US 701 BUSINESS (MADISON STREET) AT SOULES SWAMP PROJECT

NCDOT, Priority 7

INUNDATION ANALYSIS



OCTOBER 2026

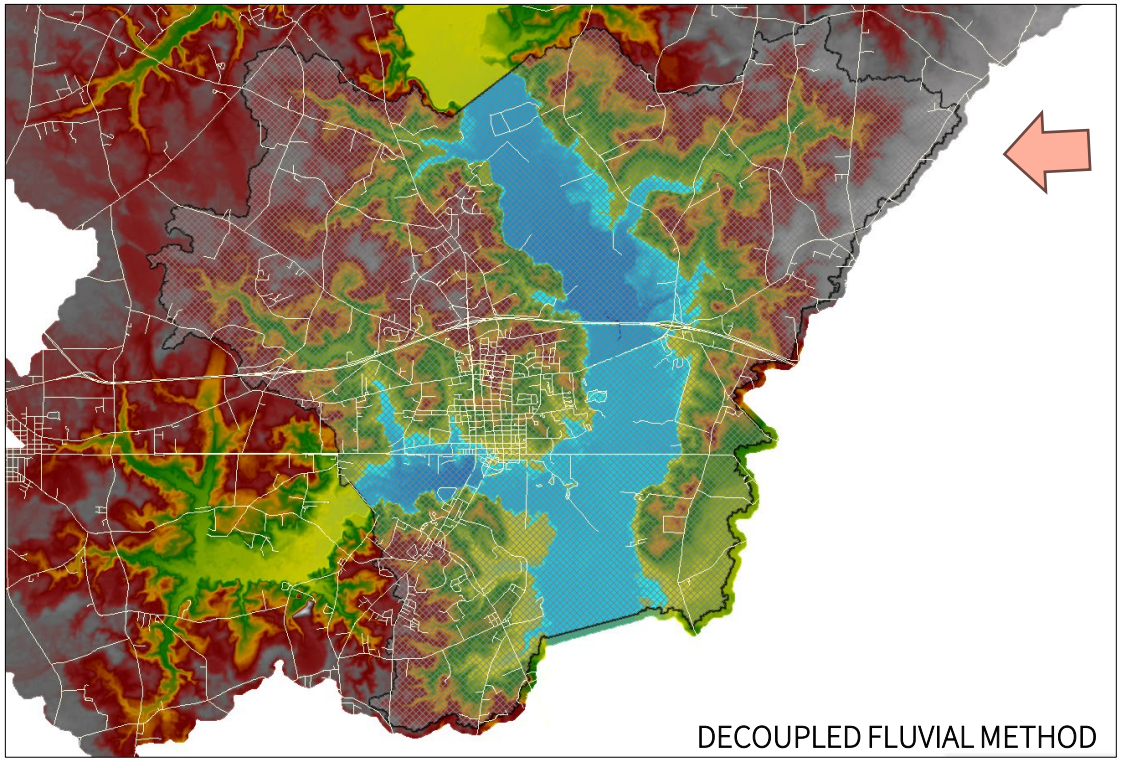
Whiteville 2D Hydraulic Modelling

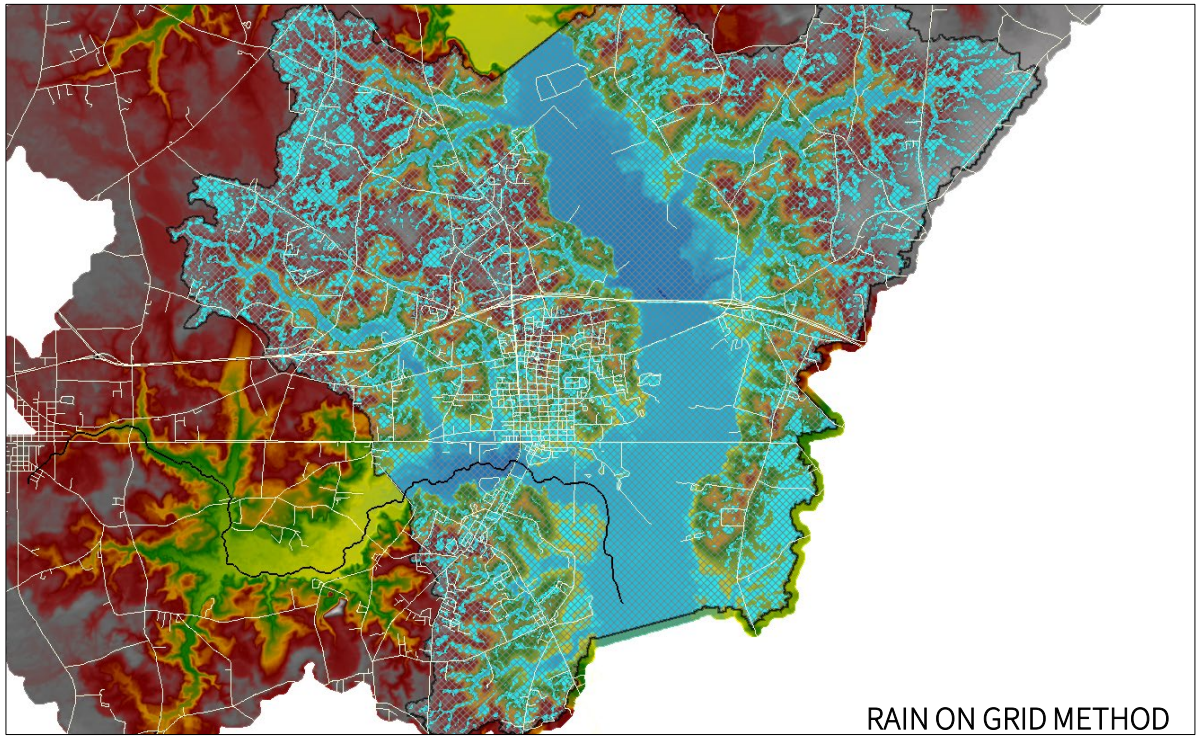
White Marsh Swamp and Soules Swamp (Progress Update)

Columbus County, NC

Proposed Condition Model – Revised Modeling Using the FEMA Decoupled Fluvial Method

- FEMA's decoupled fluvial methodology was implemented using the Inline Hydrograph approach.
- The 25-, 50-, 100-, and 500-year inline hydrographs were developed based on the calibrated model.
- The Riverine flooding is now clearly isolated from Rain-on-Grid flooding.

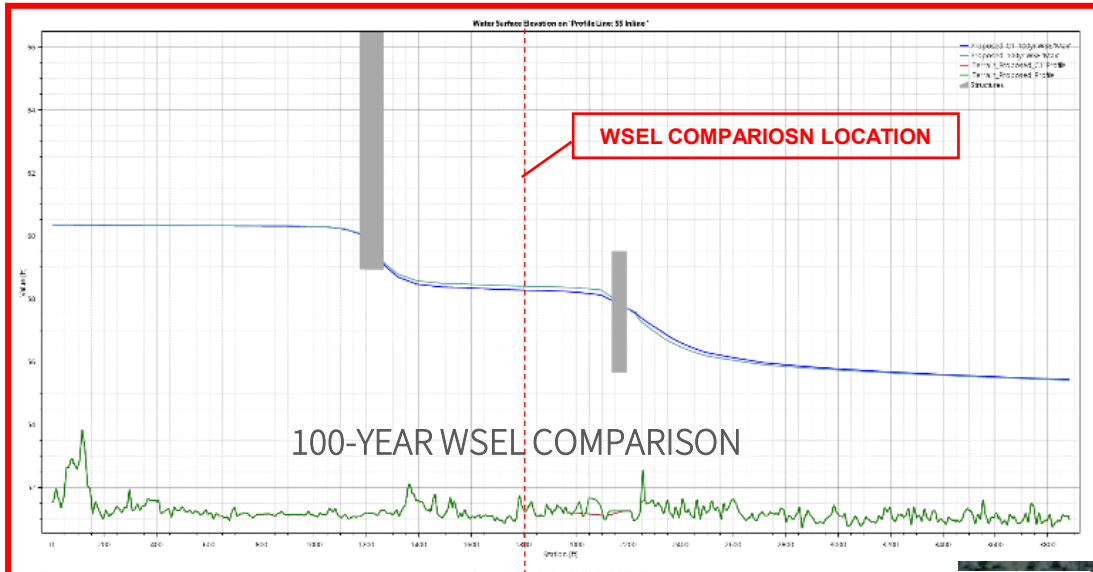


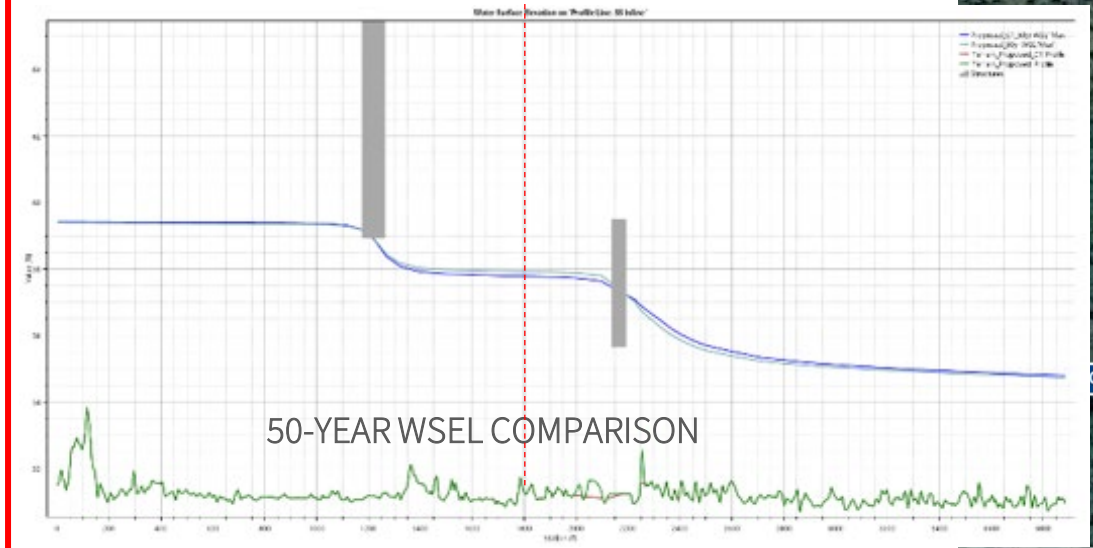


Proposed Alternatives –Soules Swamp

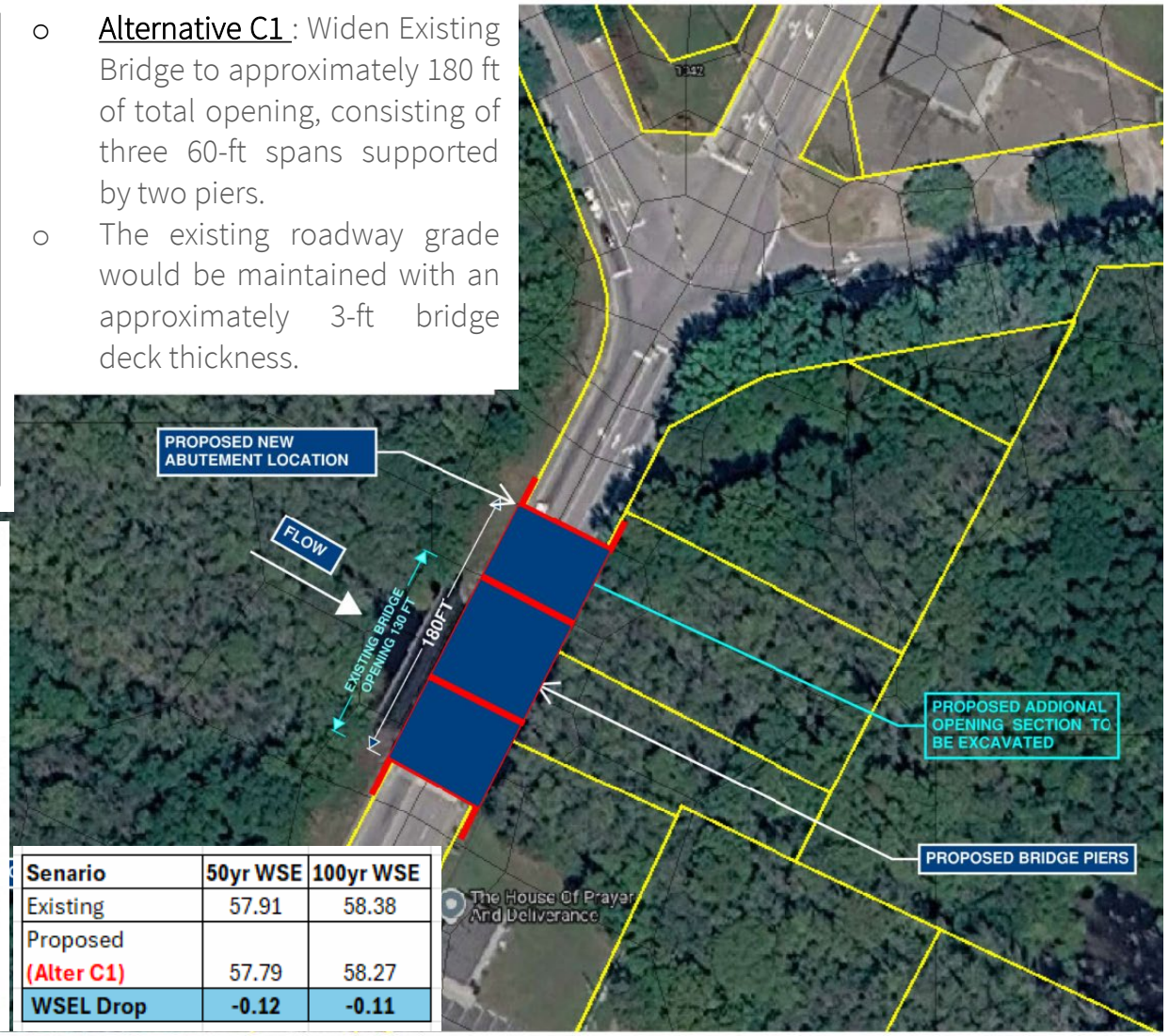
- Alternative C1 – Widen Existing Bridge:
- Alternative D1 – Existing Bridge + Additional Bridge Opening
- Alternative E1 – Widen Existing Bridge + Additional Bridge Opening:
- Alternative D1 + S. Lee Street Grade Modification -

Proposed Condition – Soules Swamp S Maddison Street Bridge Alternatives (C1)





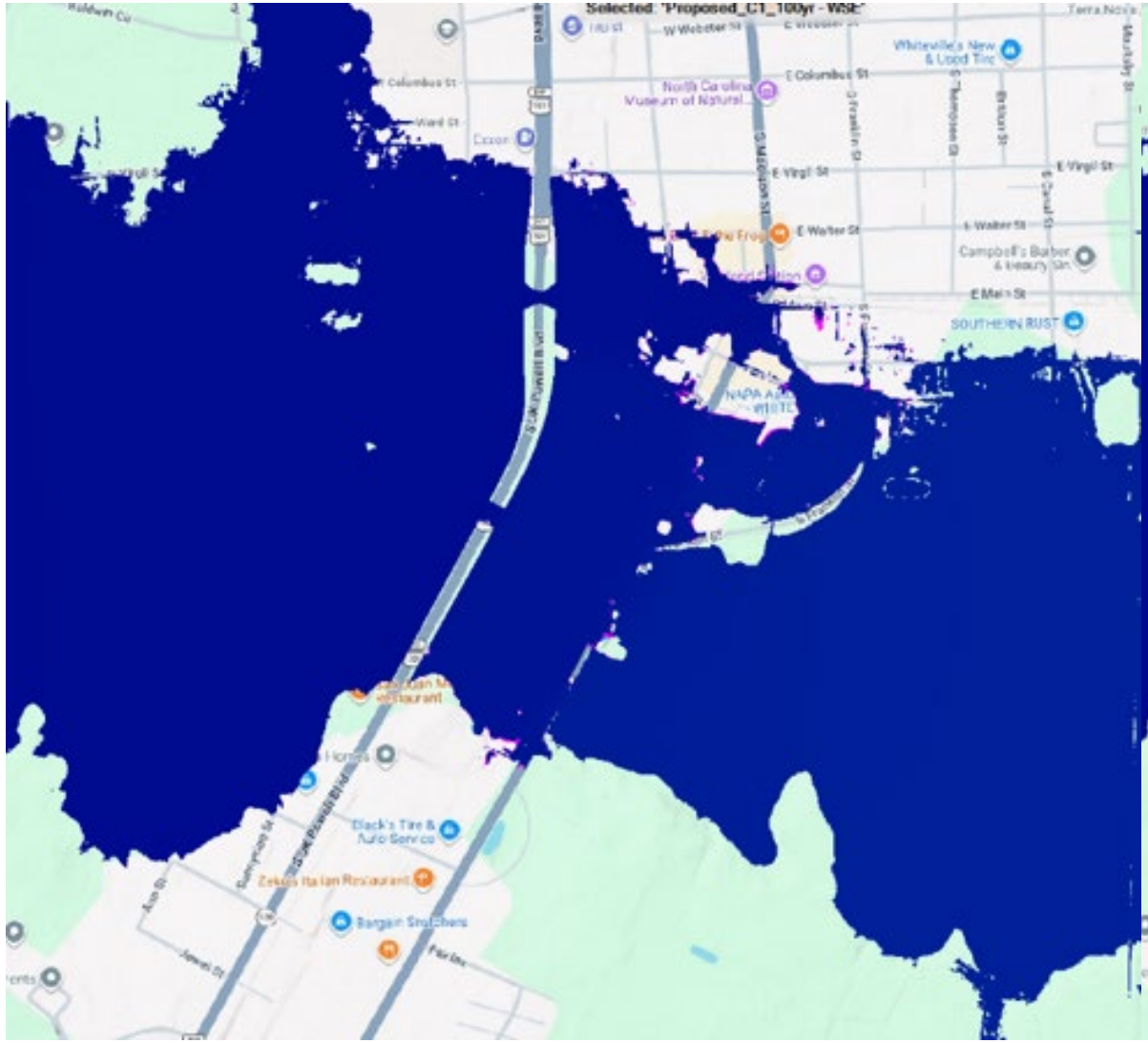
- Alternative C1 : Widen Existing Bridge to approximately 180 ft of total opening, consisting of three 60-ft spans supported by two piers.
- The existing roadway grade would be maintained with an approximately 3-ft bridge deck thickness.



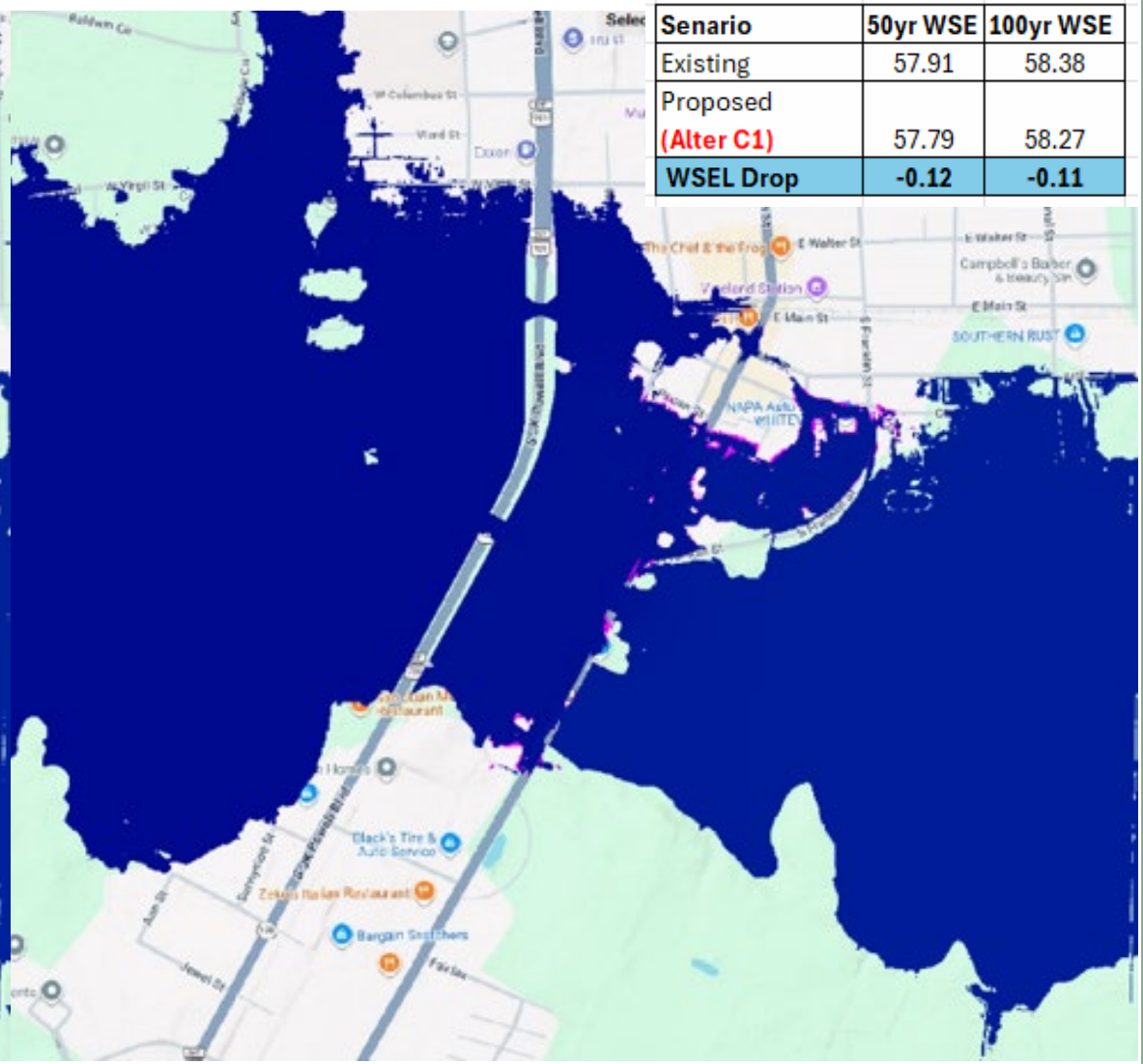
Senario	50yr WSE	100yr WSE
Existing	57.91	58.38
Proposed (Alter C1)	57.79	58.27
WSEL Drop	-0.12	-0.11

ALTERNATIVE C1 – 100- AND 50-YEAR EXISTING AND PROPOSED INUNDATION COMPARISON

Senario	50yr WSE	100yr WSE
Existing	57.91	58.38
Proposed (Alter C1)	57.79	58.27
WSEL Drop	-0.12	-0.11

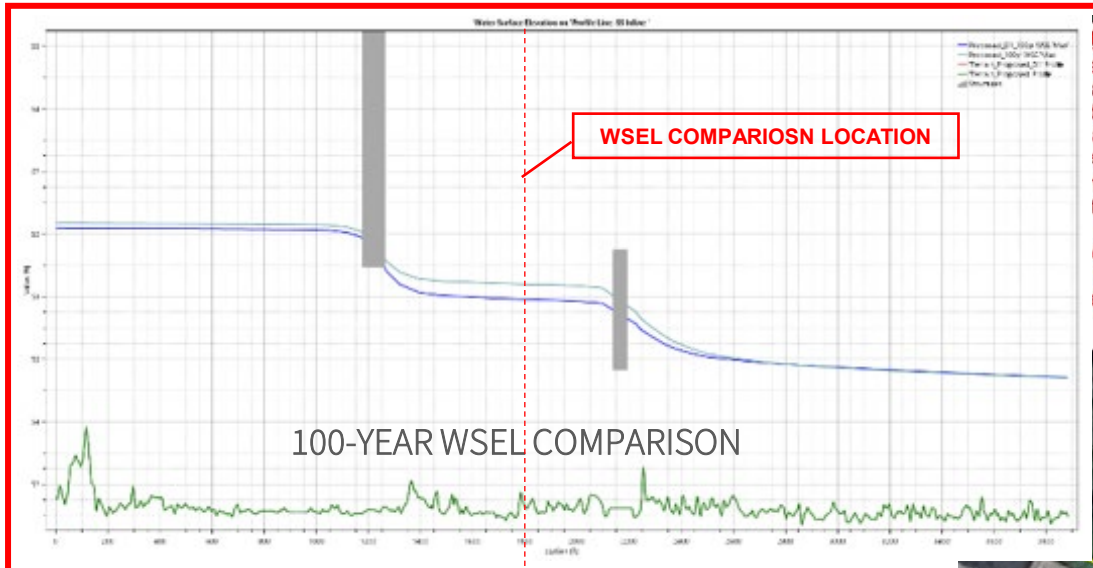


100-YEAR EXISTING VS PROPOSED



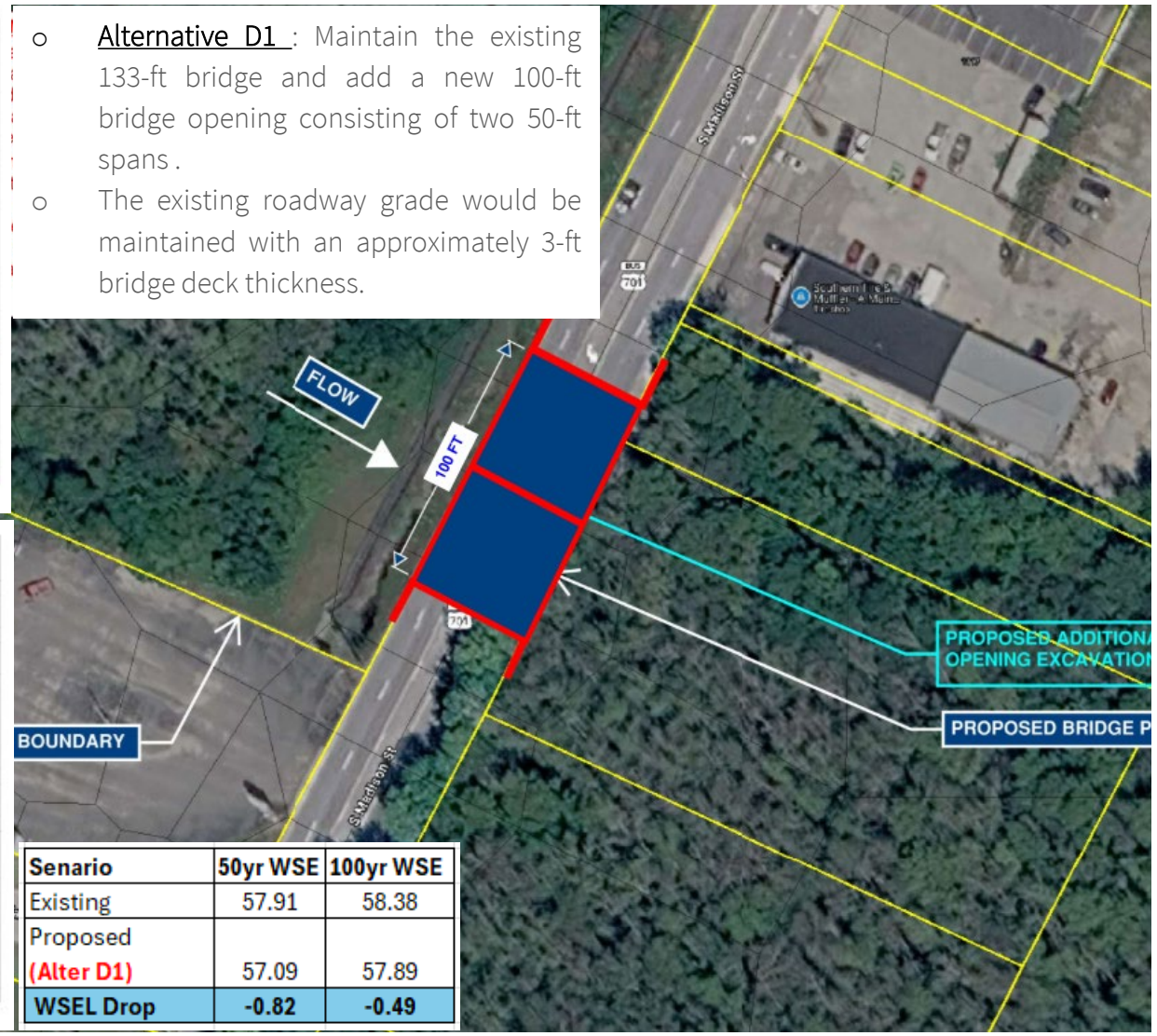
50-YEAR EXISTING VS PROPOSED

Proposed Condition – Soules Swamp S Maddison Street Bridge Alternatives (D1)



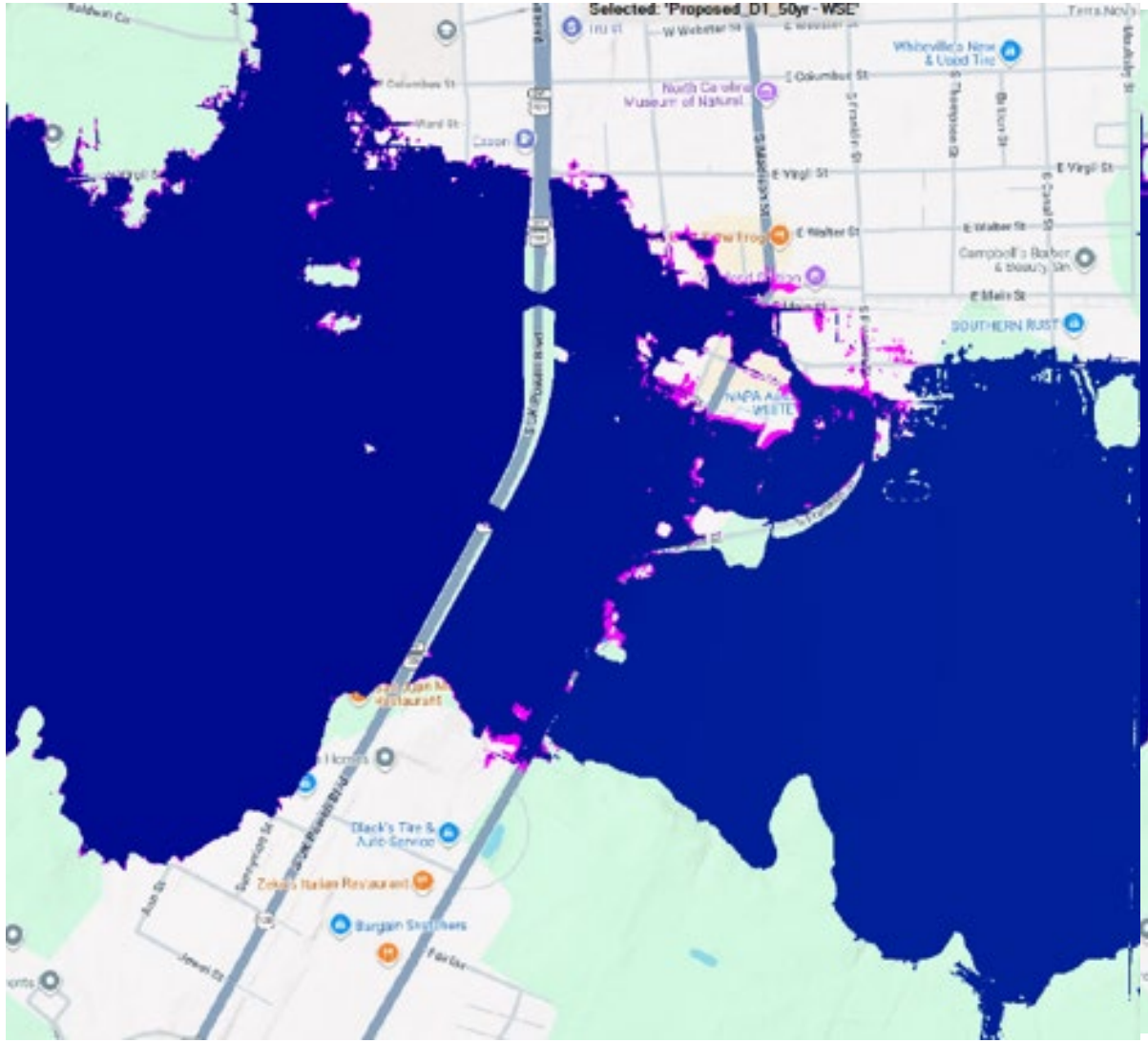


- Alternative D1 : Maintain the existing 133-ft bridge and add a new 100-ft bridge opening consisting of two 50-ft spans .
- The existing roadway grade would be maintained with an approximately 3-ft bridge deck thickness.

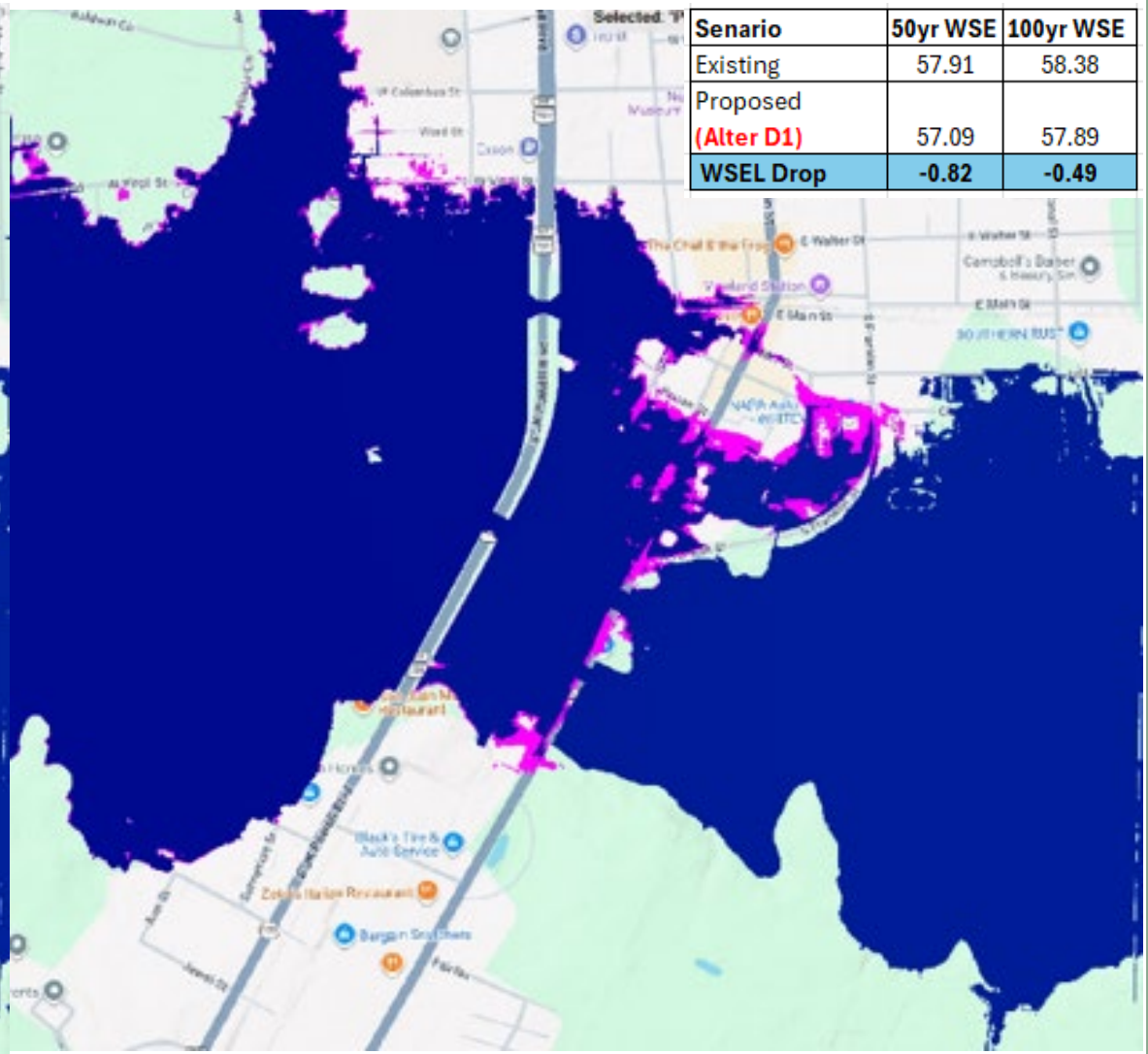


Senario	50yr WSE	100yr WSE
Existing	57.91	58.38
Proposed (Alter D1)	57.09	57.89
WSEL Drop	-0.82	-0.49

ALTERNATIVE D1 – 100- AND 50-YEAR EXISTING AND PROPOSED INUNDATION COMPARISON



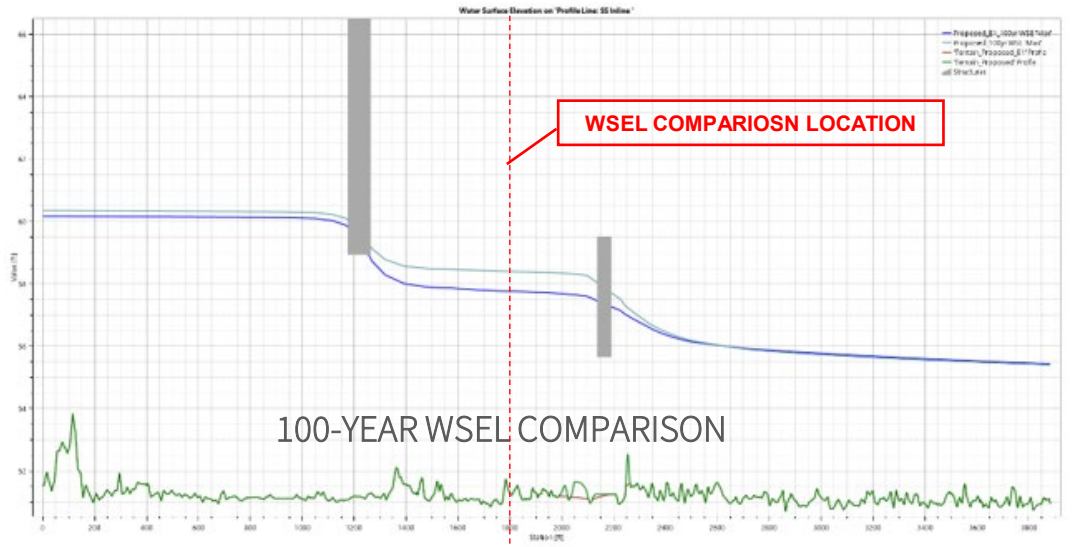
100-YEAR EXISTING VS PROPOSED

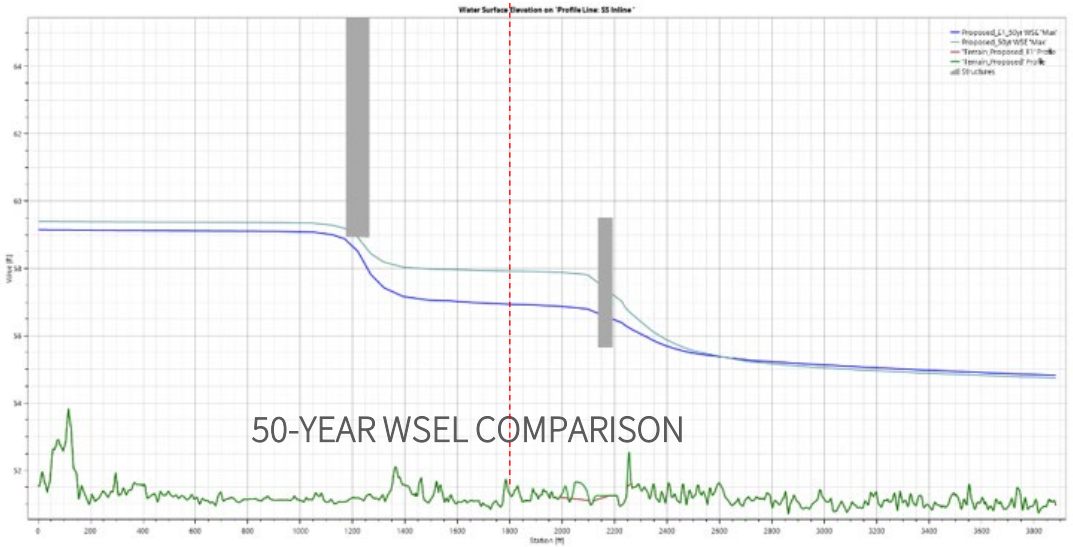


Senario	50yr WSE	100yr WSE
Existing	57.91	58.38
Proposed (Alter D1)	57.09	57.89
WSEL Drop	-0.82	-0.49

50-YEAR EXISTING VS PROPOSED

Proposed Condition – Soules Swamp S Maddison Street Bridge Alternatives (E1)





- Alternative E1 – Widen Existing Bridge + Additional Bridge Opening
- Expand the existing bridge to approximately 180 ft with three 60-ft spans and provide an additional 100-ft bridge opening on the south side consisting of two 50-ft spans.

Alternative E1

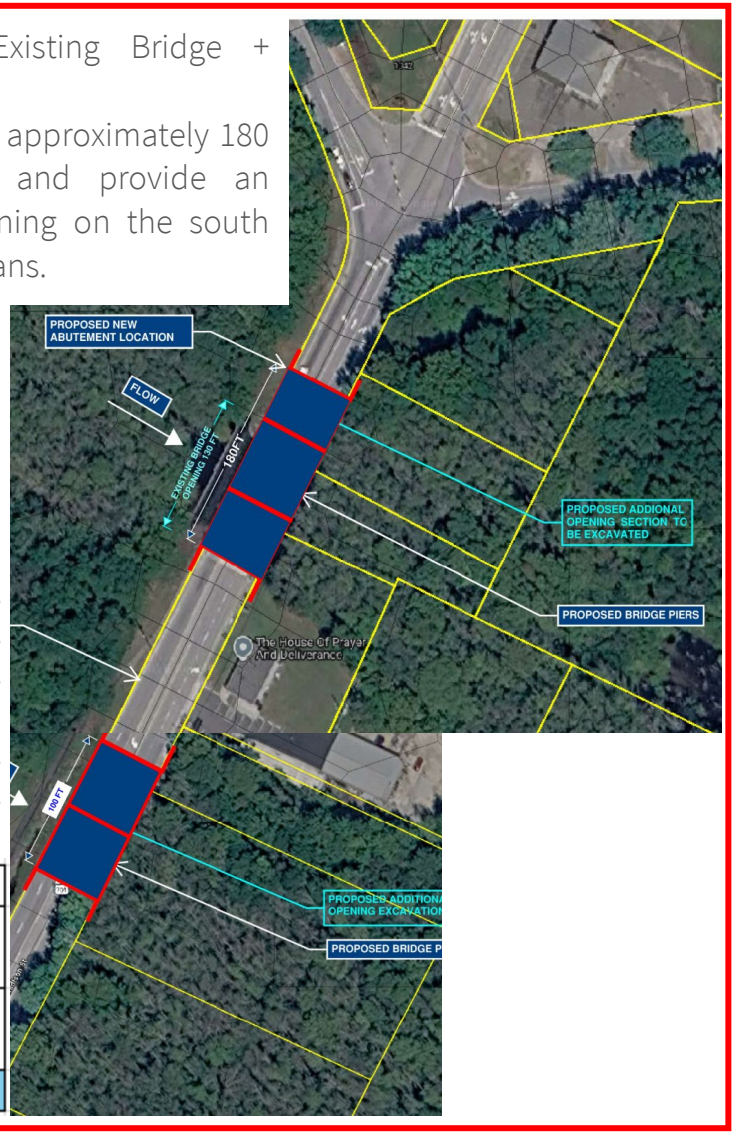
Senario	50yr WSE	100yr WSE
Existing	57.91	58.38
Proposed (Alter E1)	56.92	57.74
WSEL Drop	-0.99	-0.64

Alternative D1

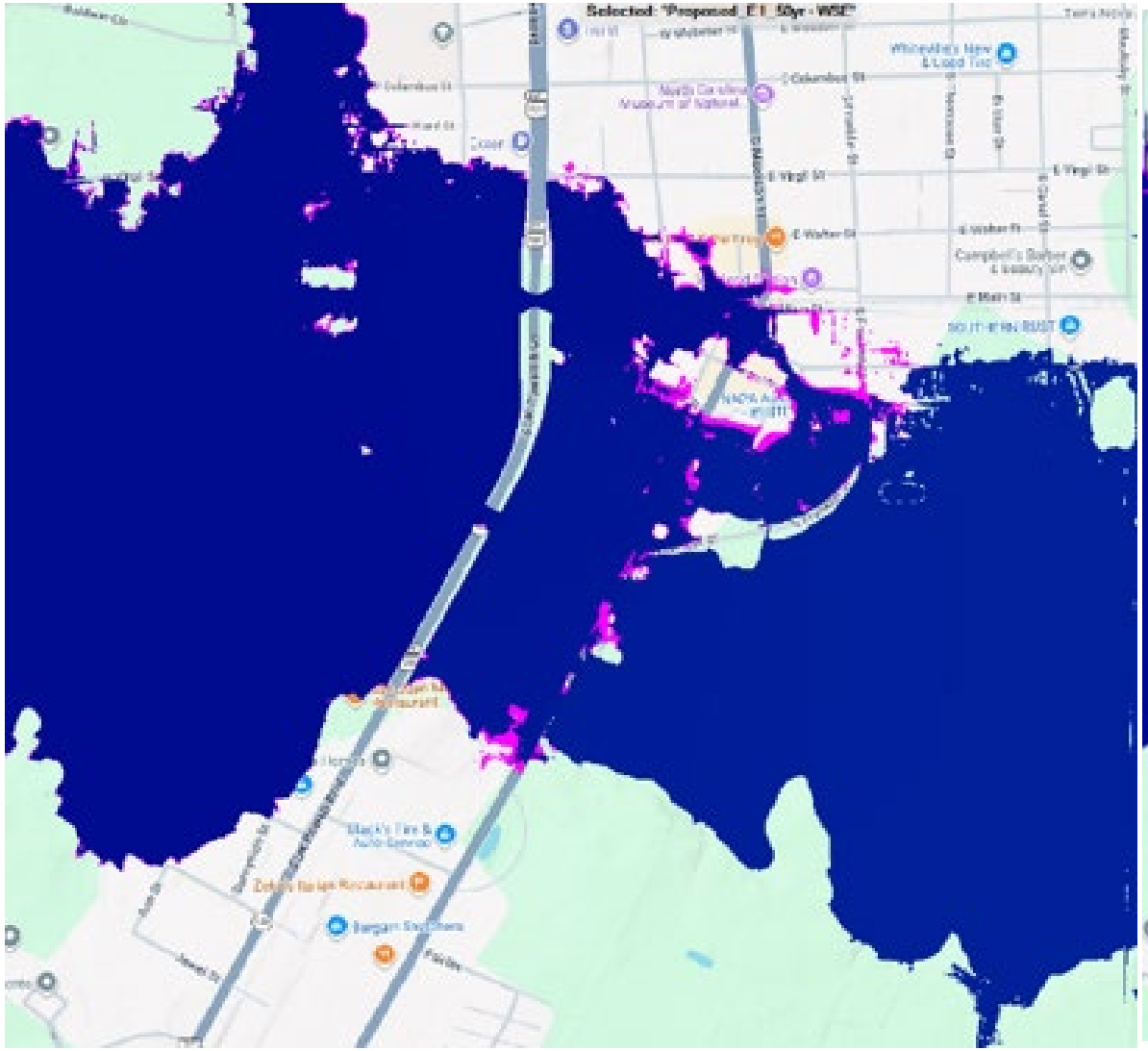
Senario	50yr WSE	100yr WSE
Existing	57.91	58.38
Proposed (Alter D1)	57.09	57.89
WSEL Drop	-0.82	-0.49

Alternative E1 vs D1

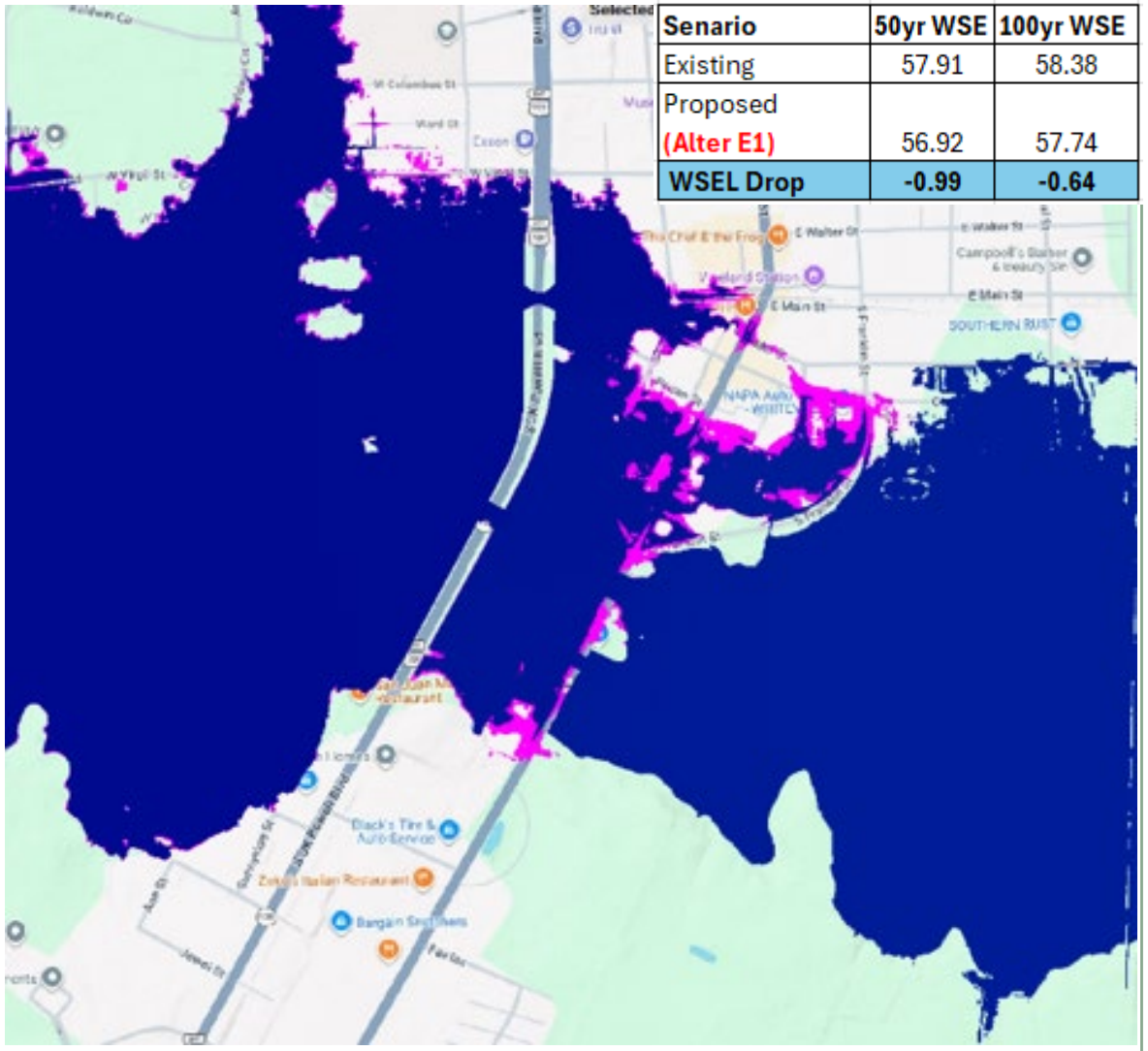
Senario	50yr WSE	100yr WSE
Proposed (Alter D1)	57.09	57.89
Proposed (Alter E1)	56.92	57.74
E1-D1	-0.17	-0.15



ALTERNATIVE E1 – 100- AND 50-YEAR EXISTING AND PROPOSED INUNDATION COMPARISON



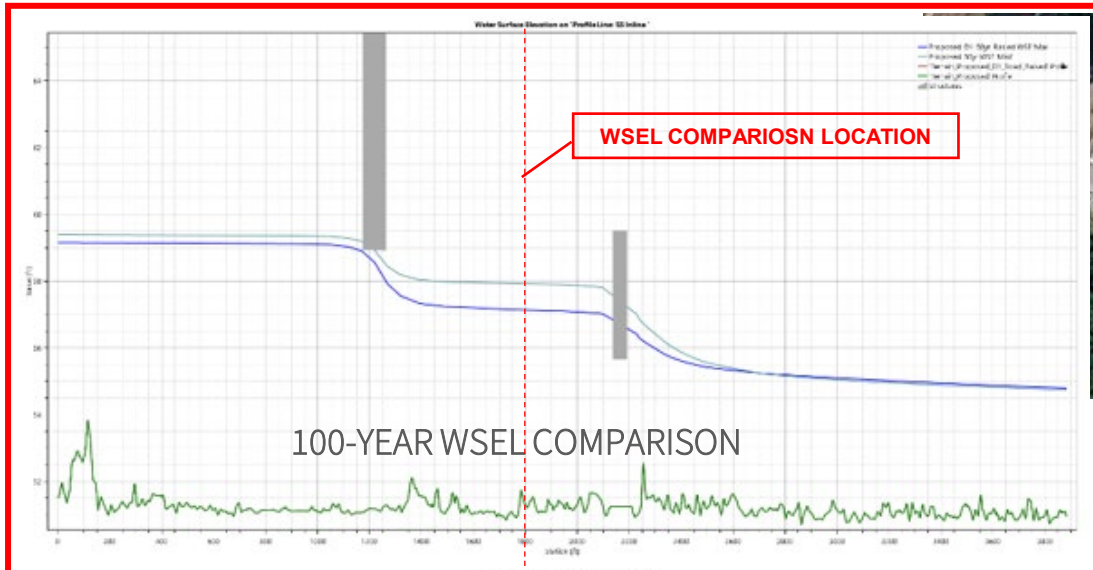
100-YEAR EXISTING VS PROPOSED

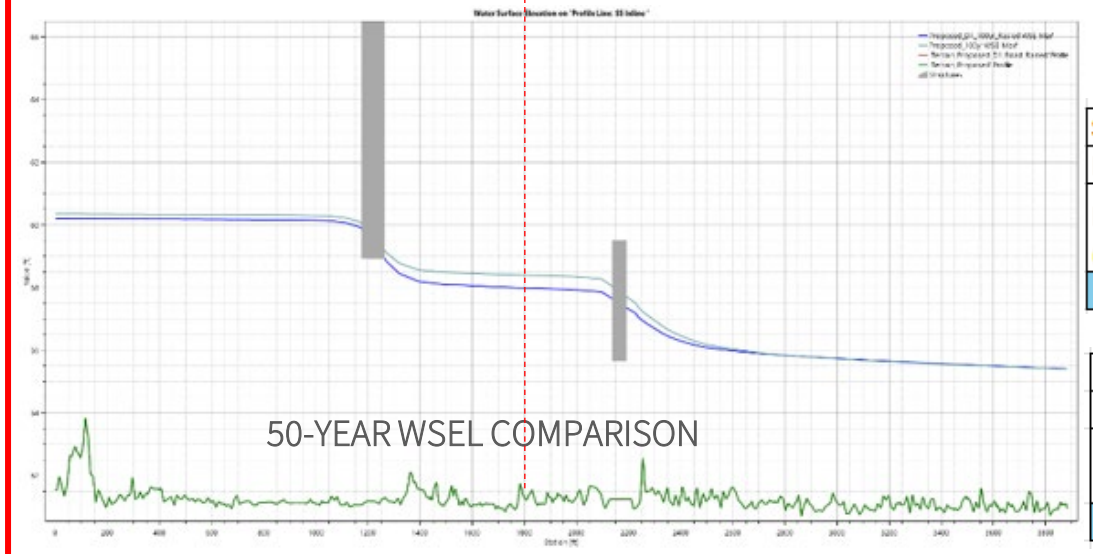


Senario	50yr WSE	100yr WSE
Existing	57.91	58.38
Proposed (Alter E1)	56.92	57.74
WSEL Drop	-0.99	-0.64

50-YEAR EXISTING VS PROPOSED

Proposed Condition – Soules Swamp S Maddison Street Bridge Alternatives (D1+Rd)



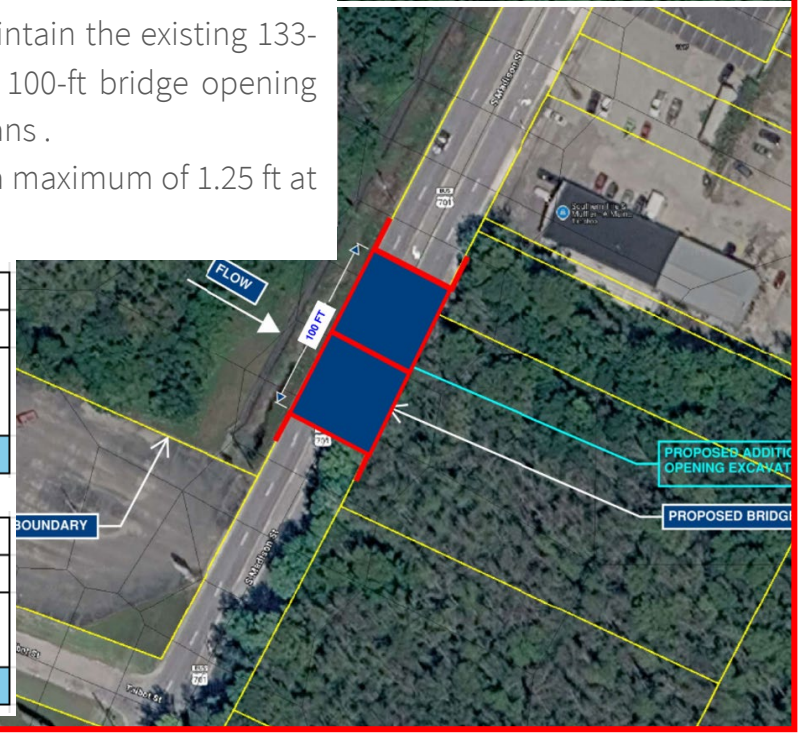




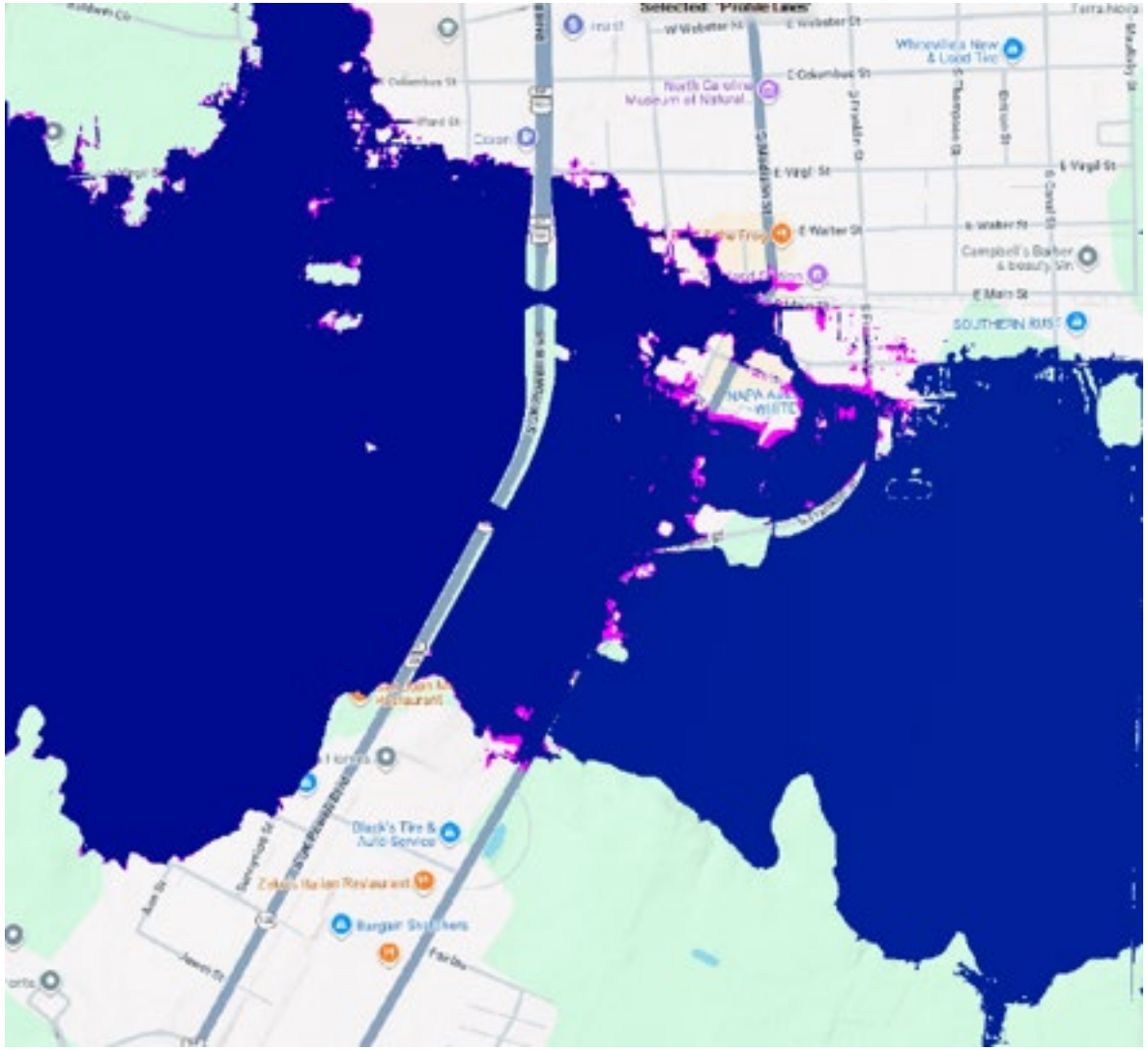
- Alternative D1+Road : Maintain the existing 133-ft bridge and add a new 100-ft bridge opening consisting of two 50-ft spans .
- Raise the S Lee street by a maximum of 1.25 ft at Sag point

Senario	50yr WSE	100yr WSE
Existing	57.91	58.38
Proposed (Alter D1+Road)	57.11	57.96
WSEL Drop	-0.80	-0.42

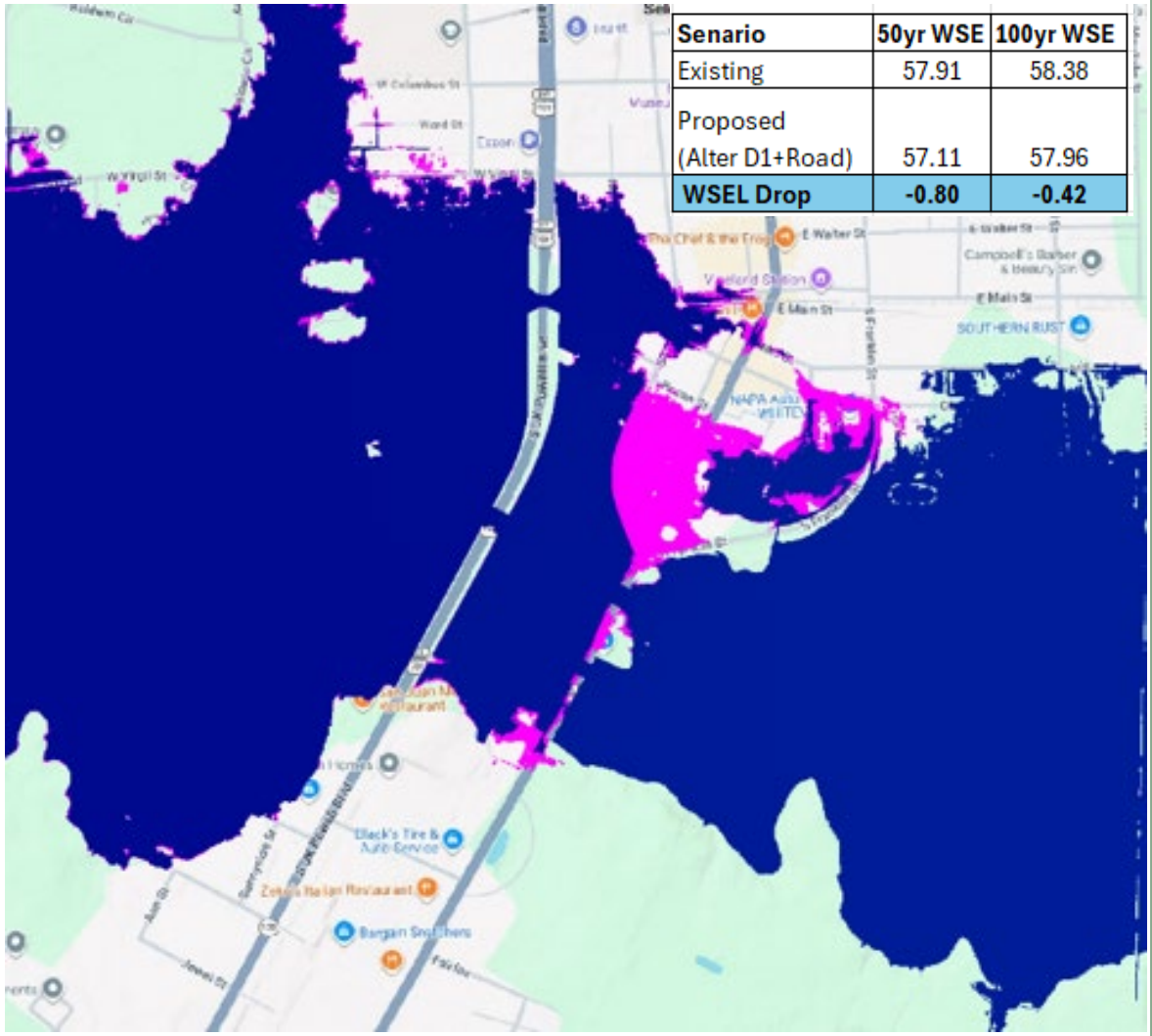
Senario	50yr WSE	100yr WSE
Existing	57.91	58.38
Proposed (Alter D1)	57.09	57.89
WSEL Drop	-0.82	-0.49



ALTERNATIVE D1+ROAD – 100- AND 50-YEAR EXISTING AND PROPOSED INUNDATION COMPARISON



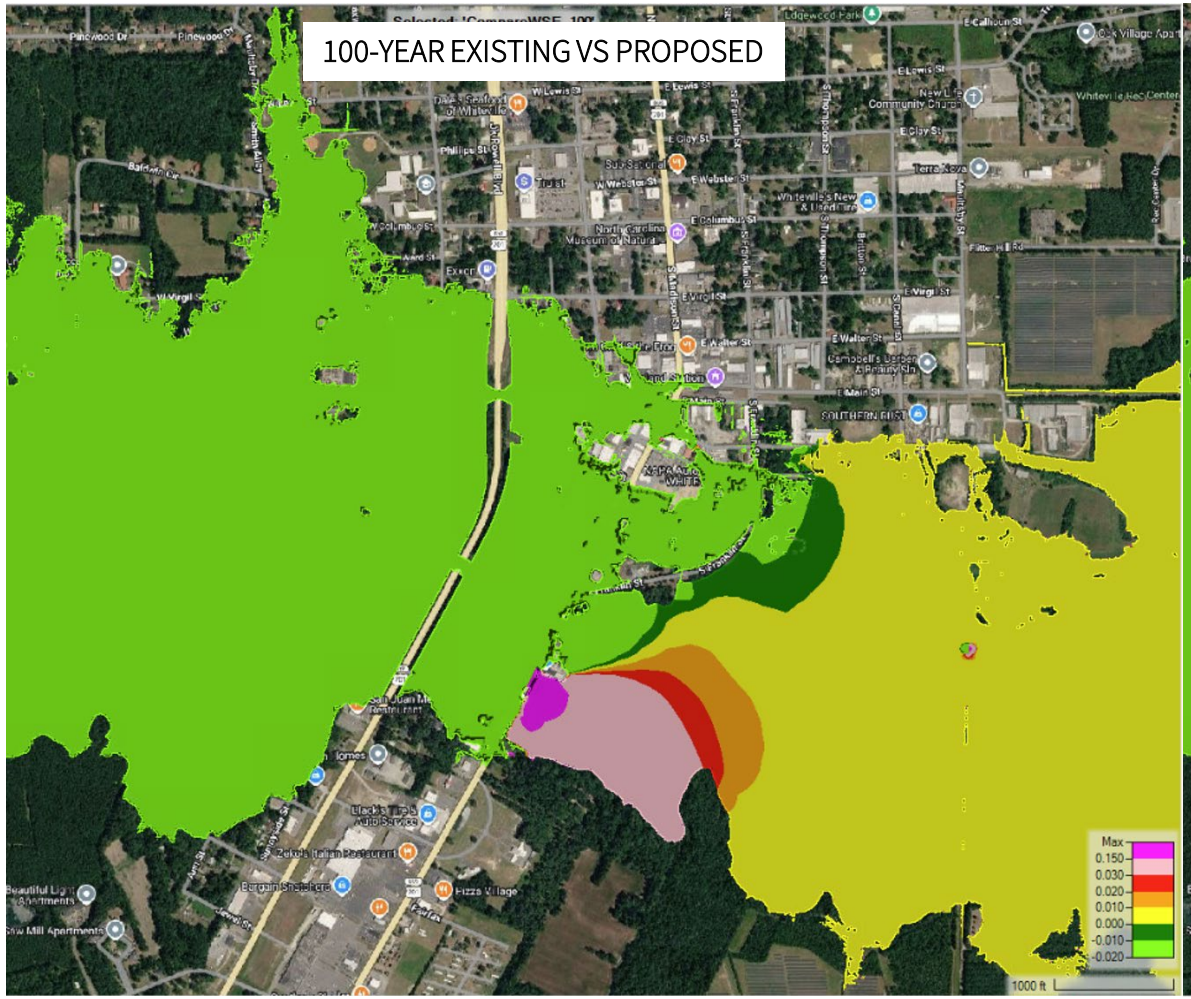
100-YEAR EXISTING VS PROPOSED



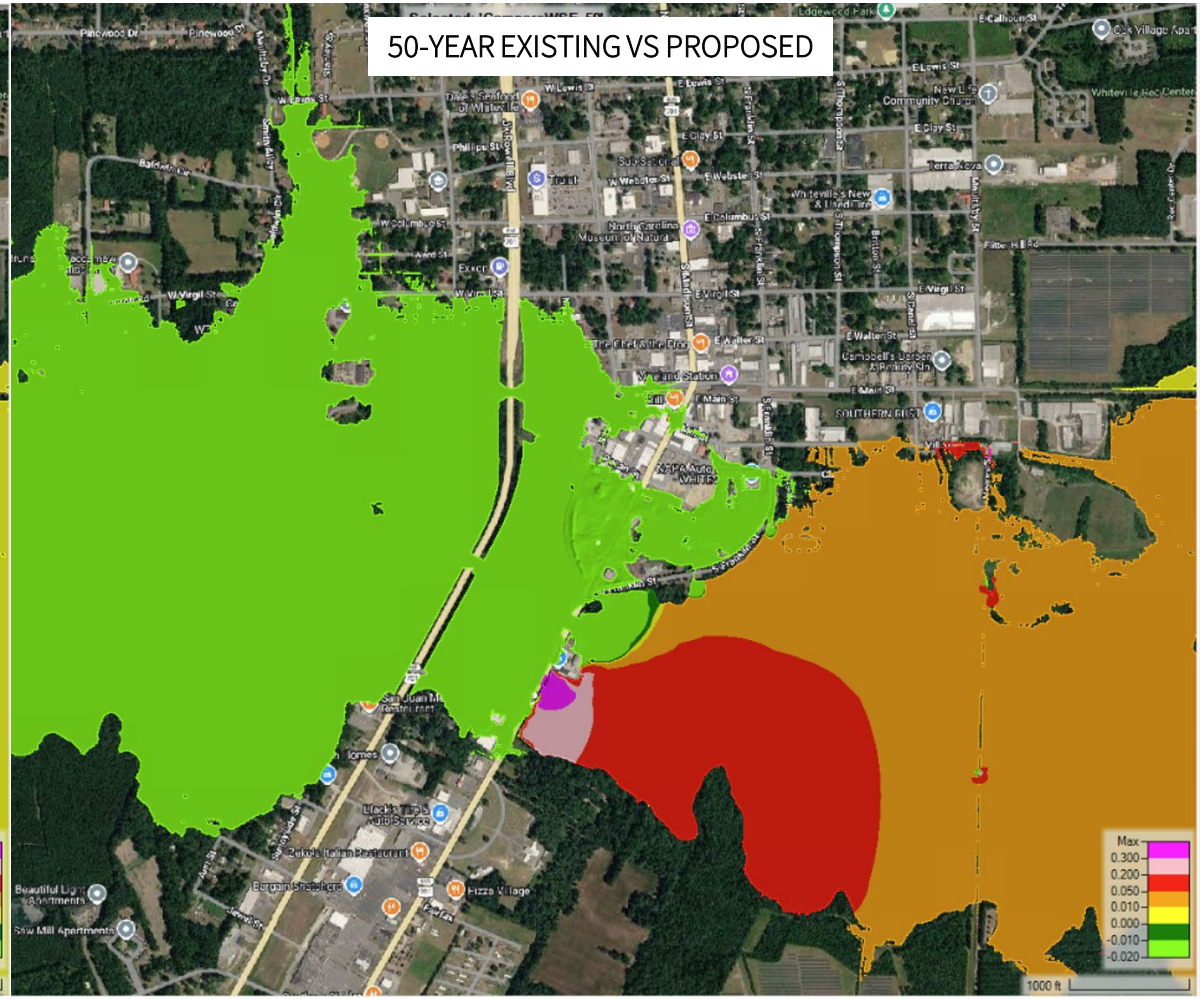
Senario	50yr WSE	100yr WSE
Existing	57.91	58.38
Proposed (Alter D1+Road)	57.11	57.96
WSEL Drop	**-0.80**	**-0.42**

50-YEAR EXISTING VS PROPOSED

ALTERNATIVE D1+ROAD VS EXISTING CONDITION – 100 & 50 YEAR STORM WATERS SURFACE +/- MAP



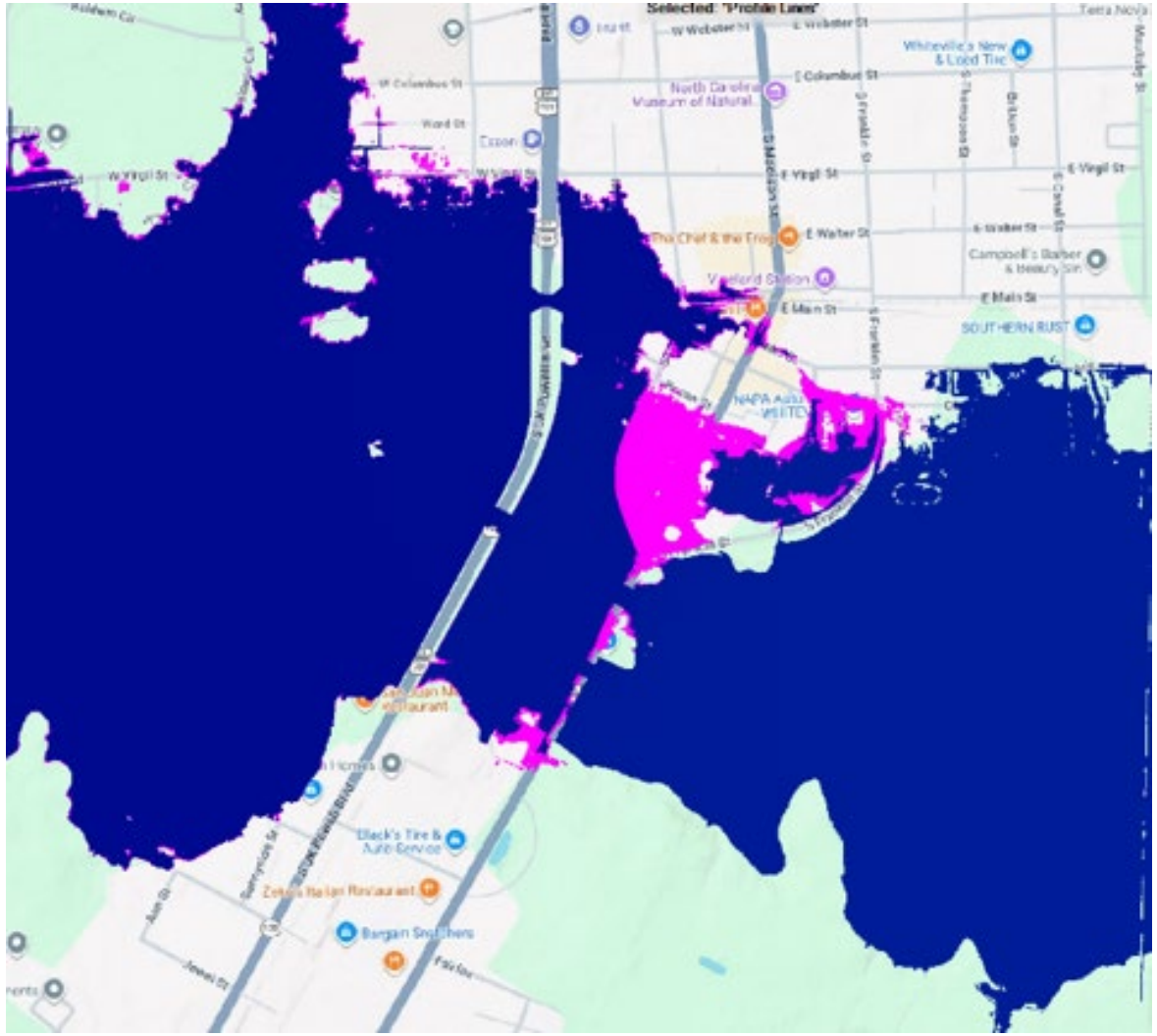
The map shows the WSEL difference for 100-year storm between the existing and proposed (D1 – Road) conditions. The green areas indicate a drop in WSEL, while the yellow areas indicate no change. The pink areas downstream of the newly added bridge indicate an increase in WSEL. The maximum increase is approximately 0.15 ft at the dark pink, while the maximum decrease is approximately 0.53 ft in the green areas. The yellow areas downstream indicate no change in WSEL.



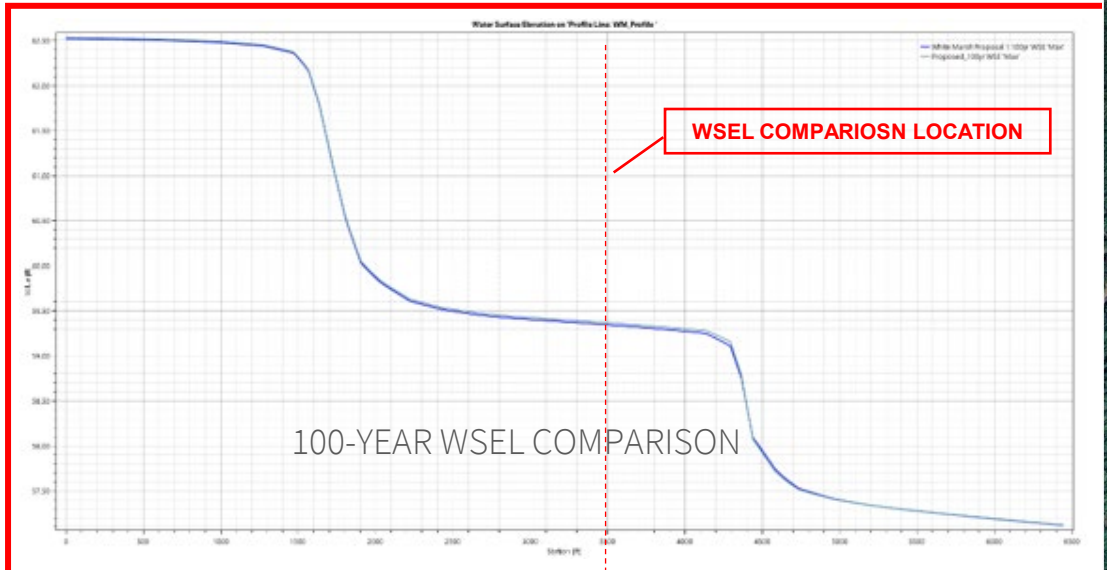
The map shows the WSEL difference for 50-year storm between the existing and proposed (D1 – Road) conditions. The green areas indicate a decrease in WSEL, while the orange areas indicate an increase approximately 0.05ft. The pink and red areas downstream of the newly added bridge indicate an increase in WSEL. The maximum increase is approximately 0.25 ft at the bridge outlet pink location, while the maximum decrease is approximately 1.5 ft in the green areas behind the proposed roadway raise, although no flooding in that area for D+1 raise , this map shows a reduction from the existing .

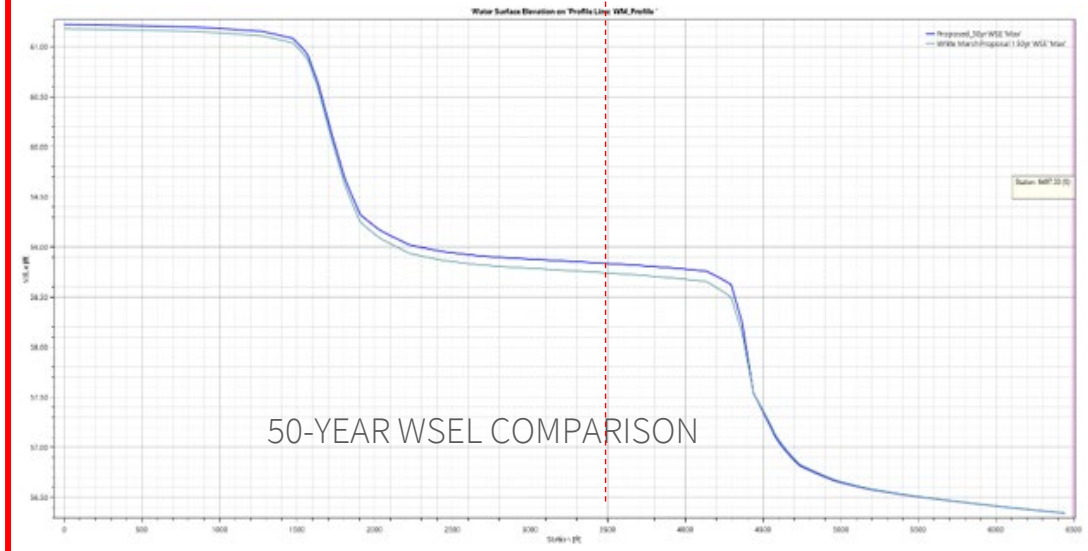
Proposed Condition – Soules Swamp S Maddison Street Bridge (Summary)

- Based on the simulated alternatives, Alternative D + Road appears to provide the greatest flood mitigation benefit to the adjacent properties.
- The reduction in flooding during the 100-year storm event is relatively small for all alternatives
- Areas east of S. Maddisson Street, north of the bridge, experience flooding due to backwater from Soules Swamp.
- There may be an opportunity to reduce flooding in this area by providing a flap gate to control backflow from Soules Swamp.
- There may be an opportunity to reduce flooding in this area by providing a flap gate to control backflow from Soules Swamp.
- Widening the bridge primarily helps reduce roadway overtopping rather than significantly reducing flooding of the adjacent properties.



Proposed Condition – White Marsh Jefferson Street Bridge Alternatives (Alt 1)

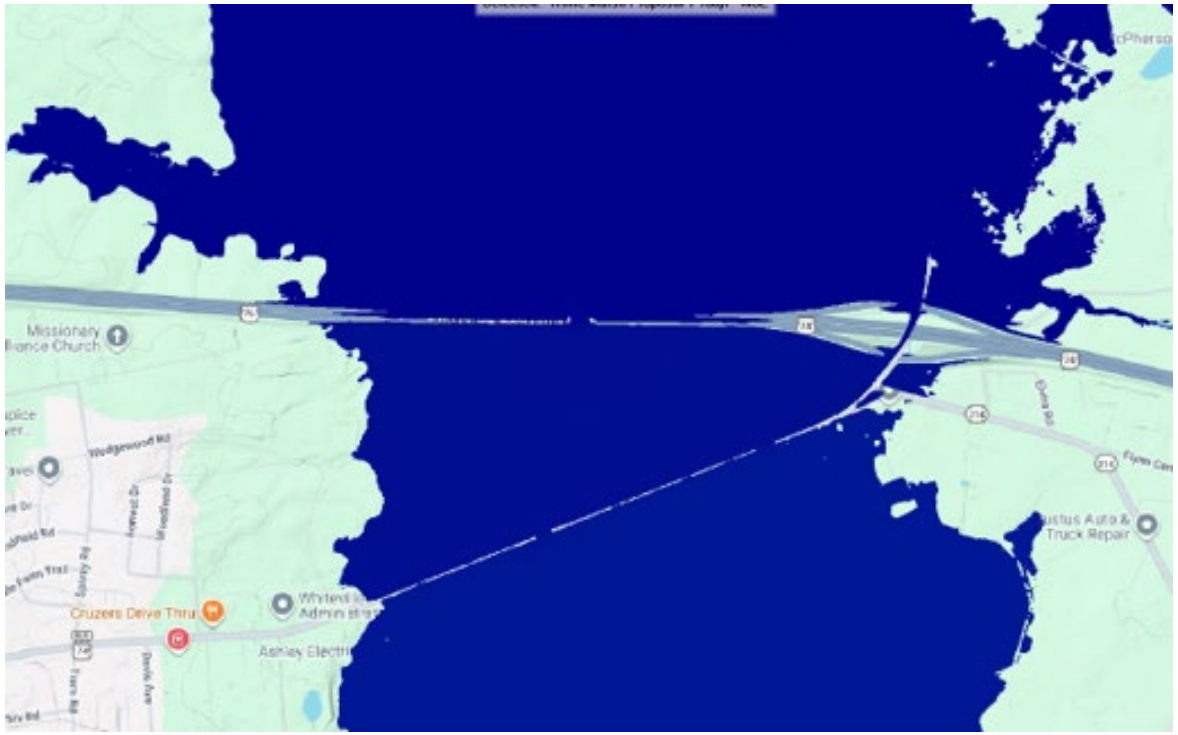




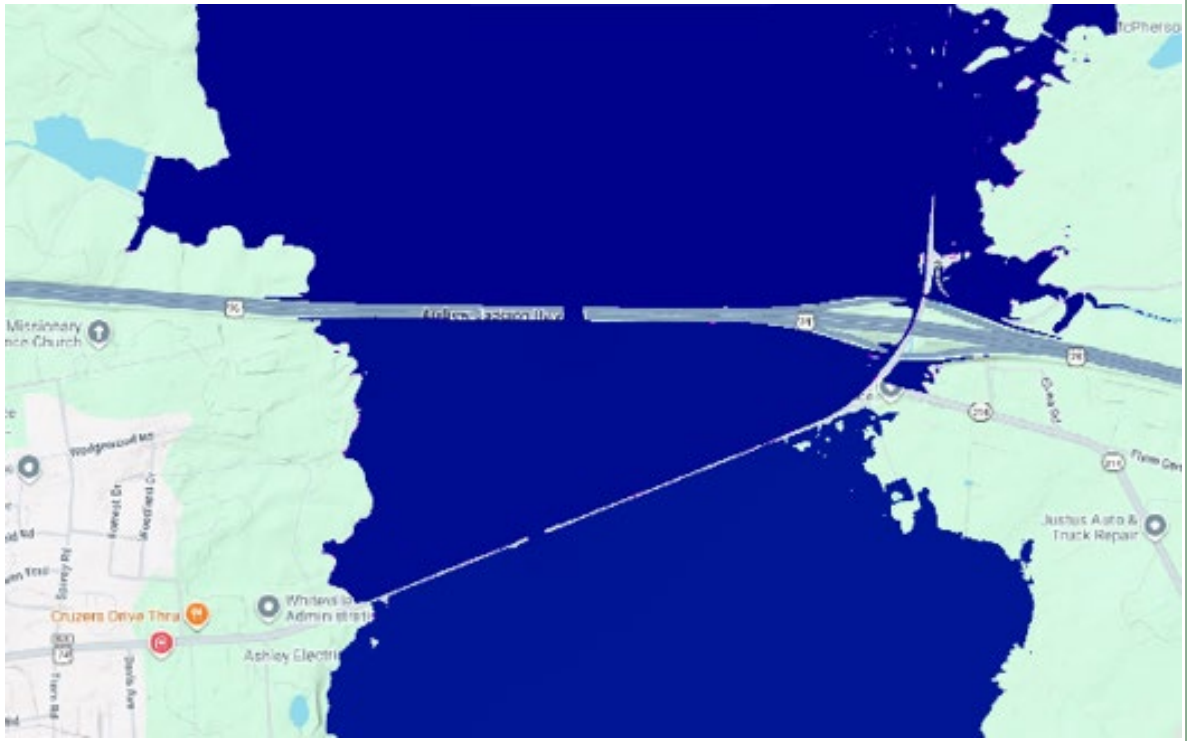


- Alternative 1: This alternative widens the existing bridge to approximately match the opening of the upstream US 74 bridge.
- All existing structures will remain in place, with no changes to the existing roadway grading.
- The reduction in water surface elevation is very minimal for both the 50- and 100-year storm events.

ALTERNATIVE 1– 100- AND 50-YEAR EXISTING AND PROPOSED INUNDATION COMPARISON

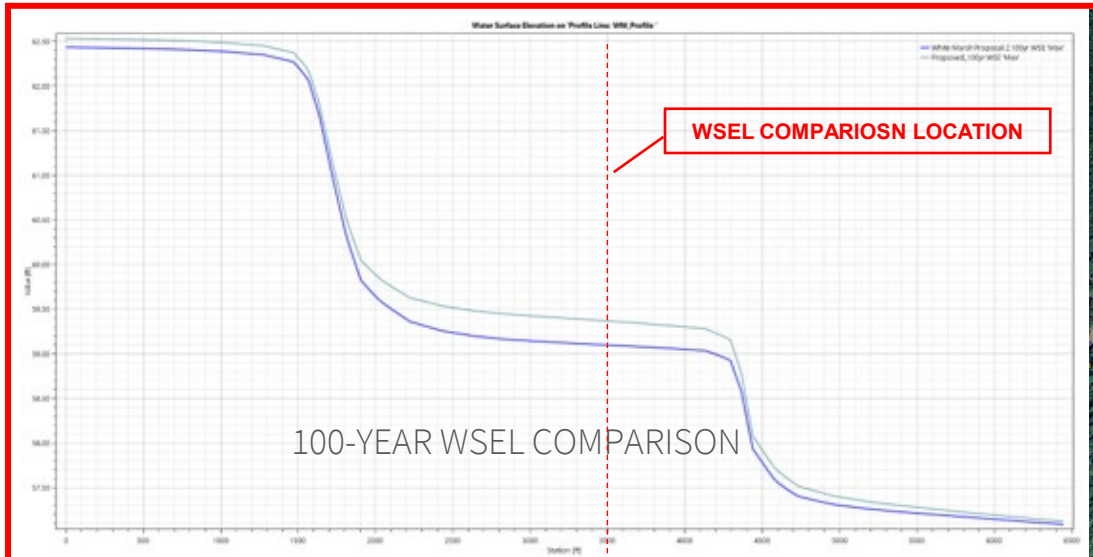


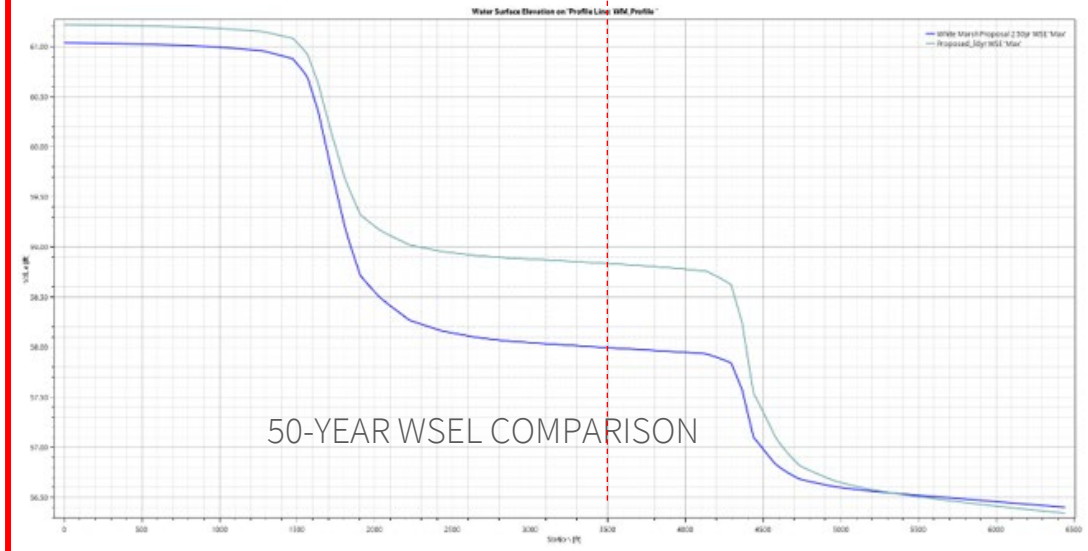
100-YEAR EXISTING VS PROPOSED

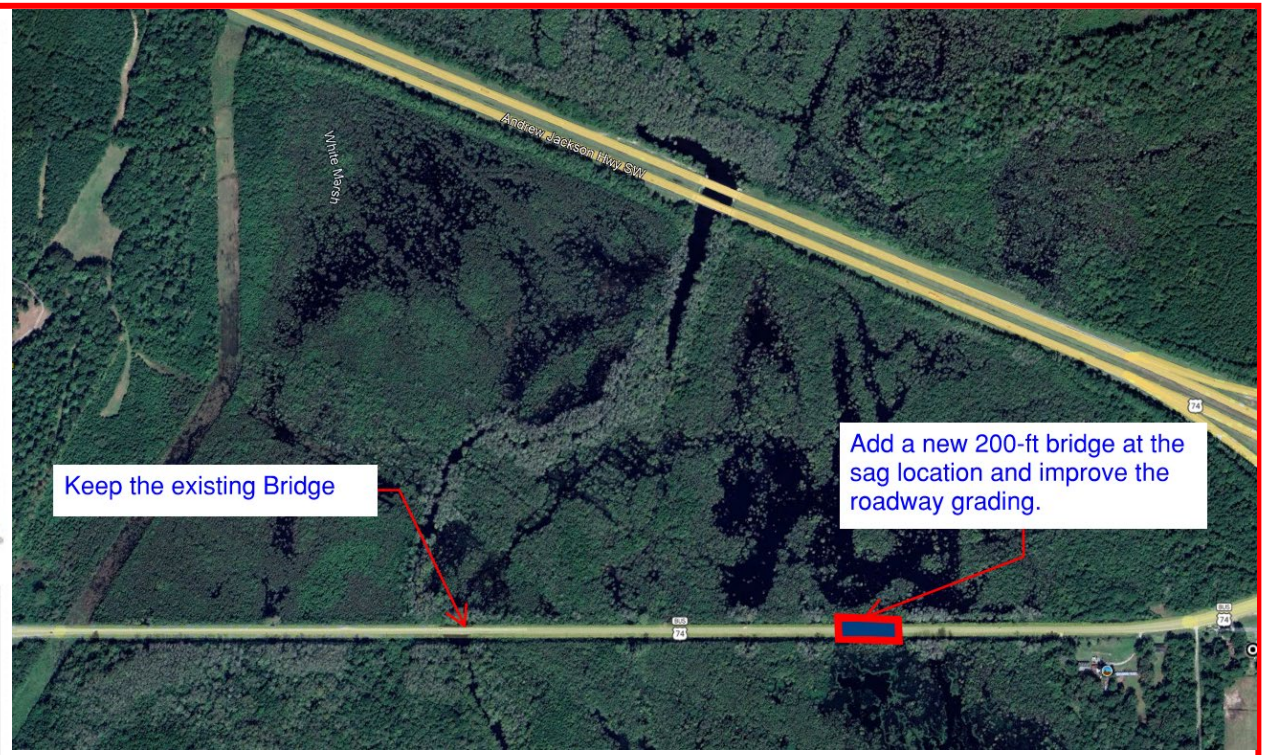


50-YEAR EXISTING VS PROPOSED

Proposed Condition – White Marsh S Maddison Street Bridge Alternatives (Alt 2)

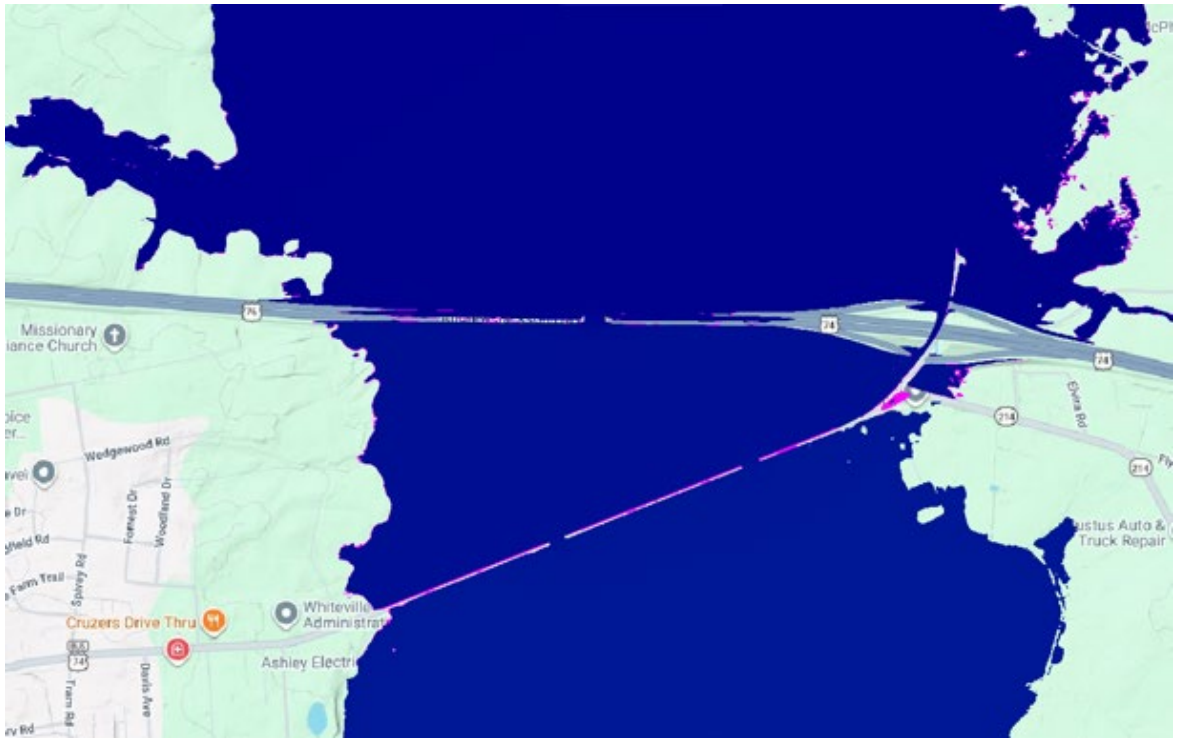




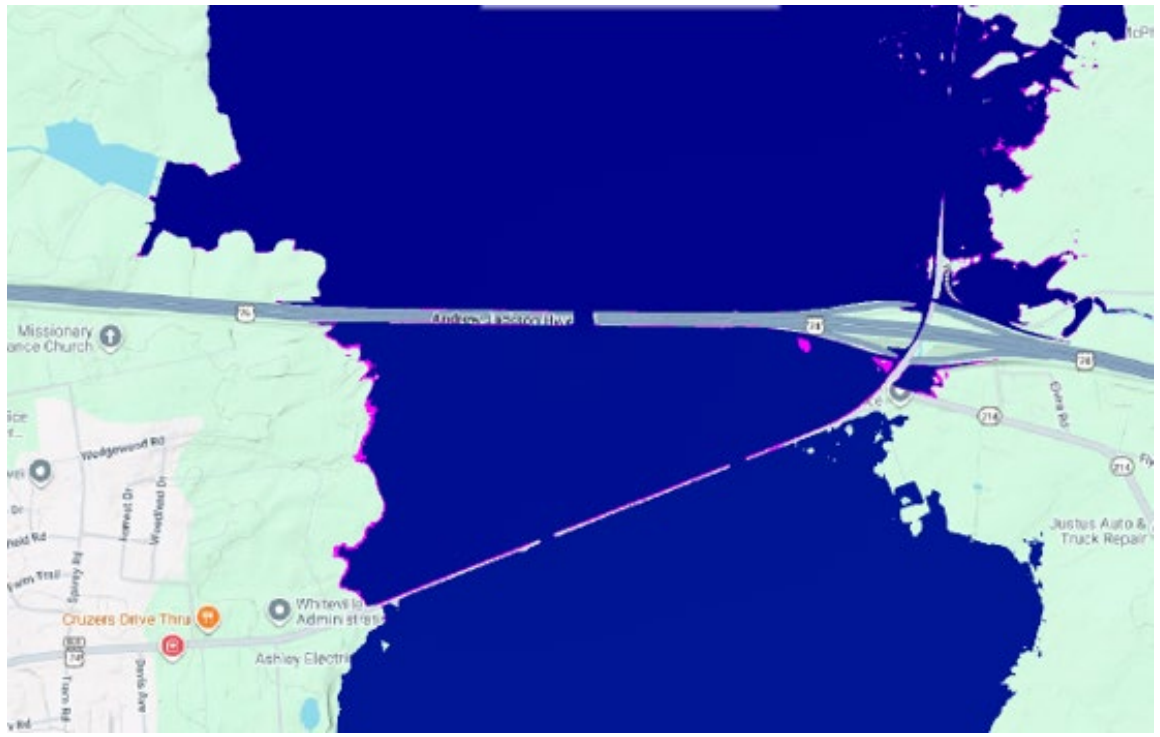


- Alternative 2: This alternative adds new bridge and rais the existing roadway at the proposed bridge .
- All existing structures will remain in place with only removing an existing CMP culvert at the new bridge location .
- The reduction in water surface elevation is very considerable for both the 50- and 100-year storm events.

ALTERNATIVE 2– 100- AND 50-YEAR EXISTING AND PROPOSED INUNDATION COMPARISON



100-YEAR EXISTING VS PROPOSED



50-YEAR EXISTING VS PROPOSED

Proposed Condition – White Marsh Swamp Jefferson Street Bridge (Summary)

- Alternative 2 provides the largest decrease in WSEL however, no structure will be outside of flooding with this option .
- Because of the flat and widen floodplain and lower velocity , the depth of the flooding may not be significantly lowered to show significant impact

Thank you