



M E M O R A N D U M

DATE: July 31, 2026

TO: Tennessee Department of Transportation

FROM: American Structurepoint, Inc.

RE: TDOT Timber Bridge Bundle #2 – Bridge 39 (PIN: 134884.00) Hydraulic Summary

CC: Steve Sellers – Tennessee Department of Transportation
Derek Link – Tennessee Department of Transportation
David Flanders – HNTB
File

This memo presents the preliminary hydraulic modeling analysis findings for TDOT Timber Bridge Bundle #2 Contract DB2601, Bridge 39 (SR 54 over Branch, PIN: 134884.00). The goal of the analysis was to determine the approximate hydraulic impacts of performing a bridge replacement. All geometric structure data utilized in the modeling originated from the Bridge Concept Report unless noted otherwise.

Modeling Methodology: The hydraulic modeling (HEC-RAS version 6.6) is in accordance with the 2012 Design Procedures for Hydraulic Structures, consisting of Tennessee Hydraulics Memorandum (THM)-01 through THM-10. No FIS data is available for Nixon Creek currently. Discharges were obtained from StreamStats mean discharge data. Site topography was based on field survey, and where available, Tennessee USDA 2015 LiDAR. Super structure elevations were recorded from field survey data. Bridge 39 was modeled with a 1-D multiple opening approach as a relief structure for the bridge over Nixon Creek approximately 530' NE.

Existing Conditions: The existing structure was modeled as a two span bridge with spans of 17 ft, and 17 ft, for an overall structure length of 34 ft and a clear span of 32 ft between front faces of the piles at the abutments. The structure was modeled with an out-to-out width of 29 ft. The piers consist of 12"x12" timber caps on 12" diameter timber piles, and the structure depth is 1.75 ft, measured from profile grade to the bottom of beam.

Natural Conditions: The natural conditions were modeled by duplicating the existing terrain, removing SR 54, and eliminating the existing structure to simulate the floodplain without the influence of the roadway and structural components.

Proposed Conditions: The proposed structure was modeled as a single span bridge with a structure depth of 3.15 ft. The structure was modeled with a clear span of 50 ft. Channel section under the bridge was modeled using a 30' Bottom width and 3:1 abutments. The proposed roadway profile was increased 0.65 ft compared to existing condition. The out-to-out bridge width was modeled as 31.25 ft.

Hydraulic Summary: The proposed structure results in a backwater of 0.18 ft, which does not exceed TDOT's recommended 1 ft maximum per THM-03. The proposed structure also has improved velocities (2.54 ft/s) compared to existing (2.62 ft/s), but a freeboard of -1.02 ft which does not meet the 1 ft minimum TDOT requirement. The water surface elevation for the proposed bridge increased compared to existing because the road overtopping elevation increase.



Hydraulic Summary Table

	Existing	Proposed
Drainage Area	14.4 mi ²	
Design Discharge (50 Year)	5170 cfs	
50 year Natural WSEL ¹	313.90	
Span Arrangement	2 – 17'	50'
Finish Grade Elevation	313.93	318.89
Low Girder Elevation ²	312.1	313.06
50 year WSEL ¹	314.02	314.08
100 year WSEL ¹	314.29	314.37
Water Area Provided Below 50 yr WSEL	113.01 ft ²	509.71 ft ²
50 Year Velocity	2.62 fps	2.54 fps
50 Year Bridge Backwater Above El. 313.90	0.12 ft @ El. 314.02	0.18 ft @ El. 314.08
100 Year Discharge	5860 cfs	
Roadway Overtopping El.	312.88	313.01
Freeboard Provided Above 50 yr Headwater ³	-1.92 ft	-1.02 ft

Notes: Elevations provided are in feet in the NAVD88 vertical datum

¹Elevation taken at 1st cross section upstream of bridge

²Elevation taken at Abutment

³Freeboard = 50 Year Headwater Elevation – Low Girder Elevation