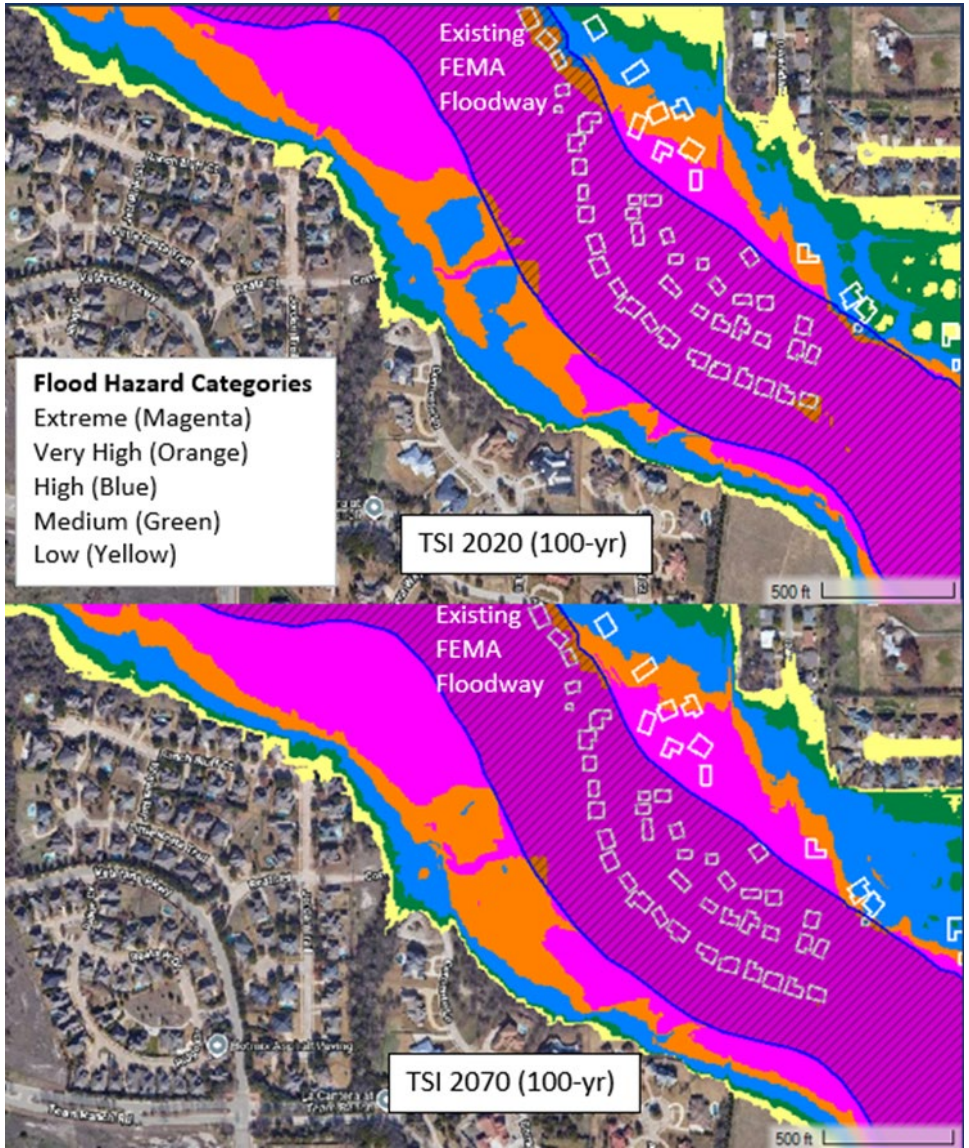
Preliminary Findings on Valley Storage



integrating **Transportation & Stormwater Infrastructure**

Preliminary Findings on Valley Storage

- Increased flows increase stages AND
  - Have shorter flood response times
  - Increase hazard to people and property



integrating **Transportation & Stormwater Infrastructure**

Existing and Future Conditions, Now What?

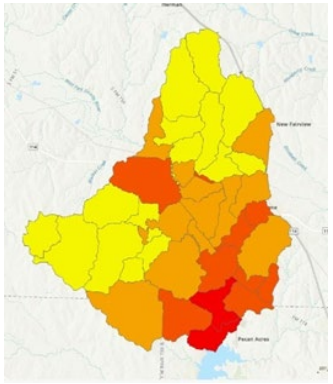
integrating **Transportation & Stormwater Infrastructure**

Integrating Transportation and Stormwater Infrastructure

- Identify Deficiencies Existing and Future
  - Flooding
  - Transportation
- Identify Opportunities
  - Can this new road provide detention storage?
  - What does it really take to have a 100-year level of service here?
  - Where are the mathematically optimal locations?
  - Are there any practically optimal locations?

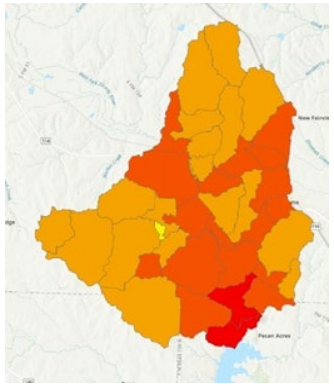
Optimization

2020

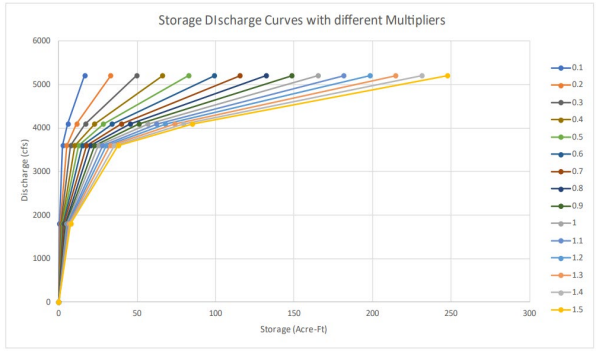


Increased Runoff and Flow

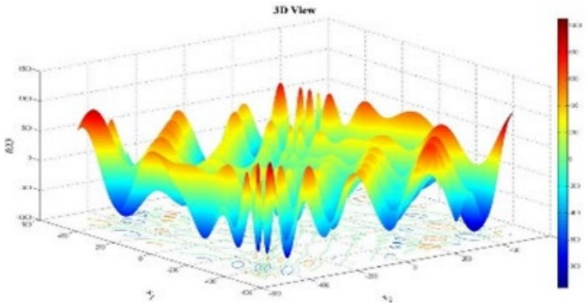
2070

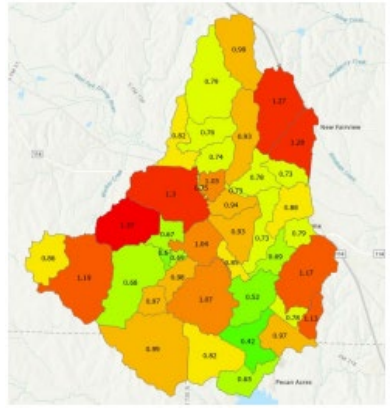


Add theoretical storage to keep 2020 flooding constant



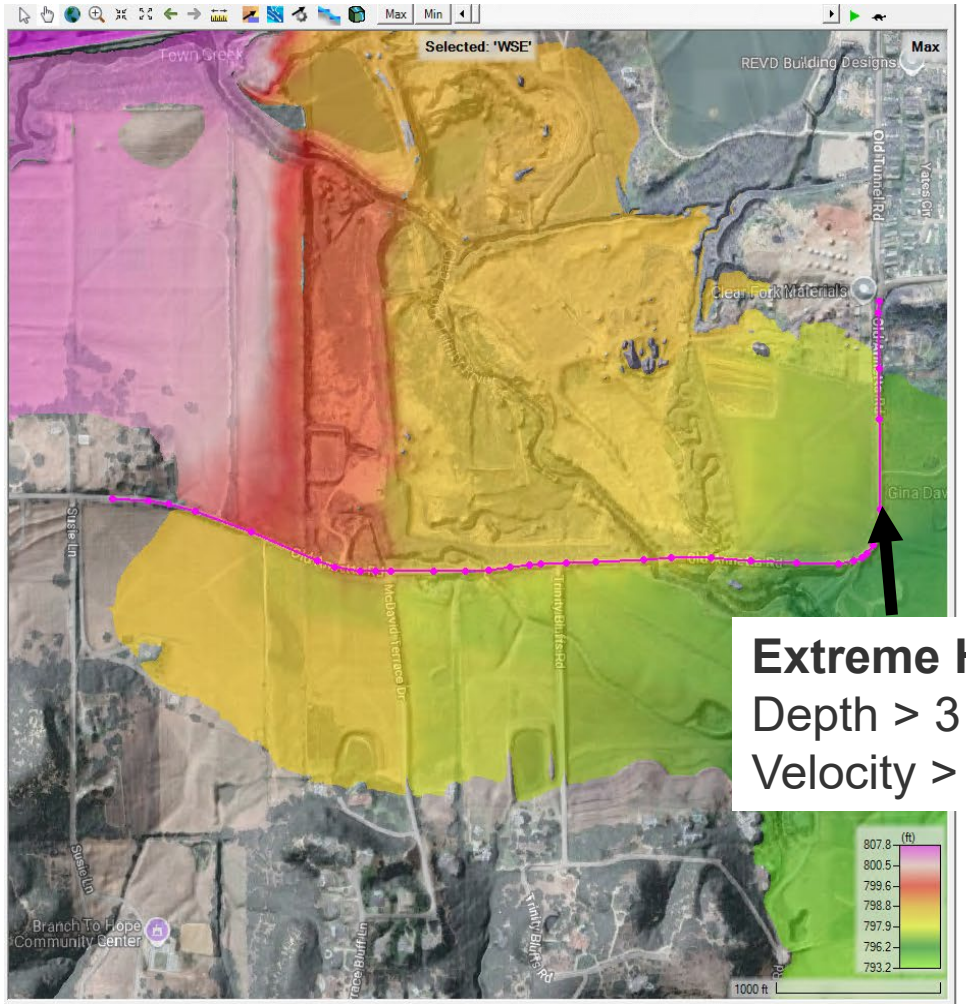
Optimize storage in the watershed



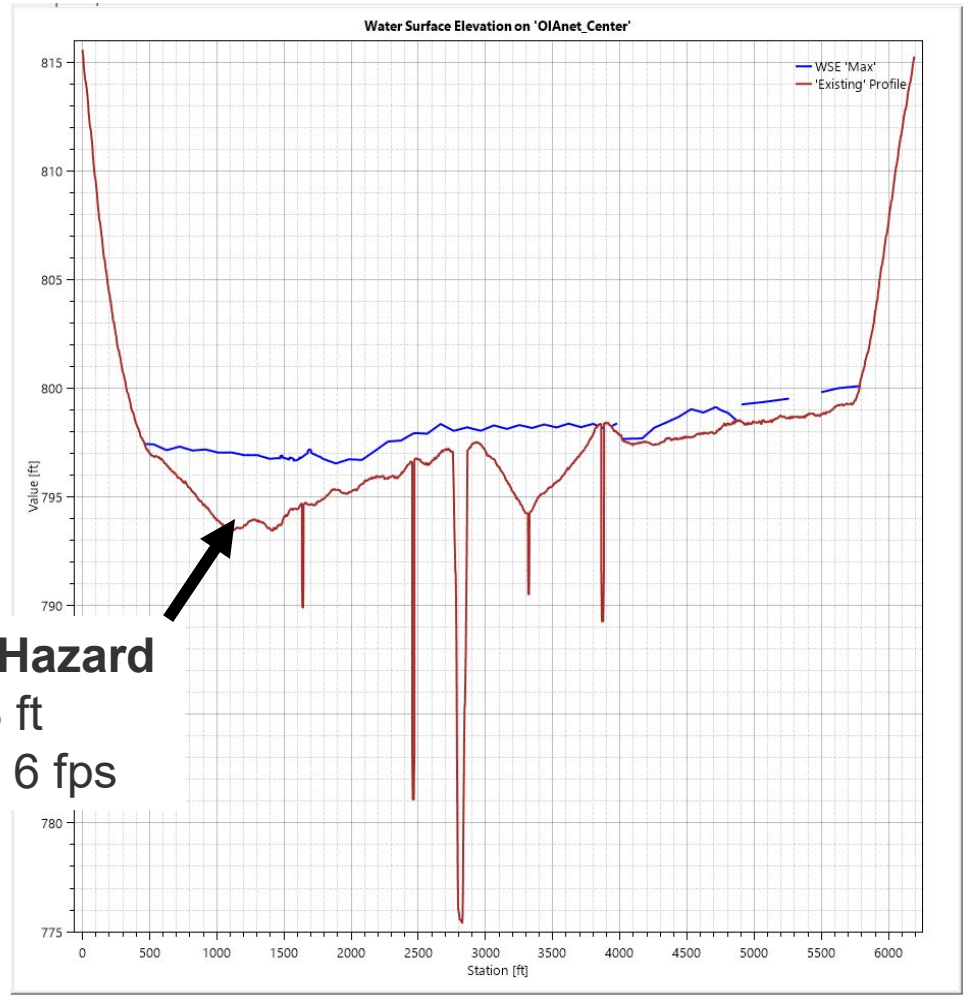


integrating **Transportation & Stormwater Infrastructure**

Alternatives Analysis

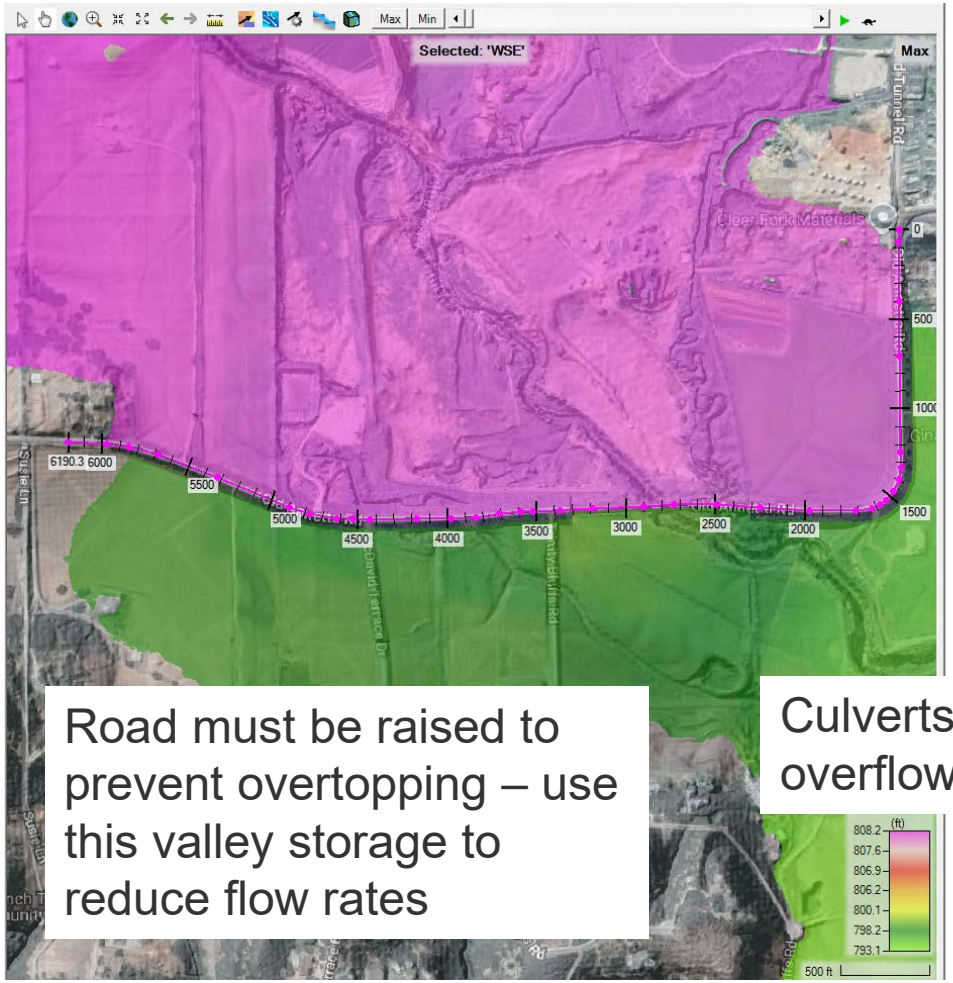


Extreme Hazard
Depth > 3 ft
Velocity > 6 fps

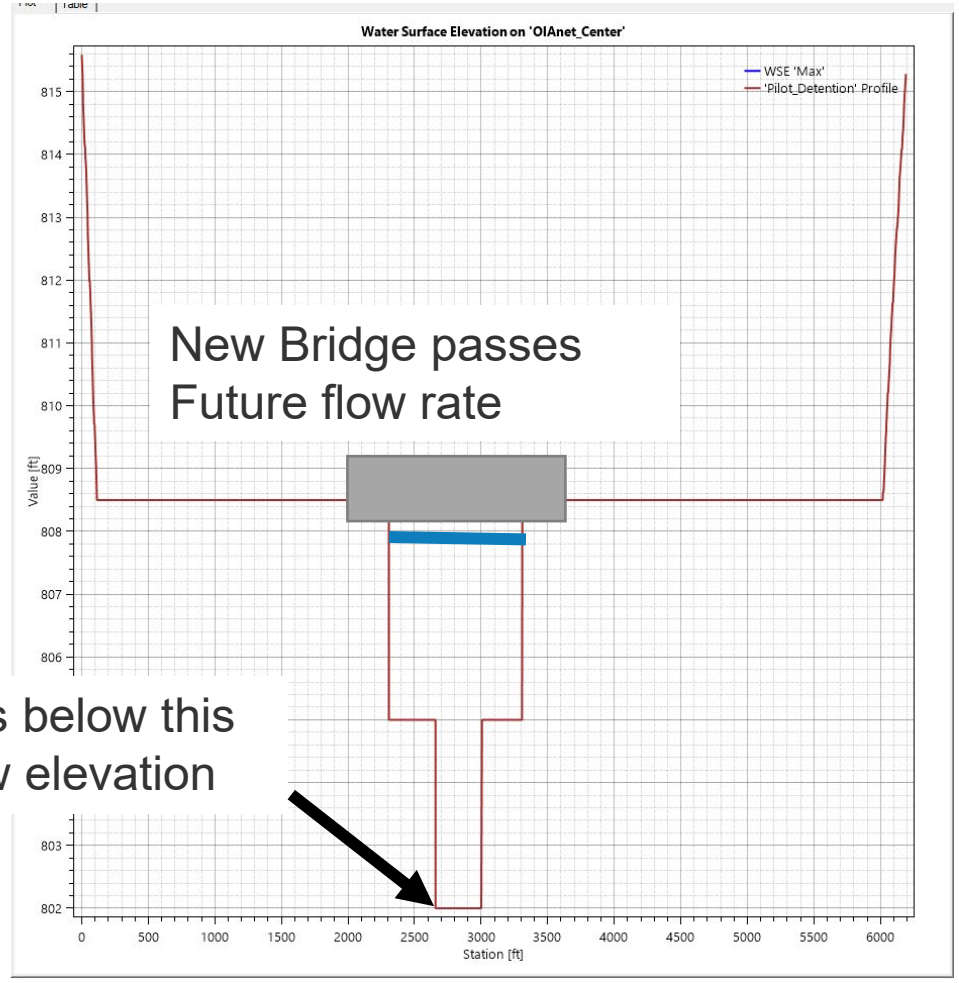


integrating **Transportation & Stormwater Infrastructure**

Alternatives Analysis



Road must be raised to prevent overtopping – use this valley storage to reduce flow rates

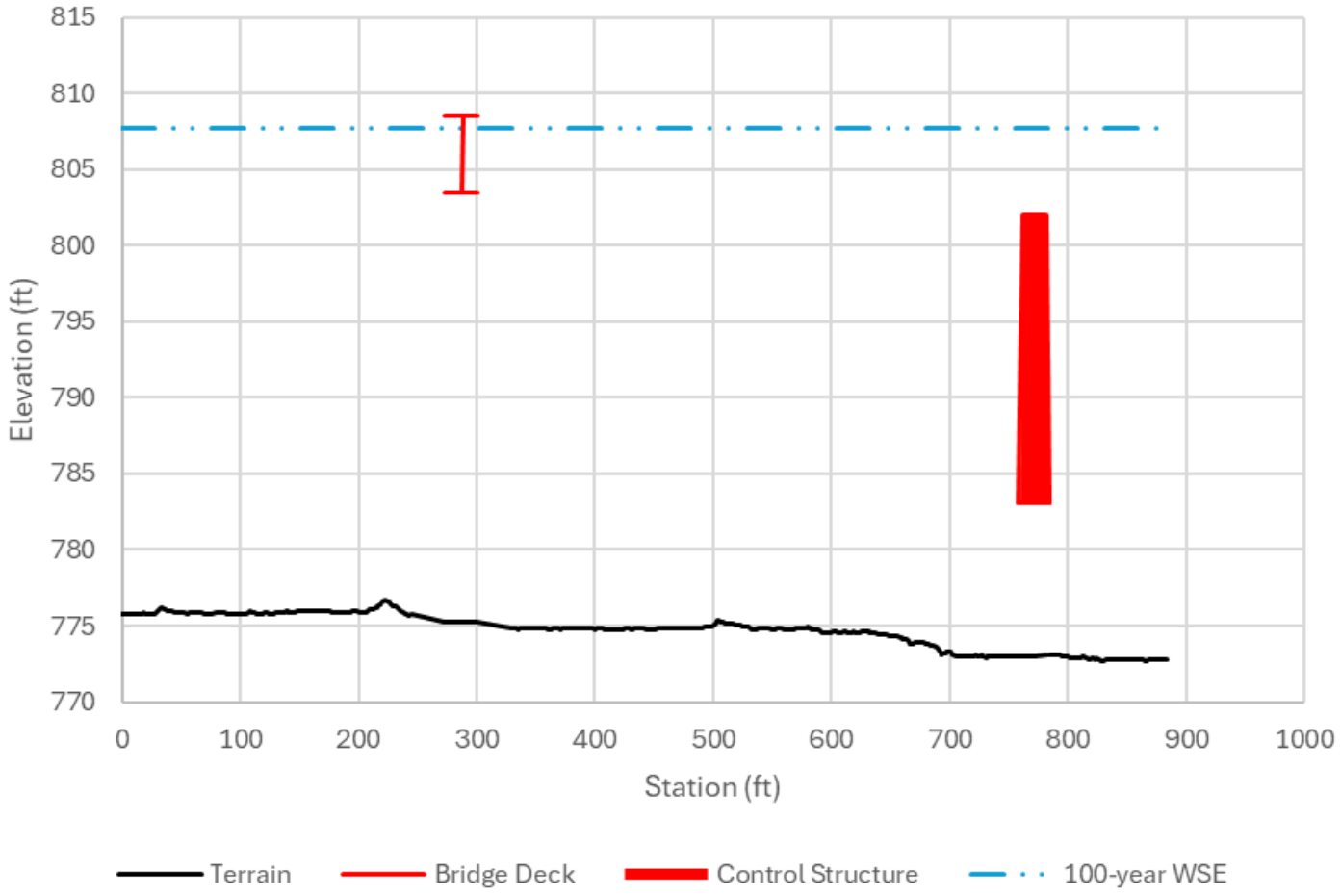


New Bridge passes Future flow rate

Culverts below this overflow elevation

integrating **Transportation & Stormwater Infrastructure**

Alternatives Analysis

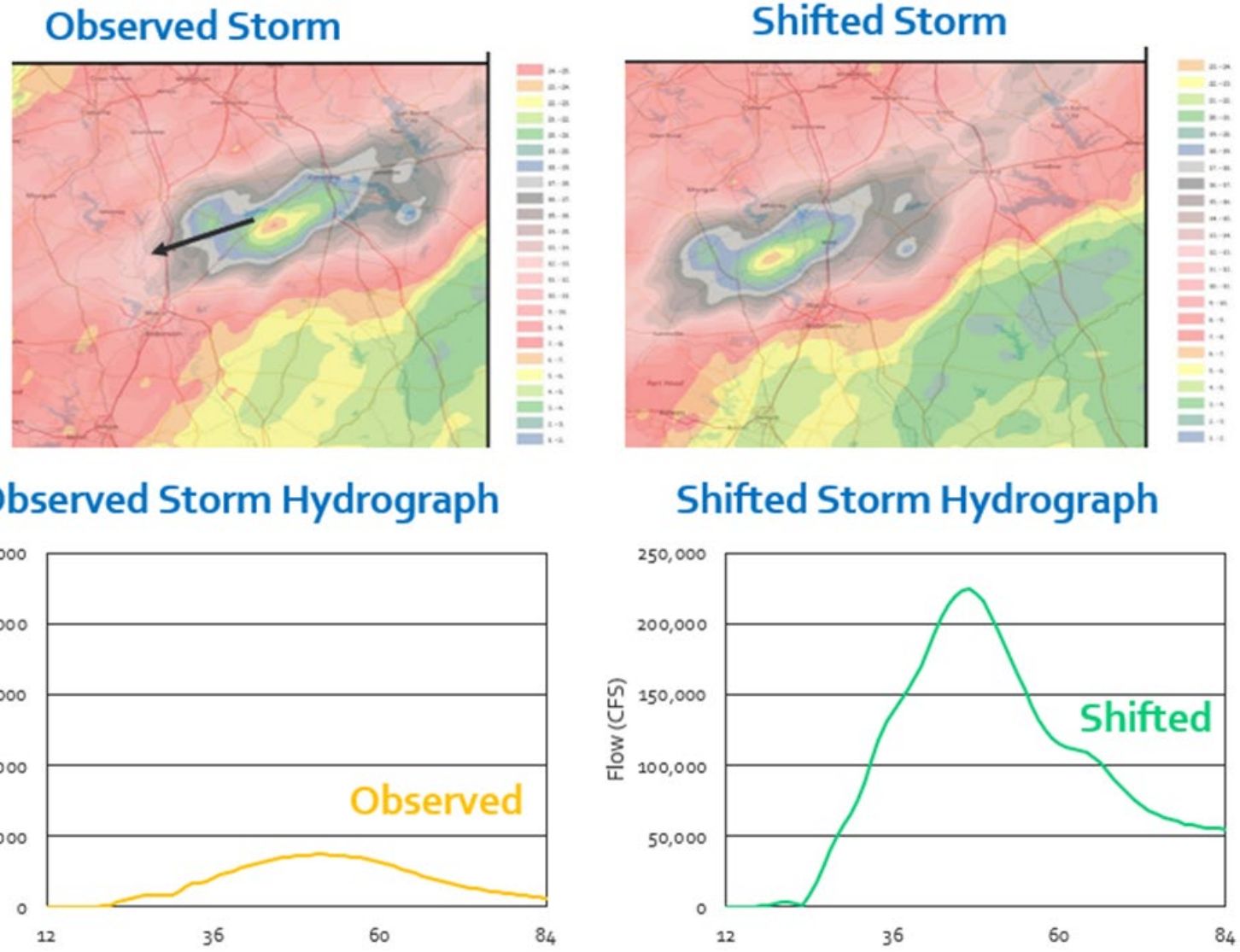


Valley Storage Added: 3,186.8 ac-ft
Flow Rate Reduction: 474 cfs

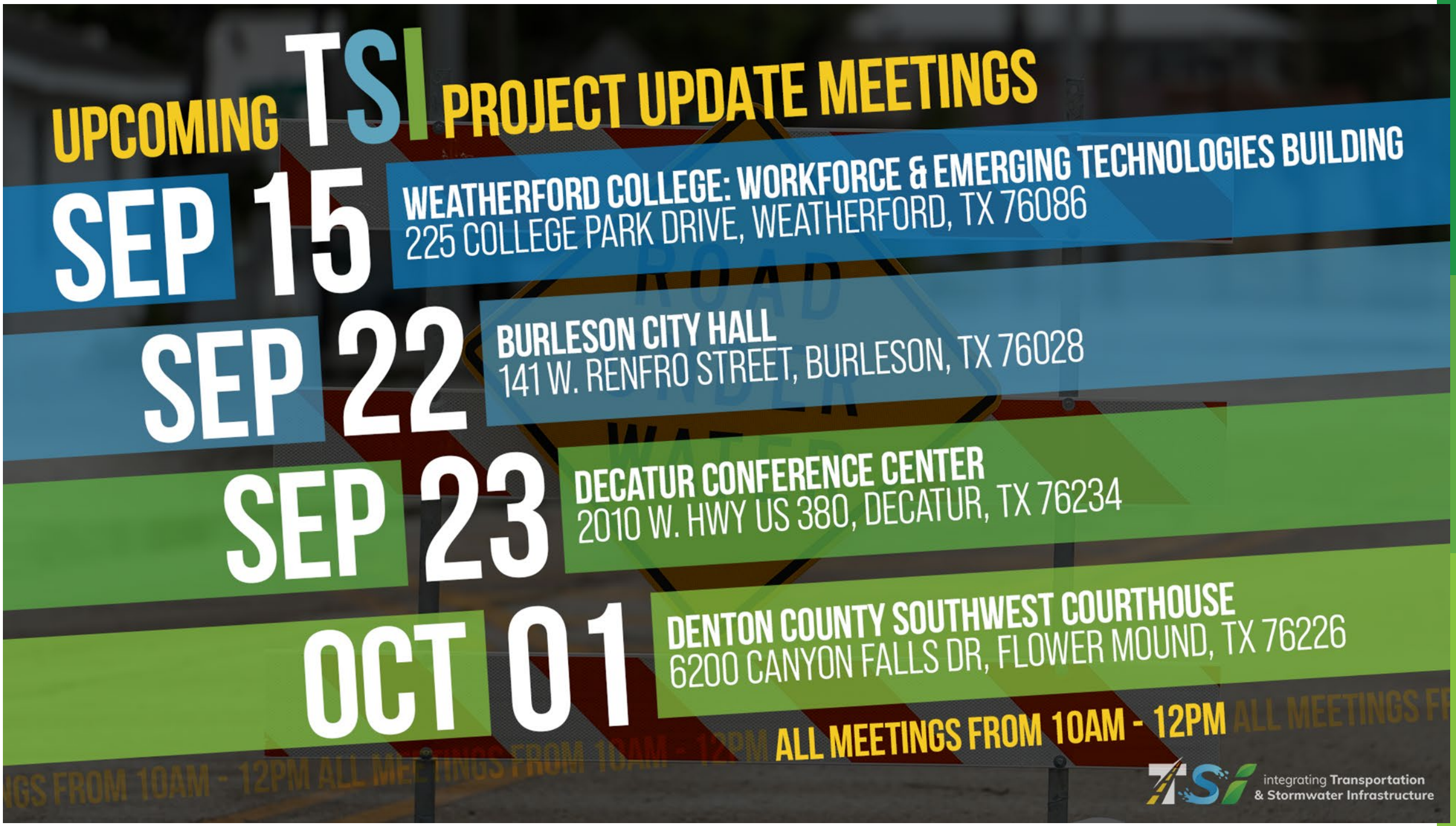
integrating **Transportation & Stormwater Infrastructure**

Storm Shifting

- Testing theory with "real" storms
- Local examples of large storms
- What if near-misses hit?



integrating Transportation & Stormwater Infrastructure


UPCOMING TSI PROJECT UPDATE MEETINGS
SEP 15
WEATHERFORD COLLEGE: WORKFORCE & EMERGING TECHNOLOGIES BUILDING
225 COLLEGE PARK DRIVE, WEATHERFORD, TX 76086
SEP 22
BURLESON CITY HALL
141 W. RENFRO STREET, BURLESON, TX 76028
SEP 23
DECATUR CONFERENCE CENTER
2010 W. HWY US 380, DECATUR, TX 76234
OCT 01
DENTON COUNTY SOUTHWEST COURTHOUSE
6200 CANYON FALLS DR, FLOWER MOUND, TX 76226
ALL MEETINGS FROM 10AM - 12PM
integrating Transportation & Stormwater Infrastructure

Estimated Study Timeline

Through Winter 2025
Continue training workshops and site visits to individual communities

Winter 2025/2026
Complete H&H modeling and identify transportation, environmental and other policy recommendations

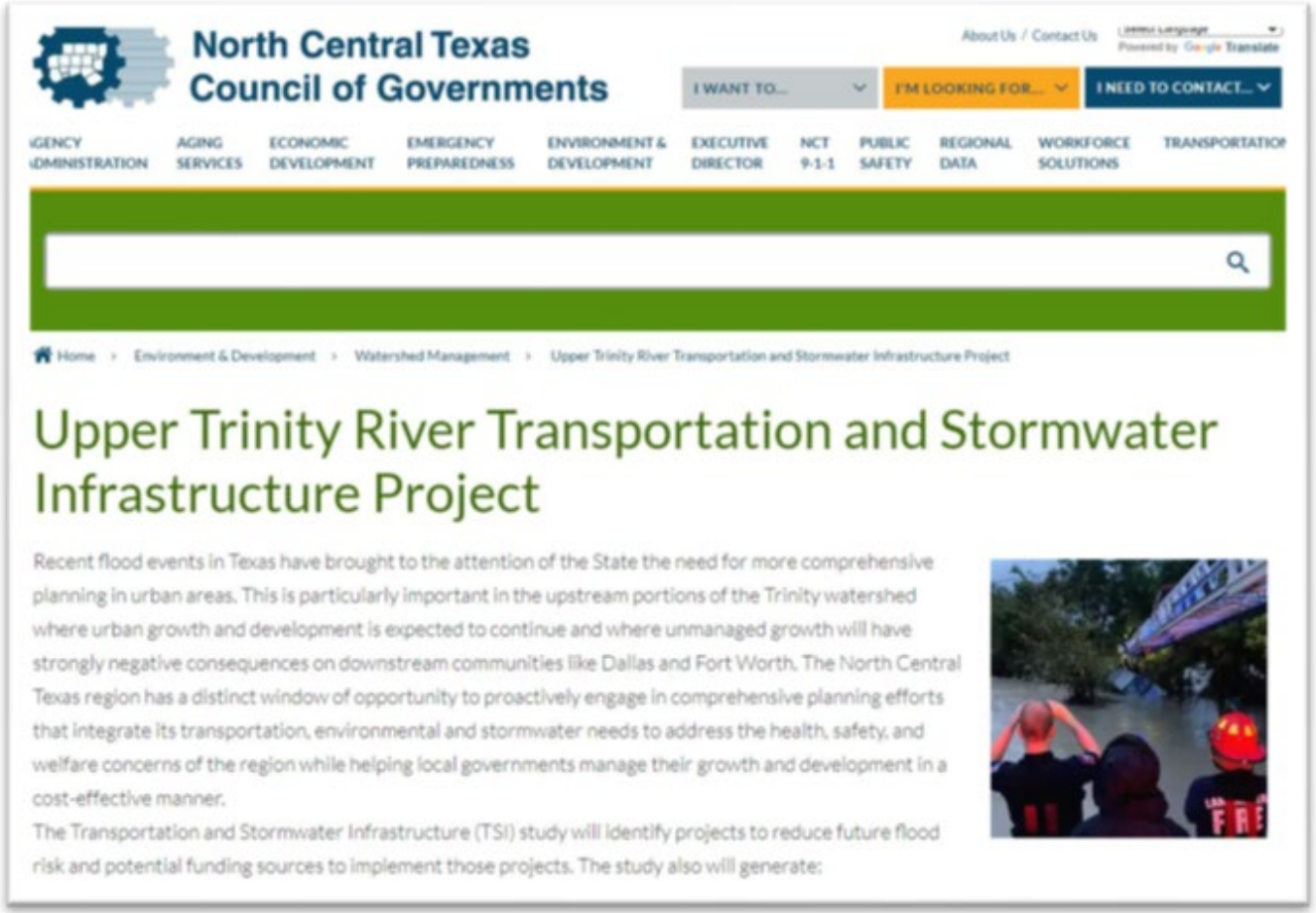
Spring 2026
Conduct project update meeting to present findings and seek stakeholder feedback

Summer 2026
Conduct project update meeting to present final products incorporating stakeholder feedback

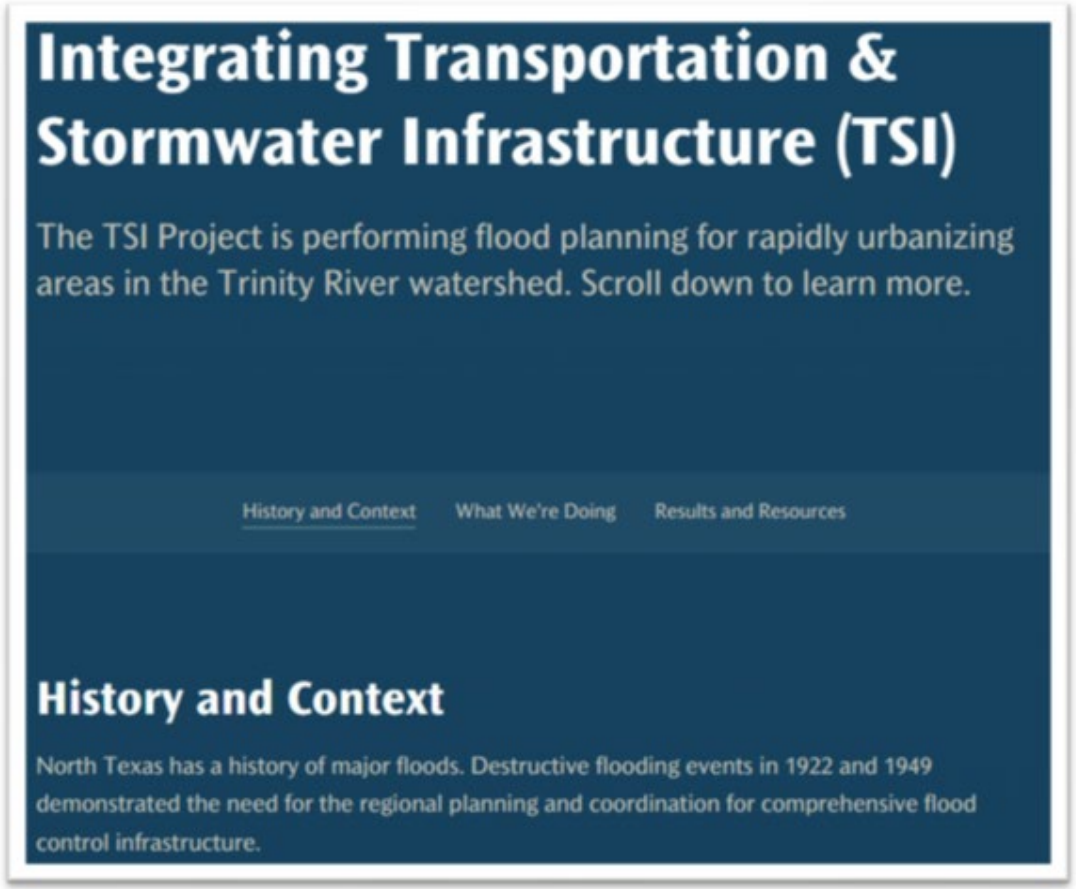
Late Summer 2026
Submit deliverables to funding agencies

integrating **Transportation & Stormwater Infrastructure**

Want to Learn More about TSI?



Project Website https://nctcog.org/tsi



Project Story Map
https://geospatial.nctcog.org/portal/apps/storymaps/stories/6b73437fc69643cb9b6f239831706191

integrating **Transportation & Stormwater Infrastructure**

Contacts

Susan Alvarez, PE, CFM
E&D Department Director, NCTCOG
Salvarez@nctcog.org
817-704- 2549

Katie Hunter
Planner, NCTCOG
Khunter@nctcog.org
817-695-9102

Jeff Neal, PTP
Senior Projects Manager, NCTCOG
jneal@nctcog.org
214-223-0578

Kate Zielke, CFM
Program Manager, NCTCOG
KZielke@nctcog.org
817-695-9227

Landon Erickson, PE
Lead Hydraulic Engineer, U.S. Army Corps of Engineers
Charles.Erickson@usace.army.mil
817-886-1692

Sam Sarkar, PE
Water Resources Advisor, Halff
ssarkar@halff.com
214-346-6368

Jeremy Dixon, PE, CFM
Associate, Freese & Nichols Inc.
Jeremy.Dixon@freese.com
214-217-2280

integrating **Transportation & Stormwater Infrastructure**