Hwy 101/61 Flood Mitigation Past, Present, and Future

Presented by:
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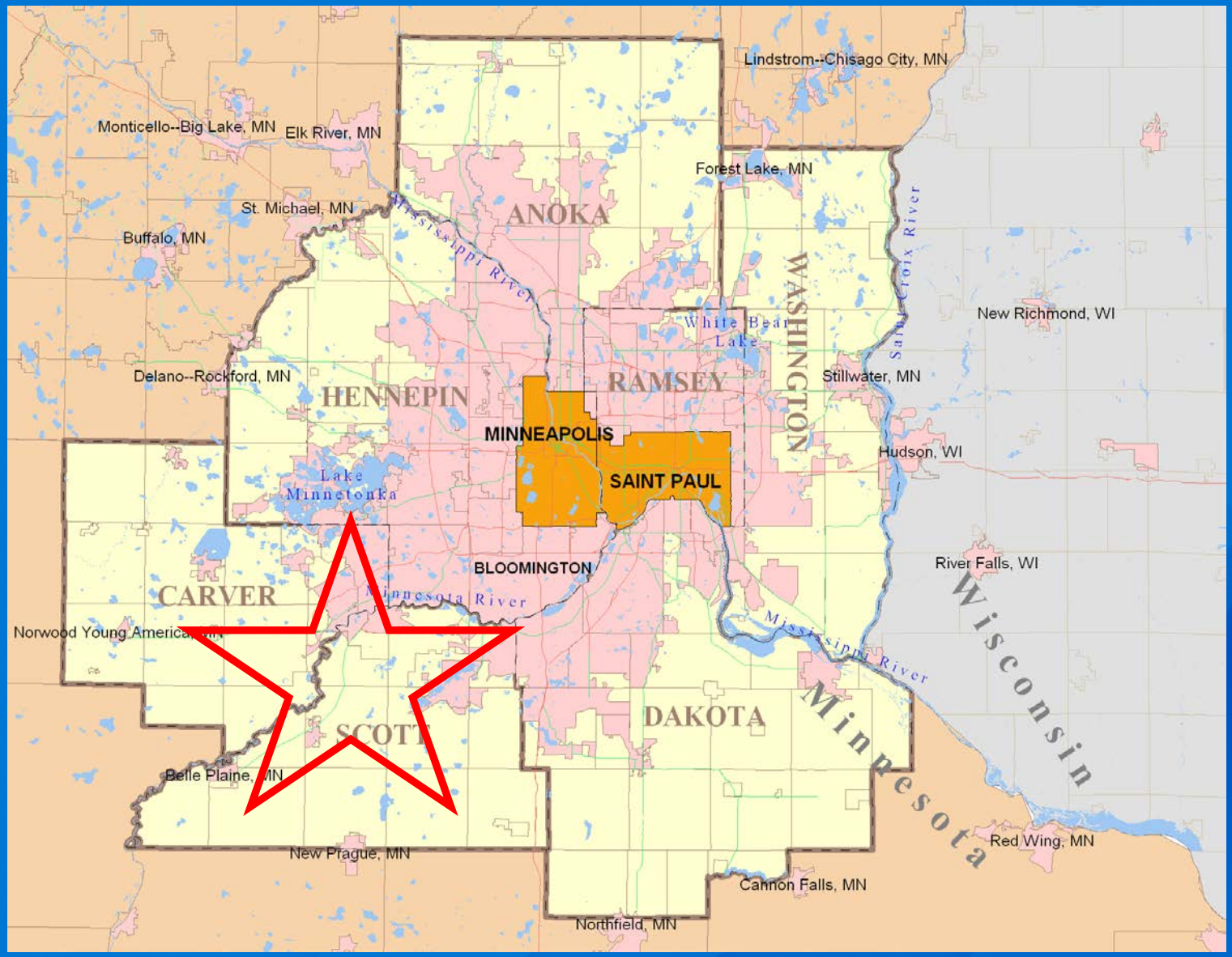
Minnesota DOT

CARVER COUNTY

SEH

MINNESOTA DEPARTMENT OF TRANSPORTATION

Area of Concern: SW Metro



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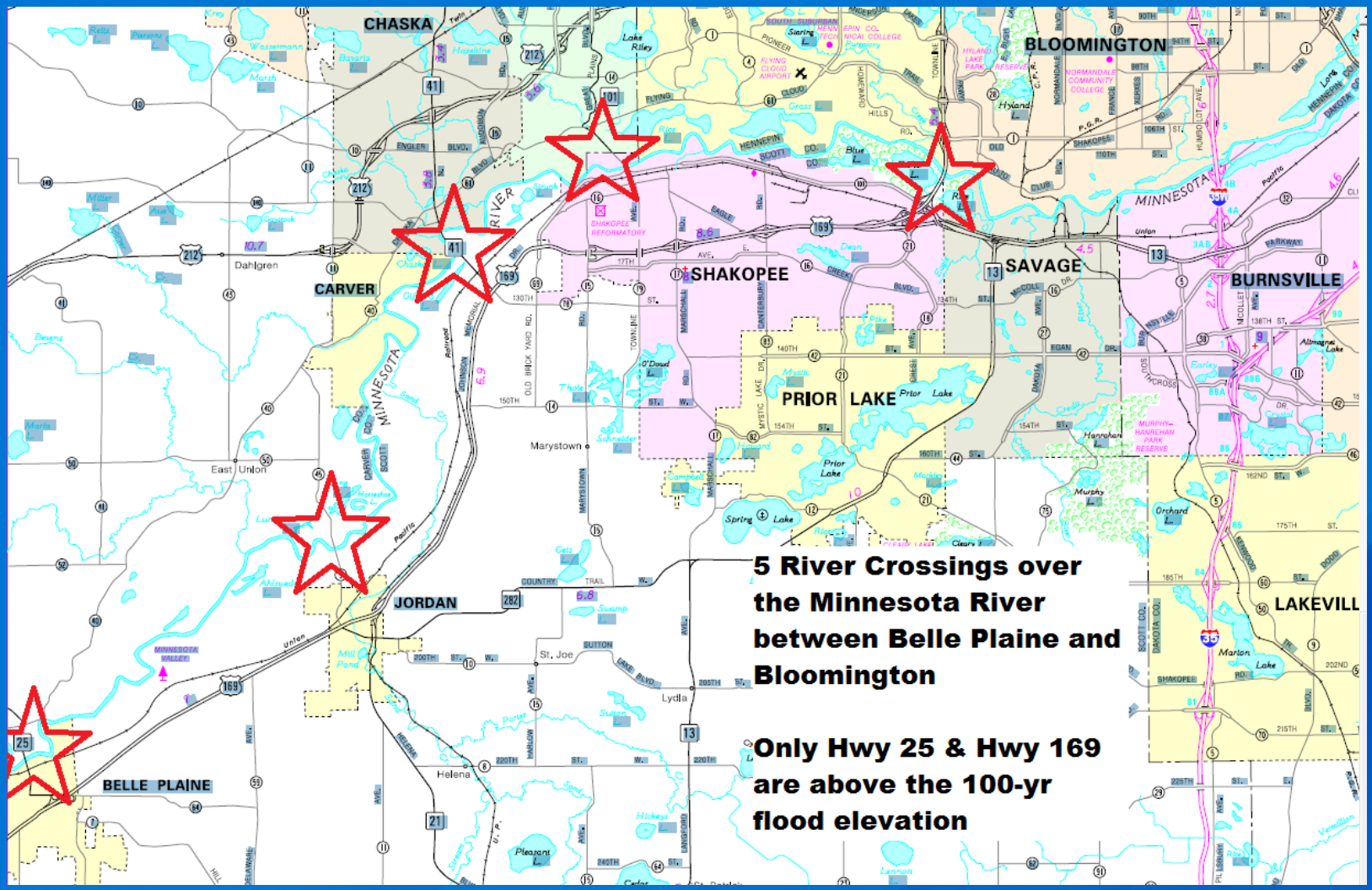


SW Metro Flooding Snapshot

- 50,000+ vehicle per day detoured. 20,000 commuters.
- Regional and local impact.
- Significant economic impact.
- Emergency response time compromised.

Friday, October 1, 2010
6:30 a.m.

CH 18, ½ mile south of TH 169 interchange

TH101 & TH41
MnDOT Flood Impact Study

Baird
Navigating New Horizons

SEH

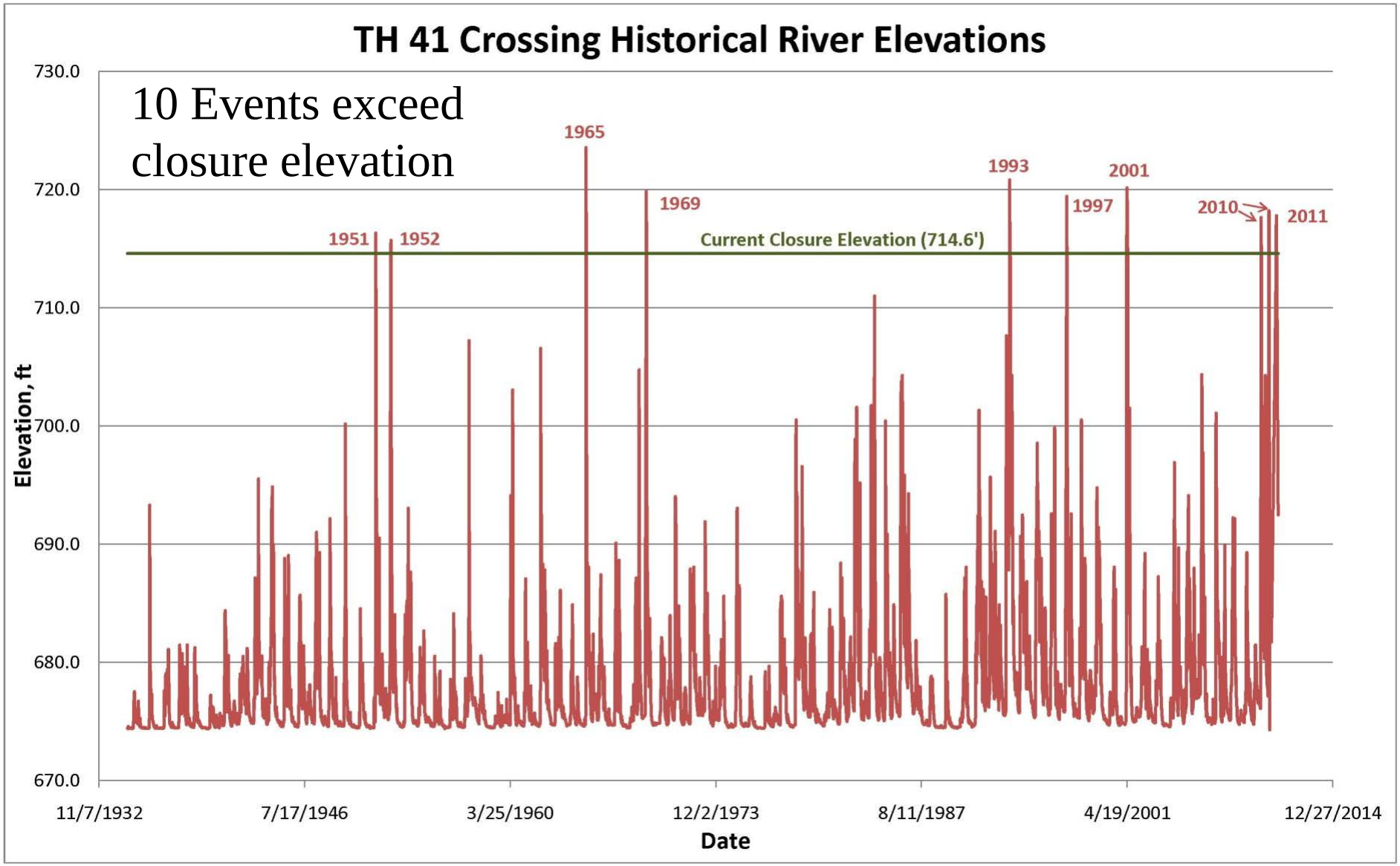
Minnesota Department of Transportation

Project Background

Study Components

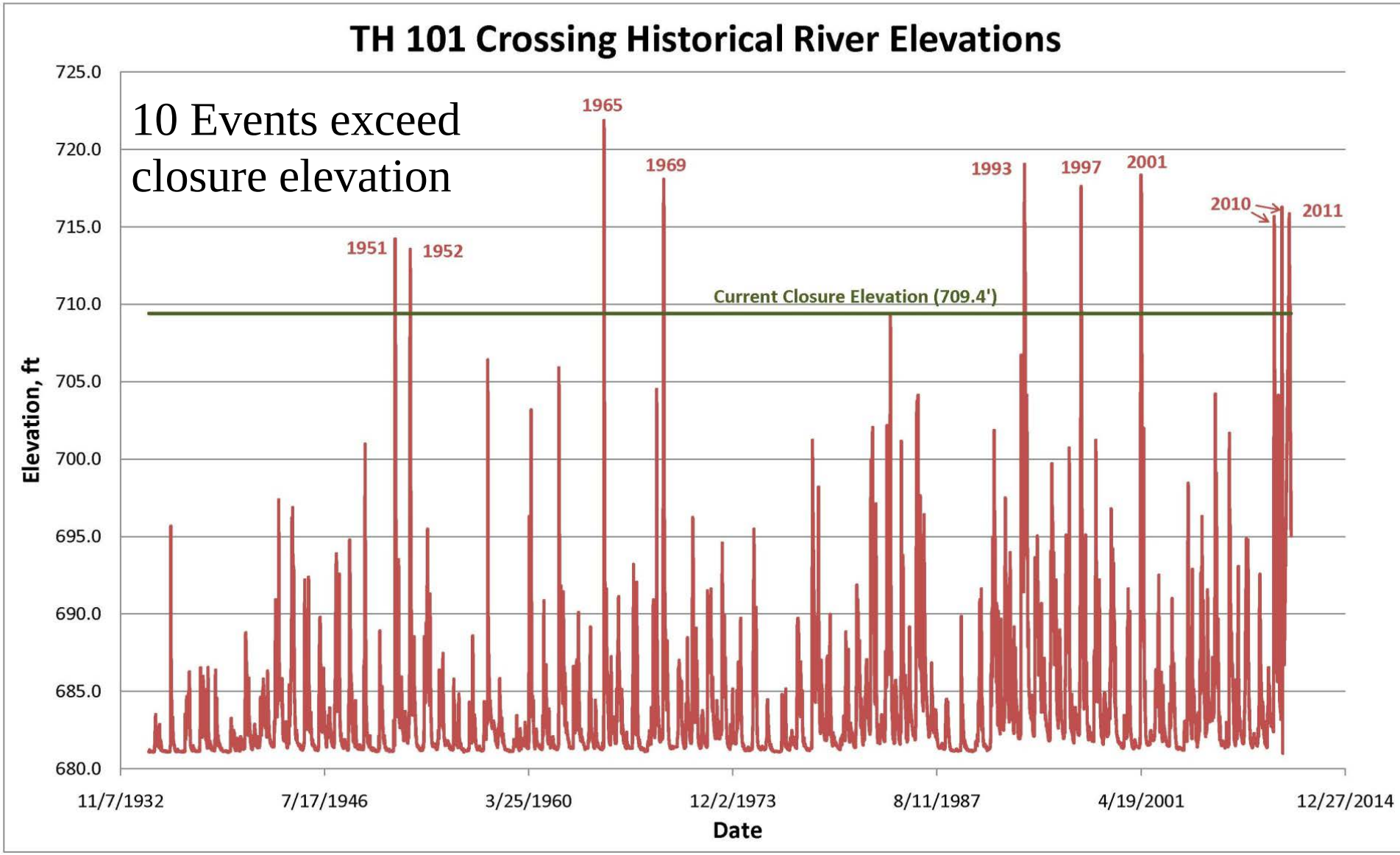
- Analysis of historical flooding
- Development and Evaluation of alternatives
- River modeling
- Agency involvement
  - USFWS
  - DNR
  - MPCA
  - USACE
  - Watershed Management Organization

Flooding History – TH41



Spring 2011 Flood – TH41
Looking North Towards Chaska

Flooding History – TH101



Spring 2011 Flood – TH101 Looking North Towards Chanhassen

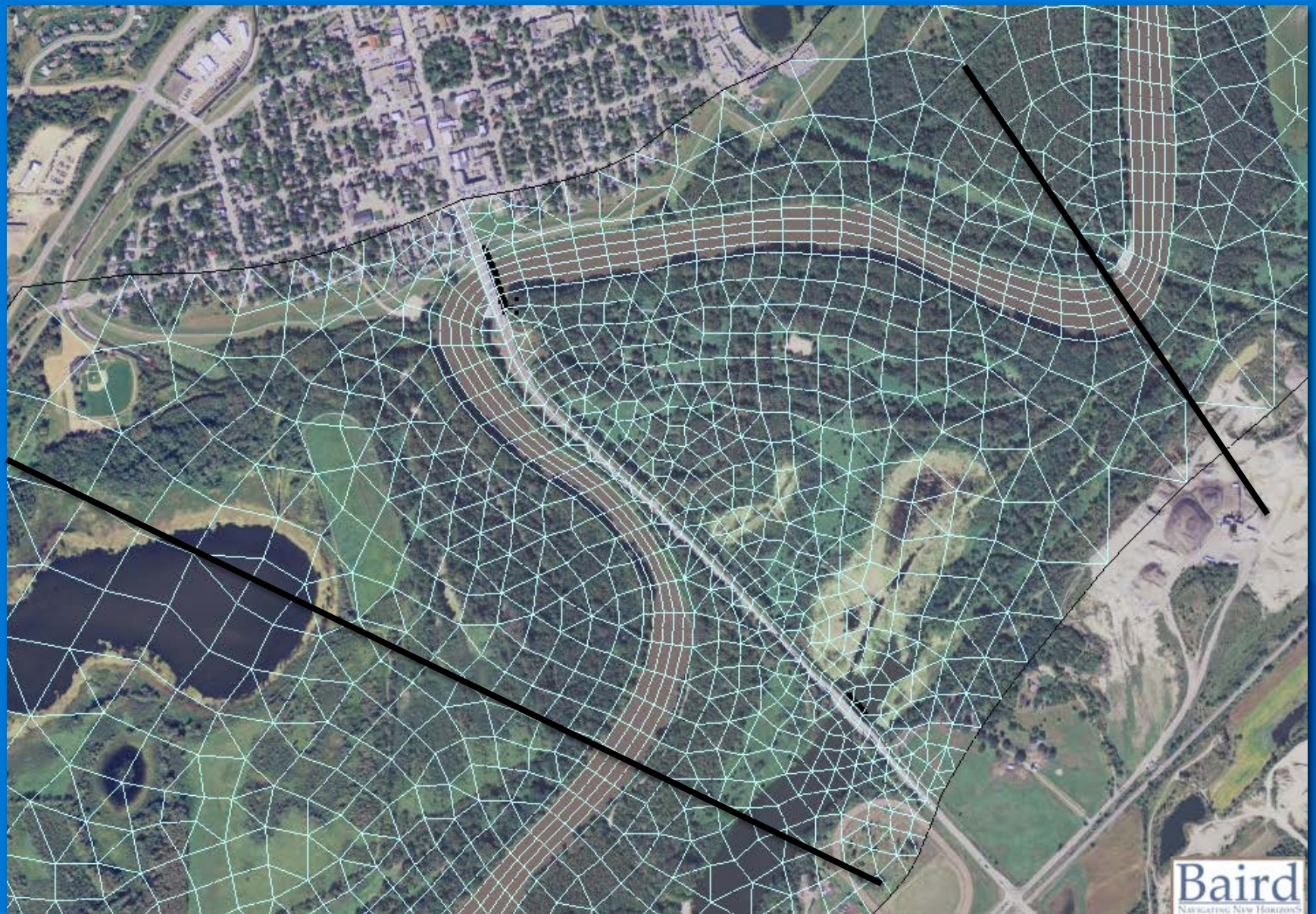
Hydraulic Modeling Objectives

- Assess Water Surface Elevation for Existing Conditions
  - Existing Conditions Model - Approx. 35 miles
  - From Carver to confluence with Mississippi River
  - HEC-RAS 4.1.0
- Develop a Calibrated 2-D Model
  - Finite-Element Surface-Water Modeling System (FESWMS by Baird)
- Assess Impact of Design Alternatives
  - Reduce Road Closure Frequency & Duration

Hydraulic Models

- HEC-RAS (1D) vs. FESWMS (2D)
  - HEC-RAS
    - Basic model used to evaluate alternatives
    - Regulatory model - Calibrated by USACE
  - FESWMS
    - Detailed data set (river cross sections, USACE hydrographic survey, LiDAR data, and USDA/NRCS National Elevation Data)
    - More accurately evaluates velocities
  - D/S boundary condition: USGS Gage at Ft. Snelling
  - Flow values: USGS Gage near Jordan

1D vs 2D Finite Element Grid - TH41



Finite Element Grid Near TH101

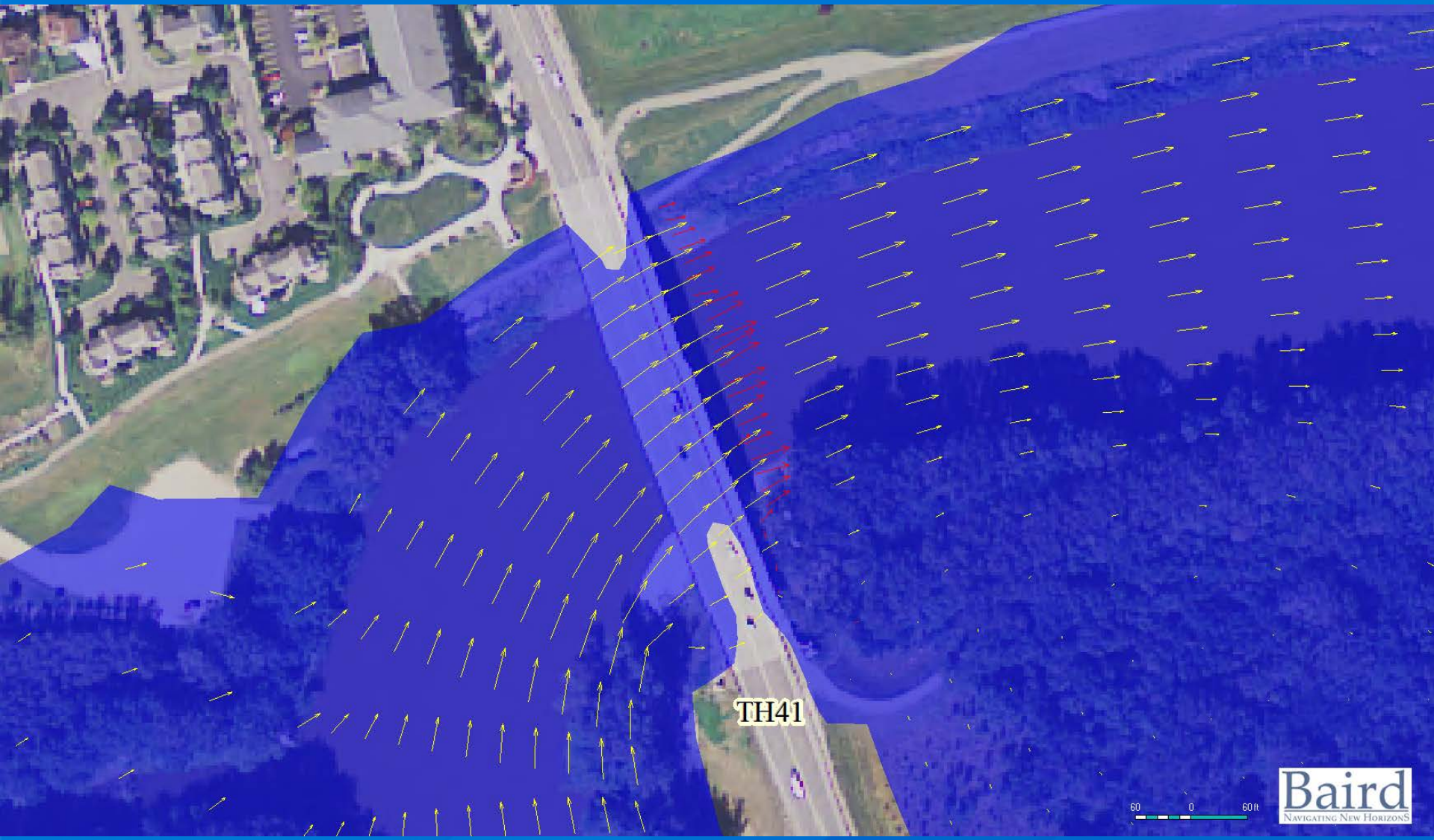
2-D Model Calibration

- Hydrodynamic Modeling using FESWMS
  - Calibrated Using Field Data
    - March 28, 2011 Event
    - Approximate 30-yr Event
    - Compared Flooded Inundation Area from Model to Actual Flood Photos
    - Measured Flow, Water Surface Elevation, and Velocity

2011 Flood Event – TH41

2011 Flood Event – TH101

Flow at Bridge 10012, TH41



Why Not Just Raise The Road

- Raising the road would cause impacts upstream as the flow is restricted due to a higher embankment
- Floodplain regulations do not allow fill in the floodway that will cause the river to rise
- Need “no-rise” solution

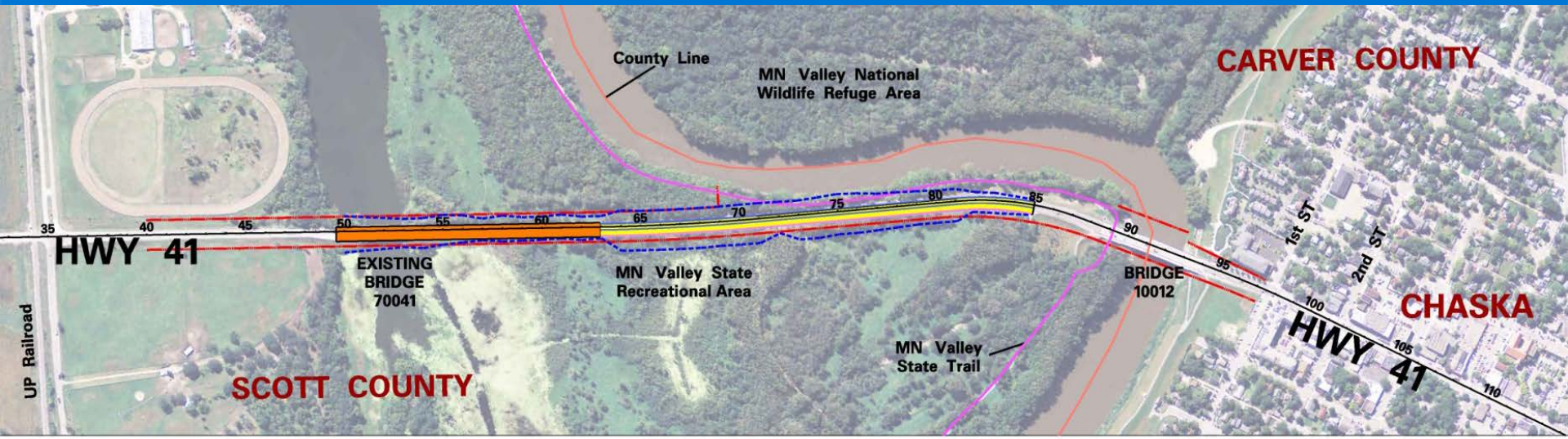
Design Alternatives

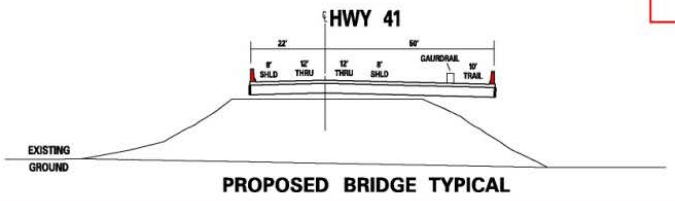
- Filling to Raise Road Profile
  - Modeling Showed Surcharge (Rise) in 100-Yr Floodway WSE
  - Culverts Could Not Mitigate Surcharge
- Use of Upstream Storage
  - Not Feasible Due to Flat River Profile
- LOMR to Allow for Some Stage Increase
  - Not Practical Due to Length of Upstream Impact (30+miles)
- Land Bridge / Bridge

Land Bridge Design

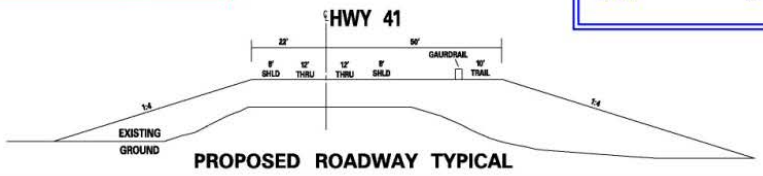
- Iterative Process which Involved Varying:
  - Road Elevation
  - Bridge Length
  - Pier Width
  - Pier Spacing
  - Bridge Deck Depth

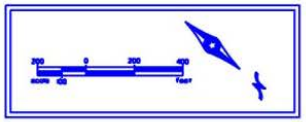
TH41 Preferred Concept

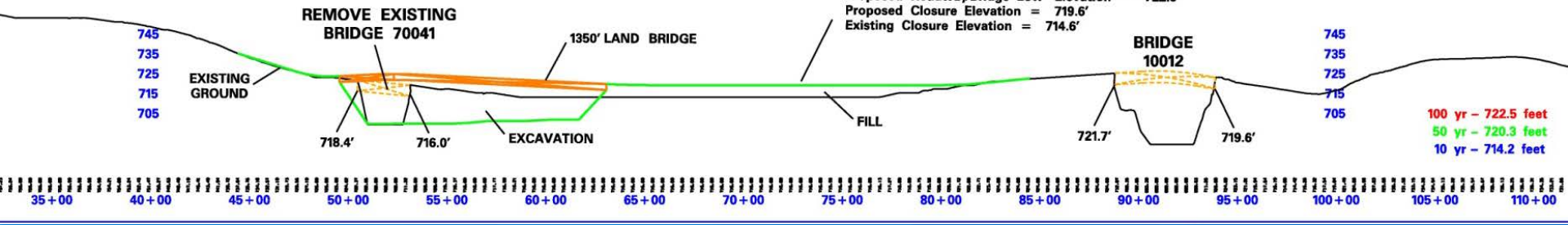




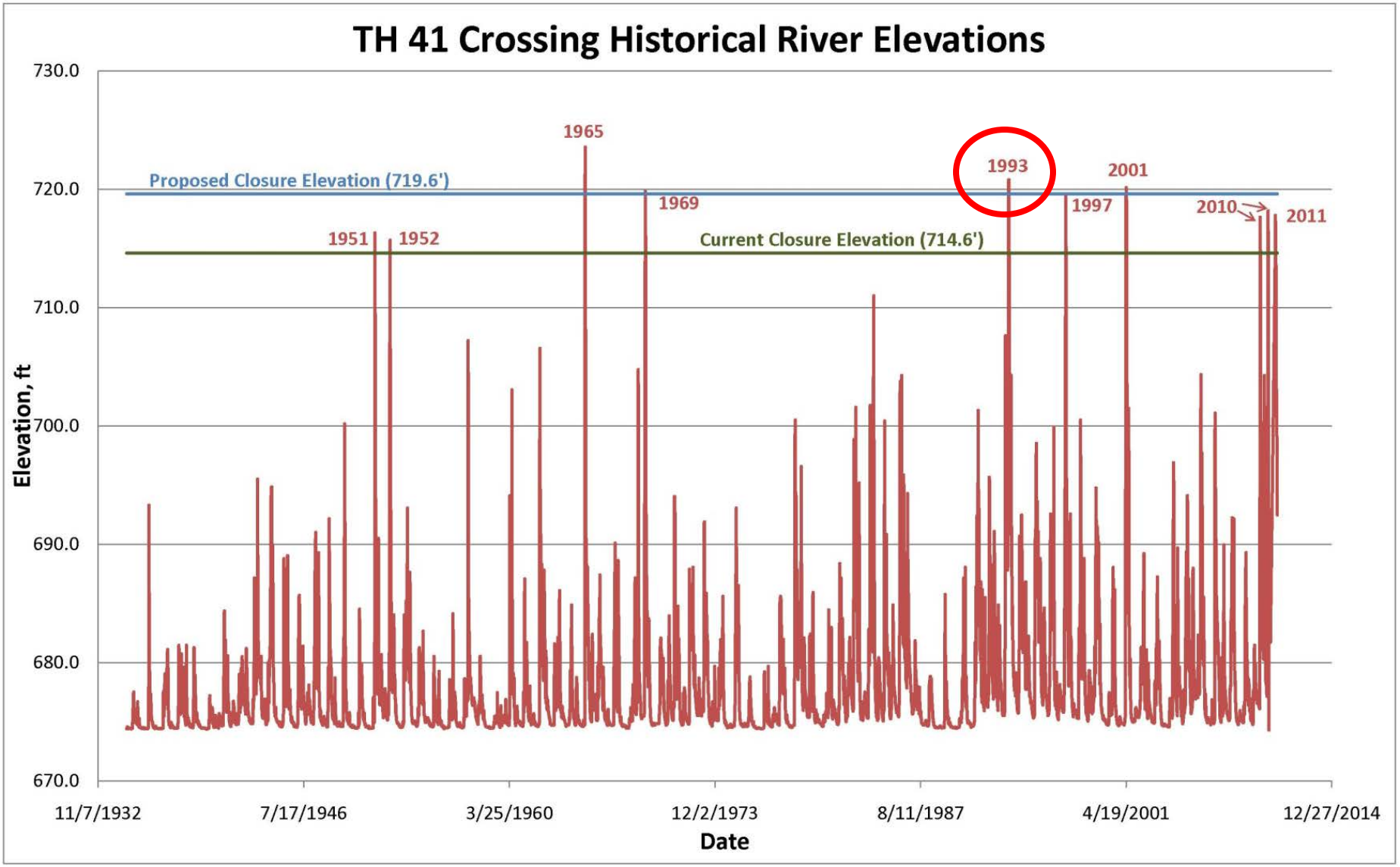
Concept Subject to Change



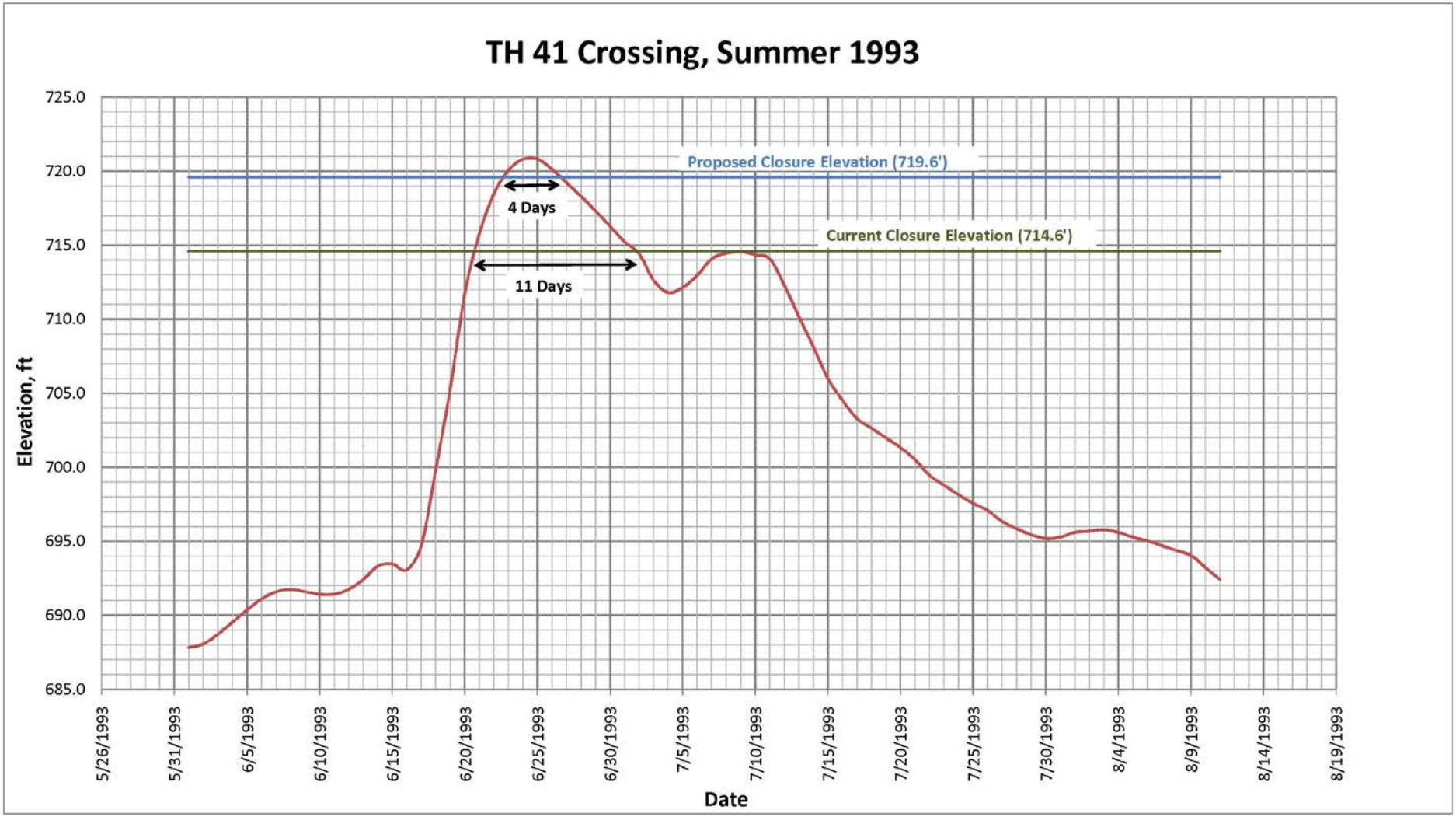




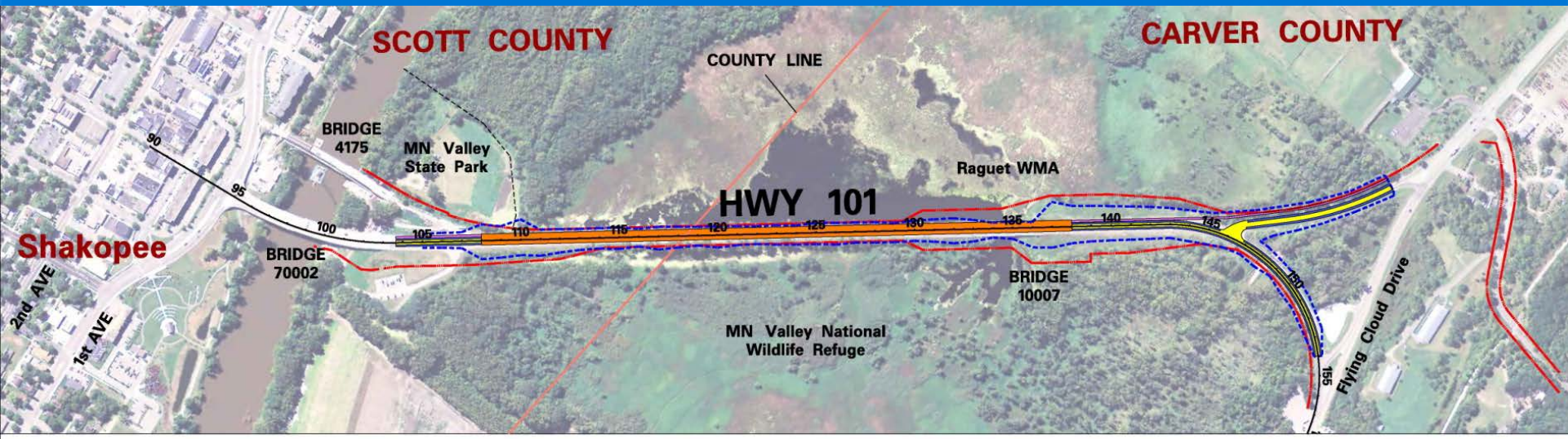
Road Closure Frequency – TH41

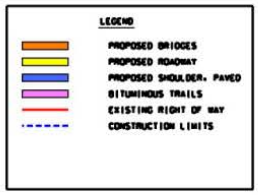


Road Closure Duration – TH41



TH101 Preferred Concept





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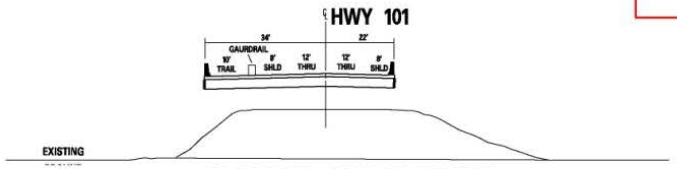
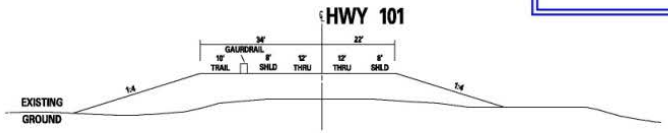
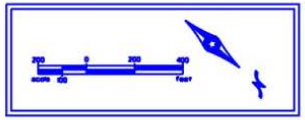
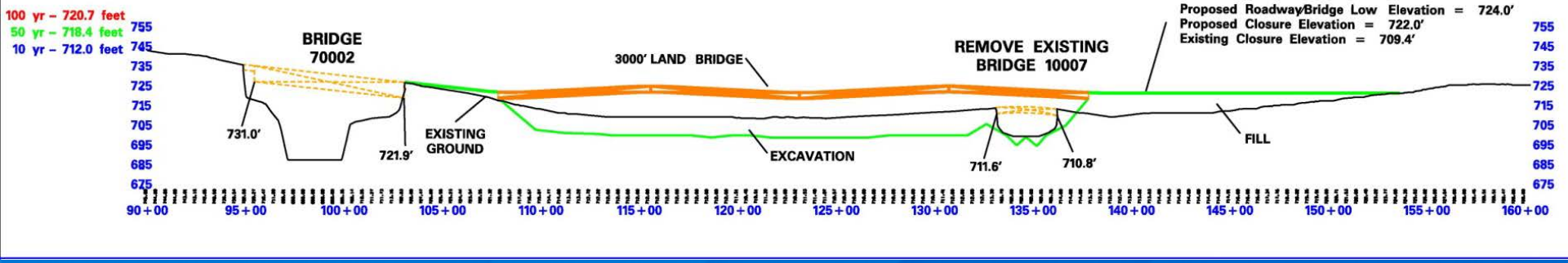


PROPOSED BRIDGE TYPICAL

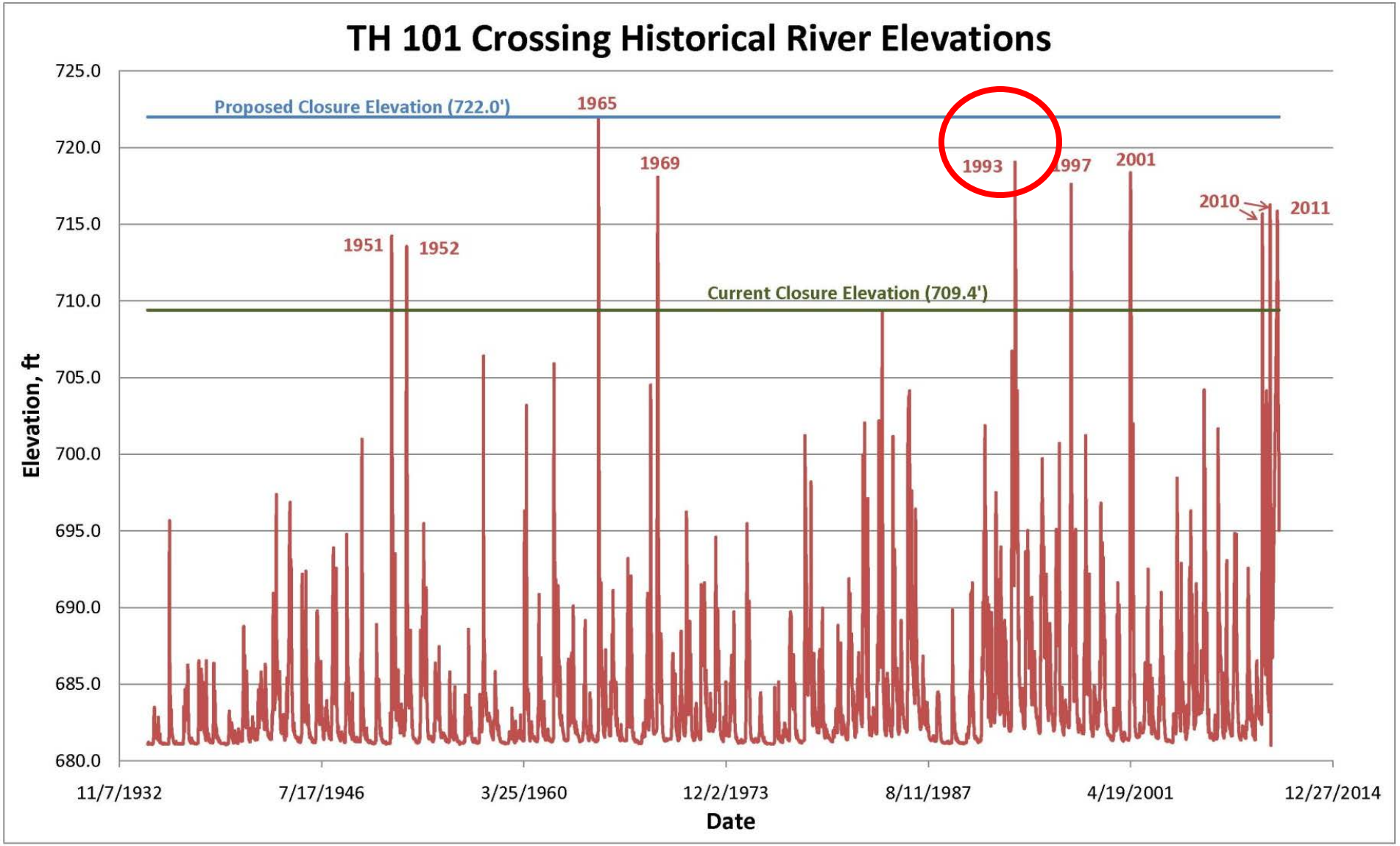


PROPOSED ROADWAY TYPICAL

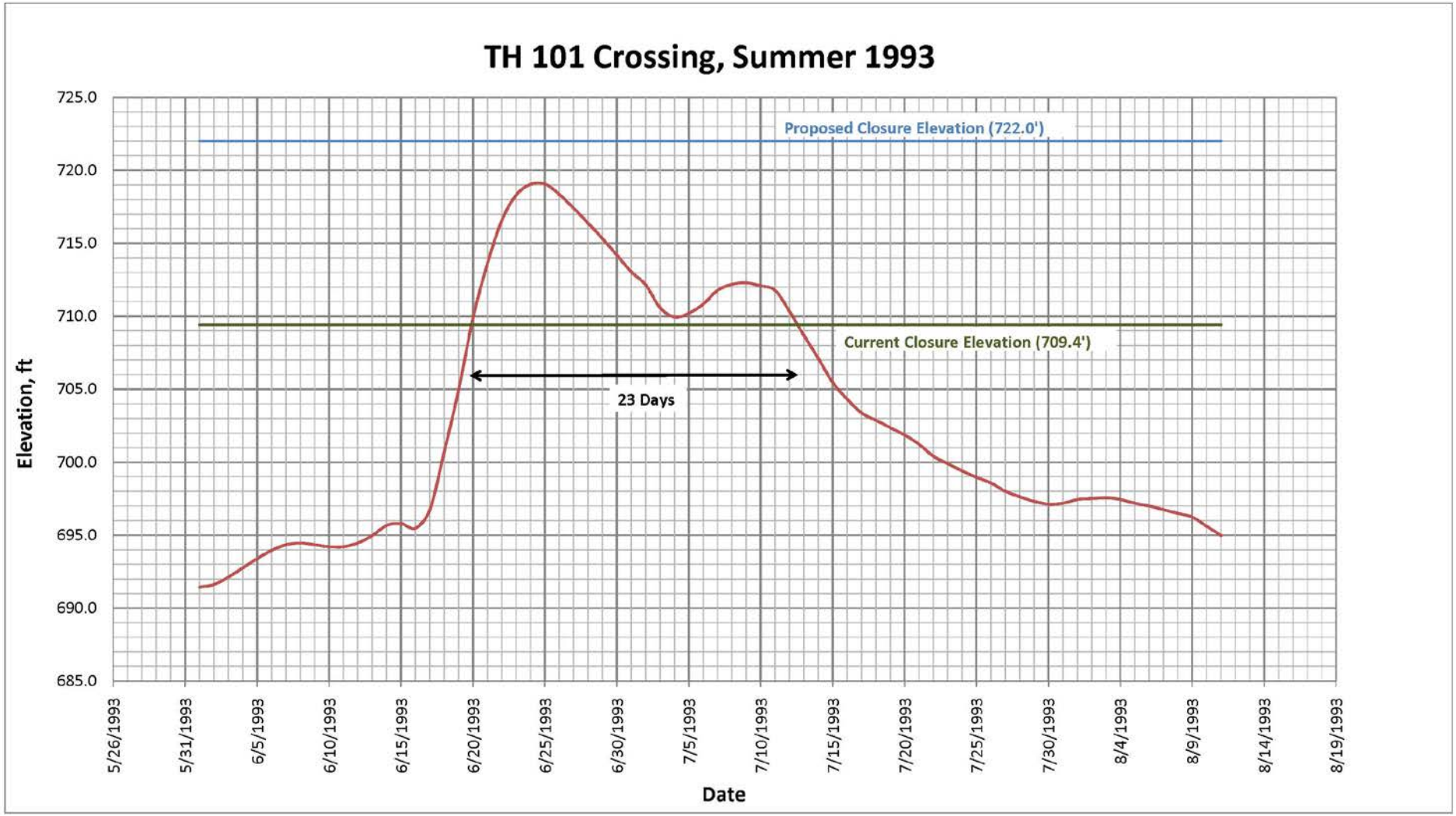




Road Closure Frequency – TH101



Road Closure Duration – TH101



Modeling Results

- TH 41 and TH 101
  - No increase in stage (No Rise)
- TH 41
  - Velocity decreased for 10-Year event
  - Increased for larger events, yet less than maximum velocity for existing conditions
- TH 101
  - Velocity decreased for all events

Evaluation Criteria

- Construction Cost
- Benefit Cost
- Property Impacts and Costs
- Constructability
- Environmental Impacts/Opportunities
- Community Input

Comparison and Selection of Alternatives

- TH41 Preferred Concept
  - $22.4 Million to Design & Construct
  - Benefit/Cost = 3.06
- TH101 Preferred Concept
  - $33.3 Million to Design & Construct
  - Benefit/Cost = 3.81
- TH101 Selected
  - Carries more traffic
  - Reduced closure frequency and duration

61
101
southwest
Reconnection
project

Project Partners:

CARVER COUNTY

MINNESOTA DEPARTMENT OF TRANSPORTATION

Scott
1853 Celebrating 150 Years 2003

SEH

SEAL OF THE CITY OF SHAKOPEE MINNESOTA
SCOTT COUNTY SEAT 1853

Hwy 101/61 Aerial Photo

Picture courtesy of Tony Wotzka, MnDOT

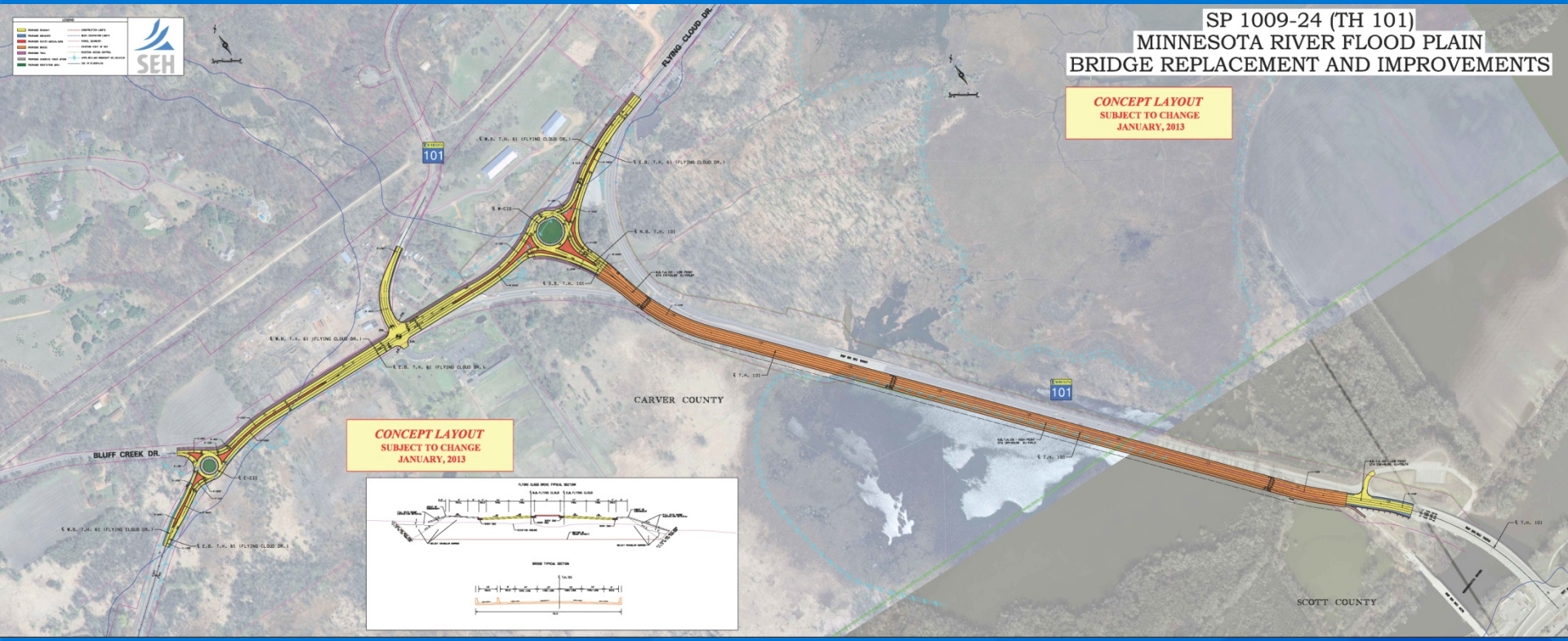
Hwy 101/61 Aerial View of Flooding

Photo courtesty of SRF, Inc

Project Background

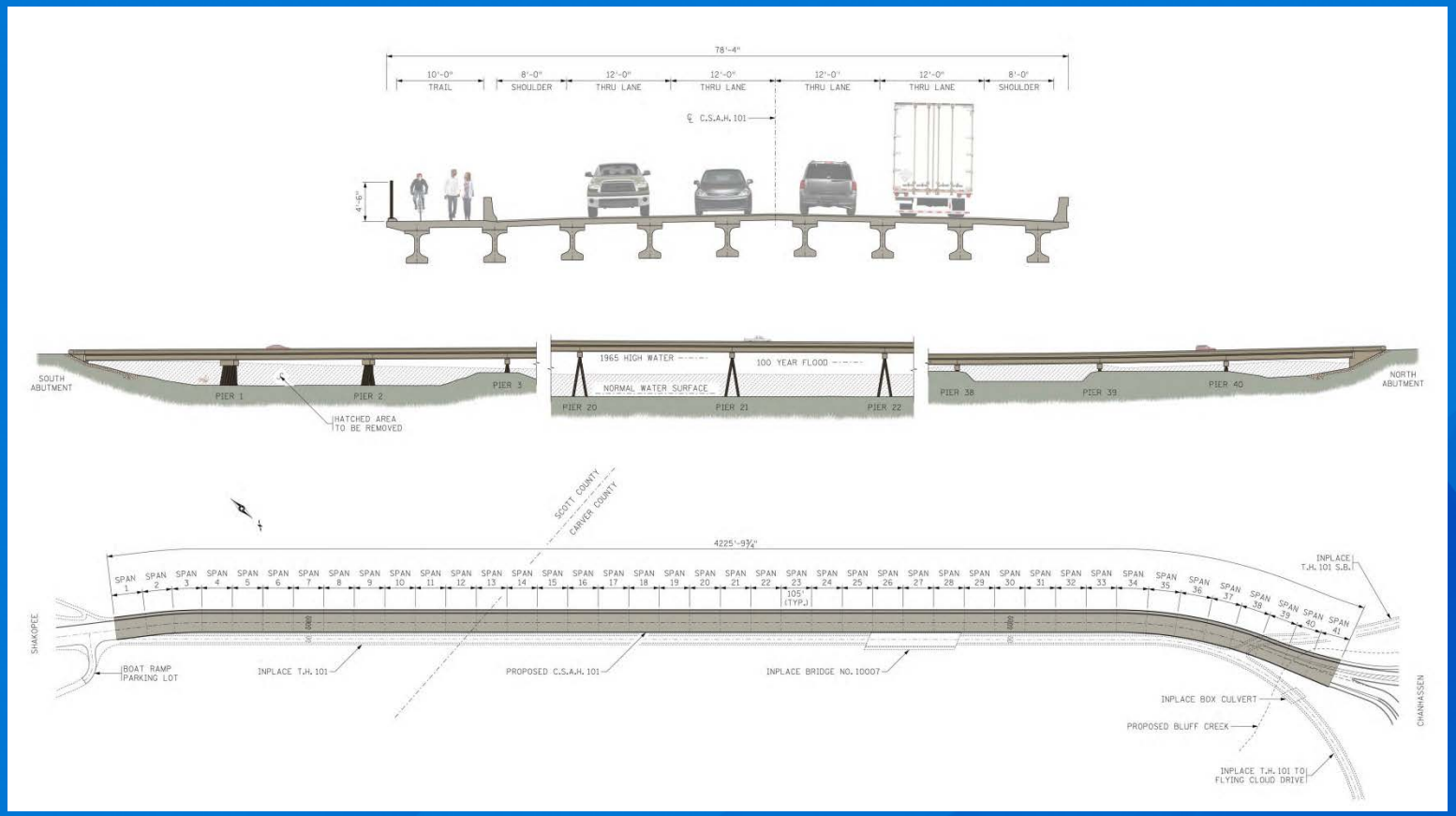
- Flood Mitigation Study Completed in 2011
- Applied for Flood Mitigation Bonds in February 2012.
- March 2012: Awarded $20,000,000 for 2 lane bridge.
- Counties Requested 2012 Legislature to fund -4-lane.
- January 2013: Cooperative Project started

Combined Project

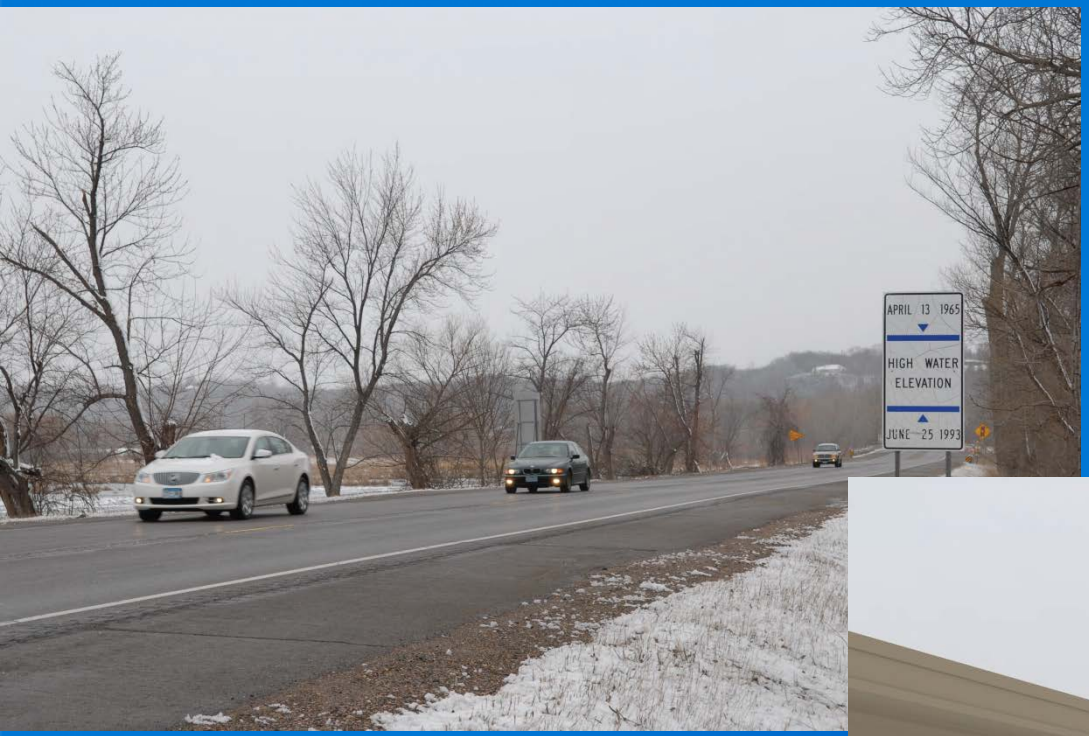


- 4226’ 4 lane Bridge – offset from existing 101 roadway.
- 4-lane CR 61 (Flying Cloud Drive) with Roundabouts.
- Signalized Intersection at 101N.

Floodplain Bridge



Floodplain Bridge Visualization



Engineering & Environmental Challenges

- Soil/foundation stability.
  - Organics 15’-90’ deep.
- Contaminated Soils.
- Bluff Creek Realignment.
- Water Quality Treatment.
- Cultural Resources.

Soil/Foundation stability

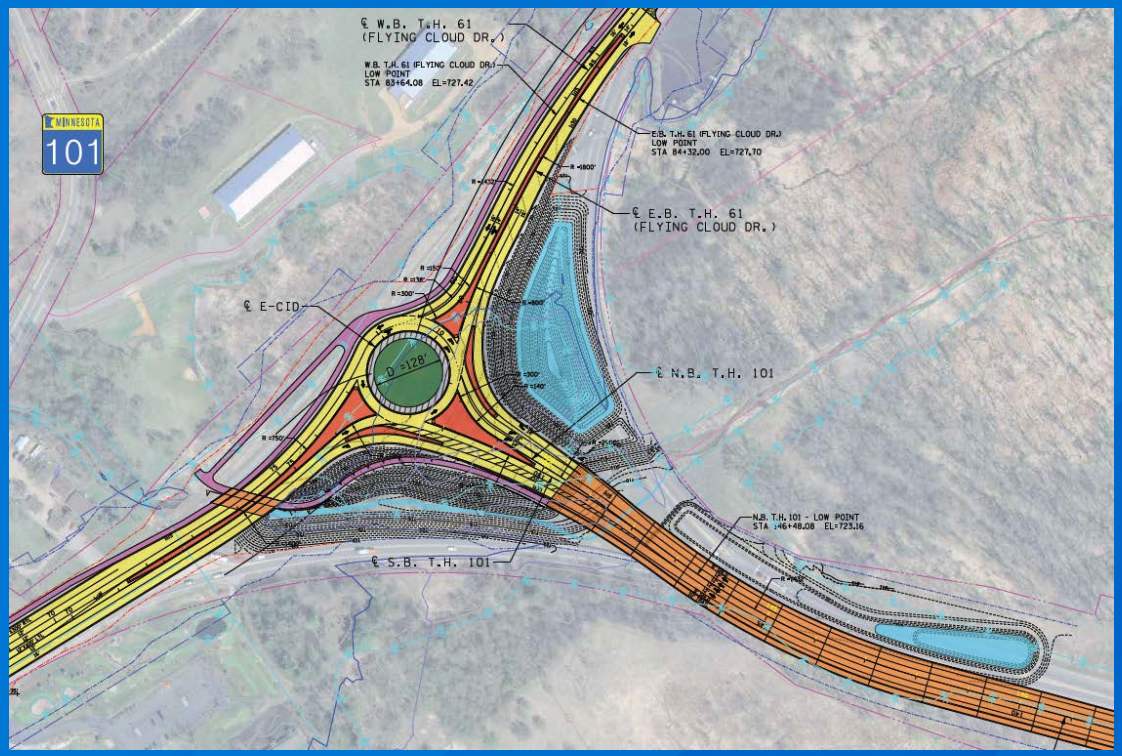
- Extended bridge ~1200ft to the north
- Pile bent pier design - lateral stability
- Other soil stability measures
  - Pile supported embankment
  - Geofoam
  - Significant Muck removal and granular fill

Bluff Creek Realignment

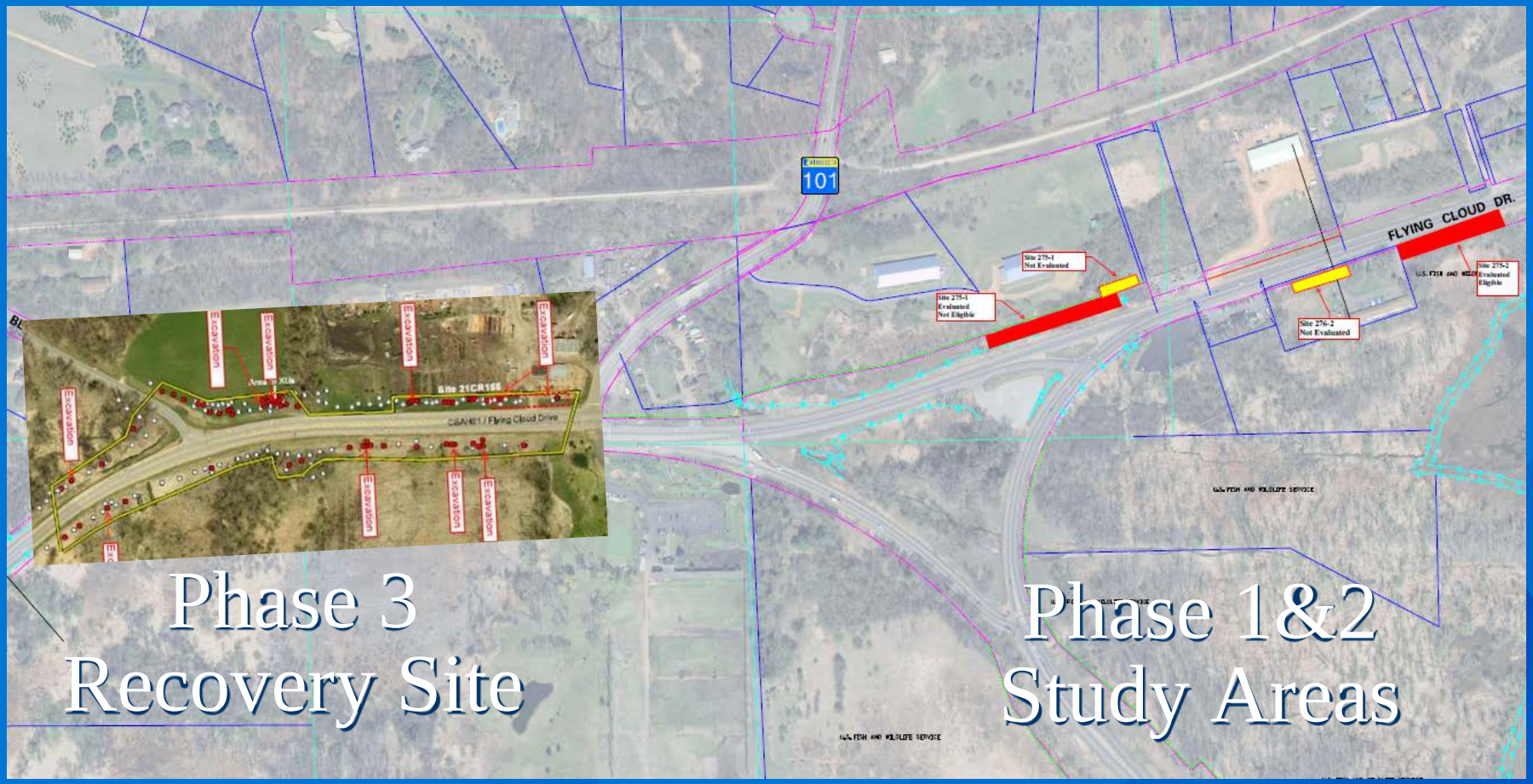
- Extended bridge ~1200ft to the north
  - Remove box culverts under Hwy 101
- Meandering channel pattern

Water Quality Treatment

- Overall Environmental Benefit
  - Removing Hwy 101 causeway, reconnecting floodplain
- Significant Resource Agency involvement



Cultural Resources - Archaeology



Cultural Resources - Archaeology

Pictures courtesy of Frank Florin

Other Challenges

- Funding
- Schedule
  - MnDOT has committed to building bridge in 2014.
  - Risk with combining bridge and ‘Y’ projects.
- Construction Phasing
- Roles and Responsibilities

→Outlined in Construction Agreement

Project Update

- Project Awarded on May 20, 2014 to Ames Construction.
  - Winning Bid was $49.3M
  - Engineers Estimate was $50.4M
- Project Groundbreaking on June 24, 2014

Photo courtesty of Fox 9 News

Project Update

- PROJECT START DELAYED DUE TO FLOODING!
- Actual project start in Late July 2014
- Anticipated completion in November 2015

Twitter: @SWReconnectProj

Facebook: https://www.facebook.com/SouthwestReconnectionProject

http://www.dot.state.mn.us/metro/projects/hwy101river/

Acknowledgements

Lyndon Robjent, Carver County
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