



S-294 over Wilsons Creek



S-53 over Little Rocky Creek



S-108 over Brown Creek

Bridge Package 15

Design-Build Project

Contract ID 8862230

Anderson, Chester, Chesterfield, and
Lancaster Counties, South Carolina



S-765 over Hanging Rock Creek

January 31, 2023



UNITED
INFRASTRUCTURE GROUP, INC.



REEVES

A COLAS COMPANY



This document is bookmarked for your convenience.

*Green and underlined text within this document indicates a **HYPERLINK** and will take you to more detailed information.*

*To return to your previous location,
simply type  + *

4.1 Technical Proposal Narrative





1.a Project Delivery and Approach



SUCCESSFUL RFIS

- District 2 Maintenance requested guardrail on all bridge rail termini (above design standards). Design team quickly completed the change, and the contractor incorporated the additional work with no impact on schedule.
- Due to a driven pile complication, a design revision to the cap was made within a few days, and the contractor incorporated the change with no impact on schedule.
- After SCDOT requested a guardrail change, an issue was immediately identified regarding parcel access being cut off. Our team worked with the District to change guardrail components to accommodate the existing drive with no impact to project schedule.

1.a.1 | Demonstrated ability to complete the project on schedule | Our team's proven success in design and construction on both CLRB 2020-1 and CLRB 2021-1 demonstrates our ability to complete this project on schedule. As of January 2023, we will have completed the items as **shown in the table below**

All 16 sites for CLRB 2020-1 are anticipated to be open to traffic by early April 2023. **Construction on CLRB 2021-1 is anticipated to be complete by November 2023.** Through careful implementation of sound management procedures, we have completed construction on many sites earlier than originally anticipated. Not only does this establish our ability to deliver, it creates availability for experienced team members to participate and successfully complete Bridge Package 15. The addition of United Infrastructure Group to our team creating the **United-Reeves JV** gives us additional capacity for construction to ensure that we continue to exceed SCDOT expectations on delivery of these projects. This same success will easily translate to Bridge Package 15 by implementing similar techniques and innovation, including lessons learned, planning for long lead times on materials, utility relocations, permitting, access, erosion control, and detours.

Team Past Performance on Closed and Load Restricted Bridge Packages for SCDOT				
Bridge Package	Design Complete	Construction Complete (Open to Traffic)	Construction Started	Sites Completed Ahead of Schedule
CLRB 2020-1	16	14	16	10
CLRB 2021-1	8	0	2	TBD



CLRB 2020-1 D2 #12 Bridge S-342



CLRB 2020-1 D2 #9 Bridge S-272

The United Reeves Joint Venture will take full advantage of our combined resources within our Project Delivery and Approach. To provide adequate time in the project schedule our team sees the need for overlapping construction of the four structures. With this in mind, we plan to create two separate bridge submittal sets. S-53 and S-765 will be in Set 1 and will be the first to be designed. These sites provide the greatest challenge of design, permitting, utility relocation and ROW acquisition and this early start will provide the longest duration to address these 3rd party challenges. Design for sites S-108 and S-294 will commence as early as possible to provide an early 2024 start of construction. Construction on the sites will overlap during the 2024 construction season as shown on our simplified bar chart (**page 6**) and in more detail within our CPM Schedule contained in Appendix A.3.

To confirm our commitment and accountability in delivering the project as scheduled, the United-Reeves JV/RK&K team is committing to increased Liquidated Damages for not meeting substantial completion dates for each bridge site and overall project substantial completion from \$750 to \$1,500 per calendar day.

Providing Schedule Certainty | The formation of our Joint Venture team to combine resources is a feature our team provides for schedule certainty. As Reeves has shown on packages 2020 and 2021, two-three sites at a time can be executed while maintaining and expediting project schedule. The combination of United and Reeves resources will allow our team to aggressively pursue the four sites within Package 15 without concern of availability.

Third-party schedule delays, especially utility relocations, have provided the greatest risk to schedule certainty. Upon review of the third-party challenges of this project, coupled with design RFC availability, our team is strengthening schedule certainty by selecting an early 2024 construction start, providing more time for utility relocations, ROW acquisition, and permitting (**see utility conflict table on the following page**). Eliminating inefficient construction activities during the winter of 2023/2024 will also enhance schedule certainty. To further monitor utility relocation schedule challenges, we will create activities within our CPM schedule during the design phase to address each relocation at each site to be reviewed and updated bi-weekly. This additional detail to utility relocation scheduling will allow our team to monitor progress more closely and provide opportunities to react to adverse relocation activity.



Utility Conflict Table			
Bridge Site	Utility	Notes	
1	S-294 over Wilson Creek	Rural Western Carolina Telecom	Two conduits on each side of bridge, possible direct bore or temporary relocation and move to new bridge.
		Starr-Iva Water & Sewer District	Confirmed they are not in project limits
2	S-765 over Hanging Rock Creek	Windstream	Pedestal and residential 12 pair cable. Would need to relocate if driveway relocated.
		Lancaster Co. Natural Gas	SC811 shows in project limits. No markers located in or adjacent to project limits. Early coordination with utility to confirm.
3	S-53 over Little Rocky Creek	Truvista	Buried cable south side of Ross Dye Rd. Adjustments near bridge based on guardrail/grading
		Chester Co. Natural Gas	Parallels roadway on north side of Ross Dye Rd. Adjustments near end of bridge based on guardrail/grading.
		Fairfield Electric Co-op	Enters project from Northwest and crosses east end of existing bridge. Three-phase line is within easement and expected prior rights. Will need to be relocated.
4	S-108 over Brown Creek	Lynches River Electric Co-op	Aerial single-phase line likely a candidate for retention based on horizontal clearances and preliminary roadway plans
		Sandhills Telecom	Could not be found in project limits. Will confirm. If found, would likely require relocation

Large increases in lead time for the scheduling of ready mixed concrete deliveries and precast bridge elements have occurred within the industry. Advanced scheduling requirements have increased 200-300%. Schedule dates for concrete placements and precast bridge element installation have become hyper critical. If scheduled dates are not met, significant delays to the project could occur. To proactively mitigate this issue, frequent communication with suppliers is critical to maintaining schedule. To enhance this communication, we will update our P6 CPM schedule weekly to aggressively manage multiple bridge sites concurrently. Weekly updates will enable our team to provide effective schedule status updates to our suppliers with long lead time activities as well as indicate any necessary internal or subcontractor resource adjustments. We will issue multiple purchase orders for ready mix supply to provide alternatives if necessary and will seek delivery agreements with independent haulers from precast facilities in the event fabricators cannot meet delivery schedules. Our team is committed to implementing measures of overtime, additional shifts, and additional resources to meet scheduled dates to avoid any delays. We will accomplish our goals through transparency, communication, proven techniques, and available technology with an unwavering focus on safety, environment, quality, cost, and time.

1.a.2 | Design completed to date — During our field inspections we noted items such as utility conflicts, hydraulic conditions, right-of-way issues, environmental concerns, roadway geometry, tie down locations, and constructability. These have been incorporated into the design tasks completed to date as detailed here. This level of design is consistent with our approach on both CLRB 2020-1 and CLRB 2021-1 which positions our team to easily meet the required project schedule.



Hydraulic Design Assessment

Bridge Site		FEMA Comment		Design Comment	
1	S-294 over Wilson Creek	Zone AE	Designed to achieve "No-Rise" Certificate	Reduced overall bridge length from 130' in the RFP to 100'. Single span bridge to meet setback requirements and provide fewer obstructions to flow.	Lowered Low Chord
2	S-765 over Hanging Rock Creek	Zone A	Designed to achieve "No-Rise" Certificate	Minimized roadway overtopping while maintaining a FEMA No Rise.	Lowered Low Chord
3	S-53 over Little Rocky Creek	Zone A	Designed to achieve "No-Rise" Certificate	Reduced overall bridge length from the RFP from 345' to 325'. Increased the length of the channel span to 90'.	Held Low Chord
4	S-108 over Brown Creek	No	Not Applicable	Reduced overall bridge length from 100' in the RFP to 80'. Increased the channel span to 80'.	Lowered Low Chord

Roadway | With SCDOT permission, our preliminary and right-of-way plans will be combined for review. This will save significant review time and get our public involvement, right of way, permitting, and utility coordination teams started much sooner with their outreach, negotiations, and impact studies.

Hydrology | Three of the four bridges are listed as some form of FEMA Flood Zone and are designed to achieve a "No-Rise" certificate. The discharges for the 25-year and 100-year events have been determined by StreamStats for South

Carolina and compared to those provided by the FEMA Studies. The discharges have been incorporated in HEC-RAS with the predetermined cross sections along with additional cross sections needed to remove errors or warnings in the models, Corrected Effective Models (CEM). The CEM models were used to analyze the Natural, Existing, Proposed and Sensitivity Models. The preliminary design for all the proposed bridges has less than one foot of backwater as compared to the Natural Model or meet/reduce the backwater of the Existing Model.

Roadway Design Tasks		Completed	Roadway Design Tasks		Completed
Preliminary design		✓	Driveway Relocations / Tie-ins		✓
Right of Way Design		✓	Slopes and NPDES Permissions Identified		✓
Completed Cross Sections		✓	Prepare Right of Way Plans for Approval		✓
Completed Construction Limits		✓	Final Design and RFC Plans		60%
Identified and Minimized New ROW Impacts		✓			
Hydrology & Hydraulic Design Tasks		Completed	Hydrology & Hydraulic Design Tasks		Completed
Preliminary field inspection		✓	Size drainage pipes		50%
Drainage area & discharges calculated		✓	NPDES permit package		50%
Triple Profile Plotted		✓	Scour		75%
Natural, existing & proposed HEC-RAS modeled		✓	FEMA No-Rise		70%
Road drainage/erosion control		20%			



Bridges | These tables illustrate the status and details of our team's proposed structures, including the use of our approved [Formal ATCs](#).

Bridge Design Tasks	Completed
Layout bridges to meet RFP requirements	✓
Select superstructure type	✓
Design preliminary superstructure	✓
Design preliminary substructure	✓
Compute elevations	25%
Design final superstructure	---
Design final substructure	---
Final Bill of materials	---
Produce AASHTOWare Load Rating	---

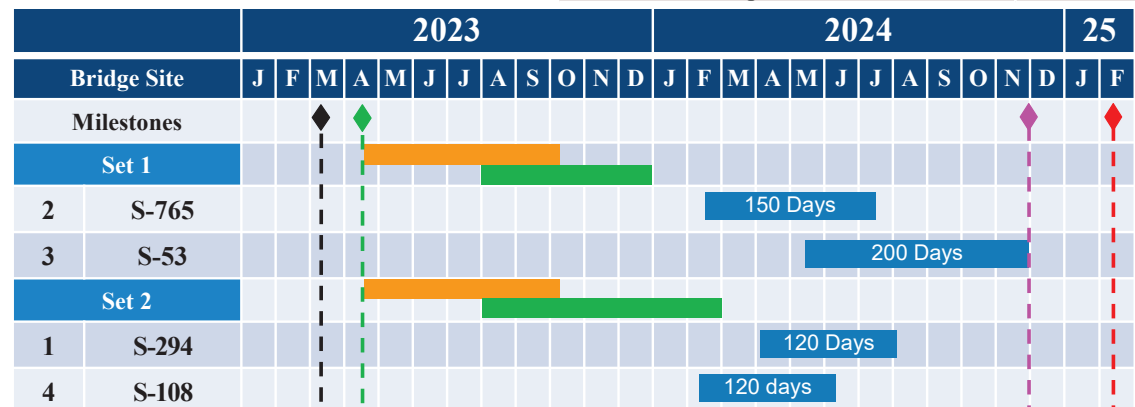
Preliminary Bridge Details							
Bridge Site	Superstructure Type	Foundation Type	Length (ft.)	Width (ft.)	Span Arrangement	Overlay Type	
1 S-294	Box Beam	Steel H Piles	100	33	Single	Asphalt	
2 S-765	Cored Slab/Box Beam	Steel H Piles / Drilled Shafts	130	30	Multi (100-30)	Asphalt	
3 S-53	Cored Slab/Box Beam	Steel H Piles / Drilled Shafts	325	36	Multi (85-90-90-60)	Asphalt	
4 S-108	Box Beam	Steel H Piles	80	30	Single	Asphalt	

Geotechnical | Initial geotechnical design tasks have been completed as noted in the table. Foundation types, sizes and depths are preliminary and based on limited sub-surface information provided. SCDOT provided one soil

Geotechnical Design Tasks	Completed
Assess borings provided by SCDOT	✓
Liquefaction screening	✓
Select foundation types	✓
Preliminary pile and drilled shaft depths	✓
Drill additional borings	---
Final pile and drilled shaft depths	---
Preliminary and Final Bridge Geotechnical Reports	---
Preliminary and Final Roadway Geotechnical Reports	---

boring at each end bent of each bridge. Our team proposes to perform additional borings before and after the bridge and also in proximity of the proposed bents to meet the requirements presented in GDM and PCDM 11, and to supplement and verify the provided borings information. Thorough knowledge of the subsurface conditions will also avoid construction issues related to pile driving and drilled shaft installation, which will help reduce schedule uncertainty.

1.a.3 | Project Schedule — We have developed a proposed schedule for delivery of each bridge within the contractual time frame as depicted by the schematic on the right. A more detailed CPM schedule is included in appendix A.3.



■ Design ■ ROW/Permitting/Utility Coordination ■ Construction
◆ Anticipated NOA (3/7/23) ◆ Anticipated NTP (4/18/23)
◆ Projected 630 Day Mark (2/7/25) ◆ United-Reeves JV 590 Day Mark (11/28/24)



The United-Reeves JV has also reduced the durations for each site based upon our approved ATC designs to further our commitment to providing schedule certainty. These site durations, as well as the overall project duration reduction are discussed further within the project quality commitment matrix.

Geographic Benefits of Team's Assets | As local contractors, United and Reeves have maintained a long-term presence in the Midlands and Upstate. As illustrated by the map below,

these bridge sites, with the exception of Anderson, are centrally located to our bridge offices in Great Falls and Blacksburg. S-53 over Little Rocky Creek in Chester County is a mere five miles from United's Great Falls Operations office providing an excellent location from which to manage the entire project. Reeves has performed a significant amount of asphalt paving near these sites with asphalt producing facilities within one hour of each bridge site. Familiarity with the

region and the ability to self-perform the asphalt paving will be key to successful project delivery. The locations of our Team's offices and resources allows us to seamlessly integrate, communicate and resolve challenges as a partner with SCDOT through meetings at any of our SC offices, SCDOT headquarters, District offices, or any bridge site with same-day notice. We can also address RFI's and attend all project meetings (design and construction) with same-day notice. For situations requiring immediate attention, we can leverage the many collaborative tools our team has successfully used during this pursuit and other project efforts.

Team's Previous Closed and Load Restricted Bridge Packages			
2021	2022	2023	2024
Design- CLRB 20	Design - CLRB 21	Design - BP 15	
Construction - CLRB 20		Const.-CLRB21	Const. - BP 15
The timing of Bridge Package 15 allows seamless transition of design and construction resources from CLRB 21 much like our team's transition from CLRB 20.			



Bridge Package 15 Crew Member Proximity					
Bridge Site	Foreman	Proximity (Miles)	Bridge Site	Foreman	Proximity (Miles)
S-294	Aaron Mc Coy	45 Miles	S-108	Bobby Edwards	35 Miles
S-294	Jay Royer	66 Miles	S-108	Todd Umbenhauer	42 Miles
S-53	Albert Watts	15 Miles	S-765	David Covin	60 Miles
S-53	Connor Coleman	46 Miles	S-765	Javonte Truesdale	21 Miles



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1.b Approach to design and minimizing need for new right-of-way

1.b.1 | Key design decisions and controlling criteria – The key design decisions and controlling criteria that dictated our design approach are summarized in the table below. Also included on the next page are the bridge design objectives that were applied in developing each structure type. These criteria and objectives closely parallel those being used on CLRB 2020-1 and CLRB 2021-1. We will be using the North Carolina standards for box beams and adapting them to SCDOT's method of detailing plans. Our team has designed box beams for six of the bridges from the CLRB 2020-1, all which have been successfully constructed, and for all eight of the bridges from CLRB 2021-1.

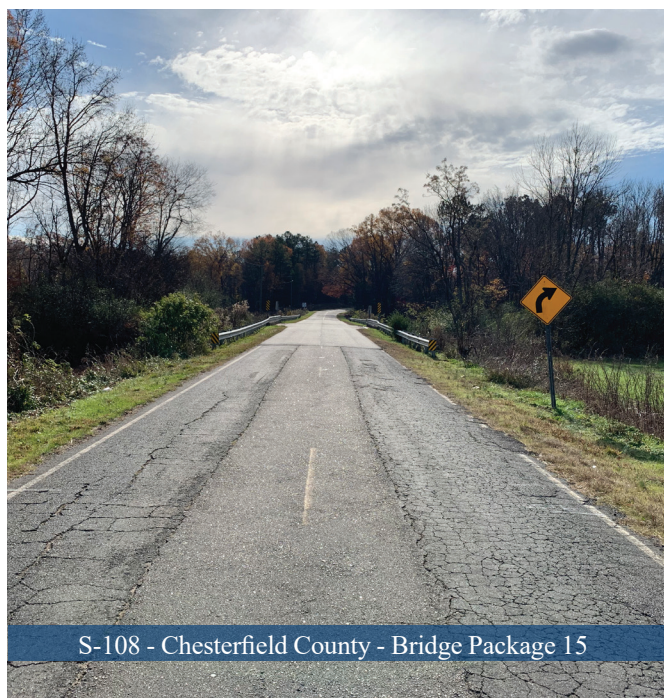
Key Design Decisions	Controlling Criteria
▪ Minimize profile work	▪ Retain existing low chords and K values within 15 mph of design speed (except for S-53), proposed structure depths, and rollover to tie to existing grades
▪ Minimize earthwork	▪ Profile and typical section with a hinged front slope beyond clear zone limits
▪ Increase safety	▪ Upgrade to latest guardrail standards, relocate drives away from bridges, ensure adequate sight distance, and provide adequate clear zone
▪ Bridge length, span configuration, superstructure type, and toe of fill	▪ Minimum setback from top of channel banks
▪ Bridge foundation type and location	▪ Span lengths over 75 feet require drilled shafts
▪ Bridge size	▪ Designated FEMA flood zone requirements cannot exceed the existing 25-Year and 100-Year water surface elevations
▪ Road and bridge profile	▪ Pass the 100-Year discharge to prevent pressure flow scour (which would produce additional scour) and to reduce or allow the road to overtop at a minimum of 50' beyond the bridge Begin and End Stations



Bridge Design Objectives

- Minimize the bridge length, number of spans, interior bents/joints
- Minimize structure depth to limit roadway approach work
- Utilize tangent bridges on curving horizontal alignments with the use of curved striping (made possible by using eleven 3'-wide prestressed concrete units
- Maximize use of precast, prestressed voided beam units as opposed to cast-in-place slabs or I-girders
- Meet toe of fill setback requirements
- Utilize standard details, where possible
- Use SCDOT standard MASH Barrier Parapet/Railing Wall for all bridges combined with SCDOT allowance to eliminate 1" of each shoulder
- Minimize hydraulic/hydrologic impacts

1.b.2 | Minimized right-of-way impacts In following the RFP requirements, we minimized the bridge lengths and superstructure depths, approach lengths, and cross section widths in order to minimize right-of-way impacts. Specific design criteria and details of each site are summarized in the accompanying tables. These results are subject to further refinement in consultation with SCDOT following the project award.



S-108 - Chesterfield County - Bridge Package 15

Minimized Right-of-Way Impacts

- By minimizing bridge lengths, we reduce the total amount of additional right of way acquired for bridge block outs
- Smaller footprint of the roadway (for all sites except S-53) was obtained by using the Low Volume Criteria in accordance with grade rollover standards
- Minimized ditch design and erosion control while still meeting all requirements
- Obtaining a No-Rise certificate eliminates need for drainage easements or additional ROW
- Incorporated hinged side slopes per the AASHTO Roadside Design Guide Section 3.5 to minimize impacts to adjacent property owners, while meeting clear zone requirements
- Used box beams at sites requiring spans greater than 70' to reduce structure depths which shortened approach lengths

Bridge Site		Total Approach Length (feet)			ROW Needed (Acres)		
		SCDOT Concept	RK&K Design	Delta	SCDOT Concept	RK&K Design	Delta
1	S-294	1020	610	-410	2.034	1.236	-0.798
2	S-765	1030	475	-555	0.525	0.106	-0.419
3	S-53	1480	875	-605	1.921	1.092	-0.829
4	S-108	745	720	-25	0.547	0.061	-0.486



1.c Proposed Design Submittal Process



Proposed design submittal process – Our conceptual roadway plans are essentially at the ROW stage. With SCDOT's permission, we would propose starting roadway submittals with the ROW package. We have been successful with this approach in CLRB 2020-1 and 2021-1, and by eliminating the Preliminary Roadway Package, we could eliminate up to 20 days from the design review process. Using this process for CLRB 2020-1, we were able to complete the design process for 16 bridges in 16 months.

2 Innovation and Added Value "CONFIDENTIAL"

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Appendix A.1 - Roadway Plans



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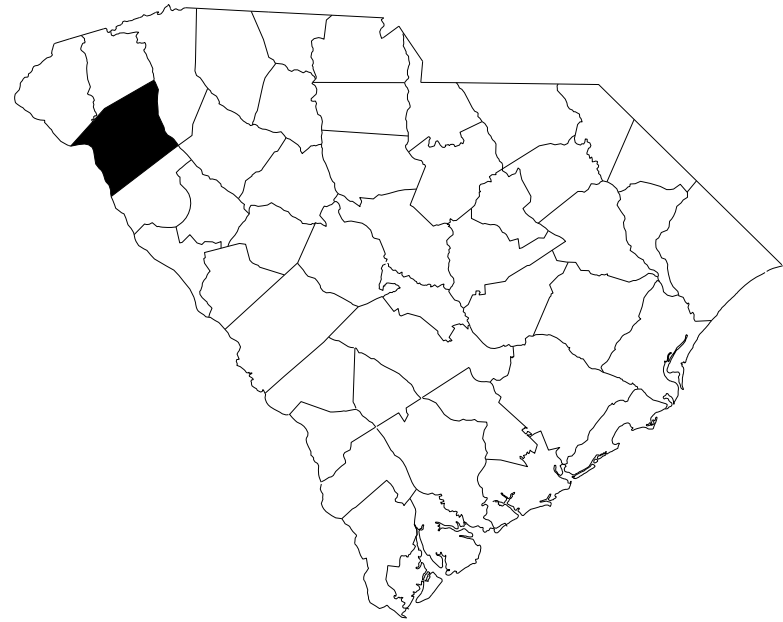
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RK&K

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SC\SCDOT\VP22-0104-CLRB DB Bridge Package I5 - Dist I_2_4\Design\Roadway\S-294\r4l156+ts.dgn
1/26/2023

INDEX OF SHEETS

<u>SHEET NO.</u>	<u>DESCRIPTION</u>	<u>SHEET SUBTOTALS</u>
1	TITLE SHEET	1
2	TYPICAL SECTIONS	1
3	PLAN AND PROFILE SHEETS	1
TOTAL SHEETS =		3



MAP SHOWING LOCATION OF
ANDERSON COUNTY IN SOUTH CAROLINA

PROJECT ID. P041156
ROAD S-294 (EAST BROAD STREET)
STA. 17+60.00 TO STA. 24+70.00
SEE SHEET 3

ENVIRONMENTAL PERMIT INFORMATION					
USACE PERMIT	___YES	___X NO			
NEPA DOCUMENT	___X YES	___NO			
401 CERTIFICATION	___YES	___X NO			
OCRM CAP	___YES	___X NO			
NAVIGABLE WATERS	___SC	___USCG	___USACE	___X N/A	

3 DAYS BEFORE DIGGING IN
SOUTH CAROLINA

CALL 811

SOUTH CAROLINA 811 (SC811)
WWW.SC811.COM

ALL UTILITIES MAY NOT BE A MEMBER OF SC811

RAILROAD INVOLVEMENT?
YES / NO

TRAFFIC DATA

2020 ADT 150

2040 ADT 219

TRUCKS 2 %



South Carolina Department of Transportation

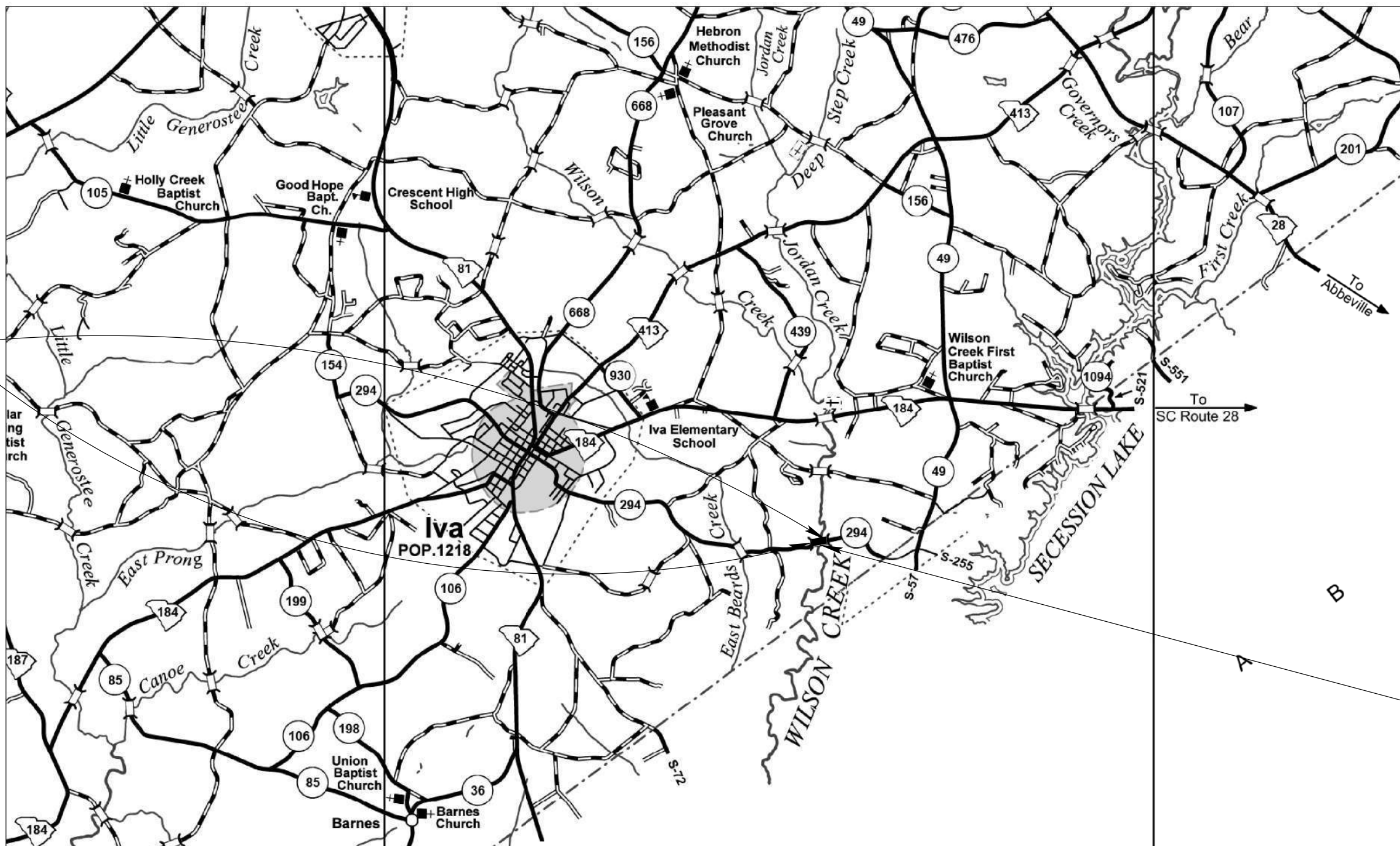


CONCEPTUAL ROADWAY PLANS FOR

ANDERSON COUNTY

PROJECT ID P041156

S-294 (EAST BROAD STREET) BRIDGE REPLACEMENT OVER WILSONS CREEK



ANDERSON COUNTY MAP

LAYOUT

SCALE = N.T.S.

NET LENGTH OF ROADWAY	0.116	MILES
NET LENGTH OF BRIDGES	0.019	MILES
NET LENGTH OF PROJECT	0.135	MILES
LENGTH OF EXCEPTIONS	0.000	MILES
GROSS LENGTH OF PROJECT	0.135	MILES

EQUALITIES IN STATIONING

NONE

NOTE: EXCEPT AS MAY OTHERWISE BE SPECIFIED ON THE PLANS OR IN THE SPECIAL PROVISIONS, ALL MATERIALS AND WORKMANSHIP ON THIS PROJECT SHALL CONFORM TO THE SOUTH CAROLINA DEPARTMENT OF TRANSPORTATION STANDARD SPECIFICATIONS FOR HIGHWAY CONSTRUCTION (2007 EDITION) AND THE STANDARD DRAWINGS FOR ROAD CONSTRUCTION IN EFFECT AT THE TIME OF FINAL RFP.

NOTE: BRIDGE PLANS BOUND UNDER SEPARATE COVER

BRIDGE No. 1

SHEET NO.	TOTAL SHEETS
1	3

Hydraulic Design Reference for these plans is the:

2009

Edition of SCDOT's "Requirements for
Hydraulic Design Studies"

Design Reference for these plans is the:

LVB

Supplemental Design Criteria For
Low Volume Bridge Replacement Projects

NPDES PERMIT INFORMATION

Disturbed Area = 0.4 Acre(s)

Project Area = 2.4 Acre(s)

Approximate Location of Roadway is

Begin

Latitude 34°17'43"N

Longitude 82°37'13"W

End

Latitude 34°17'45"N

Longitude 82°37'05"W

Hydraulic and NPDES Design
provided by:

RK&K

Designs may be obtained from the
SCDOT Regional Production Group

CONSTRUCT 100' X 33' CONCRETE BRIDGE
STA. 20+33.00 TO STA. 21+33.00
(SEE BRIDGE PLANS)

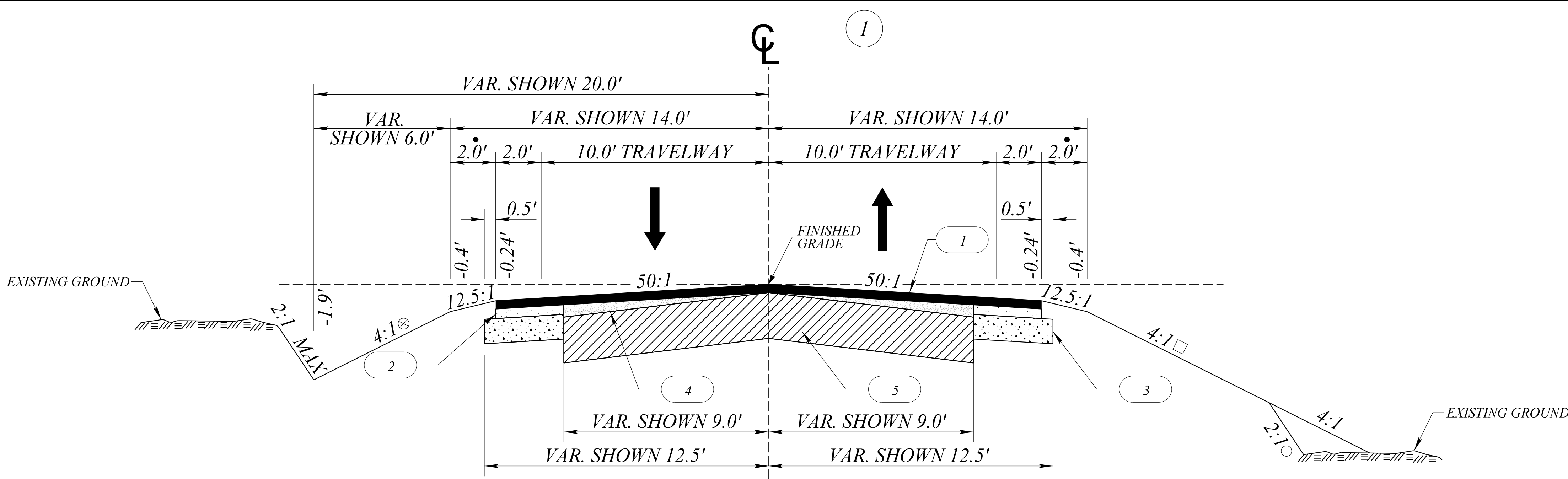
UNITED REEVES
INFRASTRUCTURE GROUP, INC. A COLAS COMPANY

RK&K

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1/26/2023

FED. ROAD DIST. NO.	STATE	COUNTY	PROJECT ID	ROUTE NO.	SHEET NO.
3	S.C.	ANDERSON	P041156	S-294	2

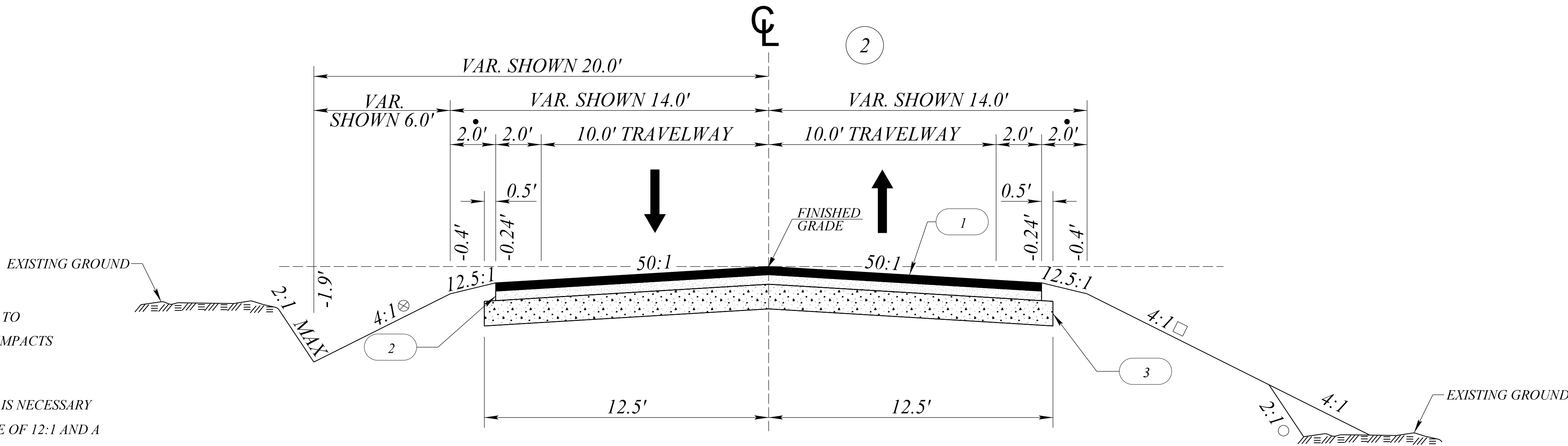
EAST BROAD STREET
BRIDGE No. 1



USE THIS SECTION ON:

S - 294 (EAST BROAD STREET) FROM STA. 17+ 60.00 TO STA. 18+ 30.63

S - 294 (EAST BROAD STREET) FROM STA. 24+ 10.20 TO STA. 24+ 70.00



USE THIS SECTION ON:

S - 294 (EAST BROAD STREET) FROM STA. 18+ 30.63 TO STA. 20+ 33.00 (BEGIN BRIDGE)

S - 294 (EAST BROAD STREET) FROM STA. 21+ 33.00 (END BRIDGE) TO STA. 24+ 10.20

FILL SLOPES

4:1 ----- IF FILL HEIGHT IS OVER 5'

2:1 ----- IF FILL HEIGHT IS UNDER 5'

- SLOPE MAY BE HINGED BEYOND CLEARZONE LIMITS TO MINIMIZE RIGHT-OF-WAY AND LAND DISTURBANCE IMPACTS

NOTE:

THIS SLOPE MAY BE VARIED WHEN A DEEPER DITCH IS NECESSARY FOR DRAINAGE PURPOSES, USING A MINIMUM SLOPE OF 12:1 AND A MAXIMUM SLOPE OF 2:1.

- ADDITIONAL 3.75' WHERE GUARDRAIL IS USED.

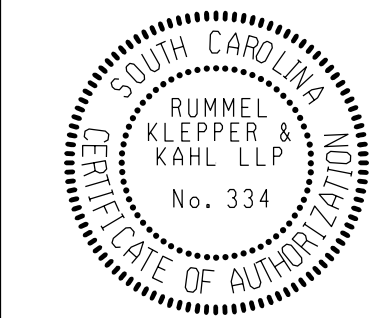
NOTE: IN AREAS WHERE EXISTING PAVEMENTS ARE WIDENED OUTSIDE THE TRAVEL LANES USE 400 PSY OF SHOULDER WIDENING MATERIAL AND OVERLAY WITH 150 PSY SURFACE COURSE TYPE C

NOTE: PAVEMENT DESIGN PROVIDED IN FINAL RFP PER SCDOT

LEGEND

1		HOT MIX ASPHALT SURFACE COURSE TYPE C (150 LBS/SY)
2		HOT MIX ASPHALT SURFACE COURSE TYPE C (175 LBS/SY)* * HOT MIX ASPHALT INTERMEDIATE TYPE B OR C (200 LBS/SY) CAN BE SUBSTITUTED
3		HOT MIX ASPHALT BASE COURSE TYPE A (450 LBS/SY)
4		HOT MIX ASPHALT SURFACE TYPE E FOR BUILDUP AND LEVELING 0" TO 1.5" ** ** HOT MIX ASPHALT INTERMEDIATE TYPE C OR SURFACE TYPE C FOR BUILDUP AND LEVELING FOR GREATER THICKNESSES
5		EXISTING PAVEMENT - RETAIN

FUNCTIONAL CLASS	DESIGN SPEED		
	MPH	FROM STA.	TO STA.
RURAL MAJOR COLLECTOR	35	17+ 60.00	24+ 70.00



CONCEPTUAL PLANS

TYPICAL SECTION
SHEET

SCALE 1"=V= NTS SCALE 1"=H= NTS

UTILITY OWNERS

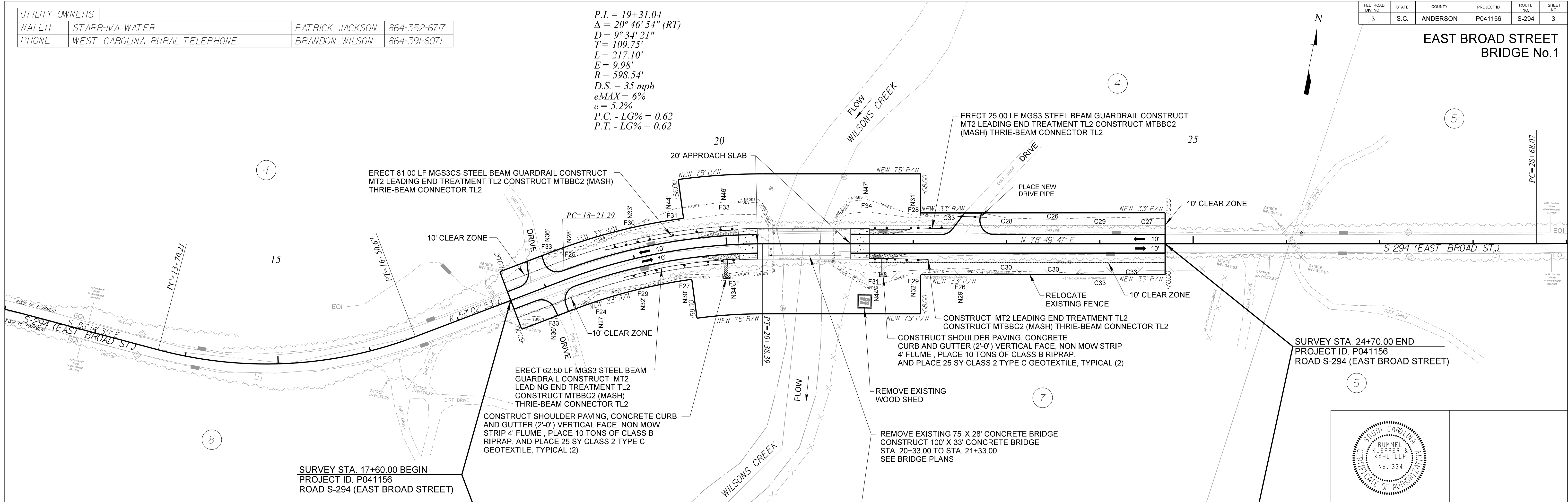
WATER	STARR-IVA WATER	PATRICK JACKSON	864-352-6717
PHONE	WEST CAROLINA RURAL TELEPHONE	BRANDON WILSON	864-391-6071

$P.I. = 19+31.04$
 $\Delta = 20^{\circ}46'54''$ (RT)
 $D = 9^{\circ}34'21''$
 $T = 109.75'$
 $L = 217.10'$
 $E = 9.98'$
 $R = 598.54'$
 $D.S. = 35$ mph
 $eMAX = 6\%$
 $e = 5.2\%$
 $P.C. - LG\% = 0.62$
 $P.T. - LG\% = 0.62$

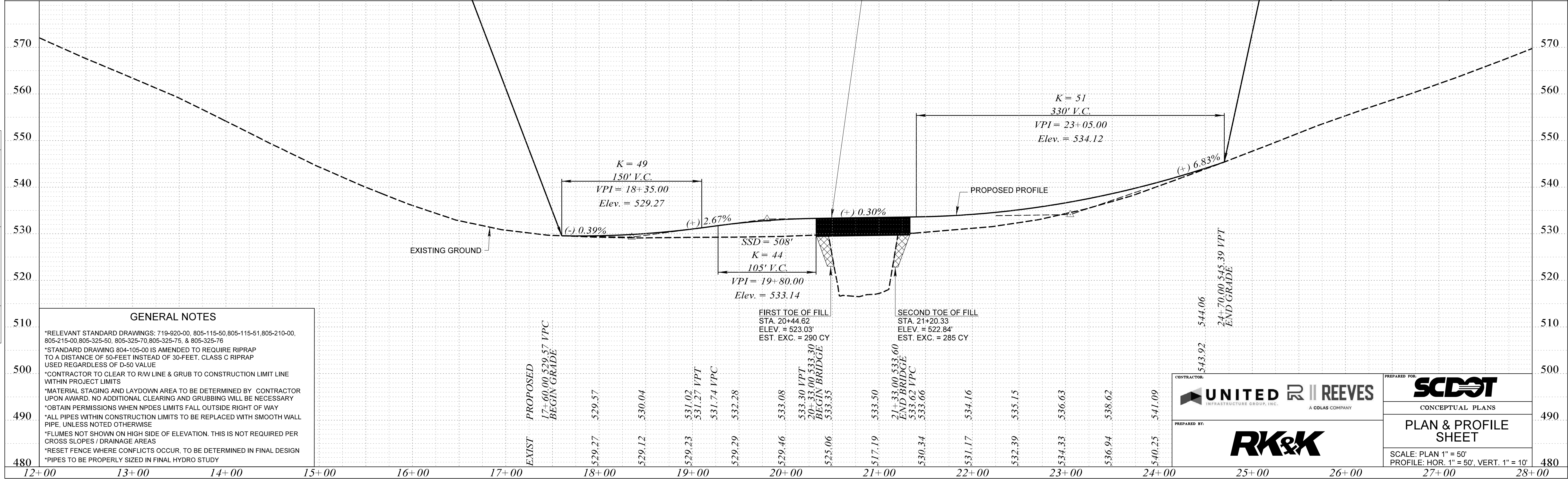
FED. ROAD DIST. NO.	STATE	COUNTY	PROJECT ID	ROUTE NO.	SHEET NO.
3	S.C.	ANDERSON	P041156	S-294	3

EAST BROAD STREET
BRIDGE No.1

PLAN	DATE	BY	DATE	BY
NOTE BOOK				
No.				



PLAN	DATE	BY	DATE	BY
NOTE BOOK				
No.				



GENERAL NOTES

- *RELEVANT STANDARD DRAWINGS: 719-920-00, 805-115-50, 805-115-51, 805-210-00, 805-215-00, 805-325-50, 805-325-70, 805-325-75, & 805-325-76
- *STANDARD DRAWING 804-105-00 IS AMENDED TO REQUIRE RIPRAP TO A DISTANCE OF 50-FEET INSTEAD OF 30-FEET, CLASS C RIPRAP USED REGARDLESS OF D-50 VALUE
- *CONTRACTOR TO CLEAR TO R/W LINE & GRUB TO CONSTRUCTION LIMIT LINE WITHIN PROJECT LIMITS
- *MATERIAL STAGING AND LAYDOWN AREA TO BE DETERMINED BY CONTRACTOR UPON AWARD. NO ADDITIONAL CLEARING AND GRUBBING WILL BE NECESSARY
- *OBTAIN PERMISSIONS WHEN NPDES LIMITS FALL OUTSIDE RIGHT OF WAY
- *ALL PIPES WITHIN CONSTRUCTION LIMITS TO BE REPLACED WITH SMOOTH WALL PIPE, UNLESS NOTED OTHERWISE
- *FLUMES NOT SHOWN ON HIGH SIDE OF ELEVATION. THIS IS NOT REQUIRED PER CROSS SLOPES / DRAINAGE AREAS
- *RESET FENCE WHERE CONFLICTS OCCUR, TO BE DETERMINED IN FINAL DESIGN
- *PIPES TO BE PROPERLY SIZED IN FINAL HYDRO STUDY

CONTRACTOR:
UNITED REEVES
INFRASTRUCTURE GROUP, INC.
A COLAS COMPANY

PREPARED BY:
RK&K

PREPARED FOR:
SCDOT
CONCEPTUAL PLANS

PLAN & PROFILE SHEET

SCALE: PLAN 1" = 50'
PROFILE: HOR. 1" = 50', VERT. 1" = 10'

<u>SHEET NO.</u>	<u>DESCRIPTION</u>	<u>SHEET SUBTOTALS</u>
1	TITLE SHEET	1
2	TYPICAL SECTIONS	1
3	PLAN AND PROFILE SHEETS	1
TOTAL SHEETS =		3



END
BEGIN

ENVIRONMENTAL PERMIT INFORMATION

CALL 811

ALL UTILITIES MAY NOT BE A MEMBER OF SC811

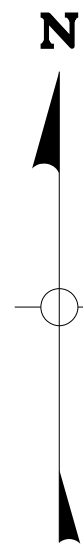
TRAFFIC DATA

2020 ADT 256

TRUCKS 5 %



BRIDGE REPLACEMENT OVER HANGING ROCK CREEK



LANCASTER COUNTY MAP

SCALE = N.T.S.

EQUALITIES IN STATIONING

NOTE: EXCEPT AS MAY OTHERWISE BE SPECIFIED ON THE PLANS OR IN THE SPECIAL PROVISIONS, ALL MATERIALS AND WORKMANSHIP ON THIS PROJECT SHALL CONFORM TO THE SOUTH CAROLINA DEPARTMENT OF TRANSPORTATION STANDARD SPECIFICATIONS FOR HIGHWAY CONSTRUCTION (2007 EDITION) AND THE STANDARD DRAWINGS FOR ROAD CONSTRUCTION IN EFFECT AT THE TIME OF FINAL RFP.

NOTE: BRIDGE PLANS BOUND UNDER SEPARATE COVER

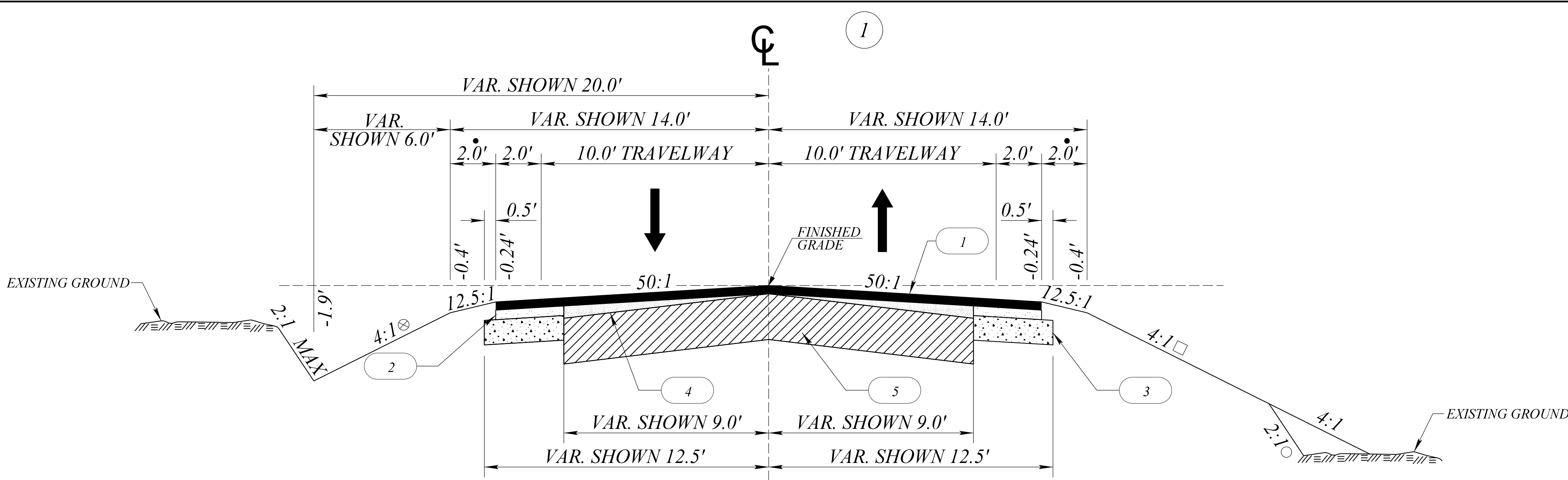
Designs may be obtained from the
SCDOT Regional Production Group

CONSTRUCT 130' X 30' CONCRETE BRIDGE
STA. 33+73.00 TO STA. 35+03.00
(SEE BRIDGE PLANS)

2:\SC\SCDOT\1\p22-0104_CLRB DB Bridge Package 15 - Dist+ 1.2.4\Design\Roadway\S-765\1r4154typ.dgn
1/26/2023
zwilson

FED. ROAD DIST. NO.	STATE	COUNTY	PROJECT ID	ROUTE NO.	SHEET NO.
3	S.C.	LANCASTER	P041154	S-765	2

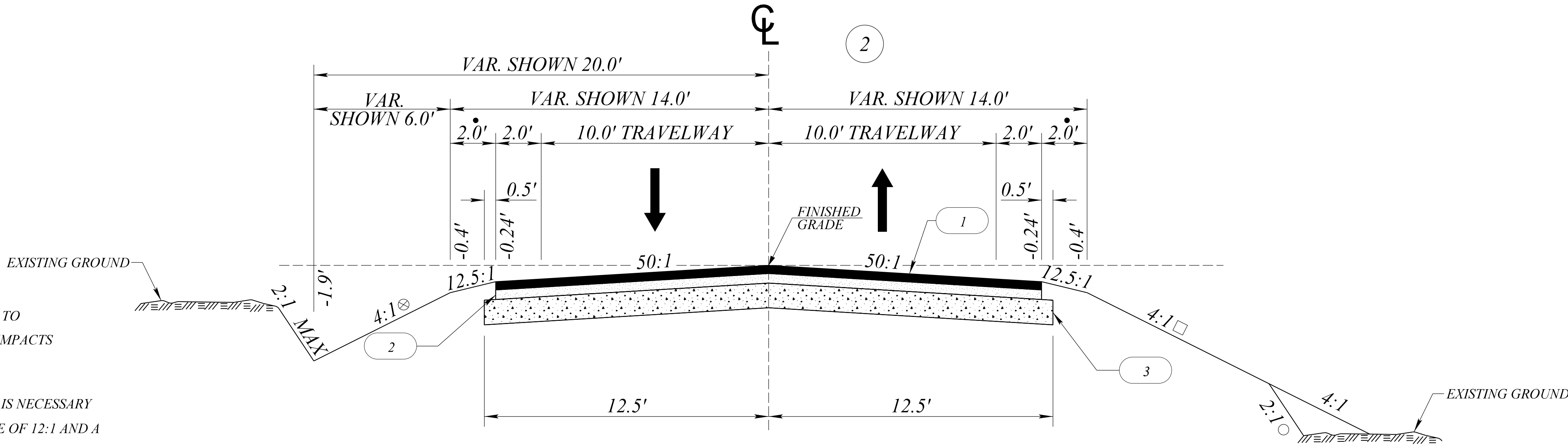
HANGING ROCK CHURCH ROAD
BRIDGE No. 2



USE THIS SECTION ON:

S - 765 (HANGING ROCK CHURCH ROAD) FROM STA. 32+40.00 TO STA. 33+33.54

S - 765 (HANGING ROCK CHURCH ROAD) FROM STA. 36+49.25 TO STA. 37+40.00



USE THIS SECTION ON:

S - 765 (HANGING ROCK CHURCH ROAD) FROM STA. 33+33.54 TO STA. 33+73.00 (BEGIN BRIDGE)

S - 765 (HANGING ROCK CHURCH ROAD) FROM STA. 35+03.00 (END BRIDGE) TO STA. 36+49.25

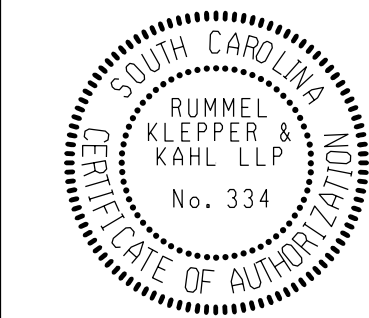
- FILL SLOPES
4:1 ----- IF FILL HEIGHT IS OVER 5'
2:1 ----- IF FILL HEIGHT IS UNDER 5'
- SLOPE MAY BE HINGED BEYOND CLEARZONE LIMITS TO MINIMIZE RIGHT-OF-WAY AND LAND DISTURBANCE IMPACTS
- ⊗ NOTE:
THIS SLOPE MAY BE VARIED WHEN A DEEPER DITCH IS NECESSARY FOR DRAINAGE PURPOSES, USING A MINIMUM SLOPE OF 12:1 AND A MAXIMUM SLOPE OF 2:1.

- ADDITIONAL 3.75' WHERE GUARDRAIL IS USED.
- NOTE: IN AREAS WHERE EXISTING PAVEMENTS ARE WIDENED OUTSIDE THE TRAVEL LANES USE 400 PSY OF SHOULDER WIDENING MATERIAL AND OVERLAY WITH 150 PSY SURFACE COURSE TYPE C
- NOTE: PAVEMENT DESIGN PROVIDED IN FINAL RFP PER SCDOT

LEGEND

1		HOT MIX ASPHALT SURFACE COURSE TYPE C (150 LBS/SY)
2		HOT MIX ASPHALT SURFACE COURSE TYPE C (175 LBS/SY)* * HOT MIX ASPHALT INTERMEDIATE TYPE B OR C (200 LBS/SY) CAN BE SUBSTITUTED
3		HOT MIX ASPHALT BASE COURSE TYPE A (450 LBS/SY)
4		HOT MIX ASPHALT SURFACE TYPE E FOR BUILDUP AND LEVELING 0" TO 1.5" ** ** HOT MIX ASPHALT INTERMEDIATE TYPE C OR SURFACE TYPE C FOR BUILDUP AND LEVELING FOR GREATER THICKNESSES
5		EXISTING PAVEMENT - RETAIN

FUNCTIONAL CLASS	DESIGN SPEED		
	MPH	FROM STA.	TO STA.
RURAL LOCAL GROUP 4	40	32+40.00	37+40.00

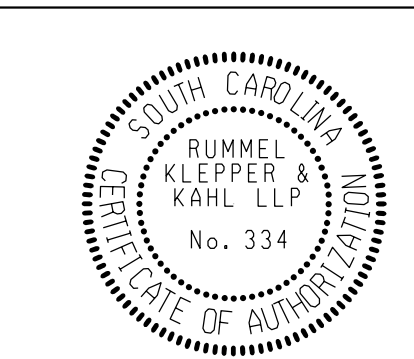



CONTRACTOR:	PREPARED BY:
PREPARED FOR:	CONCEPTUAL PLANS
	TYPICAL SECTION SHEET
SCALE 1"=V= NTS	SCALE 1"=H= NTS

FED. ROAD DIV. NO.	STATE	COUNTY	PROJECT ID	ROUTE NO.	SHEET NO.
3	S.C.	LANCASTER	P041154	S-765	3

$P.I. = 42 + 94.52$
 $\Delta = 39^\circ 52' 47'' (LT)$
 $D = 6^\circ 00' 00''$
 $T = 346.43'$
 $L = 664.66'$
 $E = 60.90'$
 $R = 954.93'$

$P.I. = 42 + 94.52$
 $\Delta = 39^\circ 52' 47'' (LT)$
 $D = 6^\circ 00' 00''$
 $T = 346.43'$
 $L = 664.66'$
 $E = 60.90'$
 $R = 954.93'$



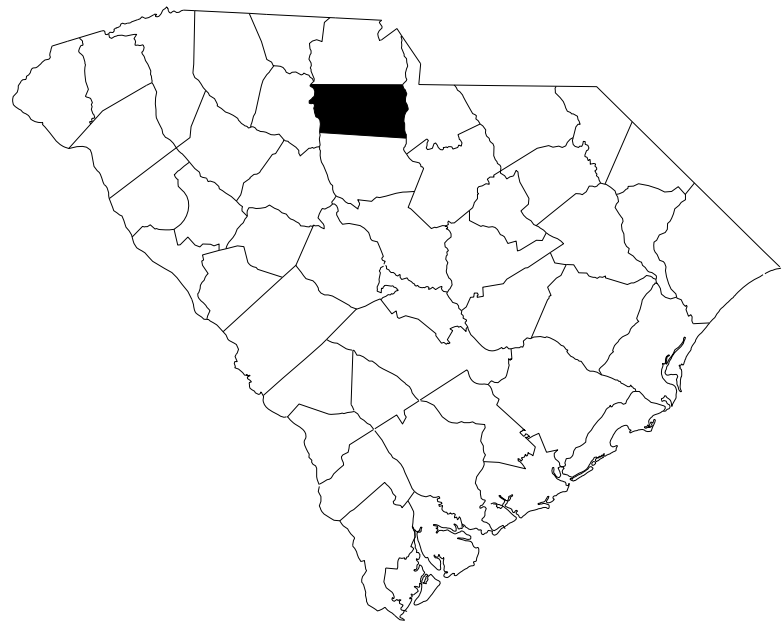
PREPARED FOR:		
CONCEPTUAL PLANS		330
PLAN & PROFILE SHEET		
SCALE: PLAN 1" = 50'		
PROFILE: HOR. 1" = 50', VERT. 1" = 10'		320
41+00	42+00	

engpro.dan

z:\wilson
SCDOT\NP22-0104-CLRB DB Bridge Package I5 - Dist L2_4\Design\Roadway\S-53\141153\ts.dgn
1/26/2023

INDEX OF SHEETS

SHEET NO.	DESCRIPTION	SHEET SUBTOTALS
1	TITLE SHEET	1
2	TYPICAL SECTIONS	1
3	PLAN AND PROFILE SHEETS	1
TOTAL SHEETS =		3



MAP SHOWING LOCATION OF
CHESTER COUNTY IN SOUTH CAROLINA

PROJECT ID. P041153
ROAD S-53 (ROSS DYE ROAD)
STA. 26+60.00 TO STA. 38+60.00
SEE SHEET 3

ENVIRONMENTAL PERMIT INFORMATION

USACE PERMIT	<input type="checkbox"/> YES	<input checked="" type="checkbox"/> NO
NEPA DOCUMENT	<input checked="" type="checkbox"/> YES	<input type="checkbox"/> NO
401 CERTIFICATION	<input type="checkbox"/> YES	<input checked="" type="checkbox"/> NO
OCRM CAP	<input type="checkbox"/> YES	<input checked="" type="checkbox"/> NO
NAVIGABLE WATERS	<input type="checkbox"/> SC <input type="checkbox"/> USCG <input type="checkbox"/> USACE	<input checked="" type="checkbox"/> N/A

3 DAYS BEFORE DIGGING IN
SOUTH CAROLINA

CALL 811

SOUTH CAROLINA 811 (SC811)
WWW.SC811.COM
ALL UTILITIES MAY NOT BE A MEMBER OF SC811

RAILROAD INVOLVEMENT?
YES / NO

TRAFFIC DATA

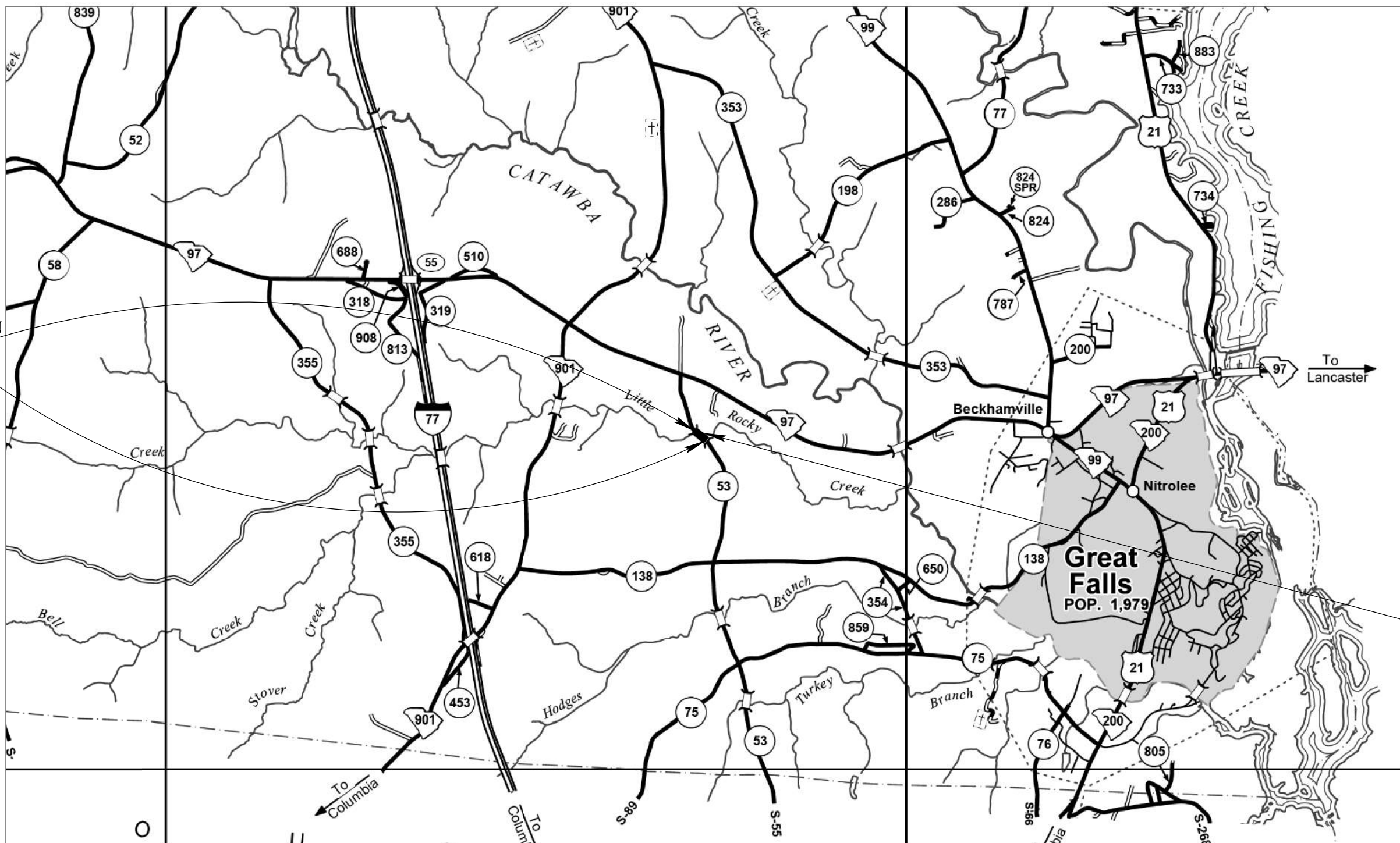
2021 ADT 550
2041 ADT 803
TRUCKS 9 %



South Carolina Department of Transportation



CONCEPTUAL ROADWAY PLANS
FOR
CHESTER COUNTY
PROJECT ID P041153
S-53 (ROSS DYE ROAD)
BRIDGE REPLACEMENT OVER LITTLE ROCKY CREEK



CHESTER COUNTY MAP

LAYOUT

SCALE = N.T.S.

NET LENGTH OF ROADWAY	0.166	MILES
NET LENGTH OF BRIDGES	0.061	MILES
NET LENGTH OF PROJECT	0.227	MILES
LENGTH OF EXCEPTIONS	0.000	MILES
GROSS LENGTH OF PROJECT	0.227	MILES

EQUALITIES IN STATIONING

NONE

NOTE: EXCEPT AS MAY OTHERWISE BE SPECIFIED ON THE PLANS OR IN THE SPECIAL PROVISIONS, ALL MATERIALS AND WORKMANSHIP ON THIS PROJECT SHALL CONFORM TO THE SOUTH CAROLINA DEPARTMENT OF TRANSPORTATION STANDARD SPECIFICATIONS FOR HIGHWAY CONSTRUCTION (2007 EDITION) AND THE STANDARD DRAWINGS FOR ROAD CONSTRUCTION IN EFFECT AT THE TIME OF FINAL RFP.

NOTE: BRIDGE PLANS BOUND UNDER SEPARATE COVER

BRIDGE No. 3

SHEET NO.	TOTAL SHEETS
1	3

Hydraulic Design Reference for these plans is the:

2009

Edition of SCDOT's "Requirements for
Hydraulic Design Studies"

NPDES PERMIT INFORMATION

Disturbed Area = 1.2 Acre(s)

Project Area = 3.2 Acre(s)

Approximate Location of Roadway is

Begin

Latitude 34°35'27"N

Longitude 80°58'31"W

End

Latitude 34°35'57"N

Longitude 80°58'21"W

Hydraulic and NPDES Design
provided by:

RK&K

Designs may be obtained from the
SCDOT Regional Production Group

UNITED REEVES
INFRASTRUCTURE GROUP, INC. A COLAS COMPANY



PLAN	NOTE BOOK	No.	DATE	BY	SUPERSEDED	NOTED	ALIGNMENT CHECKED	RT. OF WAY CHECKED

P.I. = 26+23.60
 $\Delta = 35^{\circ}02'22''$ (LT)
 $D = 7^{\circ}03'57''$
 $T = 255.97'$
 $L = 495.89'$
 $E = 39.44'$
 $R = 810.87'$
 $D.S. = 45$ mph
 $eMAX = 6\%$
 $e = 5.8\%$
 $P.C. - LG\% = 0.54$
 $P.T. - LG\% = 0.54$

SURVEY STA. 26+60.00 BEGIN
PROJECT ID. P041153
ROAD S-53 (ROSS DYE ROAD)

UTILITY OWNERS			
GAS	CHESTER COUNTY NATURAL GAS	JASON STEWART	803-385-3157
TELCOM	CHESTER TELEPHONE (TRUVISTA)	JAMIE MILLIS	803-581-9130
ELECTRIC	FAIRFIELD ELECTRIC COOPERATIVE	BRUCE BACON	803-691-3605

ERECT 262.50 LF MGS3 STEEL BEAM GUARDRAIL
CONSTRUCT MT2 LEADING END TREATMENT TL2
CONSTRUCT MTBBC2 (MASH) THRIE-BEAM CONNECTOR TL2

BEGIN ASPHALT
STA. 26+90.00

20' CLEAR ZONE

ERECT 234.00 LF MGS3CS STEEL BEAM
GUARDRAIL CONSTRUCT MT2 LEADING
END TREATMENT TL2 CONSTRUCT
MTBBC2 (MASH) THRIE-BEAM CONNECTOR TL2

20' CLEAR ZONE

1

30

15

CONSTRUCT SHOULDER PAVING, CONCRETE
CURB AND GUTTER (2'-0") VERTICAL FACE, NON MOW STRIP
4' FLUME, PLACE 10 TONS OF CLASS B RIPRAP,
AND PLACE 25 SY CLASS 2 TYPE C GEOTEXTILE, TYPICAL (2)

TIE EQUALITY:
P.O.T. STA. 32+62.24 S-53 (ROSS DYE RD.)
P.O.T. STA. 17+21.57 LITTLE ROCKY CREEK

20' APPROACH SLAB

NEW 75' R/W

NEW 75' R/W

NEW 40' R/W

NEW 40' R/W

NEW 75' R/W

NEW 75' R/W

NEW 75' R/W

NEW 75' R/W

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NEW 75' R/W

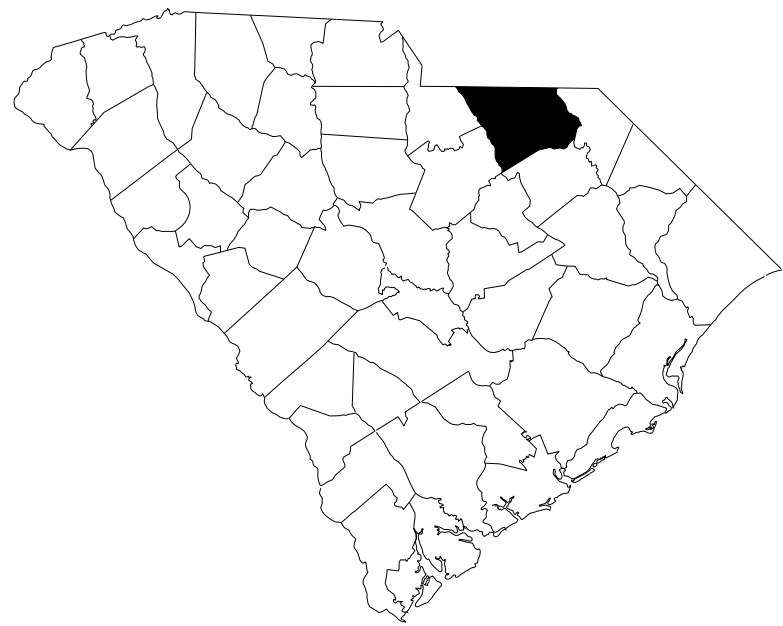
NEW 75' R/W

NEW 75' R/W</

z:\wilson
1/26/2023
\\SC\SCDOT\p22-0104-CLRB DB Bridge Package\5 - Dist L2.4\Design\Roadway\S-108\4181t.s.dgn

INDEX OF SHEETS

SHEET NO.	DESCRIPTION	SHEET SUBTOTALS
1	TITLE SHEET	1
2	TYPICAL SECTIONS	1
3	PLAN AND PROFILE SHEETS	1
TOTAL SHEETS =		3



MAP SHOWING LOCATION OF
CHESTERFIELD COUNTY IN SOUTH CAROLINA

PROJECT ID: P041181
ROAD S-108 (OUTEN STREET)
STA. 113+35.00 TO STA. 121+35.00
SEE SHEET 3

ENVIRONMENTAL PERMIT INFORMATION

USACE PERMIT	___YES	<u>X</u> NO
NEPA DOCUMENT	<u>X</u> YES	___NO
401 CERTIFICATION	___YES	<u>X</u> NO
OCRM CAP	___YES	<u>X</u> NO
NAVIGABLE WATERS	___SC ___USCG	___USACE <u>X</u> N/A

3 DAYS BEFORE DIGGING IN
SOUTH CAROLINA

CALL 811

SOUTH CAROLINA 811 (SC811)
WWW.SC811.COM
ALL UTILITIES MAY NOT BE A MEMBER OF SC811

RAILROAD INVOLVEMENT?
YES / NO

TRAFFIC DATA

2020 ADT 75
2040 ADT 115
TRUCKS 5 %



South Carolina Department of Transportation



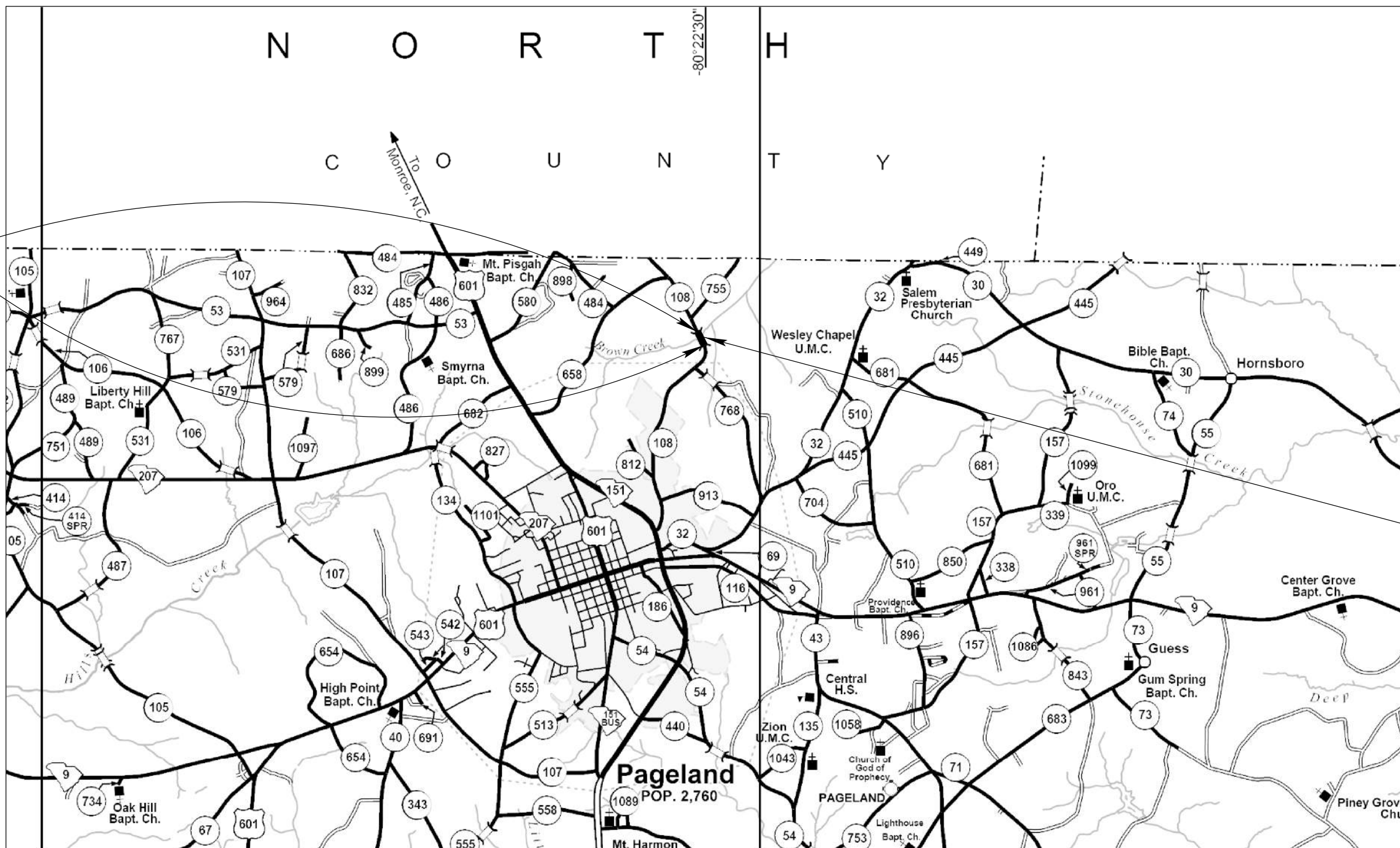
CONCEPTUAL ROADWAY PLANS
FOR

CHESTERFIELD COUNTY

PROJECT ID P041181

S-108 (OUTEN STREET)

BRIDGE REPLACEMENT OVER BROWN CREEK



CHESTERFIELD COUNTY MAP

LAYOUT

SCALE = N.T.S.

NET LENGTH OF ROADWAY	0.136	MILES
NET LENGTH OF BRIDGES	0.015	MILES
NET LENGTH OF PROJECT	0.151	MILES
LENGTH OF EXCEPTIONS	0.000	MILES
GROSS LENGTH OF PROJECT	0.151	MILES

EQUALITIES IN STATIONING

NONE

NOTE: EXCEPT AS MAY OTHERWISE BE SPECIFIED ON THE PLANS OR IN THE SPECIAL PROVISIONS, ALL MATERIALS AND WORKMANSHIP ON THIS PROJECT SHALL CONFORM TO THE SOUTH CAROLINA DEPARTMENT OF TRANSPORTATION STANDARD SPECIFICATIONS FOR HIGHWAY CONSTRUCTION (2007 EDITION) AND THE STANDARD DRAWINGS FOR ROAD CONSTRUCTION IN EFFECT AT THE TIME OF FINAL RFP.

NOTE: BRIDGE PLANS BOUND UNDER SEPARATE COVER

BRIDGE No. 4

SHEET NO.	TOTAL SHEETS
1	3

Hydraulic Design Reference for these plans is the:

2009

Edition of SCDOT's "Requirements for
Hydraulic Design Studies"

Design Reference for these plans is the:

LVB

Supplemental Design Criteria For
Low Volume Bridge Replacement Projects

NPDES PERMIT INFORMATION

Disturbed Area = 0.8 Acre(s)

Project Area = 2.8 Acre(s)

Approximate Location of Roadway is

Begin

Latitude 34°48'10"N

Longitude 80°22'30"W

End

Latitude 34°48'17"N

Longitude 80°22'34"W

Hydraulic and NPDES Design
provided by:

RK&K

Designs may be obtained from the
SCDOT Regional Production Group

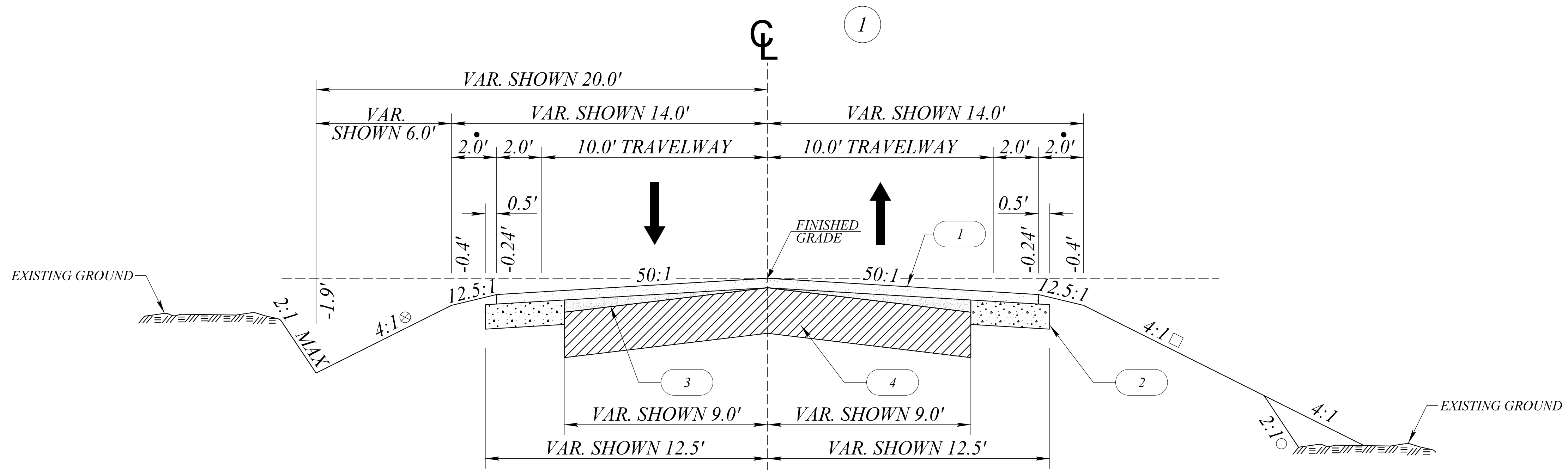
CONSTRUCT 80' X 30' CONCRETE BRIDGE
STA. 117+70.00 TO STA. 118+50.00
(SEE BRIDGE PLANS)

UNITED REEVES
INFRASTRUCTURE GROUP, INC. A COLAS COMPANY

RK&K

FED. ROAD DIV. NO.	STATE	COUNTY	PROJECT ID	ROUTE NO.	SHEET NO.
3	S.C.	CHESTERFIELD	P041181	S-108	2

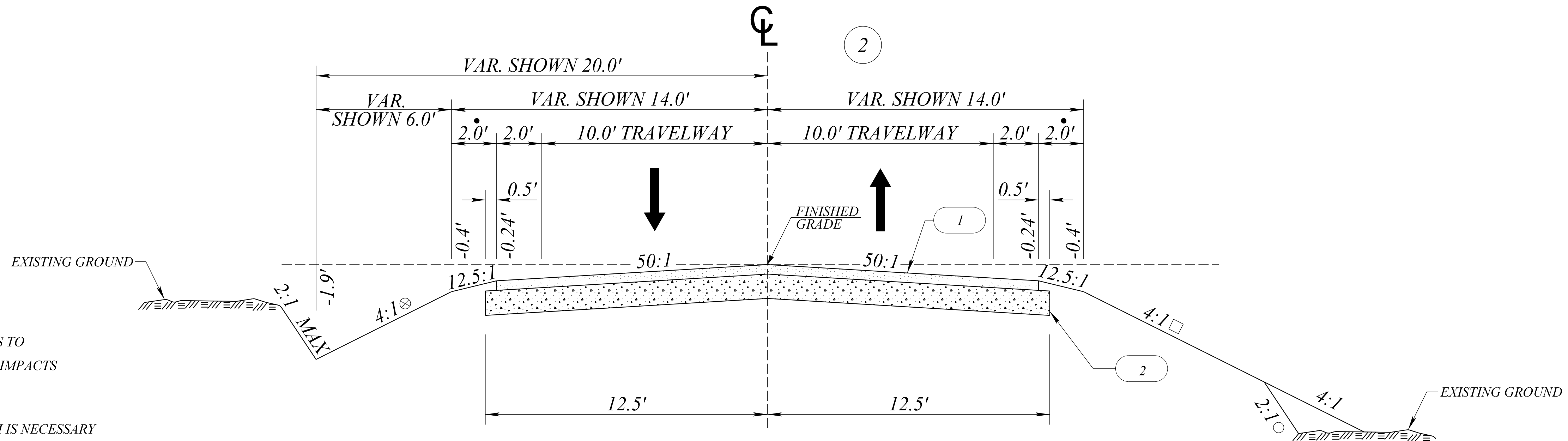
OUTEN STREET
BRIDGE No. 4



USE THIS SECTION ON:

S - 108 (OUTEN STREET) FROM STA. 113+90.00 TO STA. 114+94.35

S - 108 (OUTEN STREET) FROM STA. 120+51.23 TO STA. 121+35.00



USE THIS SECTION ON:





S - 108 (OUTEN STREET) FROM STA. 114+94.35 TO STA. 117+70.00 (BEGIN BRIDGE)

S - 108 (OUTEN STREET) FROM STA. 118+50.00 (END BRIDGE) TO STA. 120+51.23

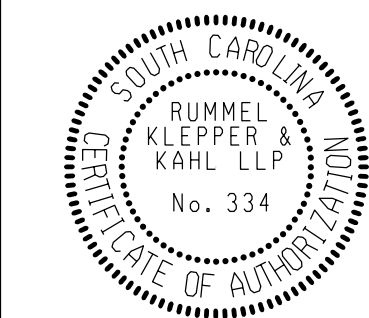
- ☐ **FILL SLOPES** EXISTING GROUND
 4:1 ----- IF FILL HEIGHT IS OVER 5'
 2:1 ----- IF FILL HEIGHT IS UNDER 5'
- ☐ **SLOPE MAY BE HINGED BEYOND CLEARZONE LIMITS TO MINIMIZE RIGHT-OF-WAY AND LAND DISTURBANCE IMPACTS**
- ☒ **NOTE:**
 THIS SLOPE MAY BE VARIED WHEN A DEEPER DITCH IS NECESSARY FOR DRAINAGE PURPOSES, USING A MINIMUM SLOPE OF 12:1 AND A MAXIMUM SLOPE OF 2:1.

- NOTE: PAVEMENT DESIGN PROVIDED IN FINAL RFP PER SCDOT

LEGEND

- | | | |
|---|-------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1 |  | <i>HOT MIX ASPHALT SURFACE COURSE TYPE C (175 LBS/SY)</i> |
| 2 |  | <i>HOT MIX ASPHALT BASE COURSE TYPE A (450 LBS/SY)</i> |
| 3 |  | <i>HOT MIX ASPHALT SURFACE TYPE E FOR BUILDUP AND LEVELING 0" TO 1.5" **</i>
<i>** HOT MIX ASPHALT INTERMEDIATE TYPE C OR SURFACE TYPE C FOR BUILDUP AND LEVELING FOR GREATER THICKNESSES</i> |
| 4 |  | <i>EXISTING PAVEMENT - RETAIN</i> |

FUNCTIONAL CLASS	DESIGN SPEED		
	MPH	FROM STA.	TO STA.
RURAL LOCAL GROUP 4	45	113+ 90.00	121+ 35.00



TYPICAL SECTION SHEET

SCALE 1"V= NTS SCALE 1"H= NTS

Appendix A.2 - Bridge Plans



UNITED
INFRASTRUCTURE GROUP, INC.



REEVES

A COLAS COMPANY

RK&K

INDEX OF SHEETS

- 1. Title Sheet
- 2. Bridge Plan and Profile
- 3. End Bents 1 & 2
- 4. Superstructure Typical Section



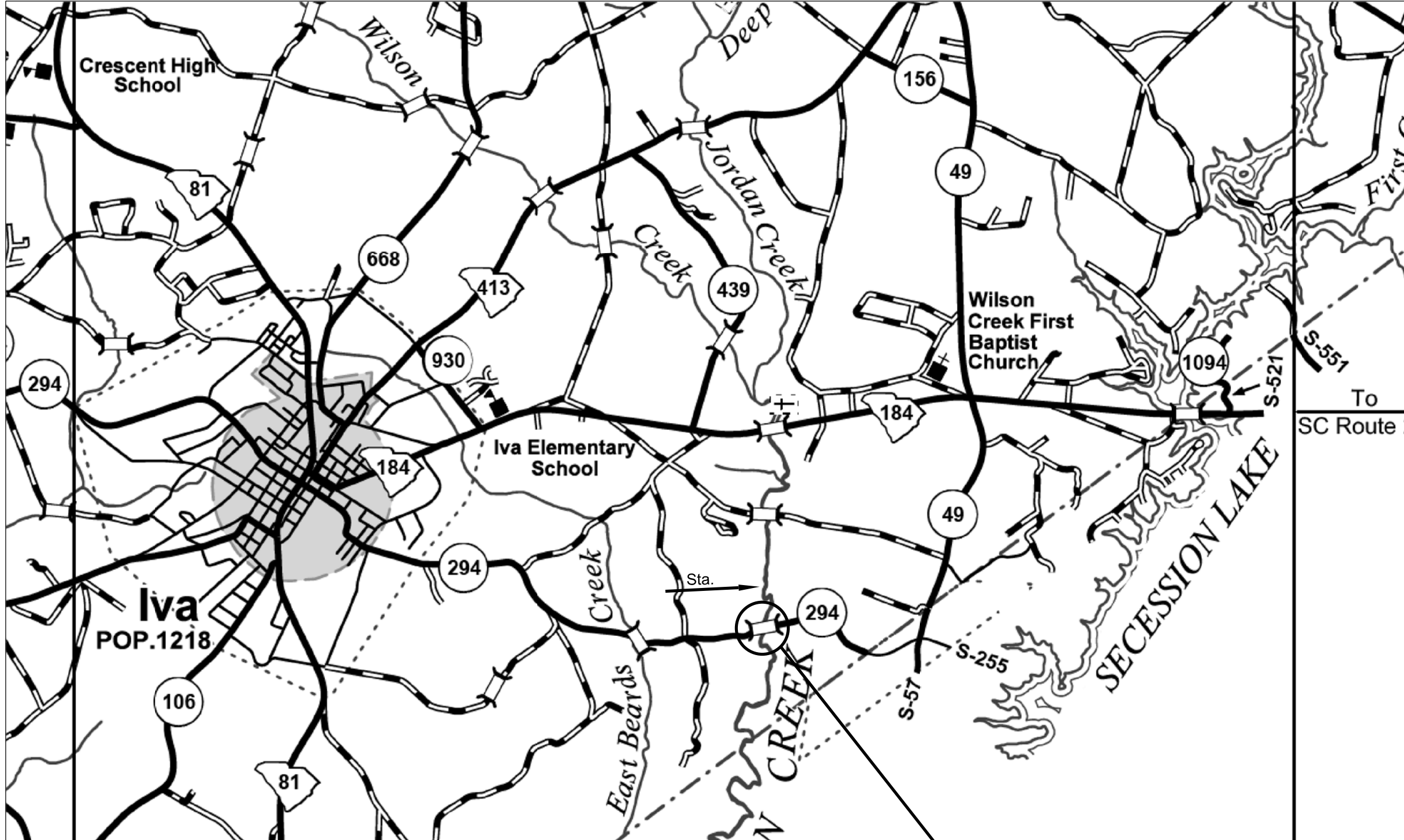
EAST BROAD STREET
BRIDGE NO. 1

CONCEPTUAL BRIDGE PLANS
FOR
ANDERSON COUNTY
PROJECT ID P041156
STATE ROUTE S-294 (EAST BROAD STREET)
REPLACE BRIDGE OVER WILSONS CREEK

Design Reference for these plans is the:

LVB

Supplemental Design Criteria For
Low Volume Bridge Replacement Projects



Approximate Location of Bridge is
Latitude 34° - 17' - 44" N
Longitude 82° - 37' - 09" W

3 DAYS BEFORE DIGGING IN
SOUTH CAROLINA
CALL 811
SOUTH CAROLINA 811 (SC811)
WWW.SC811.COM
ALL UTILITIES MAY NOT BE A MEMBER OF SC811

ASSET ID NOT ASSIGNED

TRAFFIC DATA

2020 ADT 150 V.P.D.
2040 ADT 219 V.P.D.
TRUCKS 2 %

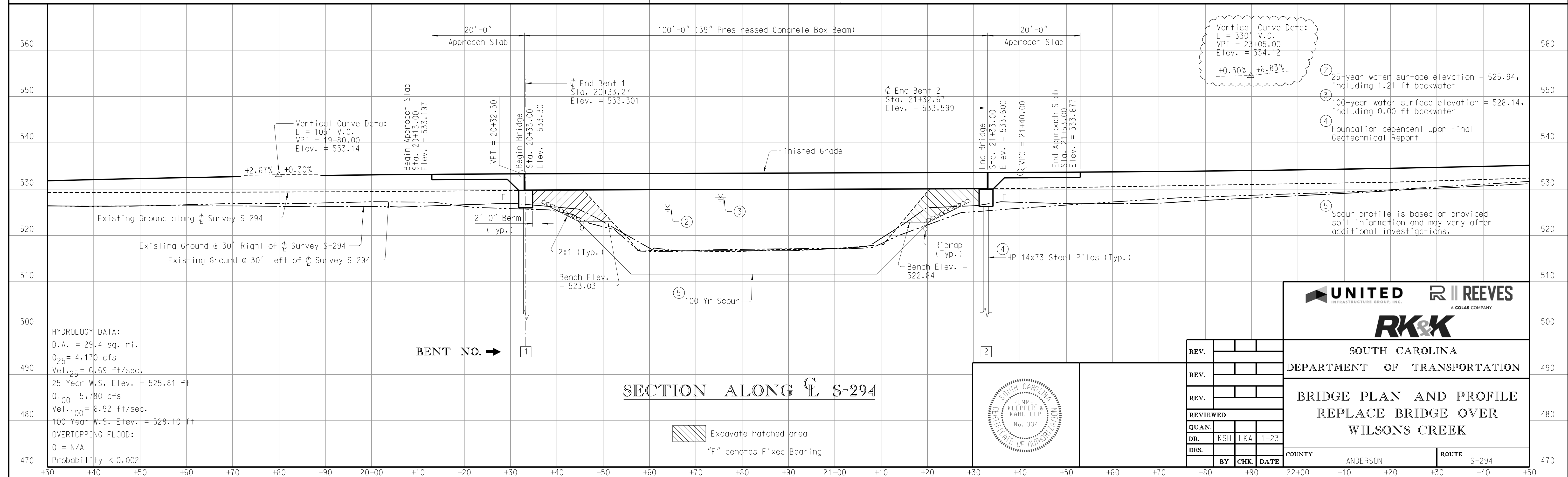
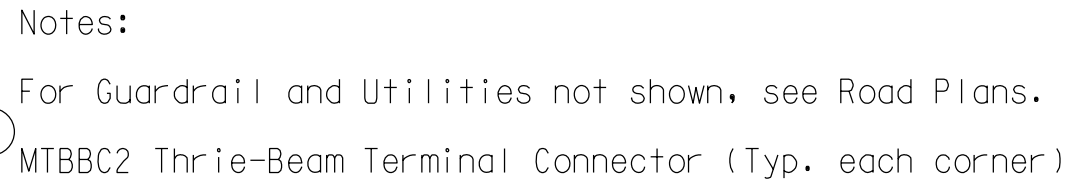
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NET LENGTH OF BRIDGES	0.018	MILES
NET LENGTH OF PROJECT	0.018	MILES
LENGTH OF EXCEPTIONS	0.000	MILES
GROSS LENGTH OF PROJECT	0.018	MILES

NOTE: EXCEPT AS MAY OTHERWISE BE SPECIFIED ON THE PLANS OR IN THE SPECIAL PROVISIONS, ALL MATERIALS AND WORKMANSHIP ON THIS PROJECT SHALL CONFORM TO THE SOUTH CAROLINA DEPARTMENT OF TRANSPORTATION STANDARD SPECIFICATIONS FOR HIGHWAY CONSTRUCTION (2007 EDITION) AND THE STANDARD DRAWINGS FOR ROAD CONSTRUCTION IN EFFECT AT THE TIME OF FINAL RFP.

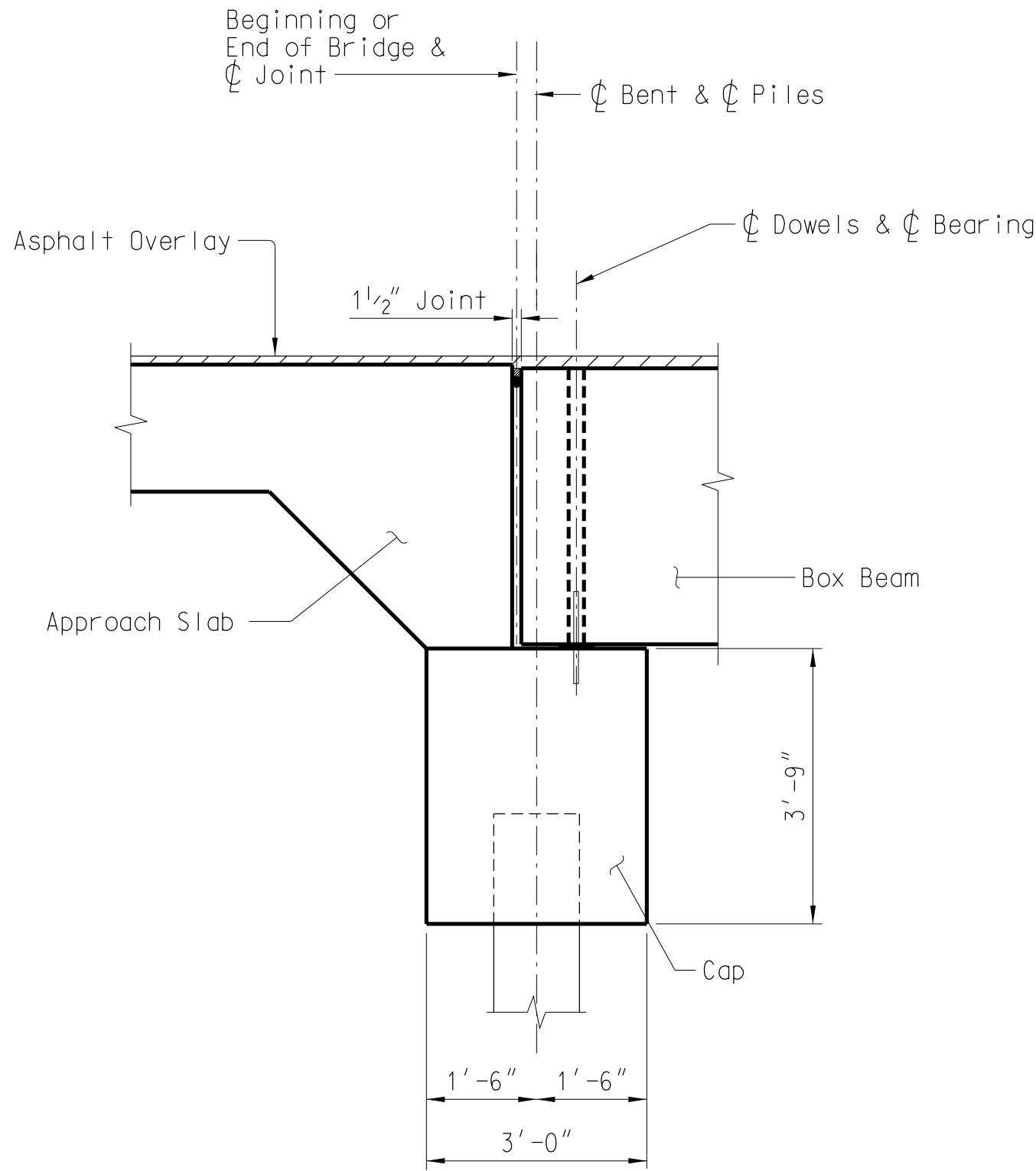
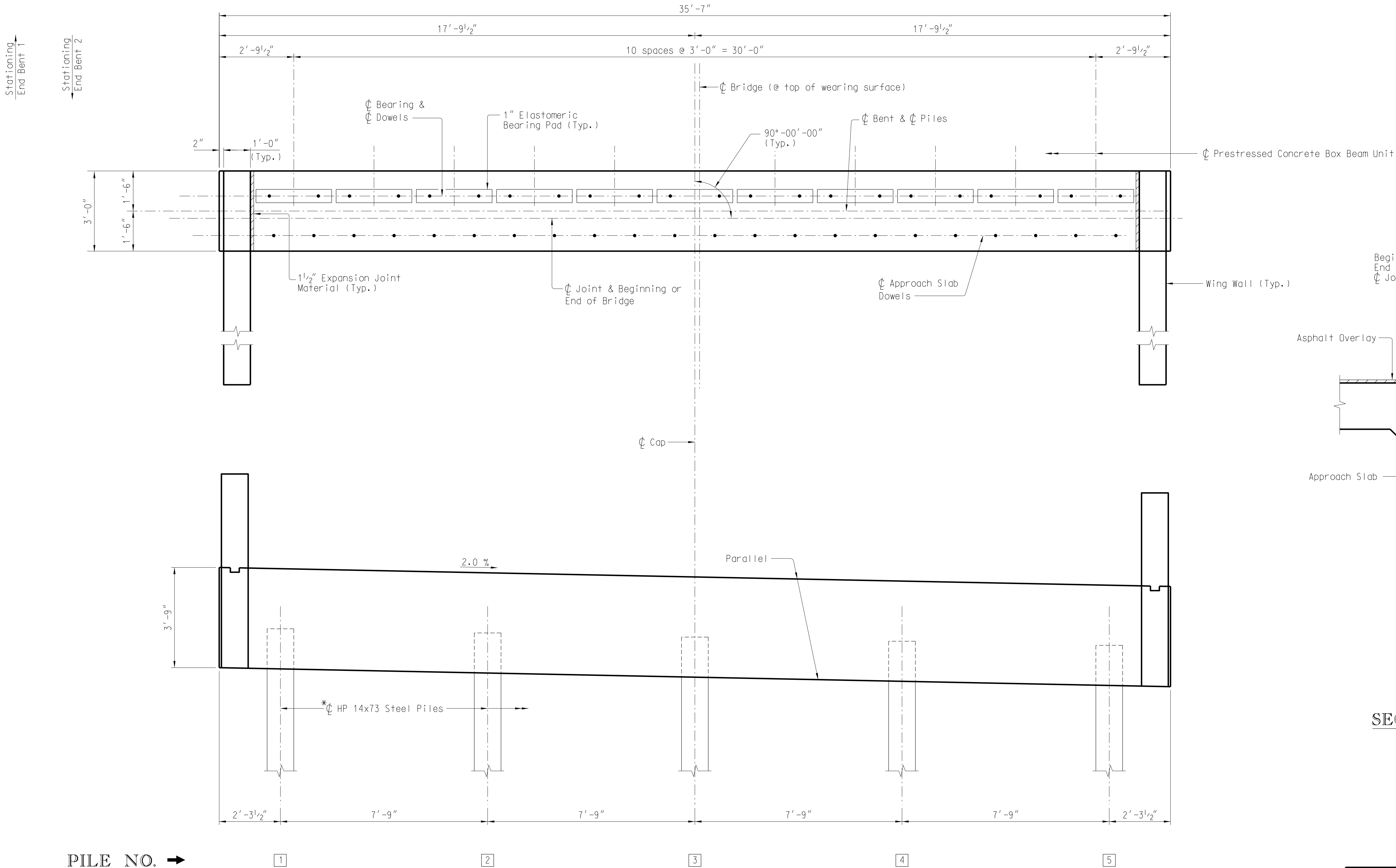


REVIEWED	DR.	LTW	LKA	CHK	DATE

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EAST BROAD STREET
BRIDGE NO. 1

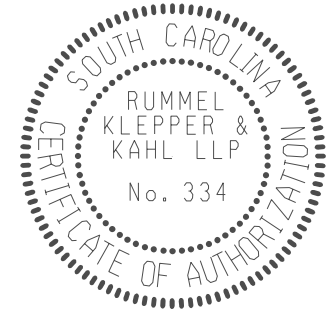


SECTION THRU BENT

PILE NO. →
Piles are numbered from left to right
looking in direction of stationing.

ELEVATION
(Looking in Direction of Stationing - End Bent 1)
(Looking in Opposite Direction of Stationing - End Bent 2)

*Foundation size dependent upon Final Geotechnical Report.



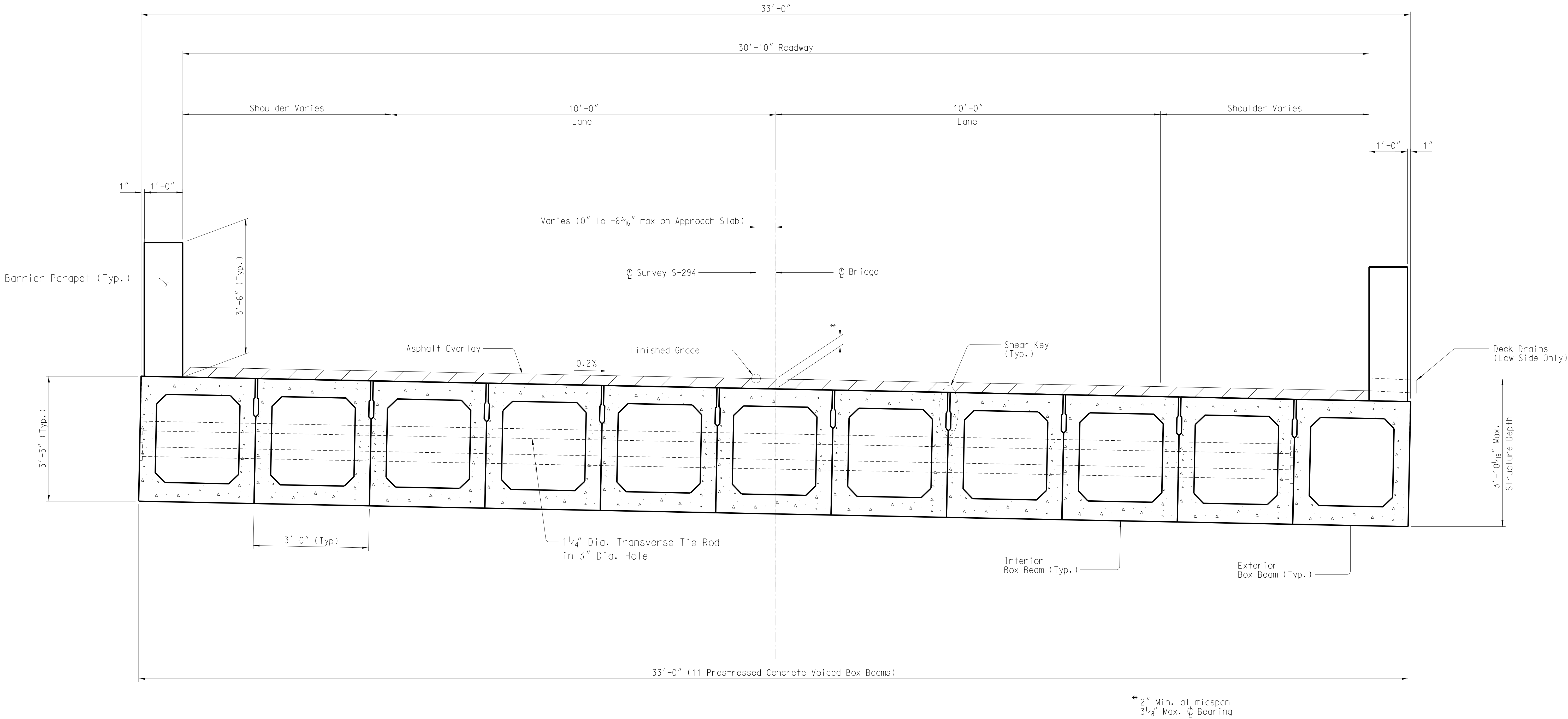
REV.			
REV.			
REV.			
REVIEWED			
QUAN.			
DR.	KSH	LKA	1-23
DES.			
BY	CHK.	DATE	

SOUTH CAROLINA
DEPARTMENT OF TRANSPORTATION

END BENTS 1 & 2

COUNTY	Anderson	ROUTE	S-294
--------	----------	-------	-------

EAST BROAD STREET
BRIDGE NO. 1



SECTION THRU SUPERSTRUCTURE

SOUTH CAROLINA
DEPARTMENT OF TRANSPORTATION

SUPERSTRUCTURE
TYPICAL SECTION

COUNTY		ANDERSON		ROUTE		S-294	
--------	--	----------	--	-------	--	-------	--

REV.			
REV.			
REV.			
REVIEWED			
QUAN.			
DR.	KSH	LKA	1-23
DES.			
BY	CHK.	DATE	



INDEX OF SHEETS

- 1. Title Sheet
- 2. Bridge Plan and Profile
- 3. End Bent 1
- 4. End Bent 3
- 5. Interior Bent 2
- 6. Superstructure Typical Section



HANGING ROCK CHURCH RD.
BRIDGE NO. 2

CONCEPTUAL BRIDGE PLANS
FOR

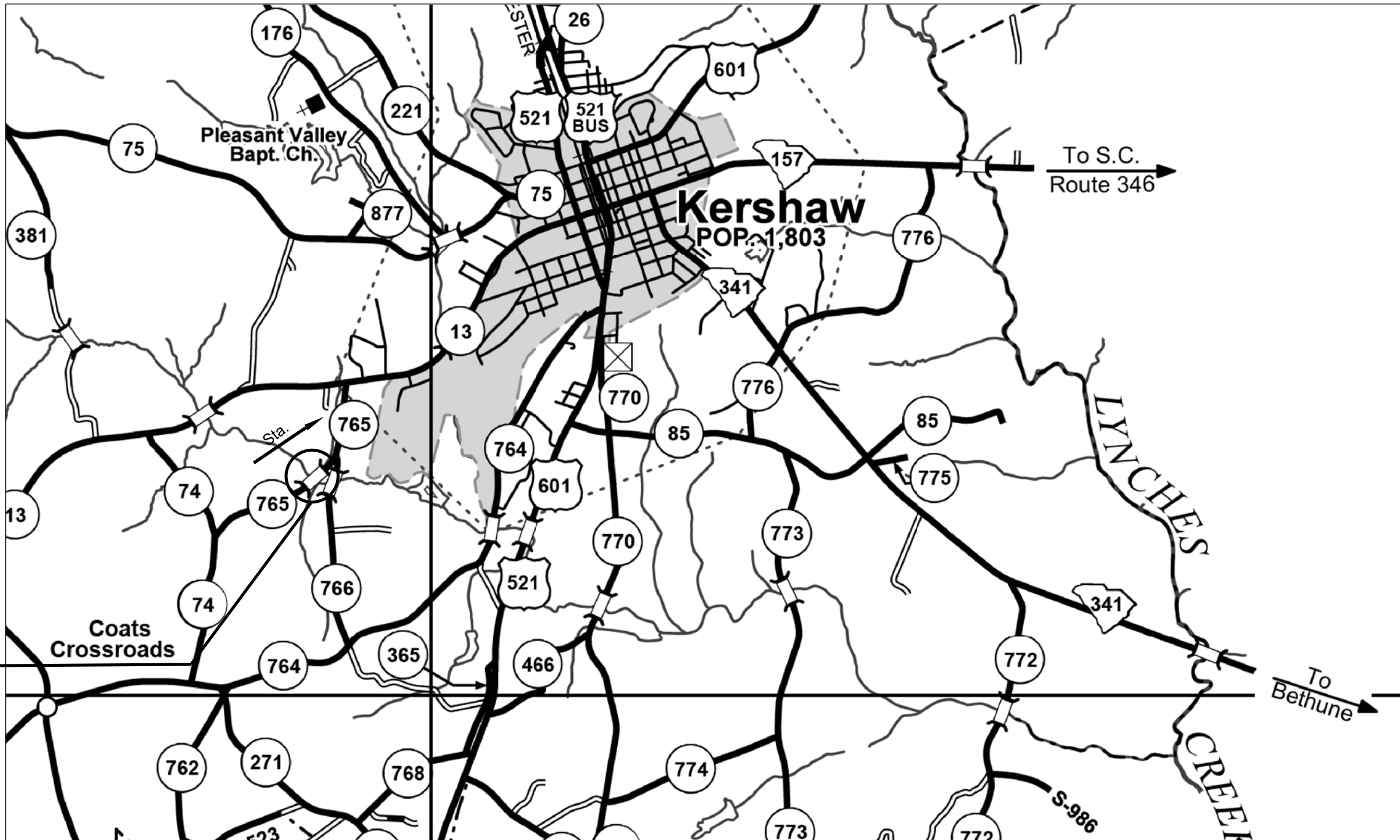
LANCASTER COUNTY
PROJECT ID P041154

STATE ROUTE S-765 (HANGING ROCK CHURCH ROAD)
REPLACE BRIDGE OVER HANGING ROCK CREEK

Design Reference for these plans is the:

LVB

Supplemental Design Criteria For
Low Volume Bridge Replacement Projects



Approximate Location of Bridge is	
Latitude	34° - 31' - 36" N
Longitude	80° - 36' - 37" W

SITE LOCATION

LAYOUT

3 DAYS BEFORE DIGGING IN
SOUTH CAROLINA
CALL 811
SOUTH CAROLINA 811 (SC811)
WWW.SC811.COM
ALL UTILITIES MAY NOT BE A MEMBER OF SC811

ASSET ID NOT ASSIGNED

TRAFFIC DATA

2020 ADT 210 V.P.D.
2040 ADT 256 V.P.D.
TRUCKS 5 %

NET LENGTH OF ROADWAY	0.000	MILES
NET LENGTH OF BRIDGES	0.024	MILES
NET LENGTH OF PROJECT	0.024	MILES
LENGTH OF EXCEPTIONS	0.000	MILES
GROSS LENGTH OF PROJECT	0.024	MILES

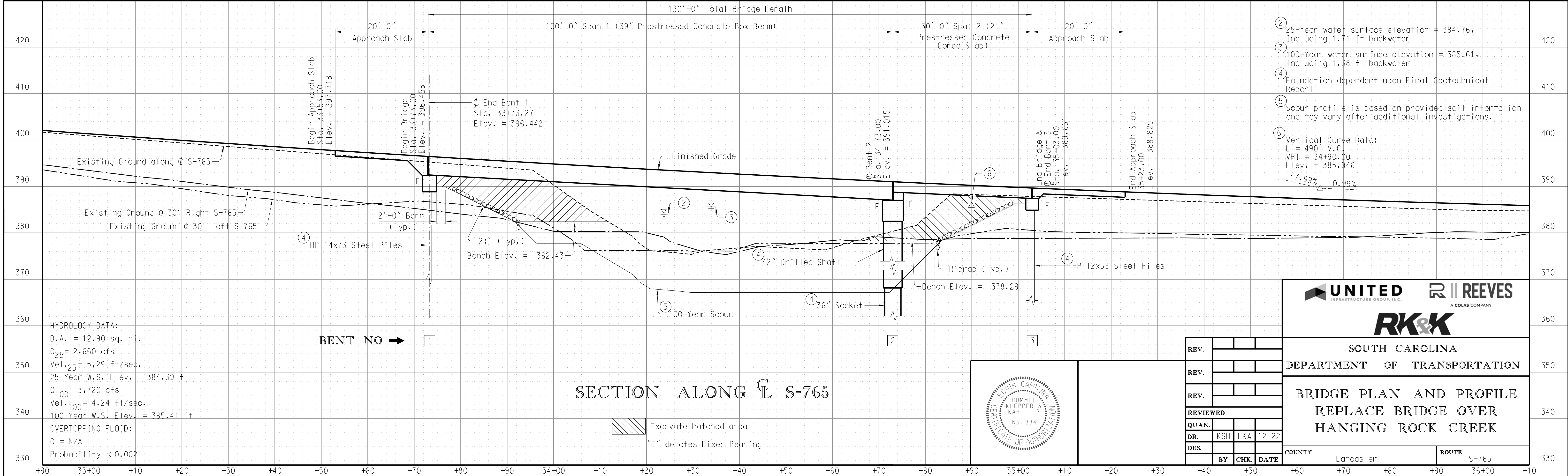
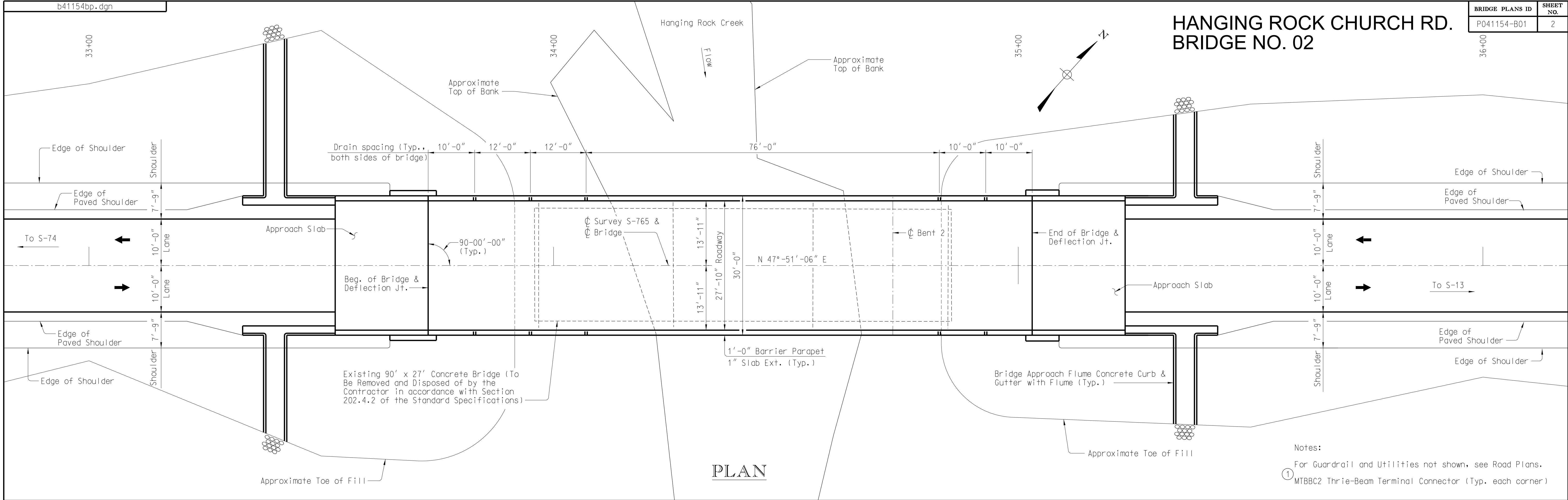


NOTE: EXCEPT AS MAY OTHERWISE BE SPECIFIED ON THE PLANS OR IN THE SPECIAL PROVISIONS, ALL MATERIALS AND WORKMANSHIP ON THIS PROJECT SHALL CONFORM TO THE SOUTH CAROLINA DEPARTMENT OF TRANSPORTATION STANDARD SPECIFICATIONS FOR HIGHWAY CONSTRUCTION (2007 EDITION) AND THE STANDARD DRAWINGS FOR ROAD CONSTRUCTION IN EFFECT AT THE TIME OF FINAL RFP.

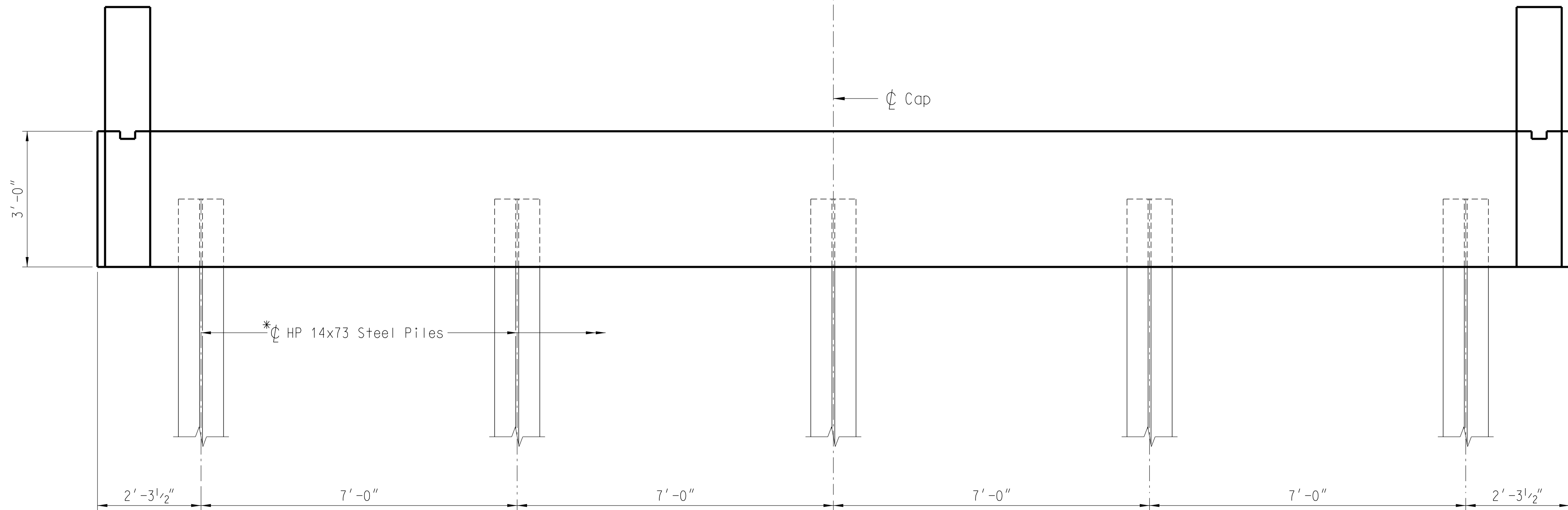
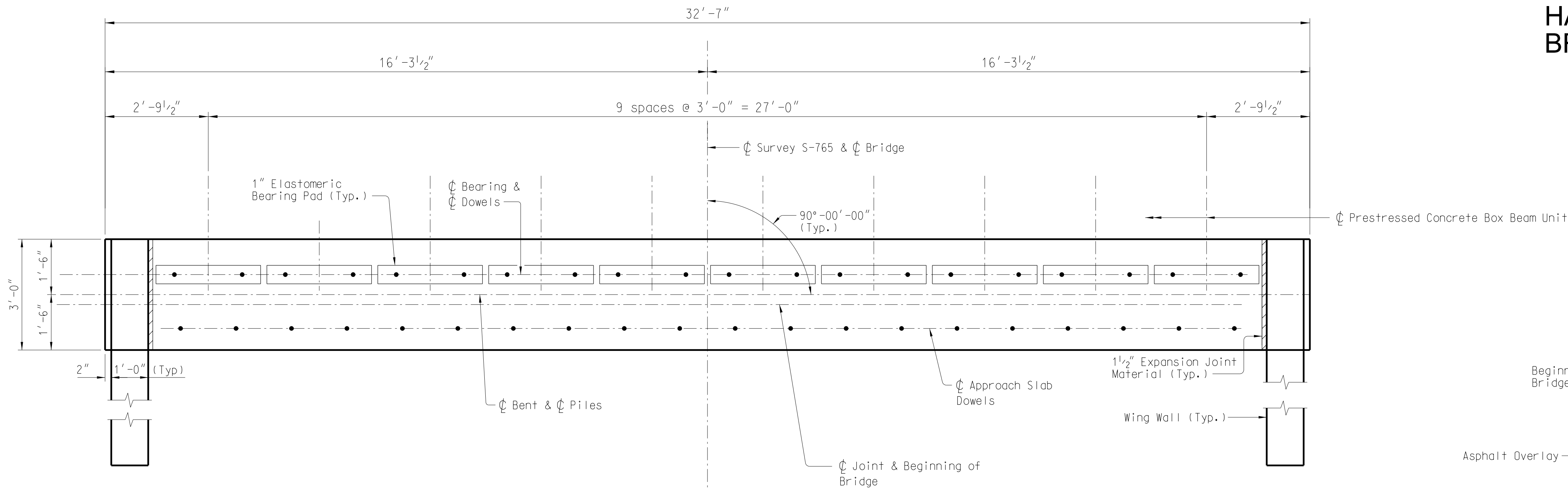
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		BY	CHK		

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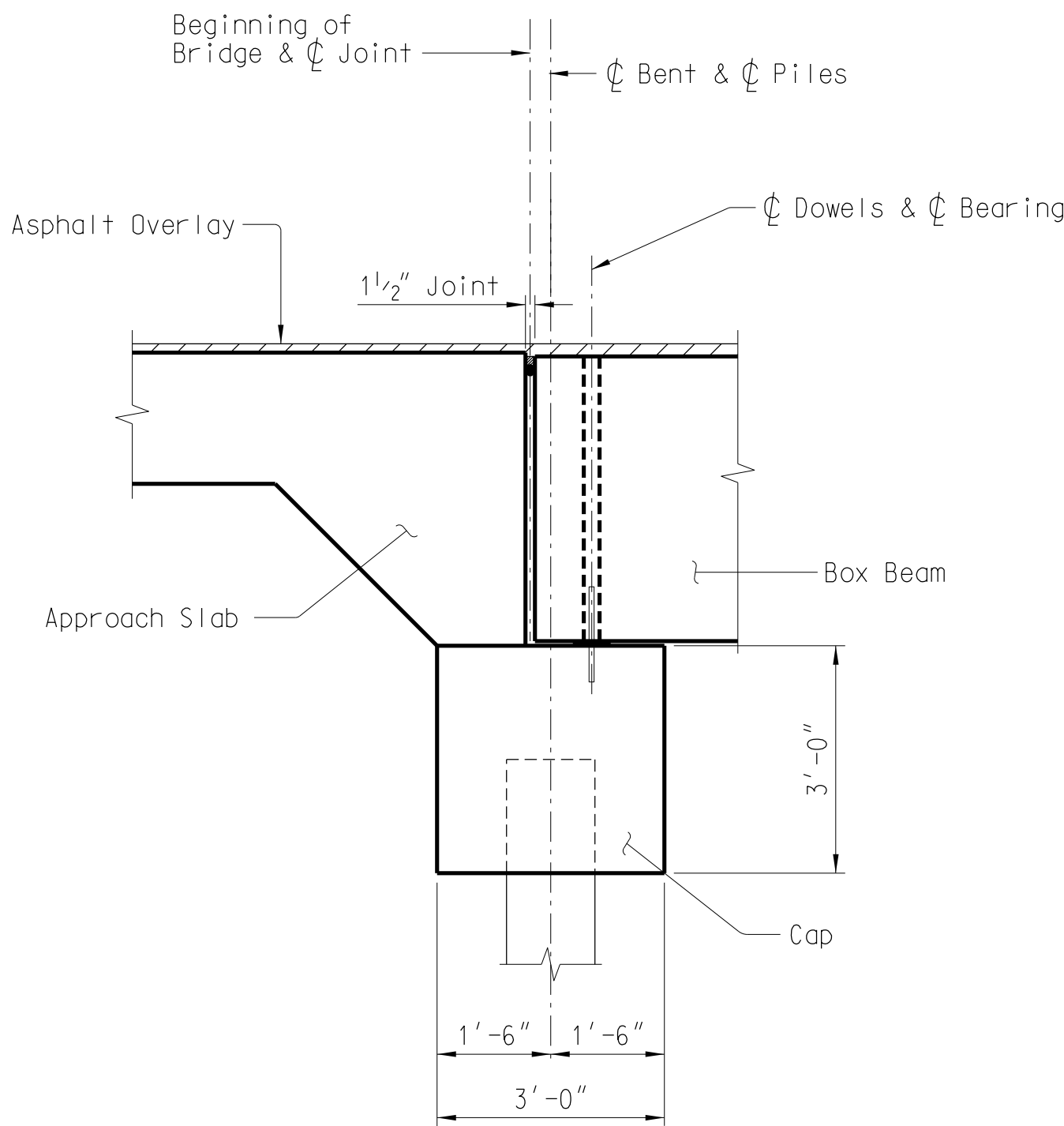
HANGING ROCK CHURCH ROAD
BRIDGE NO. 02



PILE NO. → 1
Piles are numbered from left to right
looking in direction of stationing.

ELEVATION
(Looking in the direction of stationing)

*Foundation dependent upon Final
Geotechnical Report



SECTION THRU BENT



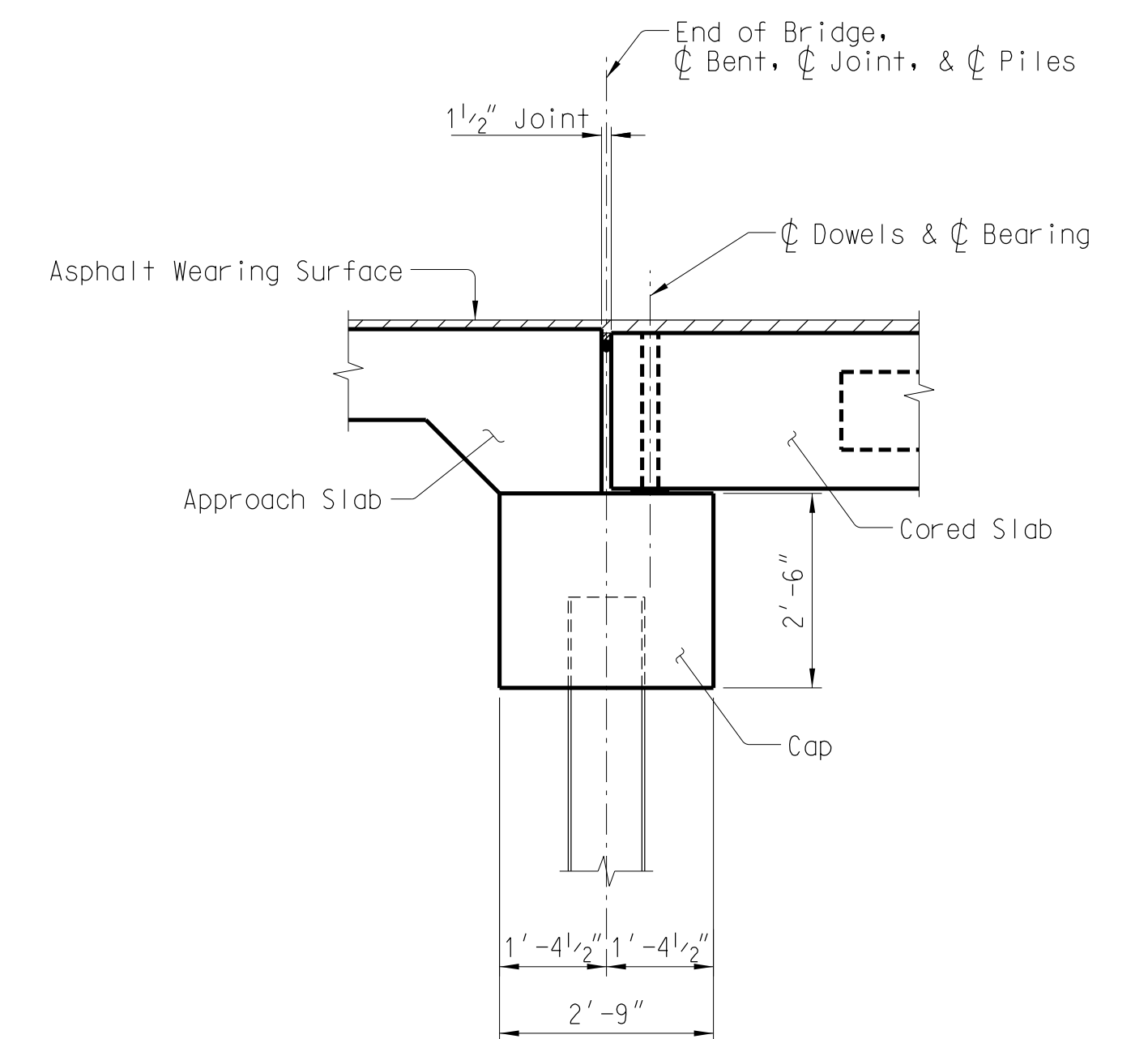
SOUTH CAROLINA
DEPARTMENT OF TRANSPORTATION

END BENT 1

COUNTY Lancaster ROUTE S-765

REV.			
REV.			
REV.			
REVIEWED			
QUAN.			
DR.	KSH	LKA	1-23
DES.			
BY	CHK.	DATE	





SECTION THRU BENT

ELEVATION
(Looking in the direction of stationing)

REV.			
REV.			
REV.			
REVIEWED			
QUAN.			
DR.	KSH	LKA	1-23
DES.			
	BY	CHK.	DATE



SOUTH CAROLINA
DEPARTMENT OF TRANSPORTATION

END BENT 3

COUNTY	Lancaster
--------	-----------

ROUTE S-765

32'-7"

16'-3 1/2"

16'-3 1/2"

2'-9 1/2"

9 spaces @ 3'-0" = 27'-0"

2" (Typ.)

1'-0" (Typ.)

3/4" Elastomeric Bearing Pad (Typ. for Cored Slabs)

1" Bent, Drilled Shaft, & Joint

90°-00'-00" (Typ.)

Survey S-765 & Bridge

Bearing & Dowels

Cored Slab Unit

Lateral Guide (Typ.)

1 1/2" Exp. Jt. Mat'l (Typ.)

Box Beam Unit

4'-0"

2'-0"

2'-0"

Architectural section drawing of a foundation wall and footing. The wall is 4'-6" high. The footing is 10'-2" wide. The wall is supported by a 10'-2" wide footing. The footing is divided into two sections: a 6'-1 1/2" section on the left and a 6'-1 1/2" section on the right. The wall is shown with a level line and a cap line. The footing is shown with a drilled shaft and a socket (typical). The footing is shown with a level line and a cap line. The footing is shown with a drilled shaft and a socket (typical).

Drilled shafts are numbered from left to right looking in direction of stationing.

(Looking in the direction of stationing)

Technical drawing of a bridge cross-section showing a bent, joint, and drilled shaft. The drawing includes labels for 'Asphalt Wearing Surface', 'Box Beam', 'Cored Slab', 'Dowels & Bearing', and 'Bent, Joint, & Drilled Shaft'. Dimensions are provided for various components: 1 1/2" for the bent/joint/shaft width, 4'-6" for the cored slab height, and 2'-0" for the box beam width. The drawing is a cross-section view of a bridge structure.

 **UNITED**
INFRASTRUCTURE GROUP, INC.

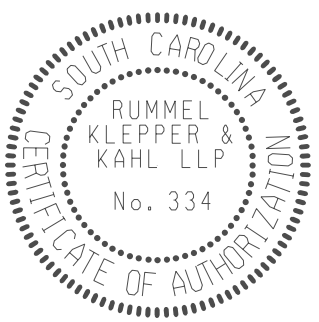
 **R II REEVES**
A COLAS COMPANY

 **RK&K**

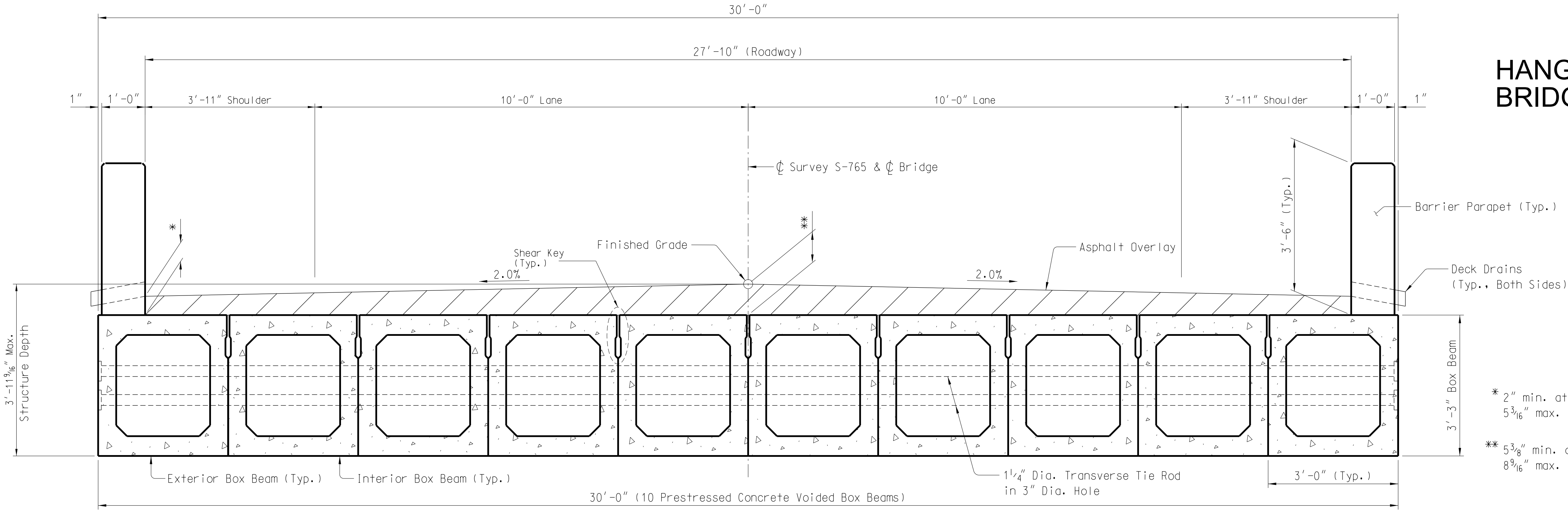
INTERIOR BENT 2

REV.			
REV.			
REV.			
REVIEWED			
QUAN.			
DR.	KSH	LKA	1-23
DES.			
	BY	CHK.	DATE

COUNTY	ROUTE
Lancaster	S-765



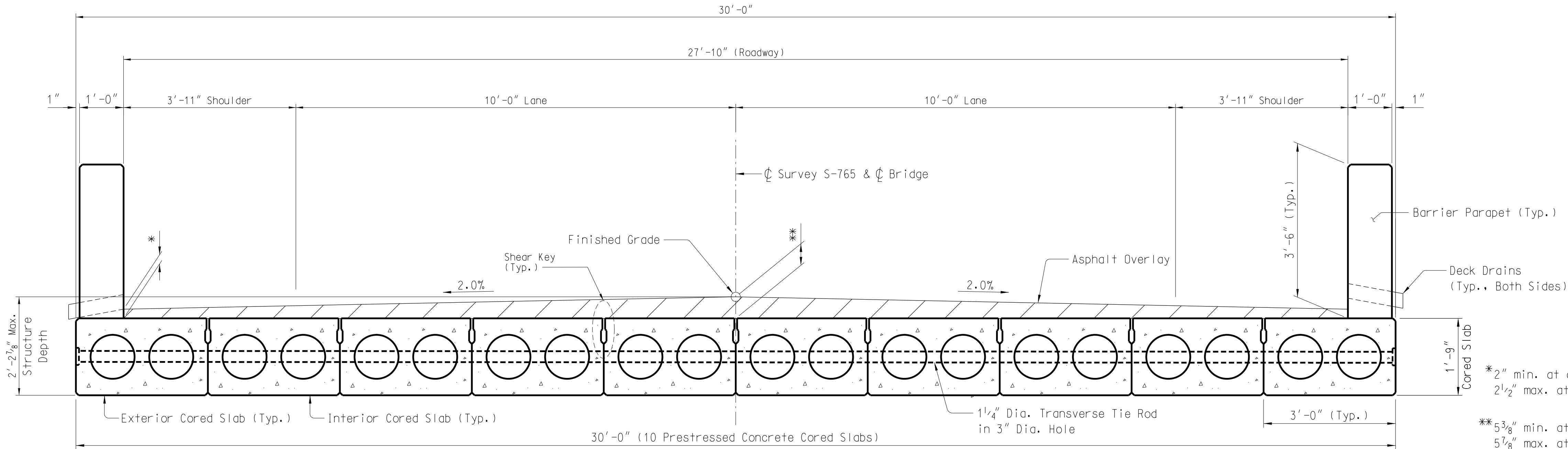
HANGING ROCK CHURCH RD.
BRIDGE NO. 02



* 2" min. at center of span
5 3/16" max. at ϕ Bearing (account for camber and vertical curve)

** 5 3/8" min. at center of span
8 9/16" max. at ϕ Bearing (account for camber and vertical curve)




SECTION THRU SPAN 1



* 2" min. at center of span
2 1/2" max. at ϕ Bearing (accounting for camber and vertical curve)

** 5 3/8" min. at center of span
5 7/8" max. at ϕ Bearing (accounting for camber and vertical curve)

SECTION THRU SPAN 2



SOUTH CAROLINA
DEPARTMENT OF TRANSPORTATION

SUPERSTRUCTURE
TYPICAL SECTION

REV.			
REV.			
REV.			
REVIEWED			
QUAN.			
DR.	KSH	LKA	12-22
DES.			
BY	CHK.	DATE	

COUNTY	Lancaster	ROUTE	S-765
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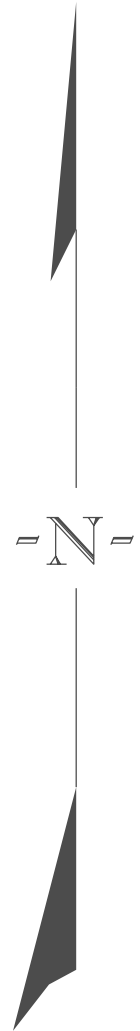
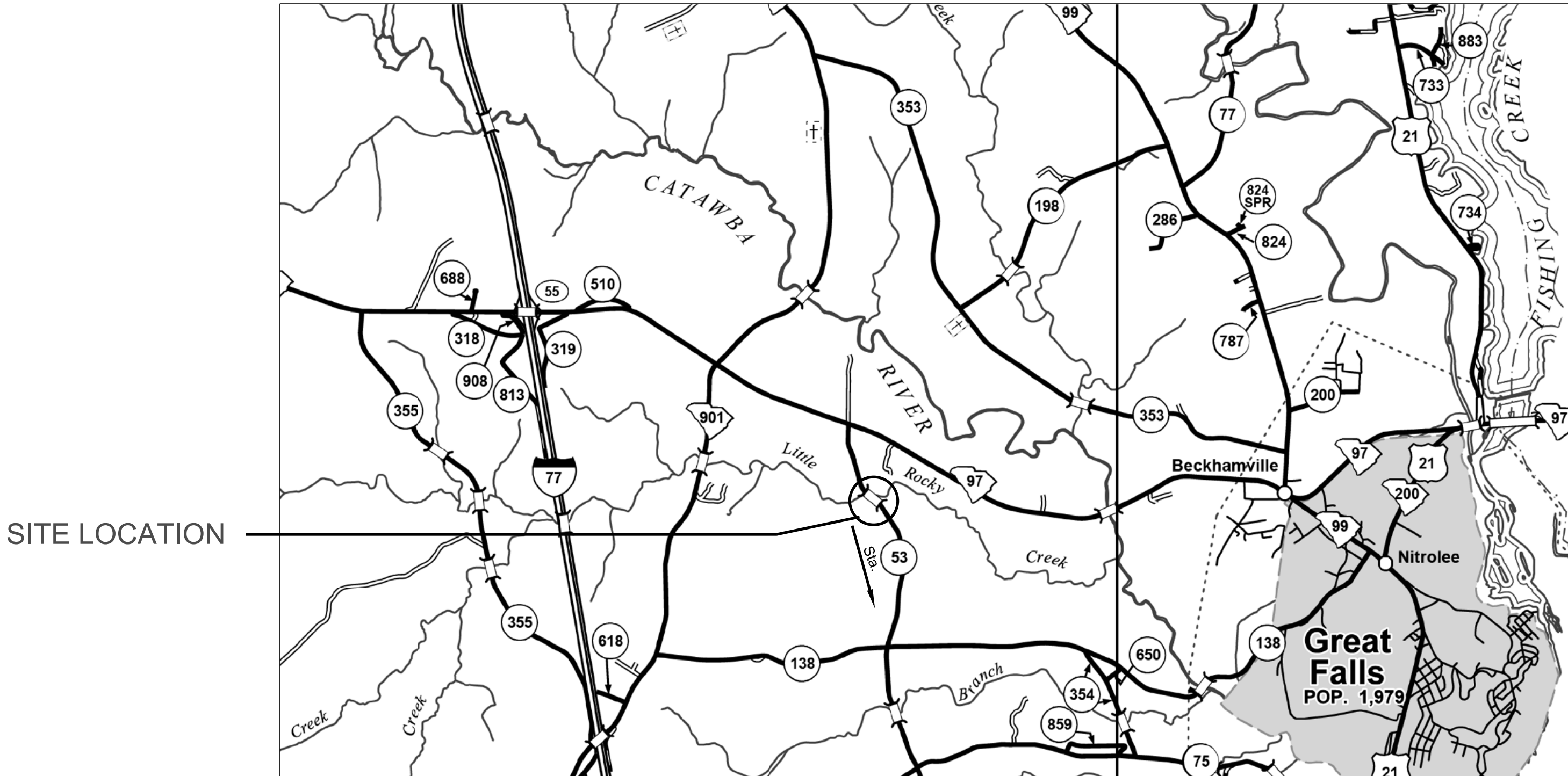
INDEX OF SHEETS

- 1. Title Sheet
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- 3. End Bent 1
- 4. End Bent 5
- 5. Interior Bents
- 6. Superstructure Typical Section



ROSS DYE ROAD
BRIDGE NO. 3

CONCEPTUAL BRIDGE PLANS
FOR
CHESTER COUNTY
PROJECT ID P041153
STATE ROUTE S-53 (ROSS DYE ROAD)
REPLACE BRIDGE OVER LITTLE ROCKY CREEK



Approximate Location of Bridge is
Latitude 34° - 35' - 24" N
Longitude 80° - 58' - 26" W

LAYOUT

3 DAYS BEFORE DIGGING IN
SOUTH CAROLINA
CALL 811
SOUTH CAROLINA 811 (SC811)
WWW.SC811.COM
ALL UTILITIES MAY NOT BE A MEMBER OF SC811

ASSET ID NOT ASSIGNED

TRAFFIC DATA			
2020	ADT	550	V.P.D.
2040	ADT	803	V.P.D.
TRUCKS	9	%	

NET LENGTH OF ROADWAY	0.000	MILES
NET LENGTH OF BRIDGES	0.061	MILES
NET LENGTH OF PROJECT	0.061	MILES
LENGTH OF EXCEPTIONS	0.000	MILES
GROSS LENGTH OF PROJECT	0.061	MILES



NOTE: EXCEPT AS MAY OTHERWISE BE SPECIFIED ON THE PLANS OR IN THE SPECIAL PROVISIONS, ALL MATERIALS AND WORKMANSHIP ON THIS PROJECT SHALL CONFORM TO THE SOUTH CAROLINA DEPARTMENT OF TRANSPORTATION STANDARD SPECIFICATIONS FOR HIGHWAY CONSTRUCTION (2007 EDITION) AND THE STANDARD DRAWINGS FOR ROAD CONSTRUCTION IN EFFECT AT THE TIME OF FINAL RFP.

REVIEWED	DR.	LTW	LKA	12-22	DATE
		BY	CHK		

1/25/2023 3:21:42 PM

[illegible]

PLAN

3'-0"

2.0%

Cap

Parallel

* HP 12x53 Steel Piles

2'-3 1/2"

8'-6"

8'-6"

8'-6"

8'-6"

2'-3 1/2"

1

2

3

4

5

(Looking in Direction of Stationing)



2

3

4

5

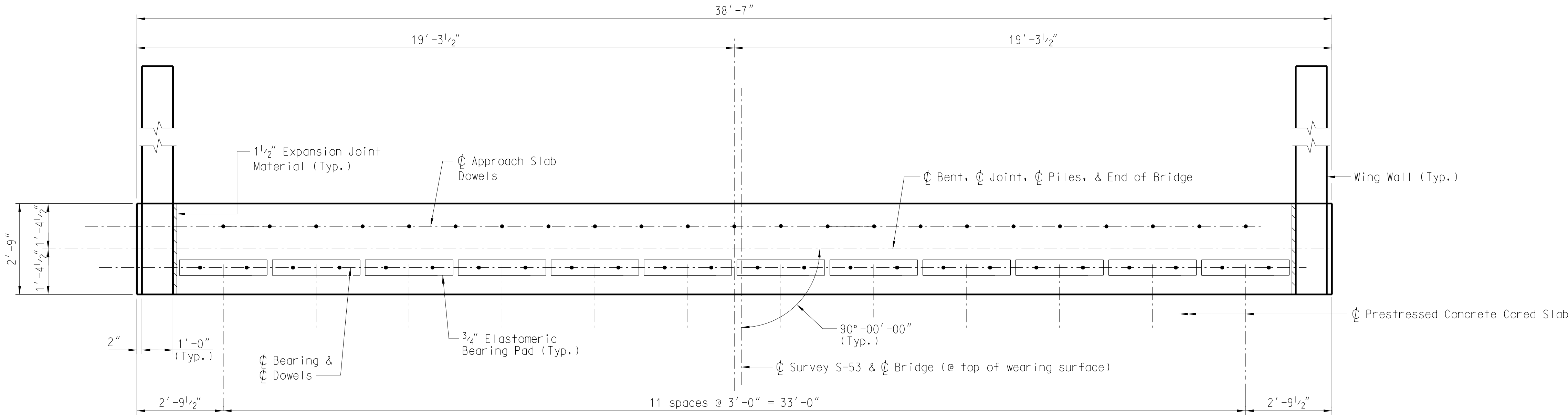
SECTION THRU BENT



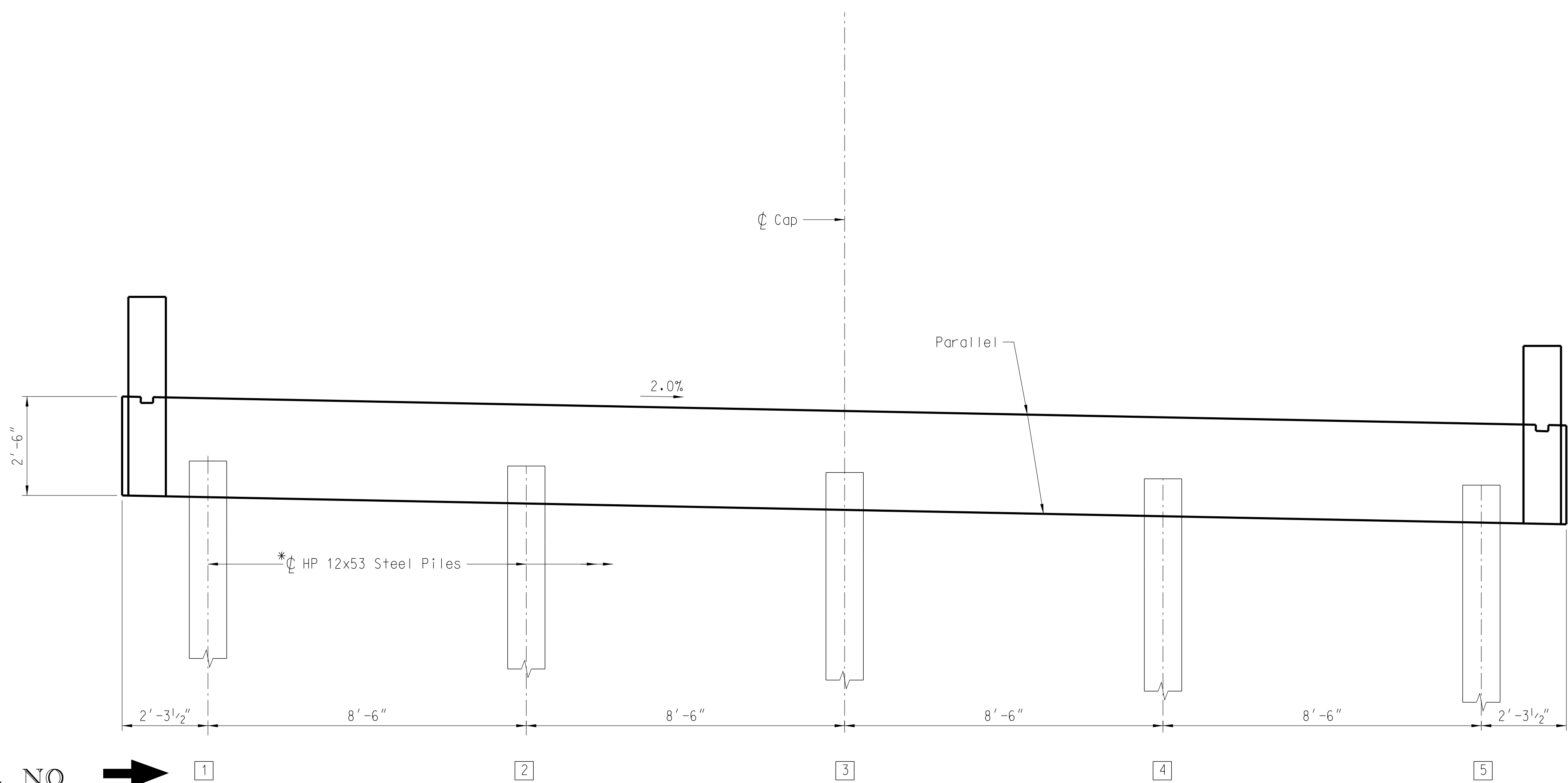
COUNTY	Chester	ROUTE	S-53
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REV.			
REV.			
REV.			
REVIEWED			
QUAN.			
DR.	LTW	LKA	1-23
DES.			
	BY	CHK.	DATE

ROSS DYE ROAD
BRIDGE NO. 3



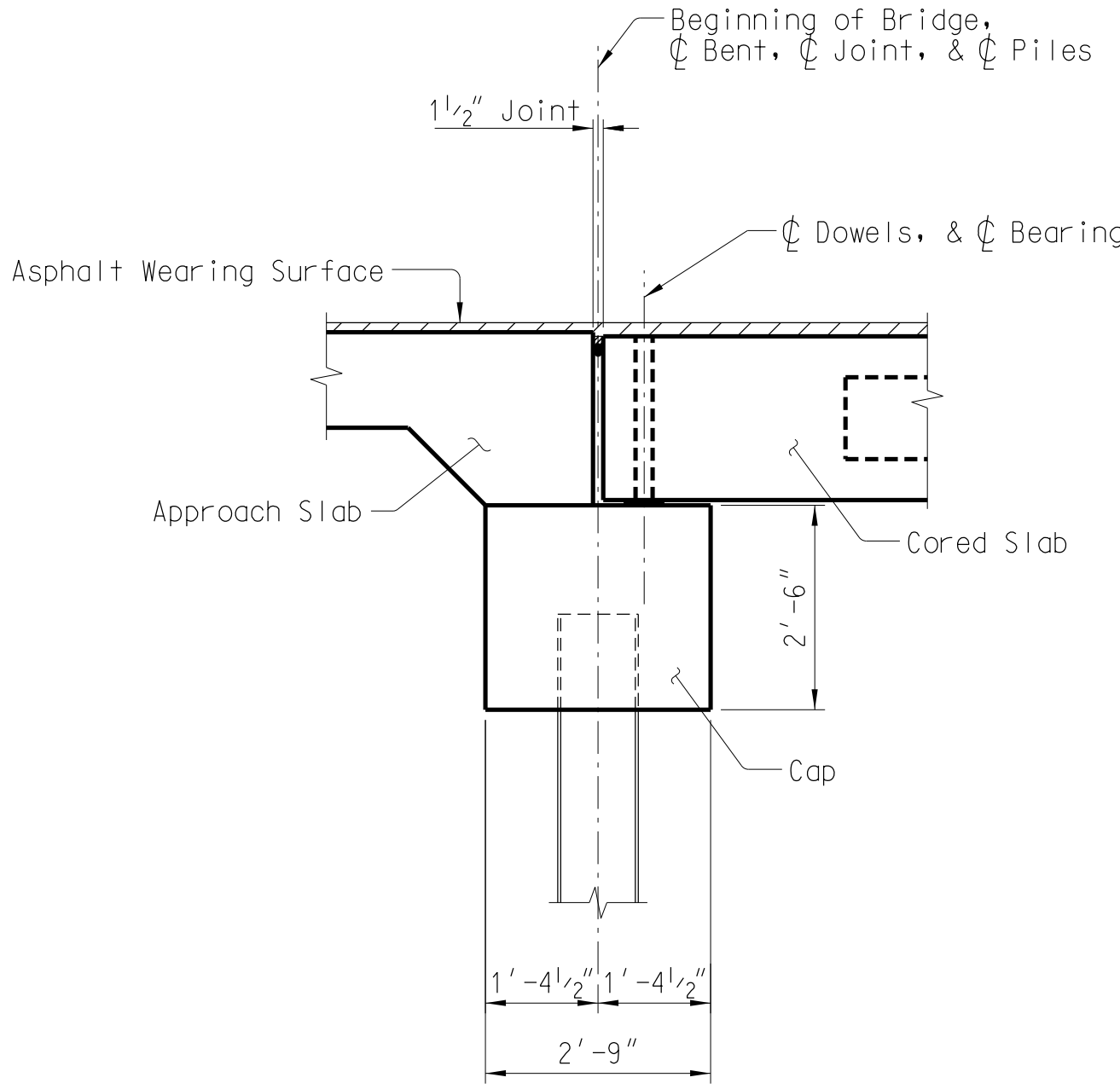
PLAN



PILE NO. →

Piles are numbered from left to right looking in direction of stationing.

ELEVATION
(Looking in Direction of Stationing)



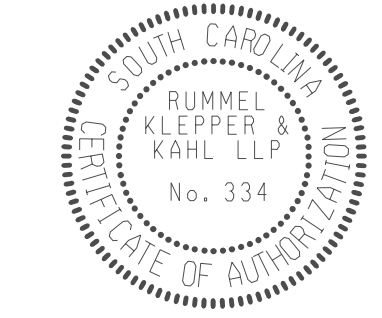
SECTION THRU BENT

SOUTH CAROLINA
DEPARTMENT OF TRANSPORTATION

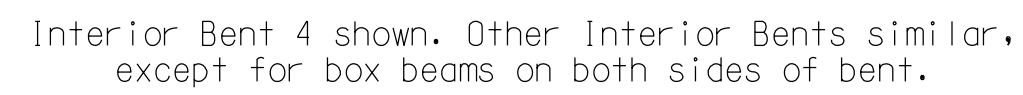
END BENT 5




REV.			
REV.			
REV.			
QUAN.			
DR.	LTW	LKA	1-23
DES.			
BY	CHK.	DATE	

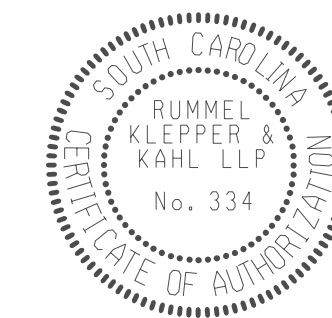
COUNTY	Chester	ROUTE	S-53
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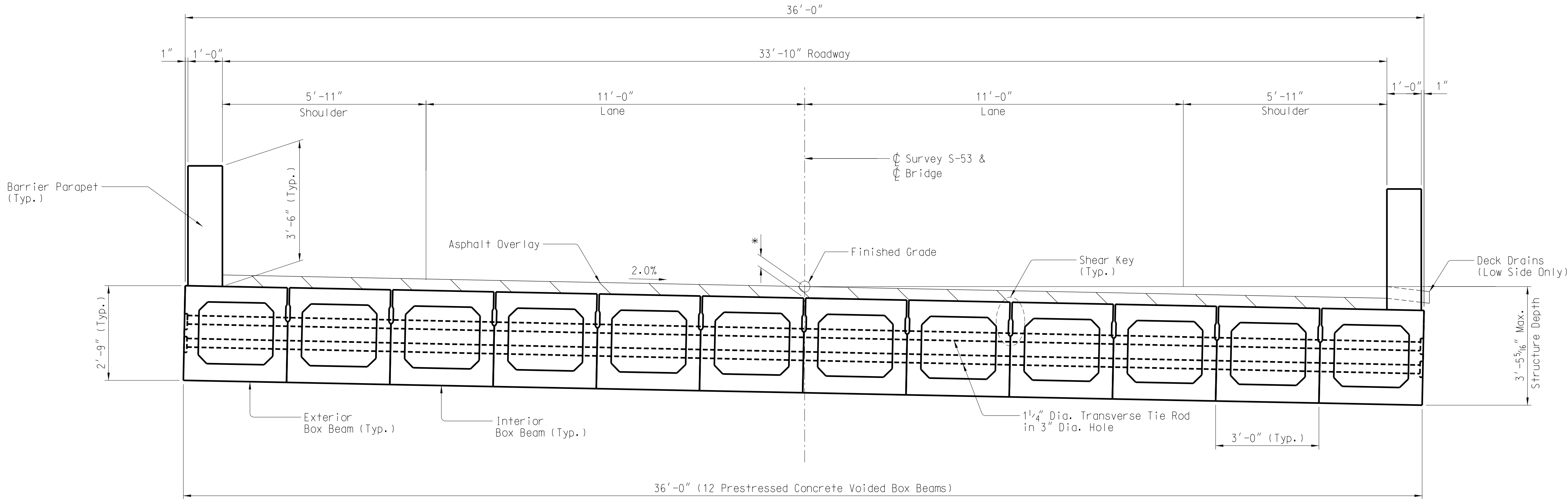


* Foundation dependent upon Final Geotechnical Report



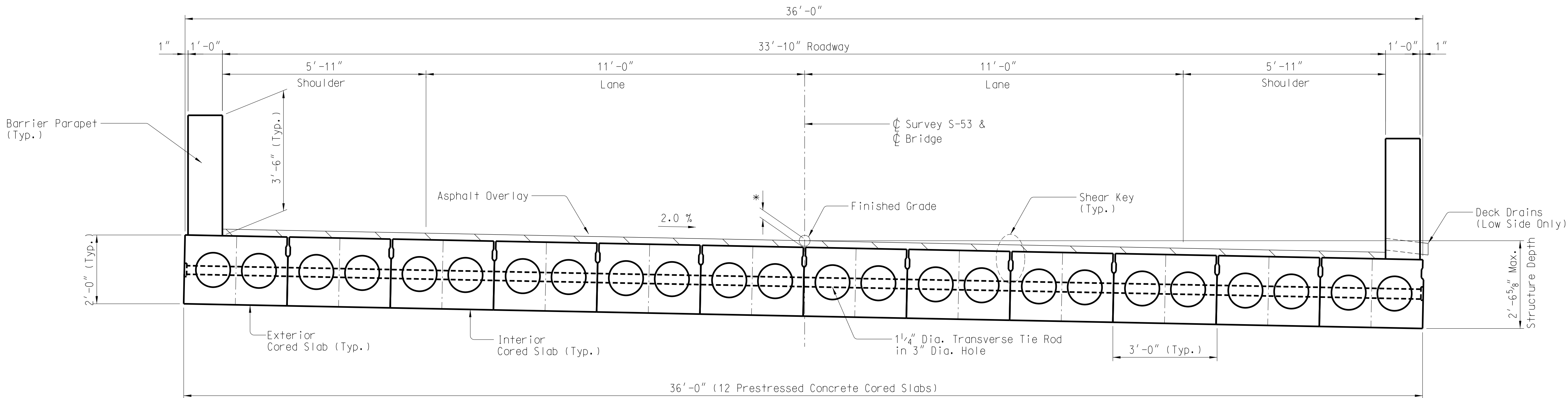
	 UNITED INFRASTRUCTURE GROUP, INC.	 REEVES A COLAS COMPANY
		
	SOUTH CAROLINA	
	DEPARTMENT OF TRANSPORTATION	
	INTERIOR BENTS	
3	COUNTY	ROUTE
E	Chester	S-53





*2" Min. at midspan
4" Max. at ϕ Bearing

SECTION THROUGH SUPERSTRUCTURE - SPANS 1-3



*2" Min. at midspan
2 5/16" Max. at ϕ Bearing

SECTION THROUGH SUPERSTRUCTURE - SPAN 4



REV.			
REV.			
REV.			
REVIEWED			
QUAN.			
DR.	LTW	LKA	12-22
DES.			
BY	CHK.	DATE	



SOUTH CAROLINA
DEPARTMENT OF TRANSPORTATION

SUPERSTRUCTURE
TYPICAL SECTION

COUNTY	Chester	ROUTE	S-53
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INDEX OF SHEETS

- 1. Title Sheet
- 2. Bridge Plan and Profile
- 3. End Bents 1 & 2
- 4. Superstructure Typical Section



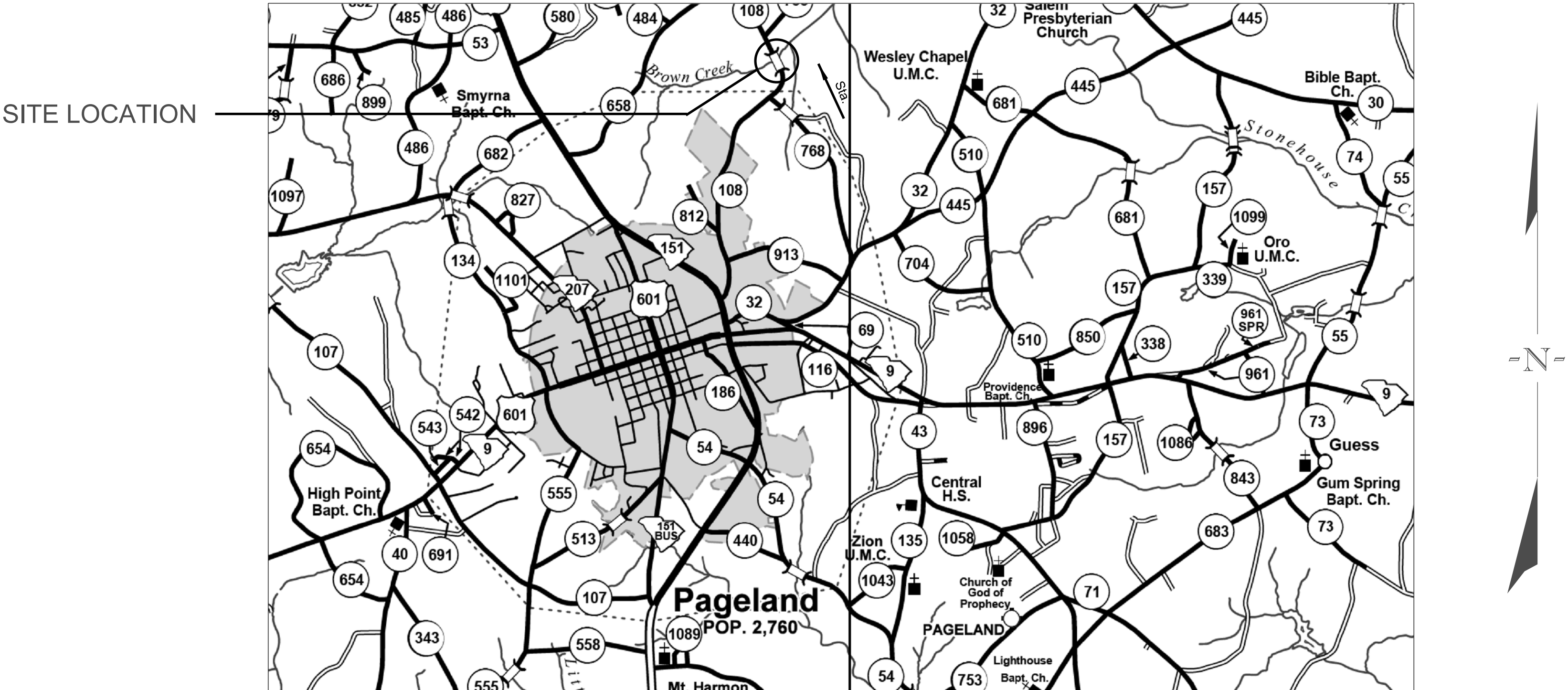
OUTEN STREET
BRIDGE NO. 4

Design Reference for these plans is the:

LVB

Supplemental Design Criteria For
Low Volume Bridge Replacement Projects

CONCEPTUAL BRIDGE PLANS
FOR
CHESTERFIELD COUNTY
PROJECT ID P041181
STATE ROUTE S-108 (OUTEN STREET)
REPLACE BRIDGE OVER BROWN CREEK



Approximate Location of Bridge is
Latitude 34° - 48' - 14" N
Longitude 80° - 22' - 32" W

LAYOUT

NET LENGTH OF ROADWAY	0.000	MILES
NET LENGTH OF BRIDGES	0.015	MILES
NET LENGTH OF PROJECT	0.015	MILES
LENGTH OF EXCEPTIONS	0.000	MILES
GROSS LENGTH OF PROJECT	0.015	MILES

NOTE: EXCEPT AS MAY OTHERWISE BE SPECIFIED ON THE PLANS OR IN THE SPECIAL PROVISIONS, ALL MATERIALS AND WORKMANSHIP ON THIS PROJECT SHALL CONFORM TO THE SOUTH CAROLINA DEPARTMENT OF TRANSPORTATION STANDARD SPECIFICATIONS FOR HIGHWAY CONSTRUCTION (2007 EDITION) AND THE STANDARD DRAWINGS FOR ROAD CONSTRUCTION IN EFFECT AT THE TIME OF FINAL RFP.

3 DAYS BEFORE DIGGING IN
SOUTH CAROLINA
CALL 811
SOUTH CAROLINA 811 (SC811)
WWW.SC811.COM
ALL UTILITIES MAY NOT BE A MEMBER OF SC811

ASSET ID NOT ASSIGNED

TRAFFIC DATA

2020 ADT 75 V.P.D.

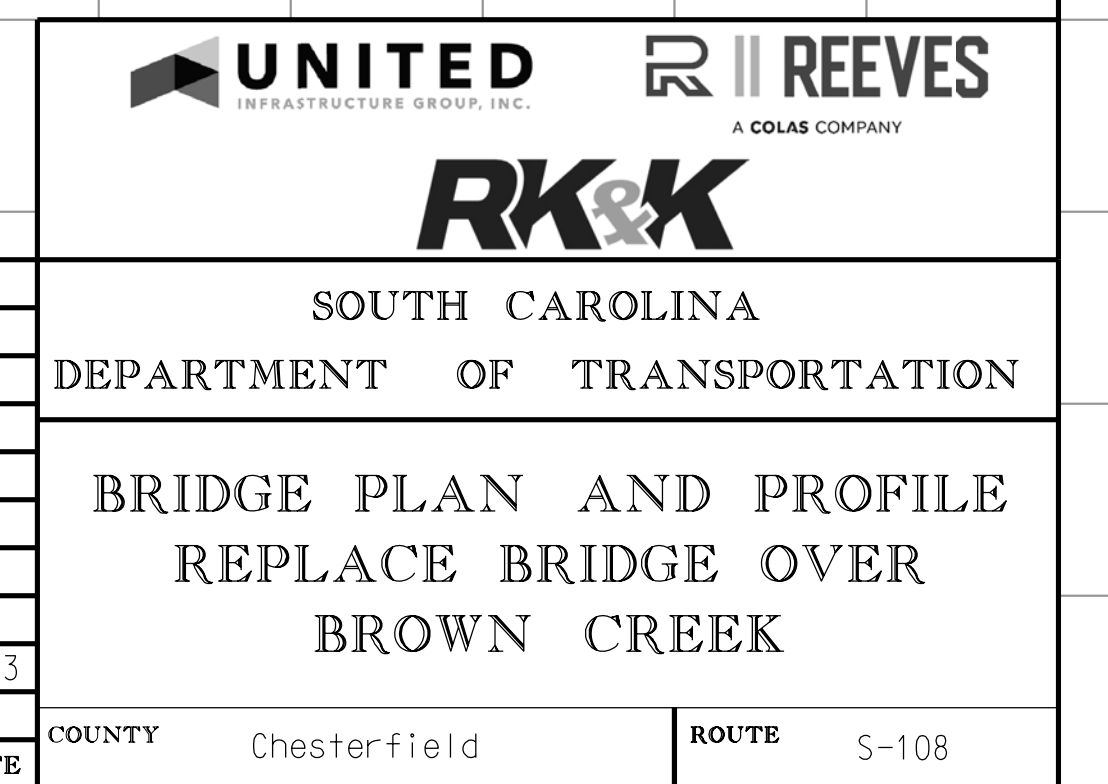
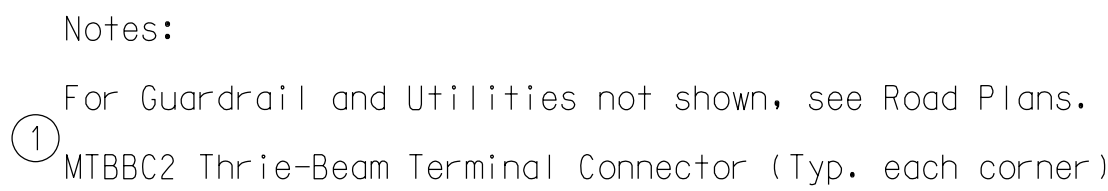
2040 ADT 115 V.P.D.

TRUCKS 5 %

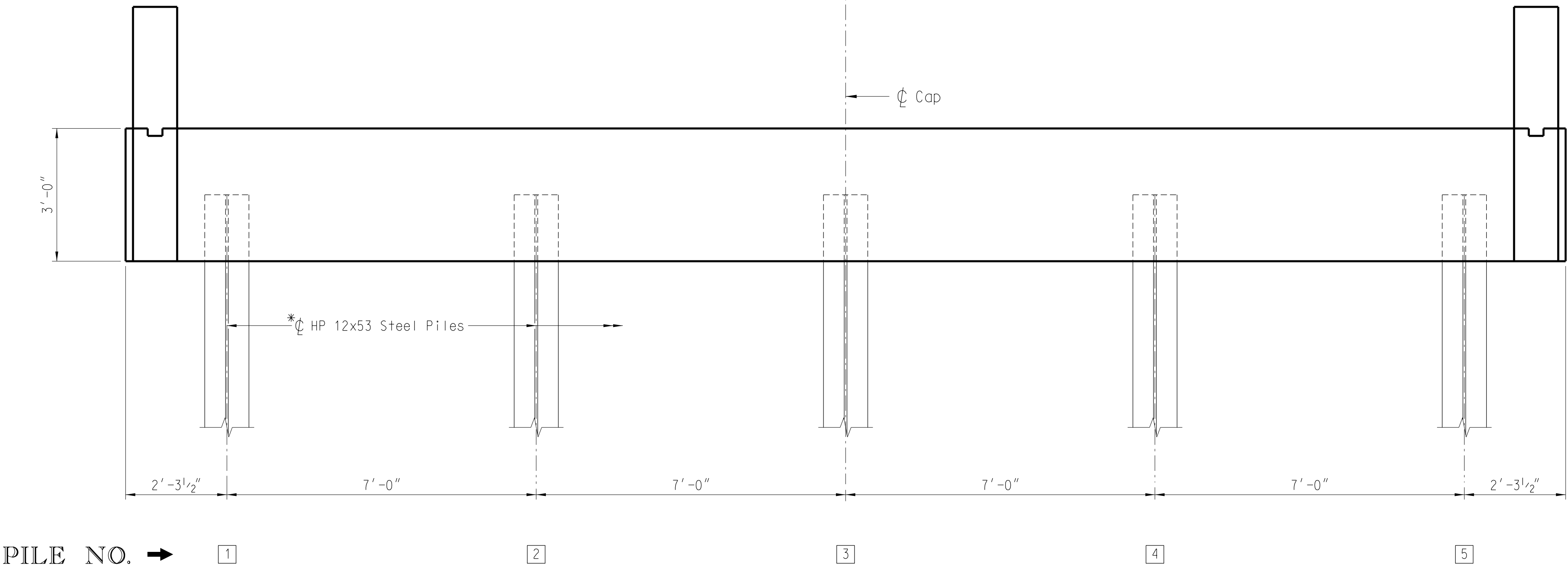
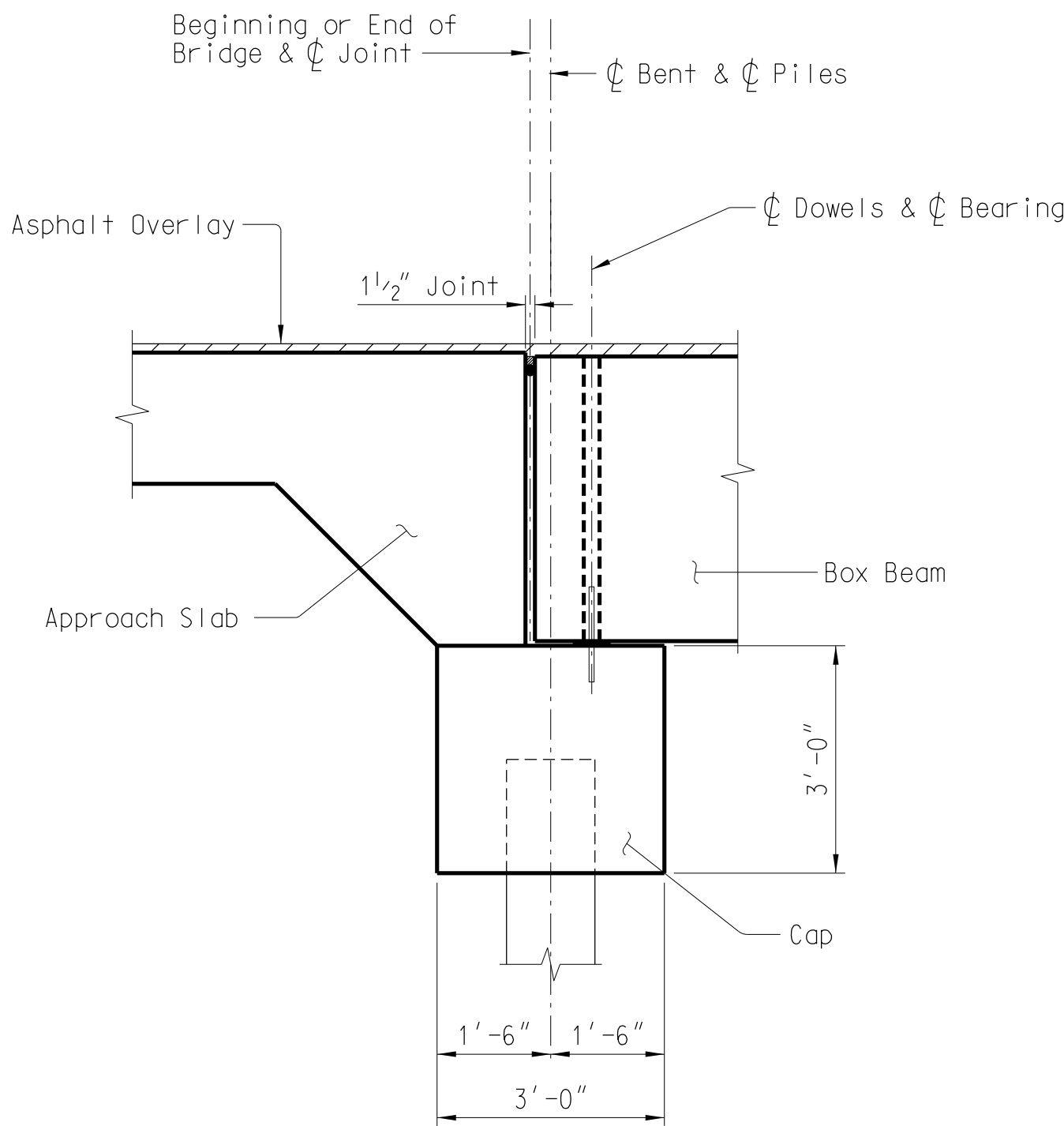
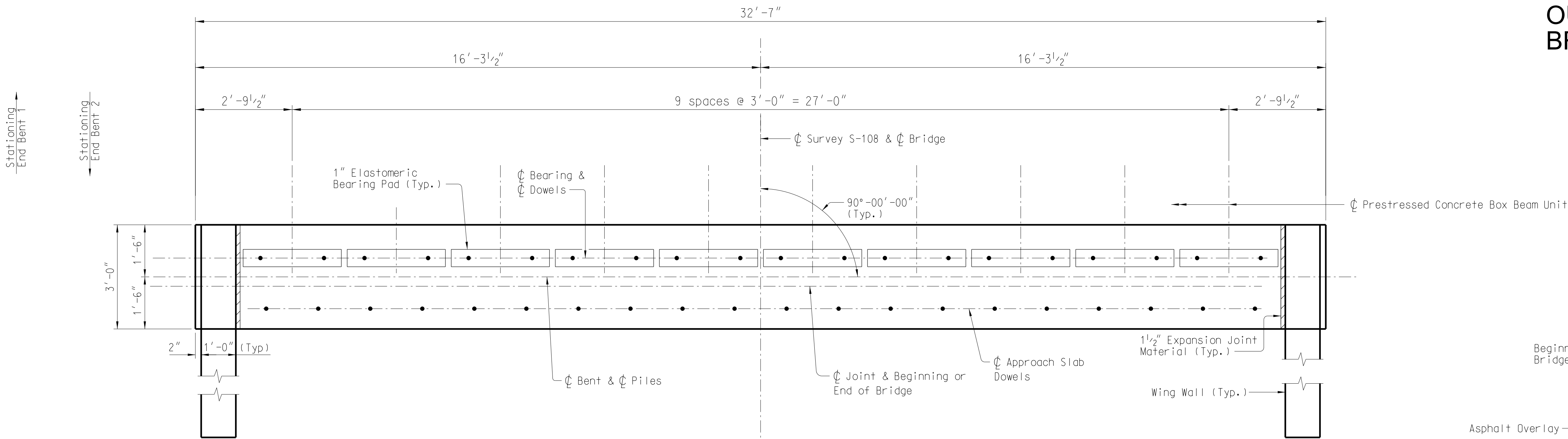


REVIEWED	DR.	LTW	LKA	12-22	DATE
		BY	CHK		

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OUTEN STREET
BRIDGE NO. 4

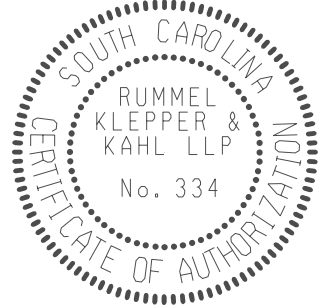


PILE NO. → 1
Piles are numbered from left to right
looking in direction of stationing.

ELEVATION

(Looking in Direction of Stationing - End Bent 1)
(Looking in Opposite Direction of Stationing - End Bent 2)

*Foundation dependent upon Final
Geotechnical Report



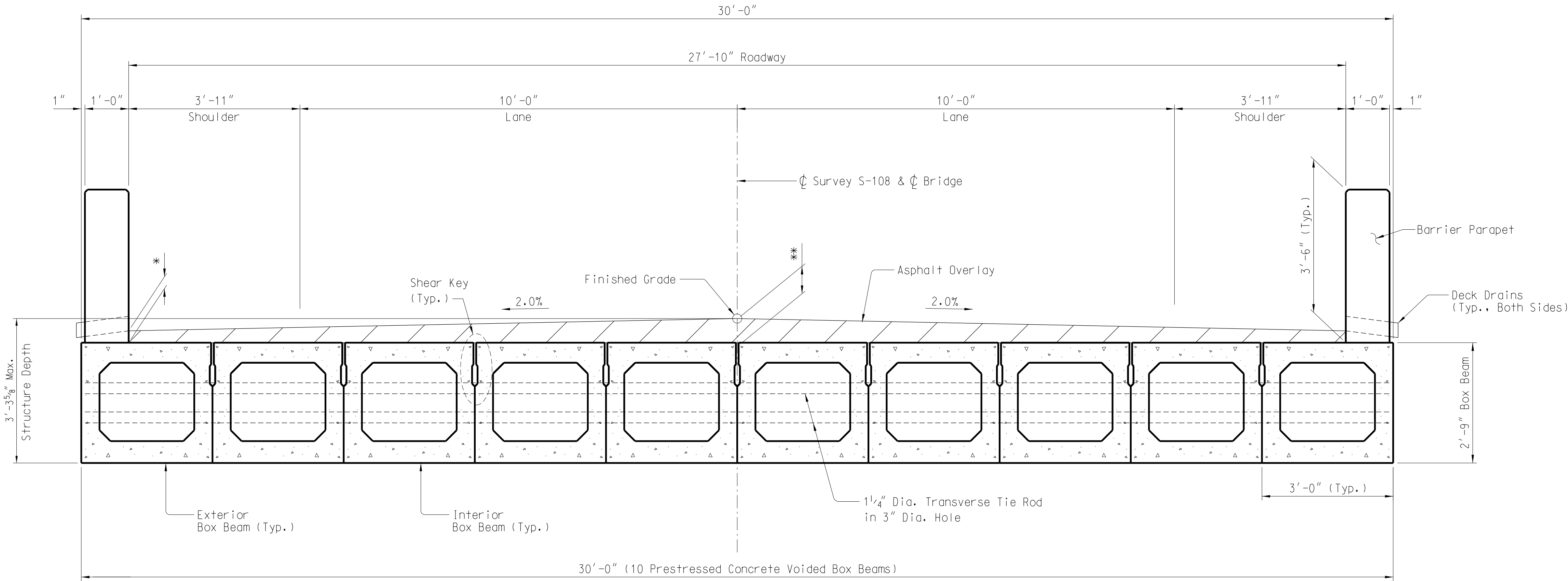
REV.			
REV.			
REV.			
REVIEWED			
QUAN.			
DR.	KSH	LKA	1-23
DES.			
BY	CHK.	DATE	

SOUTH CAROLINA
DEPARTMENT OF TRANSPORTATION

END BENTS 1 & 2

COUNTY	Chesterfield	ROUTE	S-108
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OUTEN STREET
BRIDGE NO. 4



SECTION THRU SUPERSTRUCTURE

* 2" min. at midspan
3 1/4" max. at ϕ Bearing

** 5 3/8" min. at midspan
6 5/8" max. at ϕ Bearing

1/26/2023 6:30:33 AM



REV.			
REV.			
REV.			
REVIEWED			
QUAN.			
DR.	LTW	LKA	12-22
DES.			
BY	CHK.	DATE	

SOUTH CAROLINA
DEPARTMENT OF TRANSPORTATION

SUPERSTRUCTURE
TYPICAL SECTION

COUNTY	Chesterfield	ROUTE	S-108
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Appendix A.3 - CPM Schedule



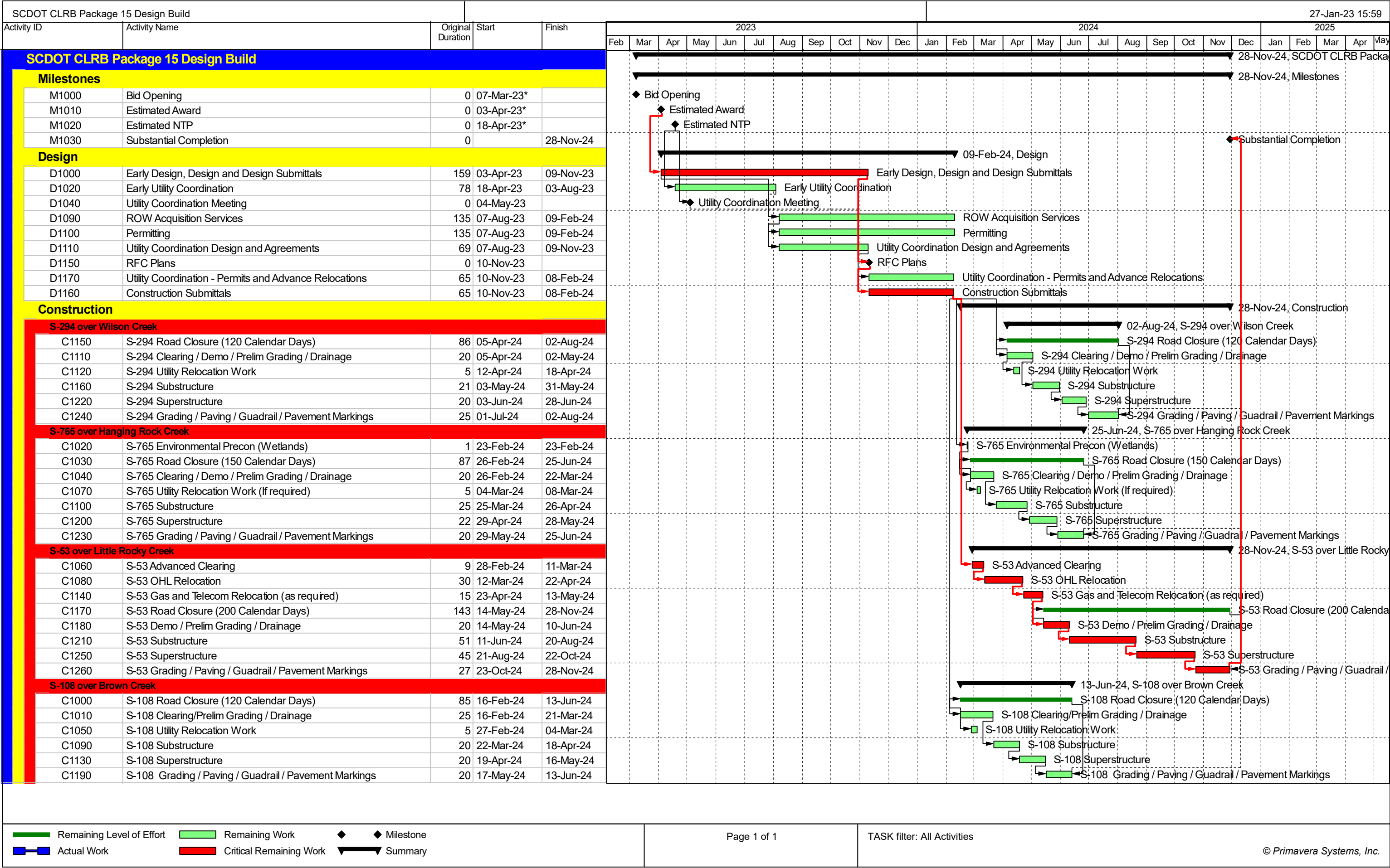
UNITED
INFRASTRUCTURE GROUP, INC.



REEVES

A COLAS COMPANY





Appendix B - Required Forms, Confidential and Proprietary Information Page List



UNITED
INFRASTRUCTURE GROUP, INC.



REEVES

A COLAS COMPANY



12. STIPEND ACKNOWLEDGEMENT FORM

Stipend Acknowledgement Form

Bridge Package 15 Anderson, Chester, Chesterfield, and Lancaster County

Proposer: United Reeves Joint Venture

ADDRESS: 5562 Pendergrass Blvd., Great Falls, SC 29055

The undersigned Proposer, hereby:

☐

Waives the stipend for this Project.

☒

Accepts the stipend for this Project.

By accepting the stipend for this Project, Proposer agrees:

- 1) to execute and include the Stipend Agreement in Article XIII of the RFP with its RFP response;
- 2) to submit an invoice with FEIN number for the stipend amount to the SCDOT POC after SCDOT's posting of the Notice of Award on SCDOT's Design-Build Website.;
- 3) to transfer all rights to its Work Product used to develop the Proposal as of the date of this acknowledgement. "Work Product" means all submittals, including ATCs, ideas, innovations, solutions, methods, processes, design concepts, materials, electronic files, marked up drawings, cross sections, quantity lists and intellectual property, made by Proposer during the RFP process, including the Proposal, exchange of information during the pre-Proposal and post-Proposal period.

SCDOT will pay the stipend to each eligible unsuccessful Proposer, who has signed a Stipend Agreement, within ninety (90) days after execution of the Contract or the decision to not award a contract.

1/26/23
Date

D. Michael Grey
Proposer

D. Michael Grey
Print Name

13. STIPEND AGREEMENT

STIPEND AGREEMENT

Project ID: 8862230

Bridge Package 15

Anderson, Chester, Chesterfield, and Lancaster County

THIS STIPEND AGREEMENT (the "Agreement") is made and entered into as of the ____ day of _____, 20__, by and between the SOUTH CAROLINA DEPARTMENT OF TRANSPORTATION (hereinafter "SCDOT"), and United Reeves Joint Venture ("Proposer"), with reference to the following facts:

SCDOT issued a Request for Proposal ("RFP") for design and construction of the above-referenced Design-Build Project ("Project"), pursuant to procurement authority granted in Section 57-5-1625 of the S.C. Code of Laws, 1976, as amended. The RFP provided for payment of stipends as provided herein. Capitalized terms used, but not defined, have the meanings ascribed in the RFP.

NOW, THEREFORE, Proposer hereby agrees as follows:

1. Work Product.

1.1 Proposer shall prepare and submit a responsible and responsive Technical Proposal and Cost Proposal that conforms in all material respects to the requirements and provisions of the RFP, as determined by SCDOT, and are timely received by SCDOT in accordance with the RFP Milestone Schedule.

1.2 By signing this Stipend Agreement, Proposer agrees to transfer full and complete ownership to SCDOT of all Work Product. The Work Product (as defined below) shall become the property of SCDOT without restriction or limitation on its use, without further compensation or consideration, and can be used in connection with this Project or any future projects by SCDOT. Neither Proposer nor any of its team members shall copyright any of the material developed under this Agreement.

1.3 The term "Work Product" shall mean the Proposal and all material, electronic files, marked up drawings, cross sections, quantity lists, submittals, alternative technical concepts (ATC), ideas, innovations, solutions, methods, processes, design concepts, Trade Secrets or confidential information, and intellectual property, made by or produced for Proposer in the development and submission of the Technical and Cost Proposal, including exchanges of information during the pre-Proposal and post-Proposal period.

2. Compensation and Payment.

2.1 A stipend to Proposer for the Work Product described herein shall be \$30,000.00 and is payable to Proposer that was determined to be responsible and (1) submitted a responsive Technical Proposal and responsive Cost Proposal to the RFP which is not selected for award of this Project, or (2) was awarded the Contract but the Contract was terminated by SCDOT for convenience after the Submittal of Proposal Due Date (See Final RFP Milestone schedule) but prior to the Notice to Proceed #1. Responsibility of Proposers and responsiveness of the Technical Proposal and Cost Proposal will be determined by SCDOT as a condition of payment.

2.2 SCDOT will pay the stipend to Proposer as follows, subject (as applicable) to the following conditions:

- (a) Proposer has submitted this signed Stipend Agreement, unchanged with its response to the RFP.
- (b) After posting of the Notice of Award on SCDOT's Design-Build Website, Proposer has submitted to SCDOT an invoice, with FEIN Number, for the Stipend amount.
- (c) After execution of the Contract or the decision not to award a contract, SCDOT will pay the invoice for the stipend amount to the unsuccessful Proposer meeting the criteria of Section 2.1 within 90 calendar days of receipt of the invoice from Proposer.
- (d) If the procurement is suspended or cancelled prior to the Proposal Due Date (see FINAL RFP Milestone schedule), no stipend will be paid to Proposer.
- (e) After the submittal of Proposals, but prior to award, if the procurement is cancelled, all Proposers that provide a responsive Technical Proposal and Cost Proposal to the final RFP and submitted a signed Stipend Agreement with their RFP shall receive the stipend.
- (f) In the event of a Best and Final Offer, only one stipend will be paid to each Proposer that executed a Stipend Agreement and met the other criteria and conditions herein.
- (g) No stipends will be paid for submitting RFQ responses.
- (h) No stipends will be paid to a Proposer who withdraws at any time from this procurement.

2.3 Acceptance by the Proposer of payment of the stipend amount from SCDOT shall constitute a waiver by Proposer of any and all right, equitable or otherwise, to bring any claim in connection with this procurement, procurement process, award of the Contract, or cancellation of this procurement.

2.4 The Proposer awarded the contract shall be not eligible to receive a stipend.

2.5 If Proposer elects to waive payment of the stipend, SCDOT will not use the ideas or information contained in that Proposer's Proposal for this Project. However, the Proposer's Proposal will be subject to the South Carolina Freedom of Information Act.

3. Indemnities.

3.1 Subject to the limitations contained in Section 3.2, Proposer shall indemnify, protect and hold harmless SCDOT and its directors, officers, employees and contractors from, and Proposer shall defend at its own expense, all claims, costs, expenses, liabilities, demands, or suits at law or equity arising, in whole or in part, from the negligence or willful misconduct of Proposer or any of its agents, officers, employees, representatives or subcontractors or breach of any of Proposer's obligations under this Agreement.

3.2 This indemnity shall not apply with respect to any claims, demands or suits arising from use of the Work Product by SCDOT.

4. Compliance With Laws.

4.1 Proposer shall comply with all federal, state, and local laws, ordinances, rules, and regulations applicable to the work performed or paid for under this Agreement and covenants and agrees that it and its employees shall be bound by the standards of conduct provided in applicable laws, ordinances, rules, and regulations as they relate to work performed under this Agreement. Proposer agrees to incorporate the provisions of this paragraph in any subcontract into which it might enter with reference to the work performed pursuant to this Agreement.

4.2 The Proposer agrees (a) not to discriminate in any manner against an employee or applicant for employment because of race, color, religion, creed, age, sex, marital status, national origin, ancestry or disability of a qualified individual with a disability; (b) to include a provision similar to that contained in subsection (a) in any subcontract; and (c) to post and to cause subcontractors to post in conspicuous places available to employees and applicants for employment, notices setting forth the substance of this clause.

5. Assignment.

Proposer shall not assign this Agreement without SCDOT's prior written consent. Any assignment of this Agreement without such consent shall be null and void.

6. Miscellaneous.

6.1 Proposer and SCDOT agree that Proposer, its team members, and their respective employees are not agents of SCDOT as a result of this Agreement.

6.2 This Agreement, together with the RFP, as amended from time to time, the provisions of which are incorporated herein by reference, embodies the entire agreement of the parties. There are no promises, terms, conditions, or obligations other than those contained herein or in the RFP, and this Agreement shall supersede all previous communications, representation, or agreements, either oral or written, between the parties hereto.

6.3 It is understood and agreed by the parties hereto that if any part, term, or provision of this Agreement is by the courts held to be illegal or in conflict with any law of the State of South Carolina, the validity of the remaining portions or provisions shall not be affected, and the rights and obligations of the parties shall be construed and enforced as if the Agreement did not contain the particular part, term, or provisions to be invalid.

6.4 This Agreement shall be governed by and construed in accordance with the laws of the State of South Carolina.

IN WITNESS WHEREOF, the parties have executed this Agreement as of the date first written above.

Witness:

SOUTH CAROLINA DEPARTMENT
OF TRANSPORTATION

By: _____
{INSERT NAME}
Design-Build Engineer

Recommended:

Brad Reynolds
Design-Build Program Manager

Proposer

United Reeves Joint Venture
Name of Proposer

Witness:

By: D. Michael Grey

Its: EVP + Chief Business Officer

11. EQUAL EMPLOYMENT OPPORTUNITY CERTIFICATION

(COMPLETE THIS SECTION FOR FEDERAL PROJECTS ONLY) EQUAL EMPLOYMENT OPPORTUNITY PERFORMANCE

Select the Certification that applies to the PROPOSER:

Certification (1) ☒ or Certification (2) ☐

Select the appropriate responses in the applicable Certification:

Certification (1): Pursuant to 41 C.F.R. §60-1.7(b)(1), Previous Equal Employment Opportunity Performance Certification, as the Prospective Prime Contractor, I HEREBY CERTIFY THAT I:

(a) **(HAVE / HAVE NOT)** developed and filed an Affirmative Action Program pursuant to 41 C.F.R. §60-2 and/or 60-4;

(b) **(HAVE / HAVE NOT)** participated in a previous contract or subcontract subject to the equal opportunity clause;

(c) **(HAVE / HAVE NOT)** filed with the Joint Reporting Committee, the Director of Office of Federal Contract Compliance, or the Equal Employment Opportunity Commission, all reports due under the applicable filing requirements,

OR

Certification (2): I, HEREBY CERTIFY that as the Prospective Prime Contractor submitting this Proposal, **(CLAIM / DO NOT CLAIM)** exemption from the submission of the Standard Form 100 (EEO-1) due to the fact that it employs a total of less than fifty (50) employees under C.F.R. §60-1.7, or qualifies for an exempted status under 41 C.F.R. §60-1.5.

I FURTHER CERTIFY that the above Certification will be made part of any Subcontract Agreement, or other agreement involved with this project.

Executed on 1/26, 2023.

Signed: D. Michael Greg
(Officer/PROPOSER)

Title: EVP + Chief Business Officer

Company: United Infrastructure Group, Inc.

Address: 5562 Pendergrass Blvd., Great Falls, SC 29055

Note: The above certification is required by the Equal Employment Opportunity Regulations of the Secretary of Labor (41 CFR 60-1.7(b)(1)), and must be submitted by PROPOSERS only in connection with contracts which are subject to the equal opportunity clause. Contracts that are exempt from the equal opportunity clause are set forth in 41 CFR 60-1.5. (Generally, only contracts of \$10,000 or under are exempt.)

Currently, Standard Form 100 (EEO-1) is the only report required by Executive Orders or their implementing regulations.

Proposers, Primary Members, or proposed Subcontractors (any tier) and Consultants who have participated in a previous contract subject to the Executive Orders and have not filed the required reports shall note that 41 CFR 60-1.7(b)(1) prevents the award of contracts and subcontracts unless such contractor submits a report covering the delinquent period or such other period specified by the Federal Highway Administration or by the Director, Office of Federal Contract Compliance, U.S. Department of Labor.

11. EQUAL EMPLOYMENT OPPORTUNITY CERTIFICATION

(COMPLETE THIS SECTION FOR FEDERAL PROJECTS ONLY) EQUAL EMPLOYMENT OPPORTUNITY PERFORMANCE

Select the Certification that applies to the PROPOSER:

Certification (1) ☒

or

Certification (2) ☐

Select the appropriate responses in the applicable Certification:

Certification (1): Pursuant to 41 C.F.R. §60-1.7(b)(1), Previous Equal Employment Opportunity Performance Certification, as the Prospective Prime Contractor, I HEREBY CERTIFY THAT I:

(a) (HAVE / HAVE NOT) developed and filed an Affirmative Action Program pursuant to 41 C.F.R. §60-2 and/or 60-4;

(b) (HAVE / HAVE NOT) participated in a previous contract or subcontract subject to the equal opportunity clause;

(c) (HAVE / HAVE NOT) filed with the Joint Reporting Committee, the Director of Office of Federal Contract Compliance, or the Equal Employment Opportunity Commission, all reports due under the applicable filing requirements,

OR

Certification (2): I, HEREBY CERTIFY that as the Prospective Prime Contractor submitting this Proposal, **(CLAIM / DO NOT CLAIM)** exemption from the submission of the Standard Form 100 (EEO-1) due to the fact that it employs a total of less than fifty (50) employees under C.F.R. §60-1.7, or qualifies for an exempted status under 41 C.F.R. §60-1.5.

I FURTHER CERTIFY that the above Certification will be made part of any Subcontract Agreement, or other agreement involved with this project.

Executed on 1/27, 2023.

Signed: Chris Don

(Officer/PROPOSER)

Title: Vice President

Company: Reeves Construction Company

Address: 243 Planners Rd
Duncan, SC 29337

Note: The above certification is required by the Equal Employment Opportunity Regulations of the Secretary of Labor (41 CFR 60-1.7(b)(1)), and must be submitted by PROPOSERS only in connection with contracts which are subject to the equal opportunity clause. Contracts that are exempt from the equal opportunity clause are set forth in 41 CFR 60-1.5. (Generally, only contracts of \$10,000 or under are exempt.)

Currently, Standard Form 100 (EEO-1) is the only report required by Executive Orders or their implementing regulations.

Proposers, Primary Members, or proposed Subcontractors (any tier) and Consultants who have participated in a previous contract subject to the Executive Orders and have not filed the required reports shall note that 41 CFR 60-1.7(b)(1) prevents the award of contracts and subcontracts unless such contractor submits a report covering the delinquent period or such other period specified by the Federal Highway Administration or by the Director, Office of Federal Contract Compliance, U.S. Department of Labor.

10. NON-COLLUSION CERTIFICATION

NON-COLLUSION CERTIFICATION

Project ID: 8862230

IN ACCORDANCE WITH THE PROVISIONS OF S.C. CODE ANN. §§ 39-3-10 ET. SEQ., 39-5-10 ET. SEQ., 15 U.S.C. §45; 23 C.F.R. §635.112(F); AND 28 U.S.C. §1746, I HEREBY ACKNOWLEDGE THAT I AM AN OFFICER OF THE PROPOSER FIRM AND, UNDER PENALTY OF PERJURY UNDER THE LAWS OF THE UNITED STATES AND SOUTH CAROLINA, DECLARE, BY MY CERTIFICATION BELOW, THAT THE FOLLOWING IS TRUE AND CORRECT, AND FURTHER, THAT THIS JOINT-VENTURE, FIRM, PARTNERSHIP, ASSOCIATION OR CORPORATION, OR ANY OTHER LEGAL ENTITY HAS NOT, EITHER DIRECTLY OR INDIRECTLY, ENTERED INTO ANY AGREEMENT, PARTICIPATED IN ANY COLLUSION, OR OTHERWISE TAKEN ANY ACTION IN RESTRAINT OF FREE COMPETITIVE BIDDING IN CONNECTION WITH THE SUBMISSION OF A BID PROPOSAL ON THE ABOVE REFERENCED PROJECT.

BY CHECKING THIS BOX ☒, I CERTIFY THAT I HAVE READ, UNDERSTAND, ACCEPT, AND ACKNOWLEDGE ALL OF THE ABOVE STATEMENTS.

Executed on 1/26/23
(Date)

Signed: D. Michael Grey
(Officer/Proposer)

EVP + Chief Business Officer
(Title)

5562 Pendargrass Blvd.
(Address)

Great Falls, SC 29055

10. NON-COLLUSION CERTIFICATION

NON-COLLUSION CERTIFICATION

Project ID: 8862230

IN ACCORDANCE WITH THE PROVISIONS OF S.C. CODE ANN. §§ 39-3-10 ET. SEQ., 39-5-10 ET. SEQ., 15 U.S.C. §45; 23 C.F.R. §635.112(F); AND 28 U.S.C. §1746, I HEREBY ACKNOWLEDGE THAT I AM AN OFFICER OF THE PROPOSER FIRM AND, UNDER PENALTY OF PERJURY UNDER THE LAWS OF THE UNITED STATES AND SOUTH CAROLINA, DECLARE, BY MY CERTIFICATION BELOW, THAT THE FOLLOWING IS TRUE AND CORRECT, AND FURTHER, THAT THIS JOINT-VENTURE, FIRM, PARTNERSHIP, ASSOCIATION OR CORPORATION, OR ANY OTHER LEGAL ENTITY HAS NOT, EITHER DIRECTLY OR INDIRECTLY, ENTERED INTO ANY AGREEMENT, PARTICIPATED IN ANY COLLUSION, OR OTHERWISE TAKEN ANY ACTION IN RESTRAINT OF FREE COMPETITIVE BIDDING IN CONNECTION WITH THE SUBMISSION OF A BID PROPOSAL ON THE ABOVE REFERENCED PROJECT.

BY CHECKING THIS BOX ☒ , I CERTIFY THAT I HAVE READ, UNDERSTAND, ACCEPT, AND ACKNOWLEDGE ALL OF THE ABOVE STATEMENTS.

Executed on 1-27-23
(Date)

Signed: Chryl Down
(Officer/Proposer)

Vice President
(Title)

248 Plennons Rd.
(Address)

Duncan, SC 29334

Reeves Construction Company

NOTICE OF RECEIPT
Bridge Package 15
Design-Build – Contract ID 8862230
Anderson, Chester, Chesterfield, and Lancaster Counties

Addendum 1

The information in this addendum shall be made part of the contract documents. PROPOSERS are instructed to incorporate the information into the previously provided RFP documents.

PROPOSERS are required to sign this document and enclose it with their Technical Proposal. Receipt of this signed document by The South Carolina Department of Transportation serves as confirmation that the PROPOSER has received and incorporated this Addendum into the contract documents.

Confirmation Statement:

I, the PROPOSER confirm that I have received this addendum package and have incorporated the information provided in the addendum into the contract documents.

D. Michael Grey
PROPOSER's Signature

1/26/23
Date

D. Michael Grey
Printed Name

For: United Reeves Joint Venture
Design-Build Team Name



NOTICE OF RECEIPT
Bridge Package 15
Design-Build – Contract ID 8862230
Anderson, Chester, Chesterfield, and Lancaster Counties

Addendum 2

The information in this addendum shall be made part of the contract documents. PROPOSERS are instructed to incorporate the information into the previously provided RFP documents.

PROPOSERS are required to sign this document and enclose it with their Technical Proposal. Receipt of this signed document by The South Carolina Department of Transportation serves as confirmation that the PROPOSER has received and incorporated this Addendum into the contract documents.

Confirmation Statement:

I, the PROPOSER confirm that I have received this addendum package and have incorporated the information provided in the addendum into the contract documents.

D. Michael Grey
PROPOSER's Signature

1/26/23
Date

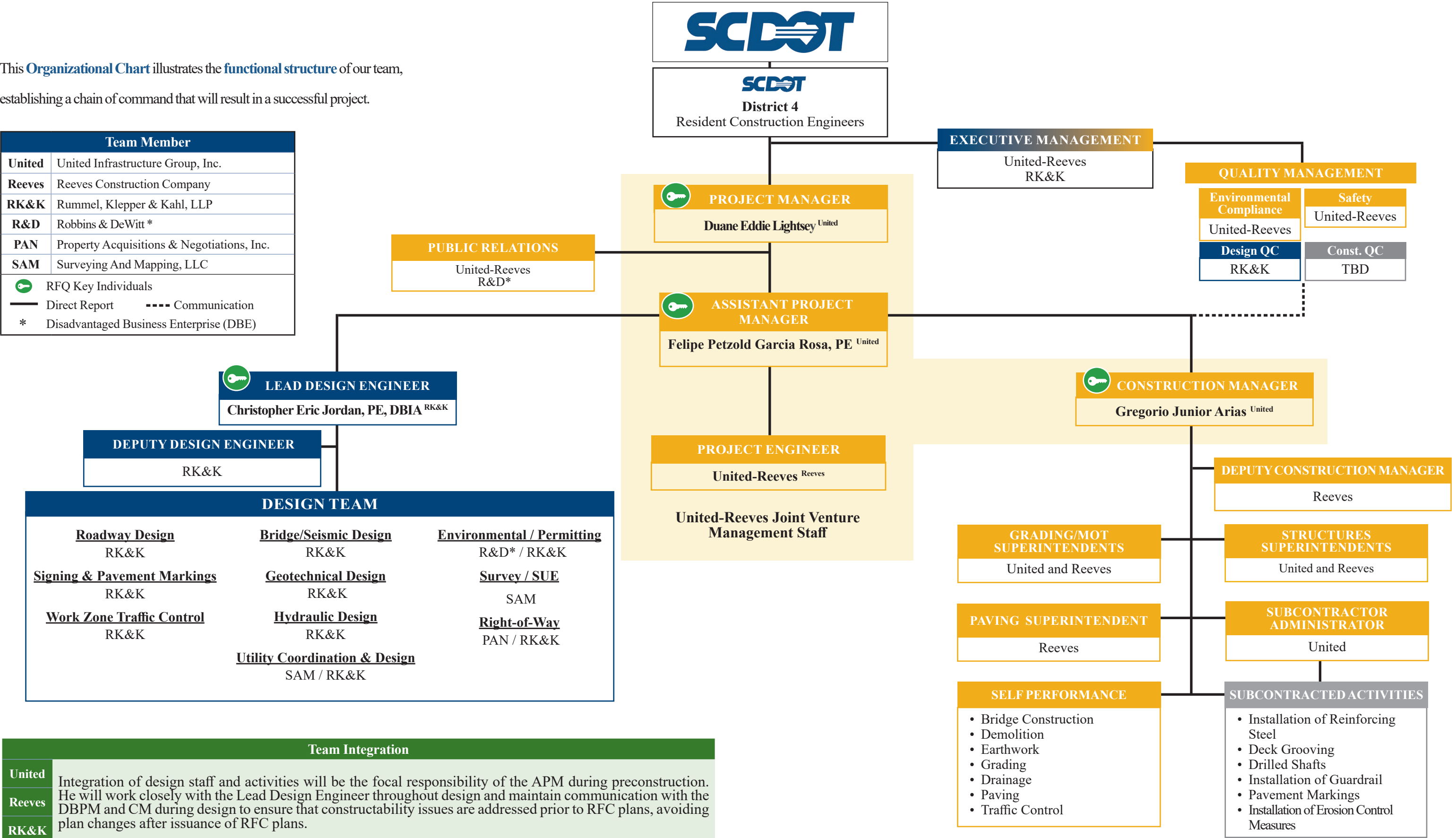
D. Michael Grey
Printed Name

For: United Reeves Joint Venture
Design-Build Team Name



This **Organizational Chart** illustrates the **functional structure** of our team, establishing a chain of command that will result in a successful project.

Team Member	
United	United Infrastructure Group, Inc.
Reeves	Reeves Construction Company
RK&K	Rummel, Klepper & Kahl, LLP
R&D	Robbins & DeWitt *
PAN	Property Acquisitions & Negotiations, Inc.
SAM	Surveying And Mapping, LLC
RFQ Key Individuals	
— Direct Report - - - - Communication	
* Disadvantaged Business Enterprise (DBE)	



Team Integration	
United	Integration of design staff and activities will be the focal responsibility of the APM during preconstruction. He will work closely with the Lead Design Engineer throughout design and maintain communication with the DBPM and CM during design to ensure that constructability issues are addressed prior to RFC plans, avoiding plan changes after issuance of RFC plans.
Reeves	
RK&K	



A COLAS COMPANY

January 27, 2023

Carmen Wright
Office of Project Delivery
South Carolina Department of Transportation
955 Park Street, Room 101
Columbia, South Carolina 29201

RE: Bridge Package 15
Contract ID 8862230 Anderson, Chester, Chesterfield, and Lancaster Counties, South Carolina

Dear Ms. Wright:

I, C. Robert Loar, in my capacity as Vice President of Reeves Construction Company, affirm that the Key Individuals represented in our Project Organization Chart in our SOQ for the referenced project shall be available to construct the Bridge Package 15 Design-Build Project, barring any unforeseen circumstances, as required in the RFP at the earliest of the times and durations identified in the RFQ and RFP, until expiration of the Warranty Period, or such earlier date as the Contract is terminated.

Respectfully Submitted,

C. Robert Loar
Vice President

State of **South Carolina**
County of **Greenville**

Sworn to and subscribed before me this 27th day of January, 2023, by

Paul Edwards
(Print name of person signing Affidavit)

Notary Public

May 5, 2026
Commission Expires

Personally Known X Or Produced Identification _____



January 31, 2023

RE: Bridge Package 15- Design-Build Project - Contract ID 8862230

6.f. Updated Organization Chart and Notarized Statement of Availability of Key Individuals

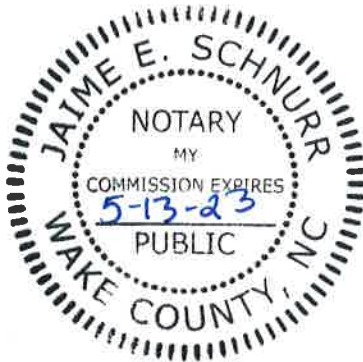
This serves as a written statement that RK&K's Key Individual, Christopher Eric Jordan, PE, DBIA, who is identified as the Lead Design Engineer on the original organizational chart submitted with the SOQ, will be available, barring any unforeseen circumstances, at the earliest of the times and durations identified in the RFQ and RFP, until expiration of the Warranty Period, or such earlier date as the Contract is terminated or SCDOT releases, in writing, such Key Individual from this requirement.



B. Keith Skinner, PE
Partner
Rummel, Klepper & Kahl, LLP


Notary Signature

Expiration 5-13-23





g. Confidential and Proprietary Information Page List

United Infrastructure Group-Reeves Construction Company-Joint Venture (United-Reeves JV) (Contractor) and Rummel, Klepper & Kahl, LLP (RK&K) (Lead Designer) have identified several items that we consider confidential and proprietary information. Per Section 4.4 of the RFP, the following is a list of page numbers that contain confidential and/or proprietary information.

Technical Proposal Narrative

- Page 7
- Pages 9-10

Appendix B - Required Forms

- United-Reeves JV Teaming Agreement
- Quality Credit Matrix

As we have designated a portion of our Proposal as “Confidential,” we have submitted one complete copy of our Proposal from which the designated “Confidential” information has been redacted, i.e. the redacted copy. The redacted copy reflects the same pagination as the original, shows the empty space from which information was redacted, and has been submitted electronically. Except for the information concealed, the redacted copy is identical to its original Proposal, and the SCDOT POC is able to view, search, copy and print the redacted copy.



Columbia, South Carolina

**SOUTH CAROLINA DEPARTMENT
OF
TRANSPORTATION**

PRIME CONTRACTOR

PREQUALIFICATION CERTIFICATE

This Certifies that your company has complied with the rules and regulations of the Department and the State of South Carolina, and subject to the rules and regulations for a prime contractor, is declared eligible to submit a bid and be awarded any construction contract issued by the Department, subject to obtaining proper bonds and insurance acceptable to the Department and complying with all other statutory and contract requirements.

ALL BIDS SUBMITTED TO THE DEPARTMENT MUST BE IN THE NAME AS SHOWN BELOW.

UNITED INFRASTRUCTURE GROUP-REEVES CONSTRUCTION COMPANY JV

Vendor ID: 1UN040

Issued : January 11, 2023

Expires: December 31, 2023

Approved By:


Prequalification Coordinator



Columbia, South Carolina

**SOUTH CAROLINA DEPARTMENT
OF
TRANSPORTATION**

PRIME CONTRACTOR

PREQUALIFICATION CERTIFICATE

This Certifies that your company has complied with the rules and regulations of the Department and the State of South Carolina, and subject to the rules and regulations for a prime contractor, is declared eligible to submit a bid and be awarded any construction contract issued by the Department, subject to obtaining proper bonds and insurance acceptable to the Department and complying with all other statutory and contract requirements.

ALL BIDS SUBMITTED TO THE DEPARTMENT MUST BE IN THE NAME AS SHOWN BELOW.

REEVES CONSTRUCTION COMPANY

Vendor ID: 1RE005

Issued : June 14, 2022

Expires: June 30, 2023

Approved By:


Prequalification Coordinator



Columbia, South Carolina

**SOUTH CAROLINA DEPARTMENT
OF
TRANSPORTATION**

PRIME CONTRACTOR

PREQUALIFICATION CERTIFICATE

This Certifies that your company has complied with the rules and regulations of the Department and the State of South Carolina, and subject to the rules and regulations for a prime contractor, is declared eligible to submit a bid and be awarded any construction contract issued by the Department, subject to obtaining proper bonds and insurance acceptable to the Department and complying with all other statutory and contract requirements.

ALL BIDS SUBMITTED TO THE DEPARTMENT MUST BE IN THE NAME AS SHOWN BELOW.

UNITED INFRASTRUCTURE GROUP, INC.

Vendor ID: 1UN002

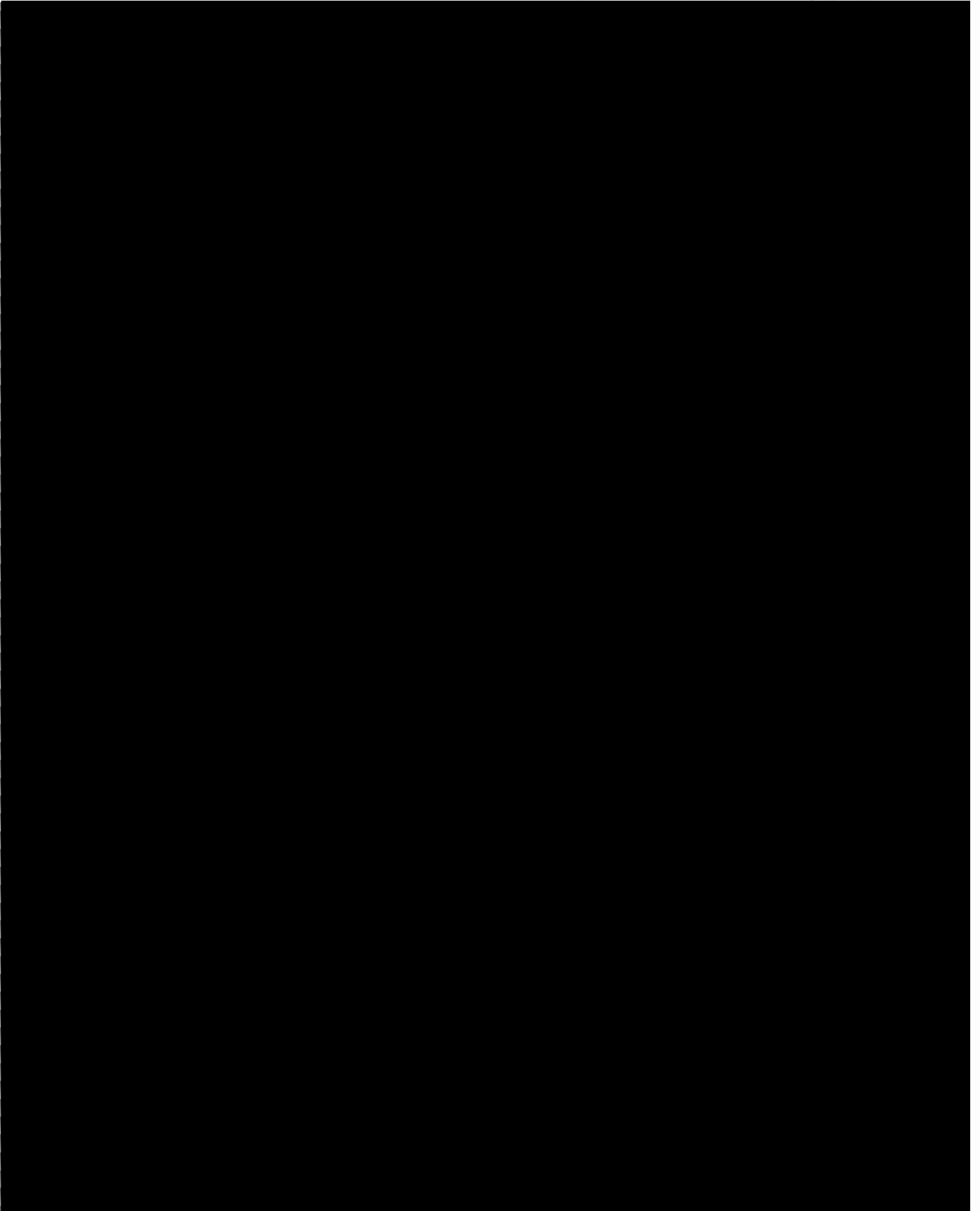
Issued : December 13, 2022

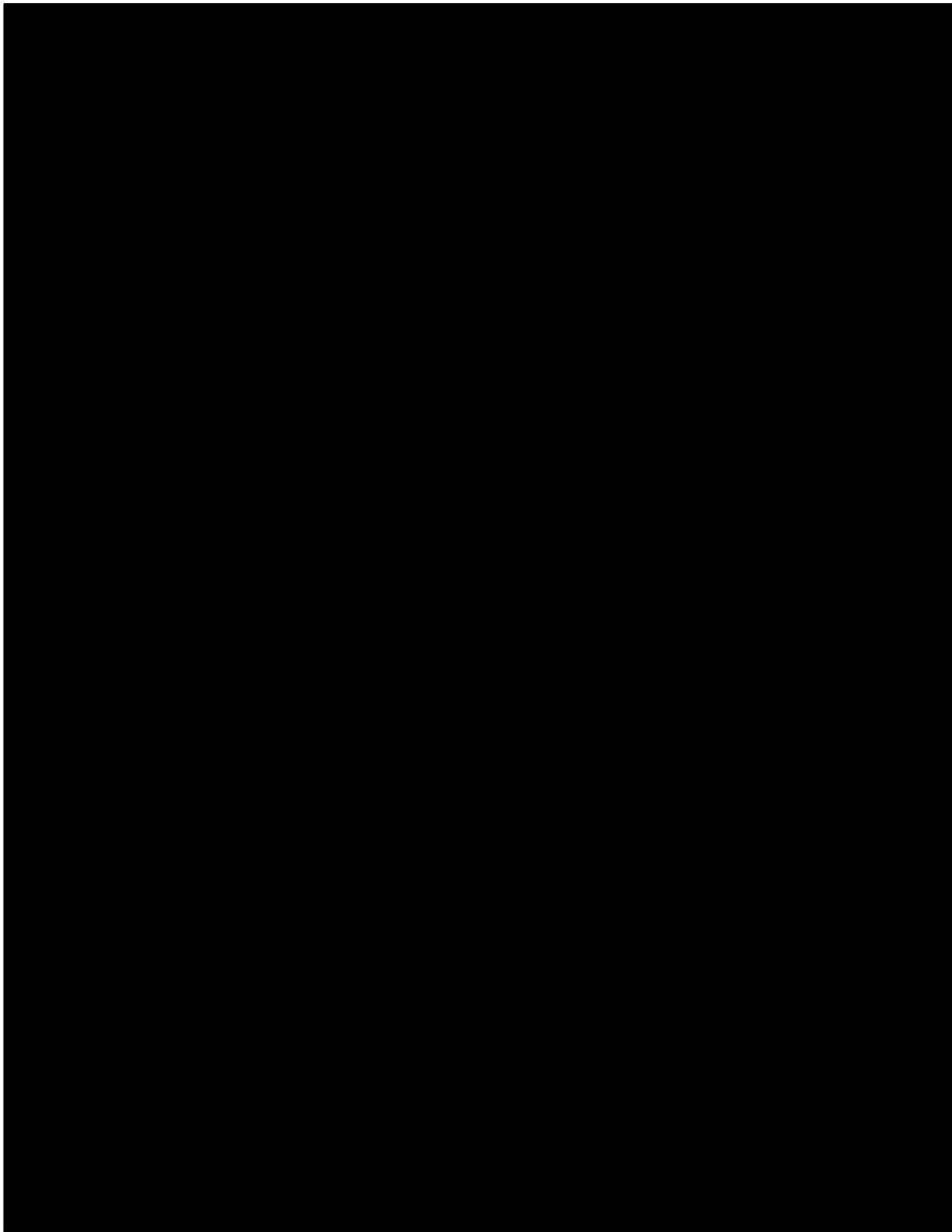
Expires: December 31, 2023

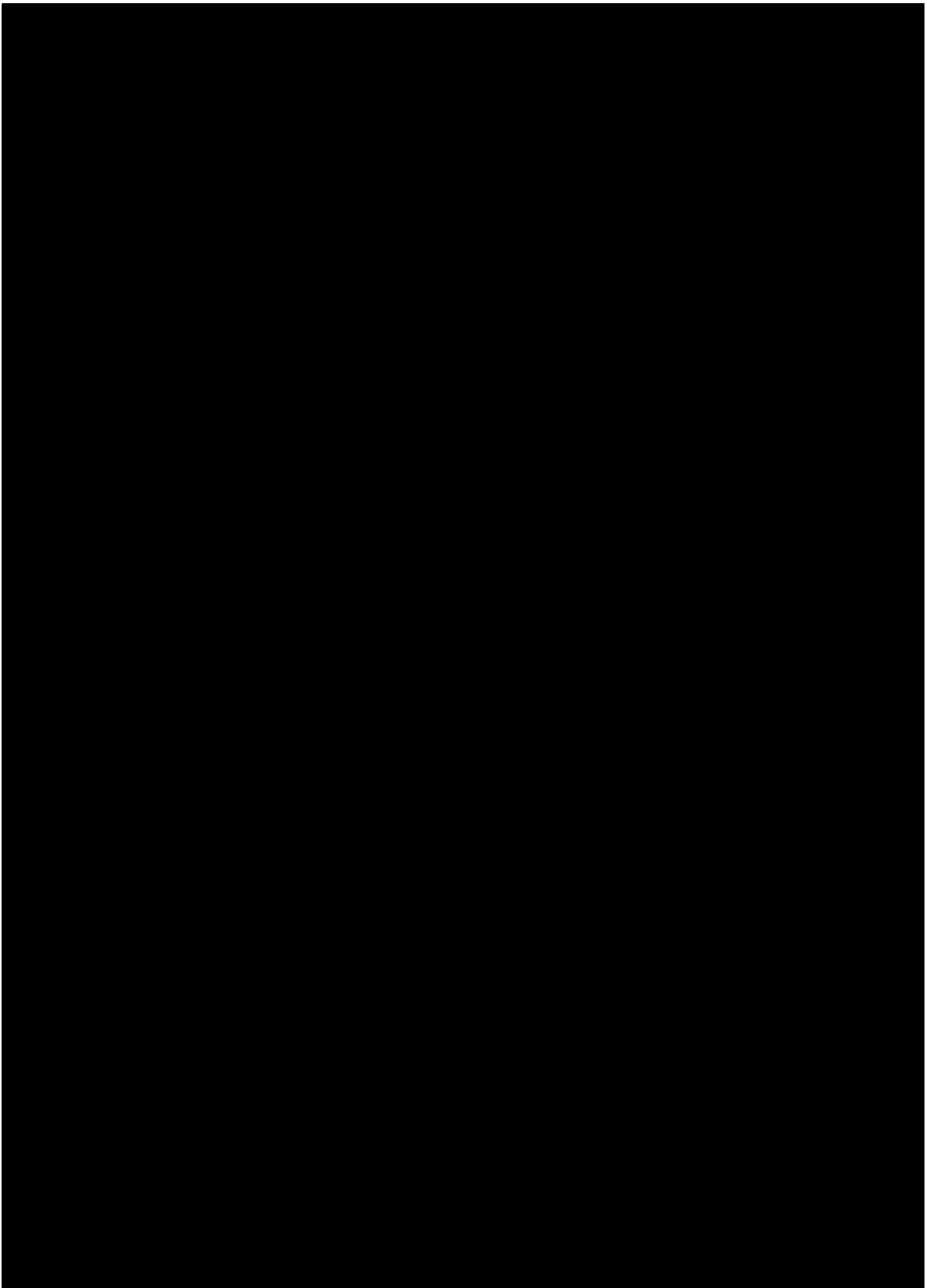
Approved By: Maria G. Duroso
Prequalification Coordinator

CONFIDENTIAL

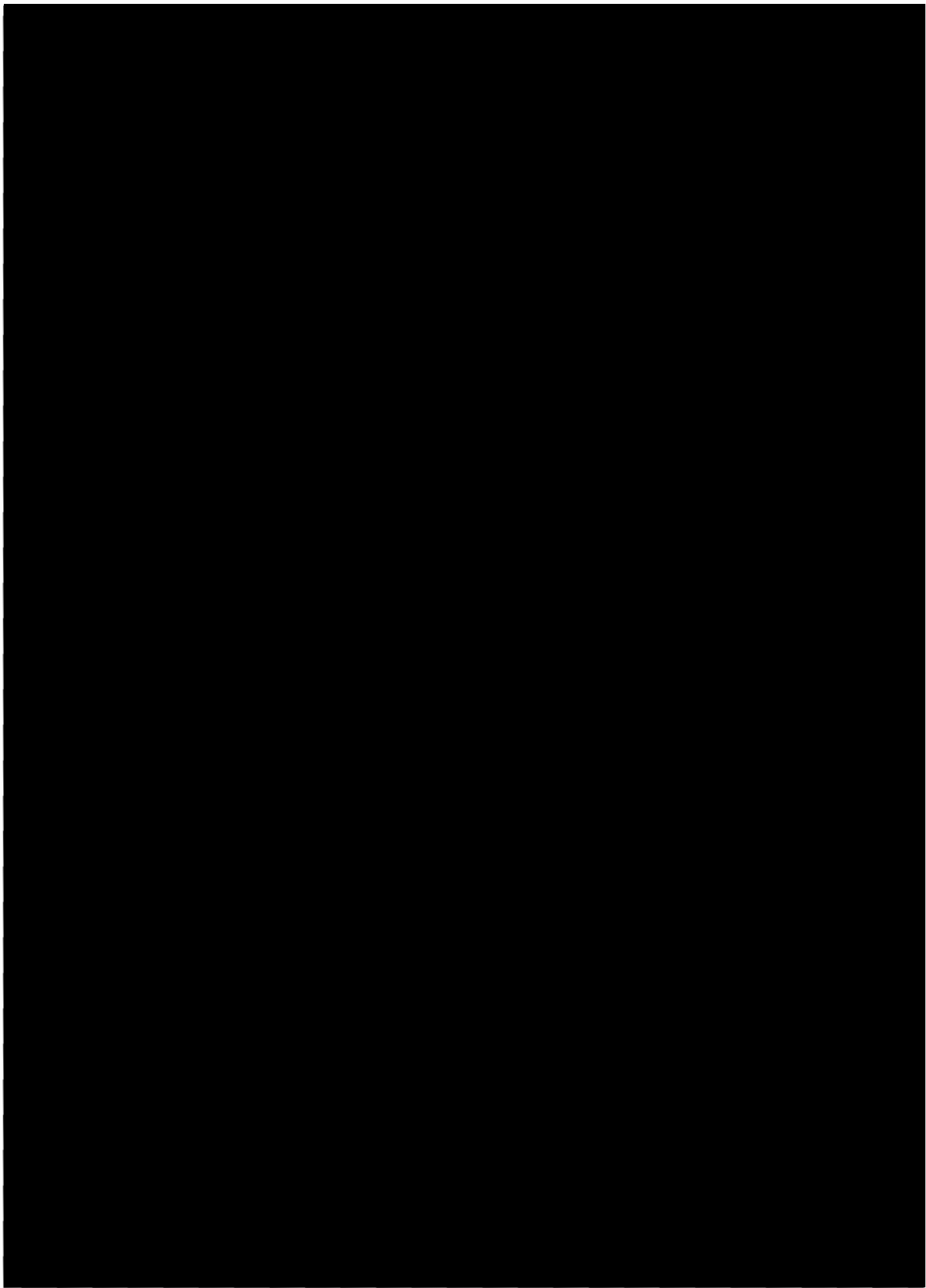
**AMENDED AND RESTATED
JOINT VENTURE TEAMING AGREEMENT**











Bridge Package 15 Quality Credit Matrix

Number	Description	Added Value/Benefits	Cost/Schedule Impacts	Self-imposed Assurance

Cost/Schedule Impacts – Describe the Cost in dollars and/or Schedule impacts in days associated with the feature (positive or negative).
Self-imposed Assurance – Discuss any penalties or liquidated damages that will apply in the event the CONTRACTOR cannot implement the feature as described.

Appendix C - Approved Formal ATCs being incorporated into the Proposer's Cost Proposal



UNITED
INFRASTRUCTURE GROUP, INC.



REEVES

A COLAS COMPANY



Formal Alternative Technical Concepts Submittal Form

Project: Bridge Package 15

Project ID: 8862230

ATC No.: 1

Priority: High

Team: United-Reeves JV/RK&K

Date: 1/9/23

Description (required):

This ATC seeks to reduce the bridge length at S-294 (East Broad Street) over Wilson Creek in Anderson County.

Usage:

Our team is proposing to use a 100' single span bridge for S-294 over Wilson Creek.

Deviations (required):

This bridge length would deviate from the minimum bridge length provided in Attachment B of the RFP of 130 feet for this site.

Justification:

Upon an in-depth review of the site and the model, our team determined that a 100' single span bridge would be achievable at this site. Included with this ATC is a Bridge Hydraulic Analysis Report, Bridge Plan and Profile, Bridge Typical Section showing superstructure depth, and Roadway Plan and Profile for supporting justification. These documents show we meet the minimum toe of fill set backs to top of bank and the hydraulic requirements for freeboard and backwater. Even when utilizing a 130' bridge as shown in the Minimum Span Length chart, the 100-year backwater does not change from 0.99' in the corrected existing conditions.

Schedule:

Approval of this ATC would allow a construction schedule savings of 8 weeks due to the elimination of setting multiple spans of girders and constructing drilled shafts.

Impacts:

This ATC will reduce impacts to total roadway length, required right-of-way, and environmental resources.

History:

Many states have a great success rate of using and constructing 100' single span box beam bridges. The Reeves/RK&K team has previously designed a 100' single span box beam bridge at S-87 over Pagett's Creek in Union County.

Risks:

No risks to SCDOT or others are anticipated.

Costs (required):

This single span bridge would provide a cost savings of roughly \$400,000 by not requiring multiple spans and drilled shafts and lessening roadway work and right-of-way impacts.

Quality:

No adverse impact to quality or performance with the implementation of this ATC.

Formal Alternative Technical Concepts Submittal Form

Project: Bridge Package 15

Project ID: 8862230

ATC No.: 1

Priority: High

Team: United-Reeves JV/RK&K

Date: 1/9/23

Operations & Maintenance:

No negative impact to long-term operation and maintenance is anticipated with this ATC. This single span bridge ATC will reduce operation and maintenance costs with the removal of two joints.

Bridge Hydraulics Analysis for Alternative Technical Concept (ATC 1)

The analysis presented in this document covers evaluation and comparison of bridge hydraulic performance of the original SCDOT proposed design and the ATC 1 design option under consideration for the Anderson S-294 bridge replacement over Wilsons Creek. The evaluation was performed using HECRAS version 6.2 software.

I. INTRODUCTION

RK&K performed a bridge hydraulics analysis for the low-volume bridge replacement of the bridge in Anderson County along S-294 over Wilsons Creek. A preliminary bridge analysis was completed to determine the minimum bridge length provided in the Request for Proposals dated December 5, 2022 addended January 5, 2023. The results of this preliminary study were used to determine the minimum bridge length of 130'. Based on the analysis and the information provided in this memorandum, RK&K proposes an Alternative Technical Concept of a bridge length of 100'. All pertinent data and supporting documentation are provided below.

II. DESIGN CRITERIA

- Design Storm: 25-Year
- Overtopping: If the design flood overtops the existing road grade, the proposed bridge may be designed to account for a comparable amount of overtopping flow on the roadway approaches in accordance with Exhibit 4b. Bridge structure overtopping for the design storm event is not allowed.
- Freeboard: Shall not be less than 2 feet above the 25-year event unless the existing freeboard clearance is less than 2 feet.
- Backwater: Shall be 1 foot or less unless the hydraulic model results demonstrate the existing backwater is greater than 1 foot. When the existing backwater is greater than 1 foot, this level of hydraulic performance can be improved or maintained, provided the EOR researches and certifies to the best of his/her knowledge and belief that the existing backwater is not causing adverse impacts to upstream and adjacent properties.
- Low Chord: Shall not be less than the existing bridge low chord elevation unless the hydraulic model results demonstrate the low chord elevation passes the 500-year return storm event without putting the bridge under pressure flow. Additionally, the EOR shall research and certify to the best of his/her knowledge and belief that a reduction in elevation should not cause adverse impacts to upstream, adjacent, and downstream properties.
- Abutments: Provide a minimum 5' abutment toe setback from the top of the channel bank.

III. MODEL UPDATES

The preliminary model was updated using the guidance of the HEC-RAS Hydraulic Reference Manual Version 5.0 dated February 2016. Below is a list of updates that were completed by RK&K during the hydraulic design process. All models and subsequent updates were run in HEC-RAS version 6.2.

- Additional cross sections were added to the model for more accurate representation of the channel characteristics and to match SCDOT requirements for maximum cross section spacing more closely.
- A sensitivity test was completed to verify the extents of the truncated model that was provided.
- Channel geometry was verified and edited in the bridge cross sections.
- Updated terrain data was acquired using the SCDNR County DEM for the stream extents outside of the SCDOT survey. The additional LiDAR terrain was determined to match and be consistent with the SCDOT survey. The

provided model showed a difference in ground elevations between the survey and the additional terrain of approximately 4'.

- In existing and proposed conditions, ineffective flow locations and elevations were adjusted using the ratios provided in the HEC-RAS Hydraulic Reference Manual. Ineffective flows were edited to include the 48" culvert within the floodplain.
- In existing conditions, the low chord of the bridge was revised to 529.13' as determined from the existing road survey and measured structure depth, compared to 528.88' in the provided study.
- The existing 48" pipe was added to the model and a multiple openings analysis was run in both existing and proposed conditions.
- The existing 1' bridge rail was added to the model and the existing bridge structure depth was updated to 8" per information obtained from the RK&K field inspection, as compared to the 0.92' bridge deck in the provided study.
- The bridge modeling approach was edited to use the greater of the Momentum and Energy equations during low flow conditions and to use the Pressure and/or Weir Equation during high flow conditions. Energy Only was used for the high flow conditions in the provided study. Energy only is optimal only when there is significant overtopping of the bridge and roadway. Pressure and/or Weir Equations take into account losses and is the more conservative of the two high flow methods.
- The proposed bridge model was edited for the correct structure depth and correct bridge rail height determined from RK&K's structures department. The structure depth was revised to a total depth of 3.84' and the bridge rail height was revised to 3.5'.
- The internal bridge cross sections were updated using the most recent SCDOT survey information.

The 130', three-span (30'-70'-30') bridge with the changes mentioned above applied provides a 100-year backwater of 0.99'.

IV. CONCLUSION AND RESULTS

The HEC-RAS analysis showed that a 100' single span bridge meets the RFP requirements from December 5, 2022. No adverse effects are present at the adjacent, upstream, and downstream properties due to the shortening of the bridge. No residential homes are in the floodplain within the limits of the study. Table 1 shows a summary of the design criteria for the Anderson County bridge along S-294.

Table 1: Summary of Results

<u>CRITERIA</u>	<u>SCDOT RFP</u> <u>Existing Model*</u>	<u>SCDOT RFP</u> <u>Model*</u>	<u>RK&K Existing</u> <u>Model</u>	<u>RK&K Revised</u> <u>Model</u>
25-Year WSEL	528.66	528.30	527.33	525.94
100-Year WSEL	530.56	529.71	529.84	528.14
100-Year Backwater (ft)	+1.23	+0.54	+2.60	+0.99
25-year Freeboard (ft)	0.22	2.00	1.80	3.52
Low Chord Elevation	528.88	530.30	529.13	529.46
Bridge Length (ft)	75	130	75	100
Span Arrangement	5 @ 15'	30'-70'-30'	5 @ 15'	Single Span

*All values were pulled from the Preliminary Hydraulic Analysis Report.

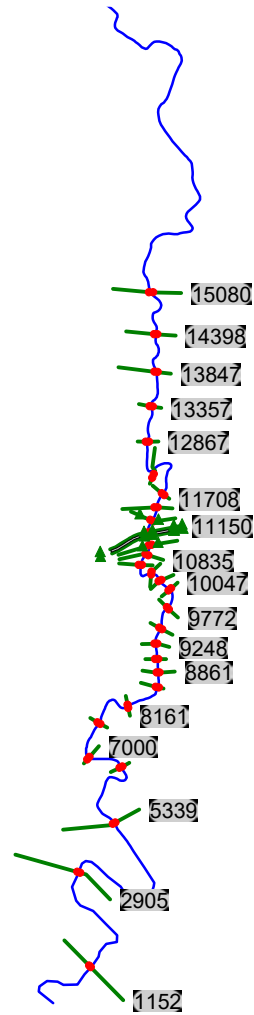
See Appendix B for bridge plan and profile showing that all setback requirements are met.

V. ATTACHMENTS

- Attachment A: RK&K Proposed Model HEC-RAS Outputs
- Attachment B: Preliminary Study Comparisons
- Attachment C: Bridge Plan and Profile
- Attachment D: Roadway Profile

Appendix A: RK&K Proposed Model HEC-RAS Outputs

Anderson S-294 HEC-RAS Schematic



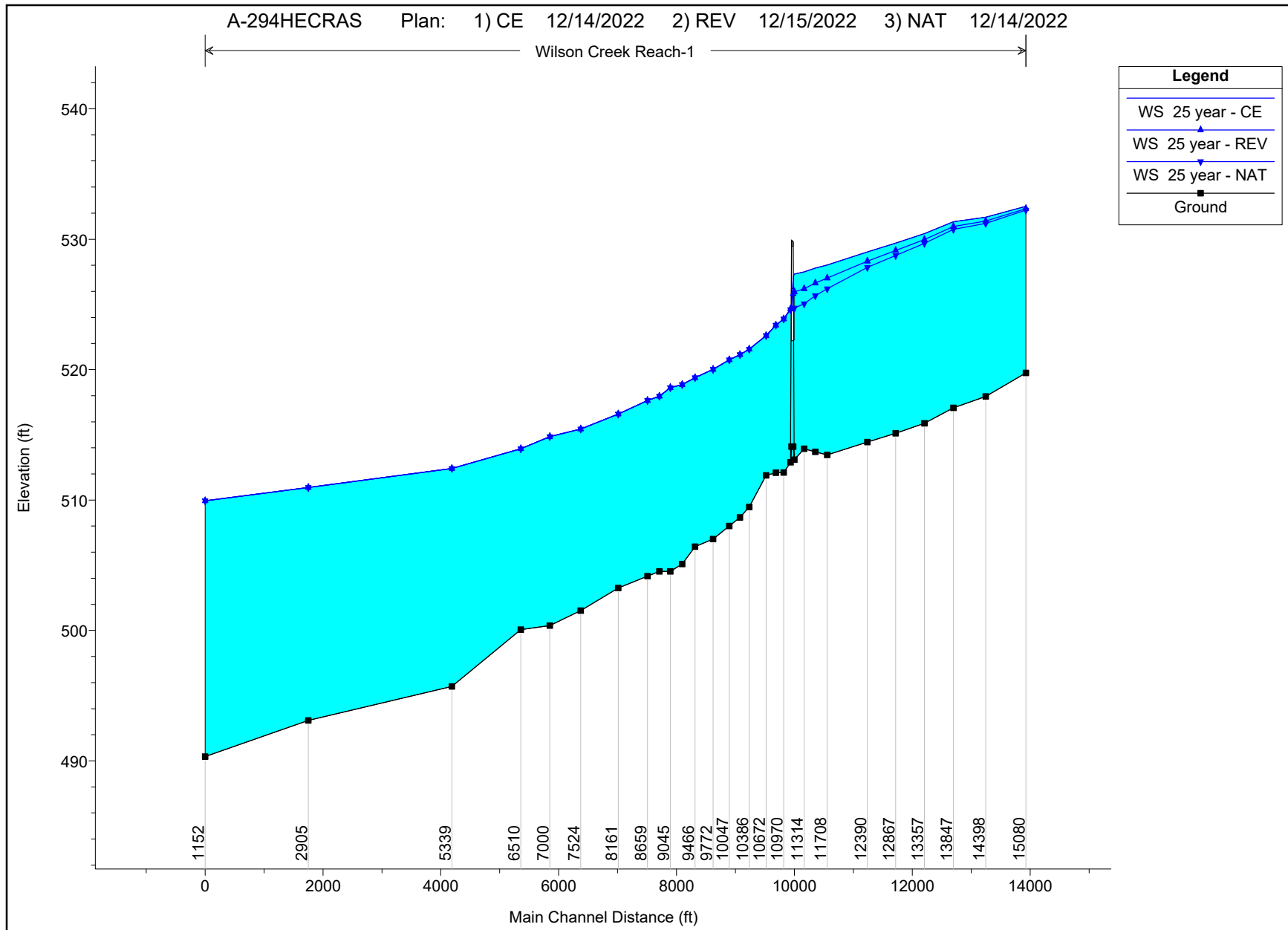
Geometry Naming Conventions:

Natural (NAT) - Natural Conditions

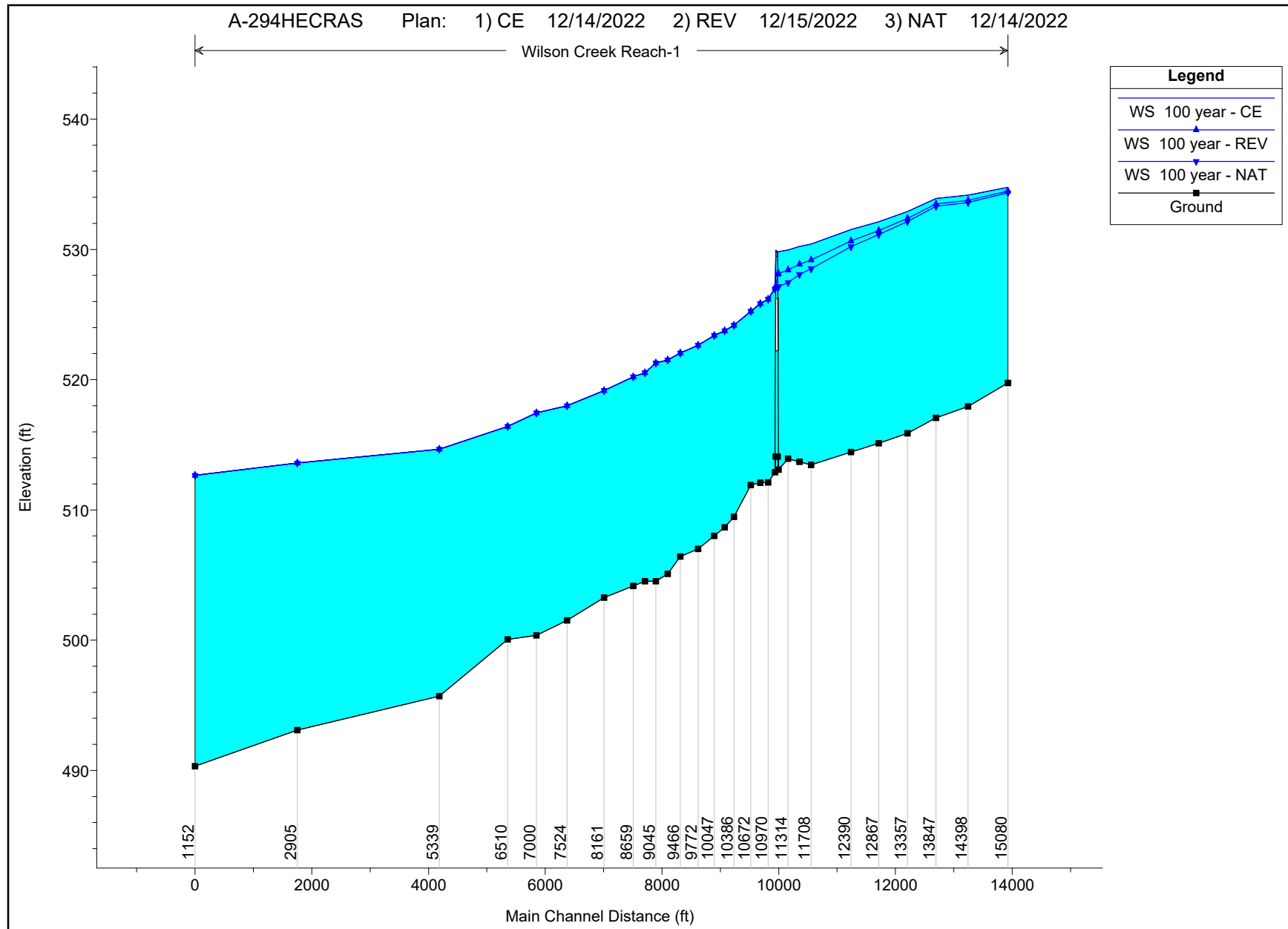
Corrected Effective (CE) - Existing Conditions

Revised (REV) - Proposed Conditions

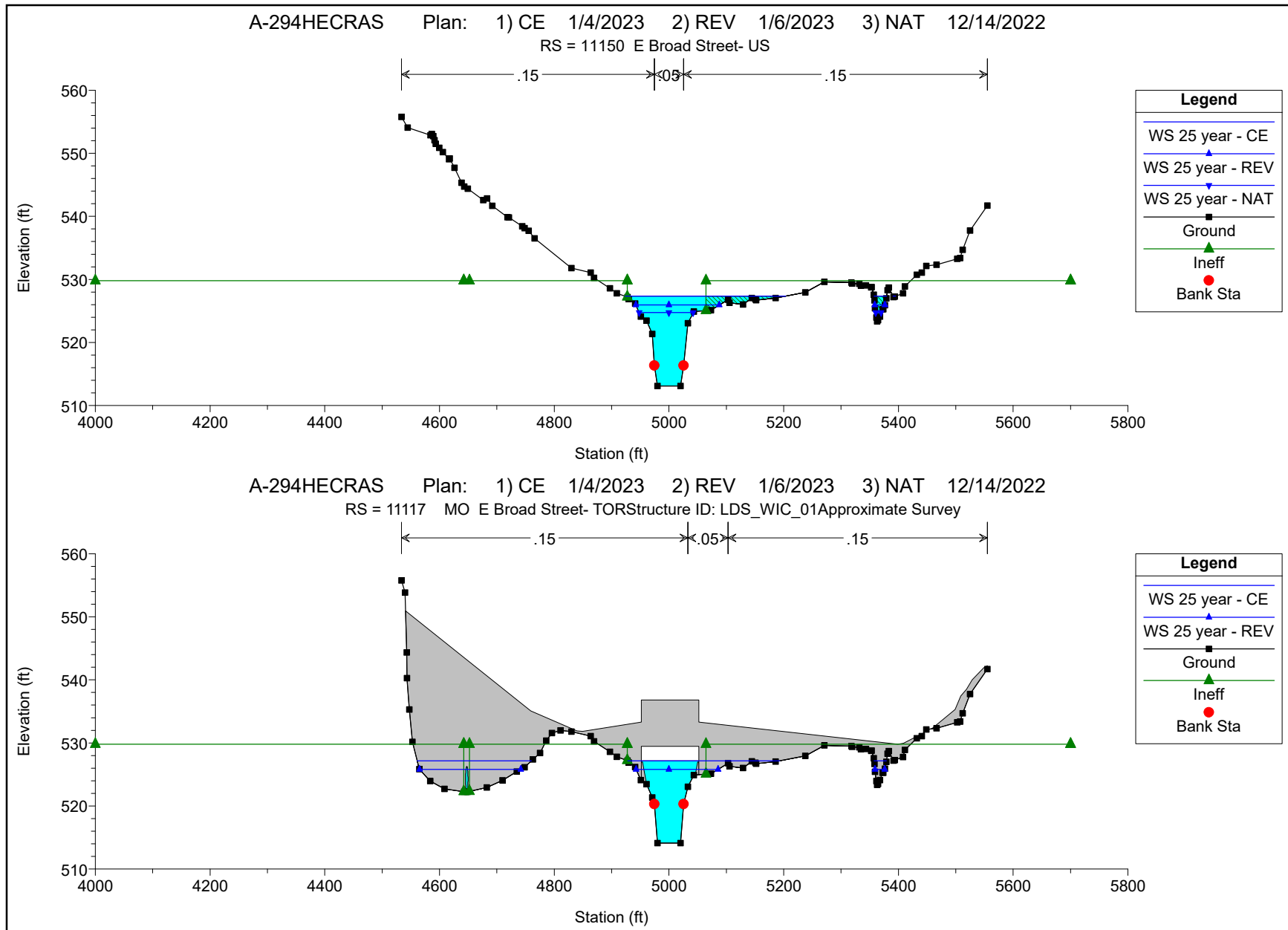
Anderson S-294 25-Year Profile



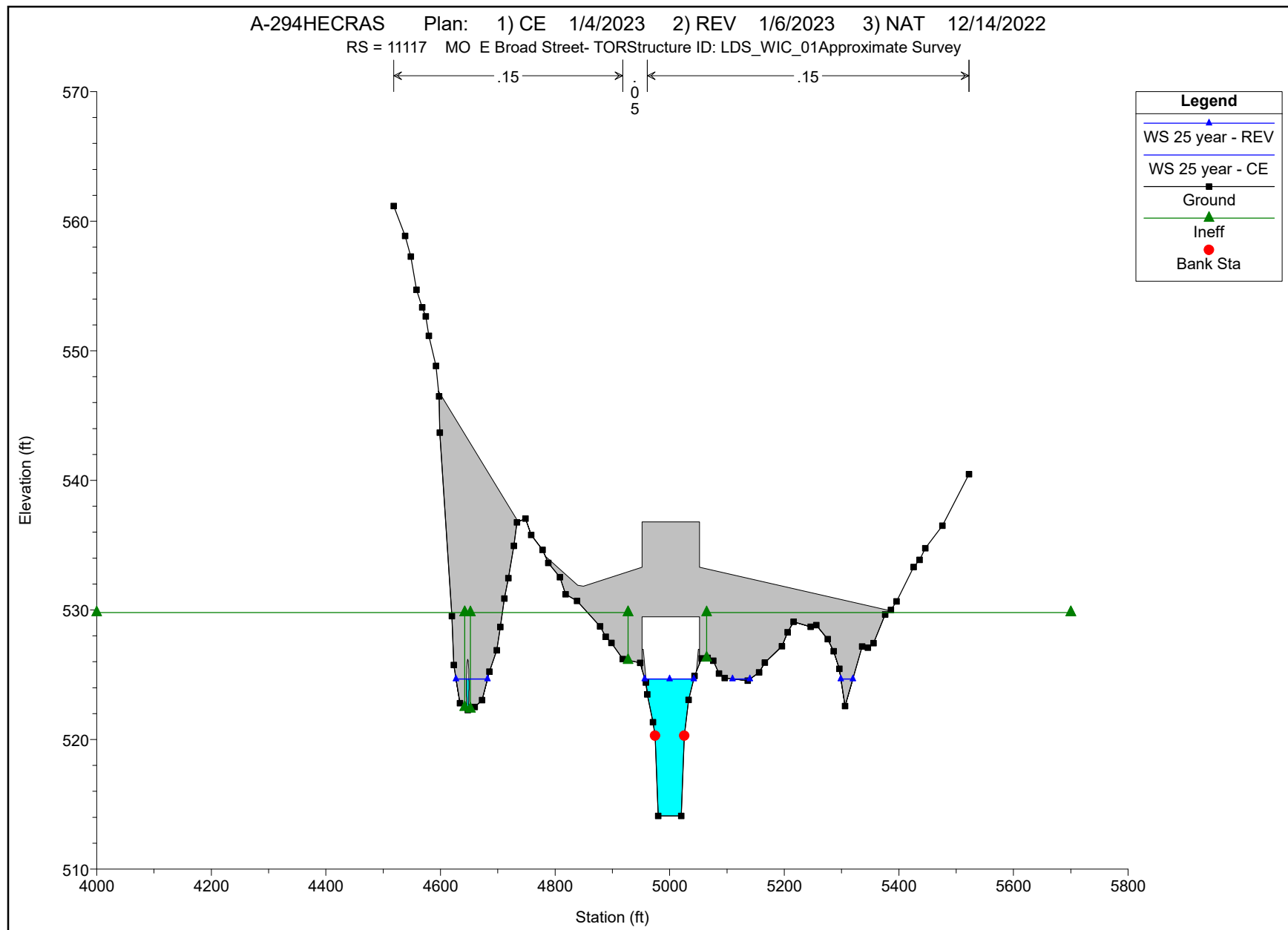
Anderson S-294 25-Year Profile



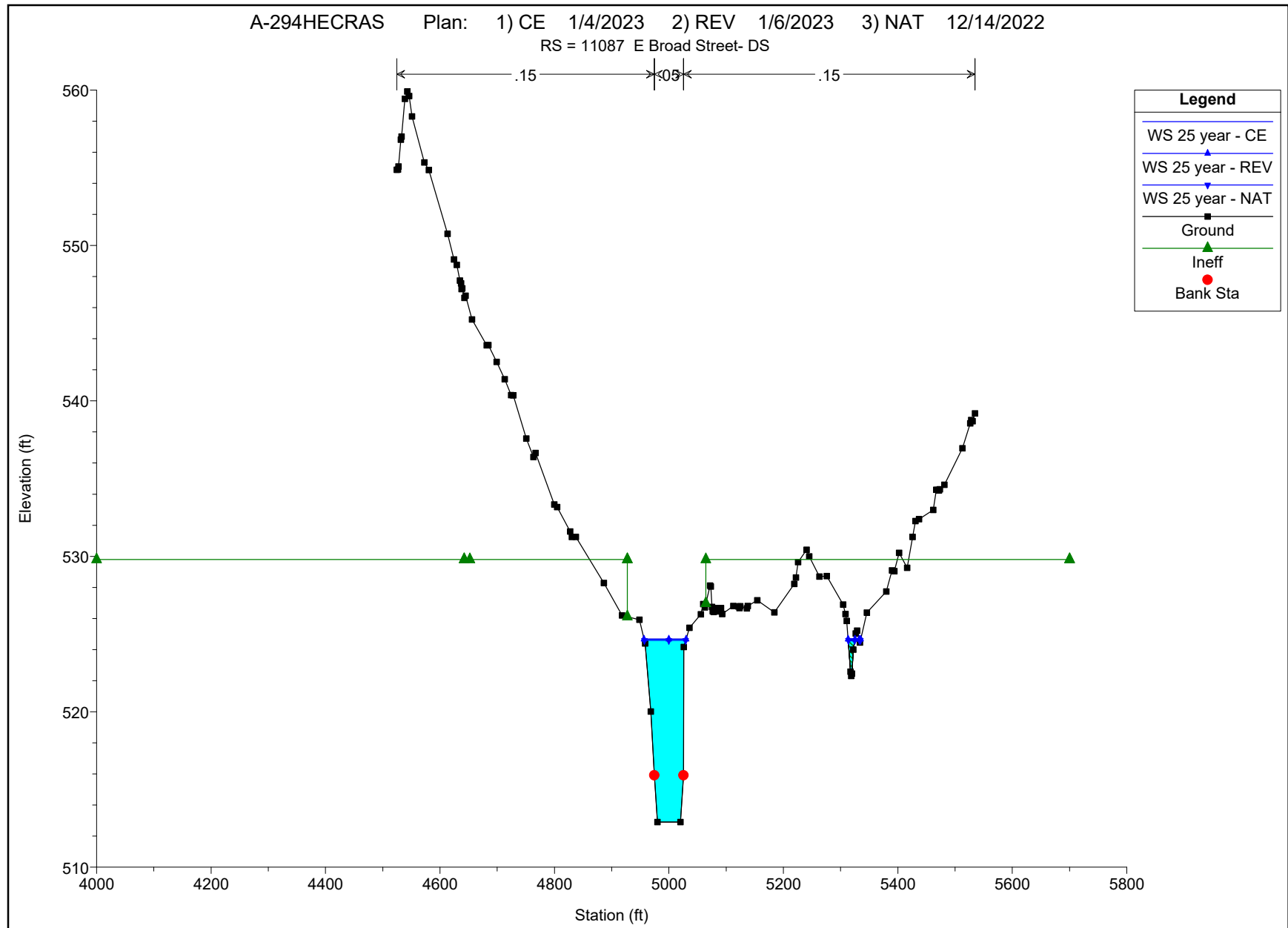
Anderson S-294 25-Year Bridge Cross Sections



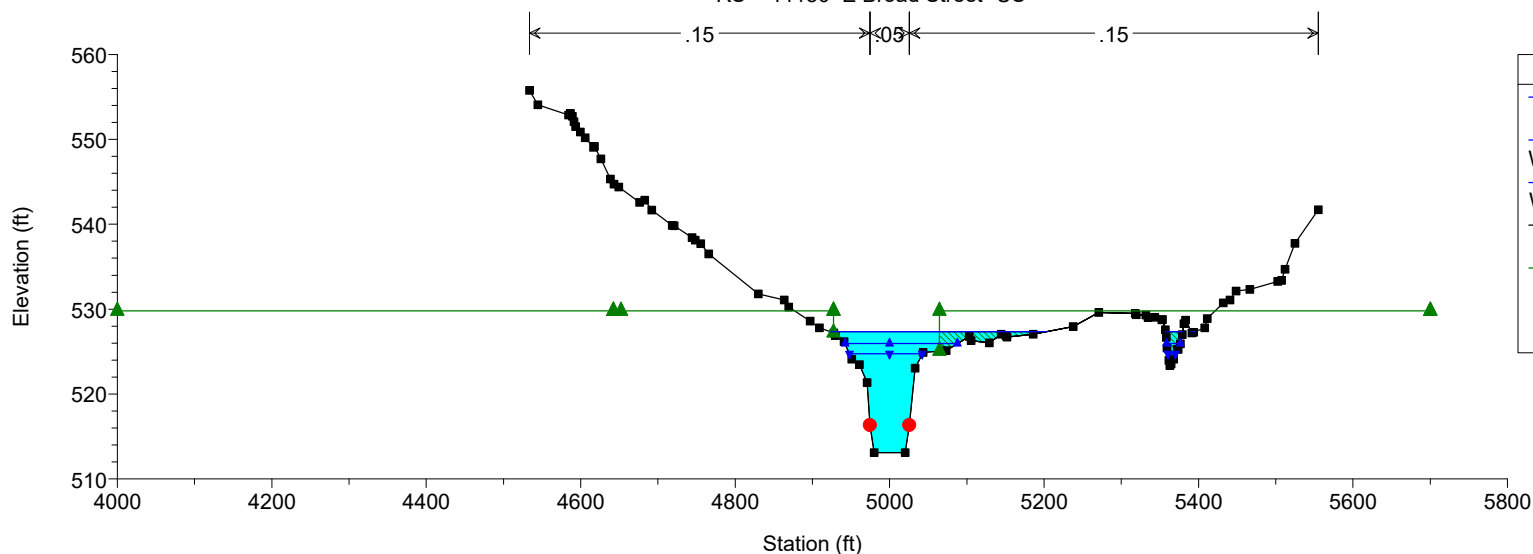
Anderson S-294 25-Year Bridge Cross Sections



Anderson S-294 25-Year Bridge Cross Sections

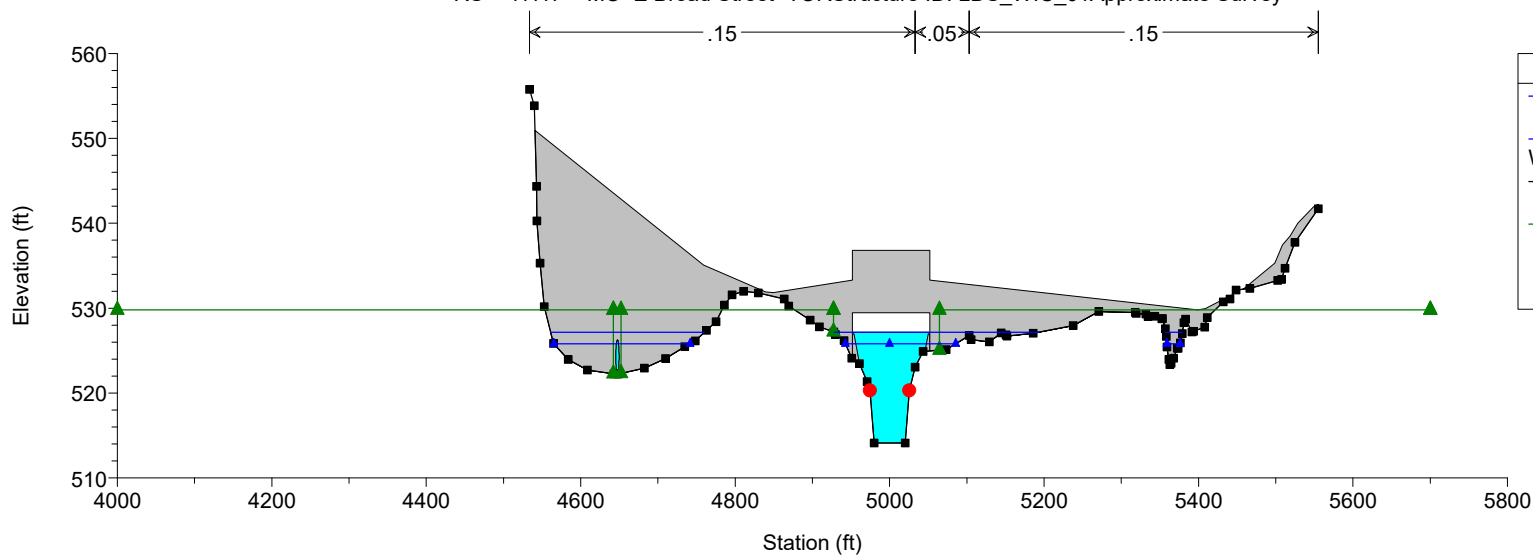


A-294HECRAS Plan: 1) CE 1/4/2023 2) REV 1/6/2023 3) NAT 12/14/2022
 RS = 11150 E Broad Street- US



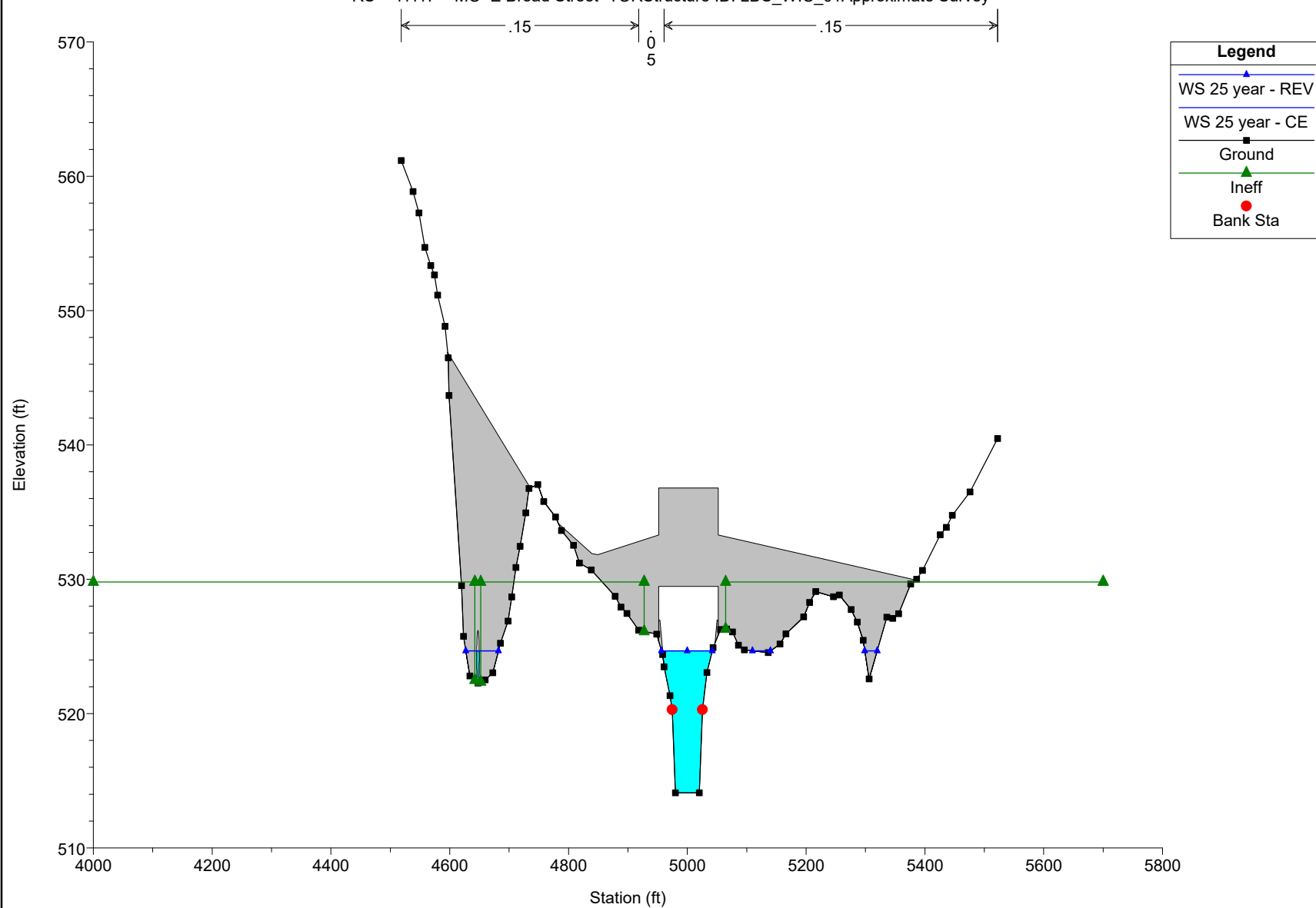
Legend	
WS 25 year - CE	▲
WS 25 year - REV	▼
WS 25 year - NAT	■
Ground	■
Ineff	▲
Bank Sta	●

A-294HECRAS Plan: 1) CE 1/4/2023 2) REV 1/6/2023 3) NAT 12/14/2022
 RS = 11117 MO E Broad Street- TORStructure ID: LDS_WIC_01Approximate Survey

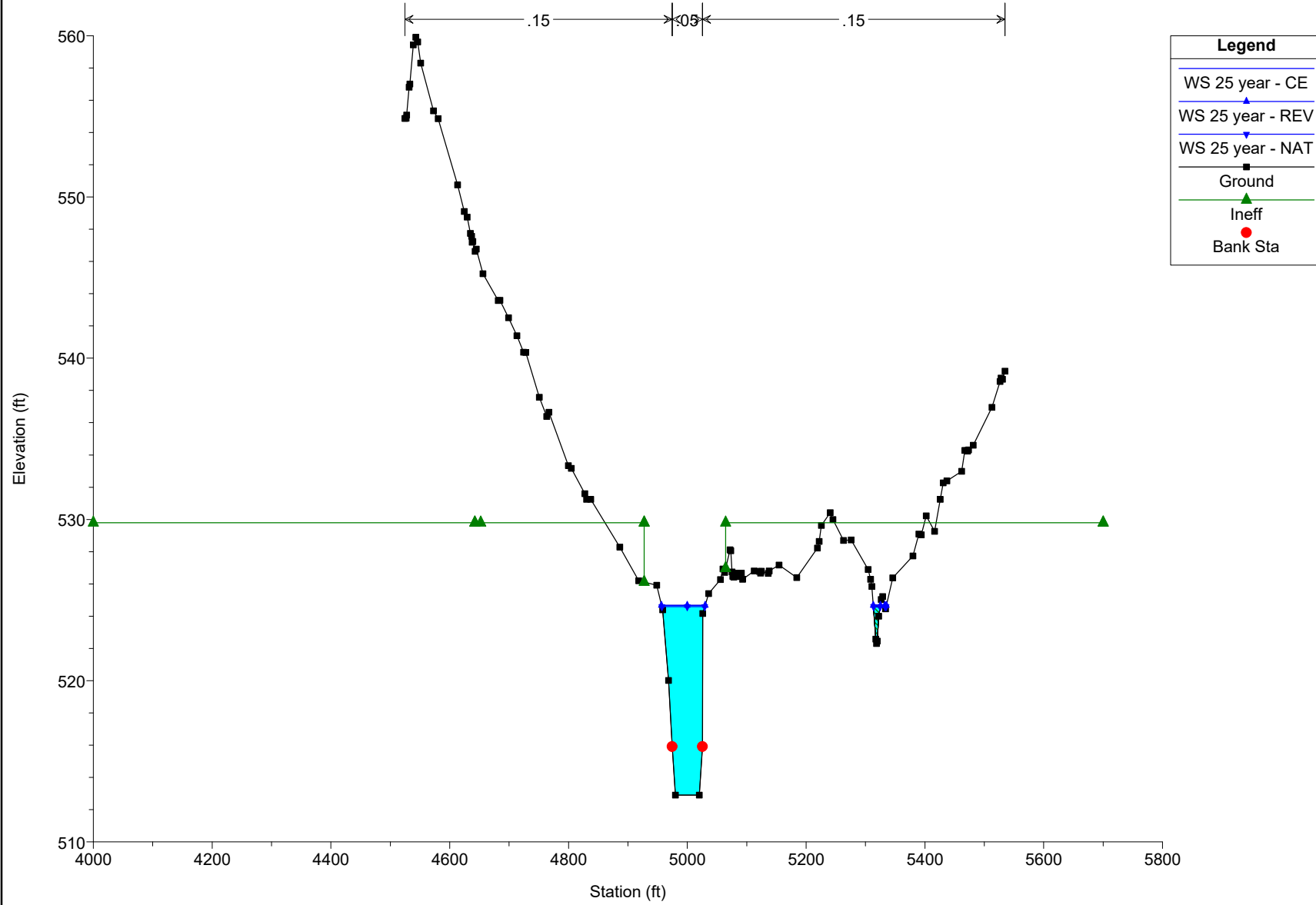


Legend	
WS 25 year - CE	▲
WS 25 year - REV	▼
Ground	■
Ineff	▲
Bank Sta	●

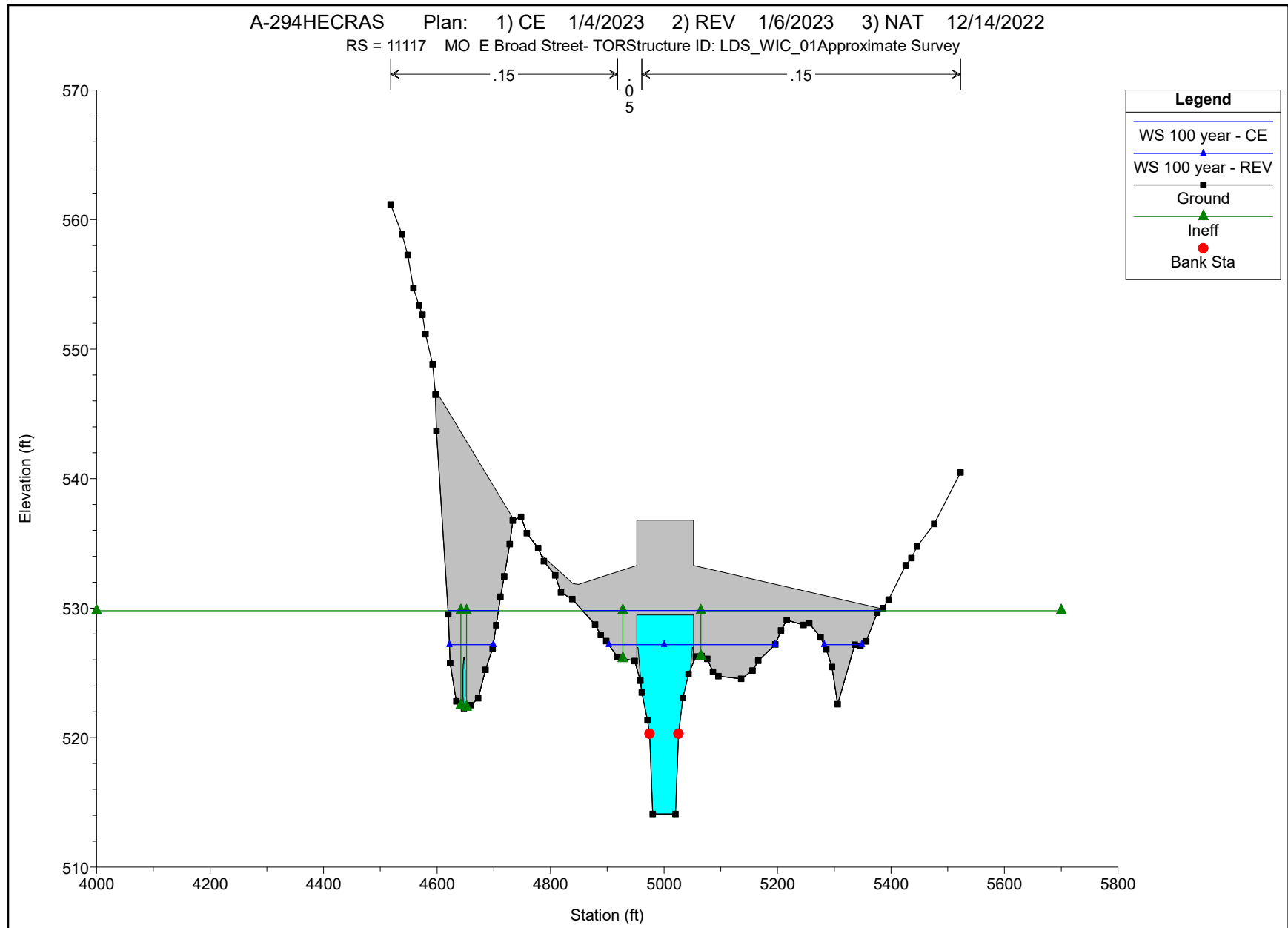
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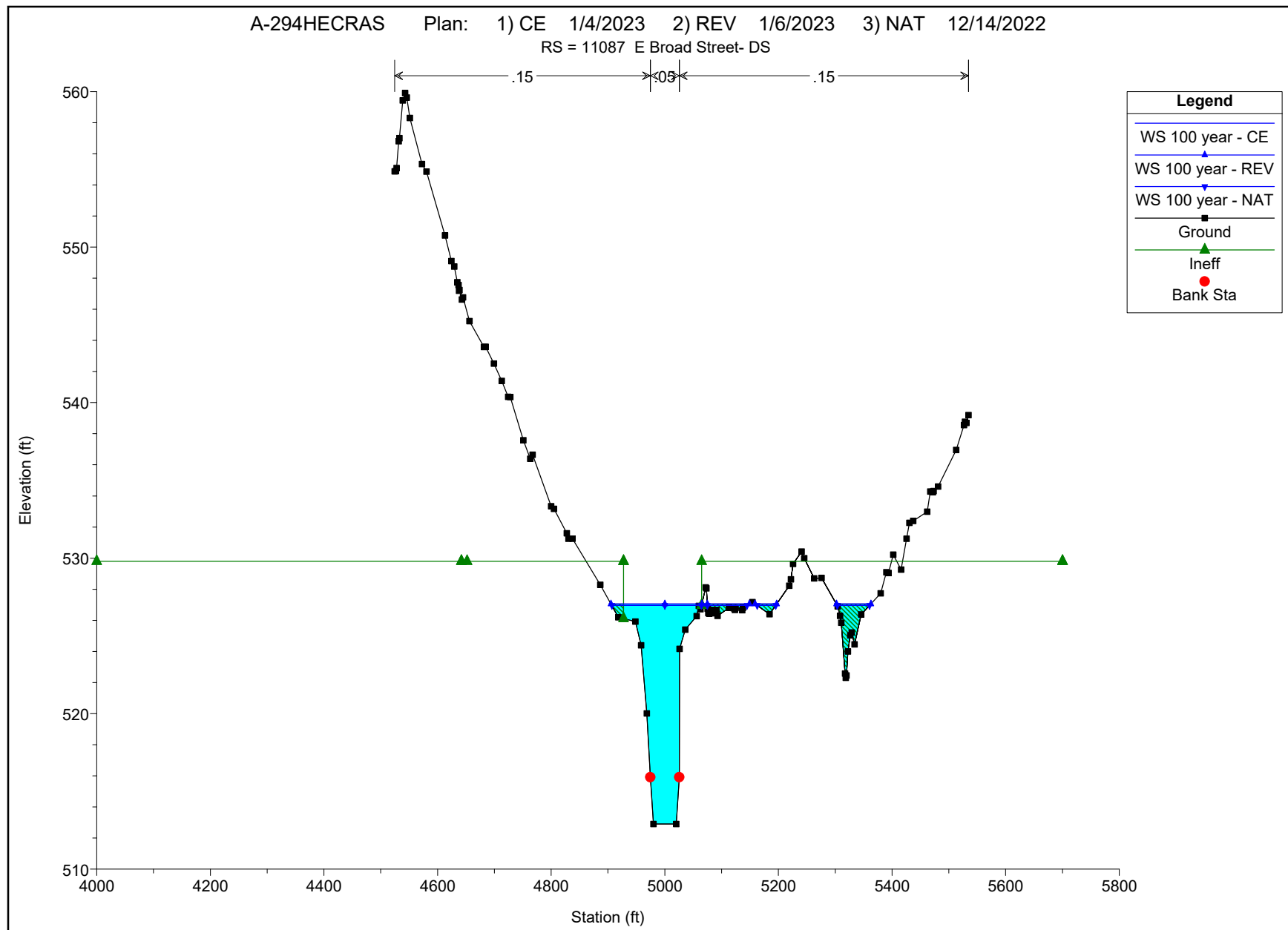
A-294HECRAS Plan: 1) CE 1/4/2023 2) REV 1/6/2023 3) NAT 12/14/2022
RS = 11087 E Broad Street- DS



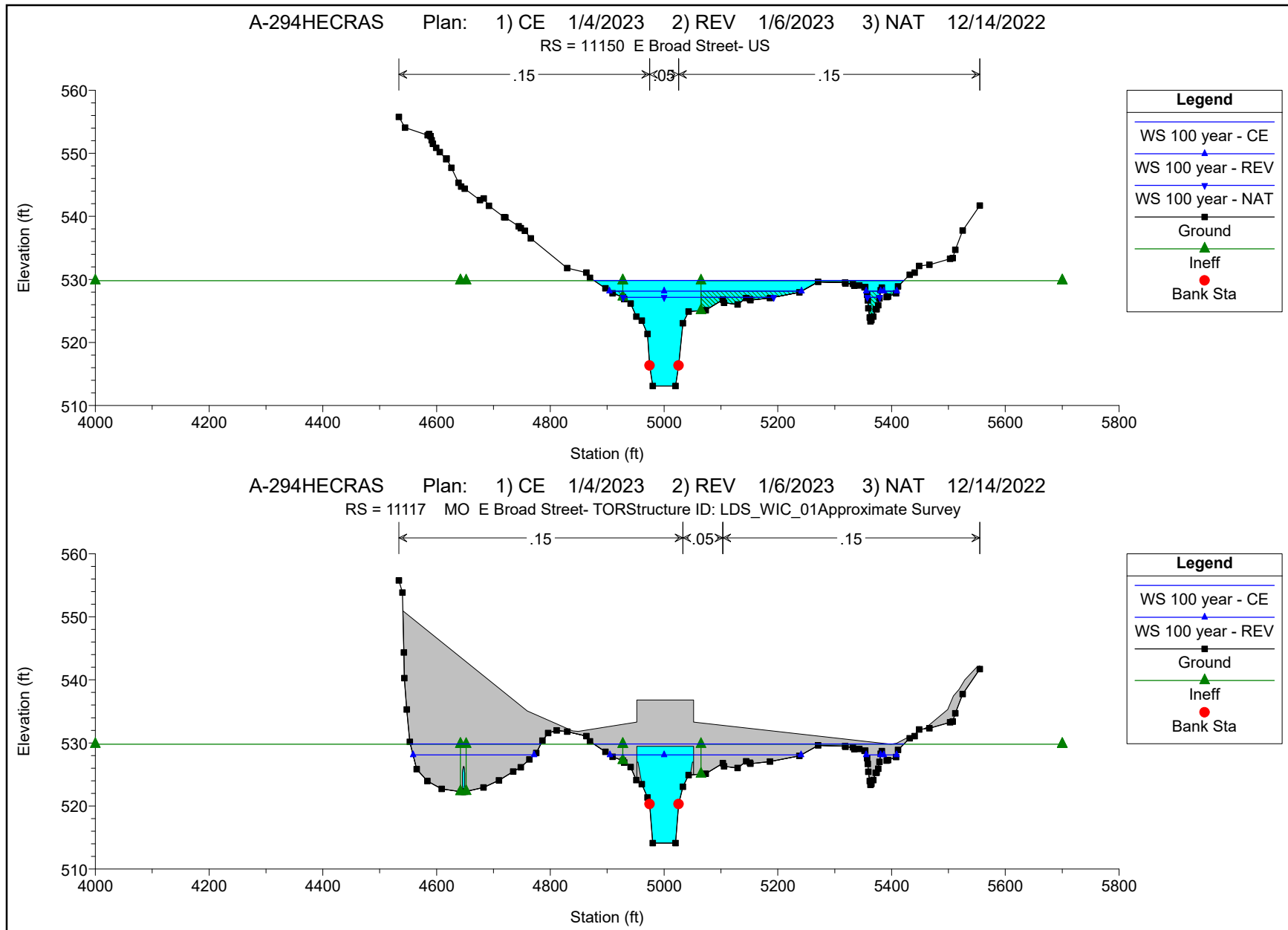
Anderson S-294 25-Year Bridge Cross Sections



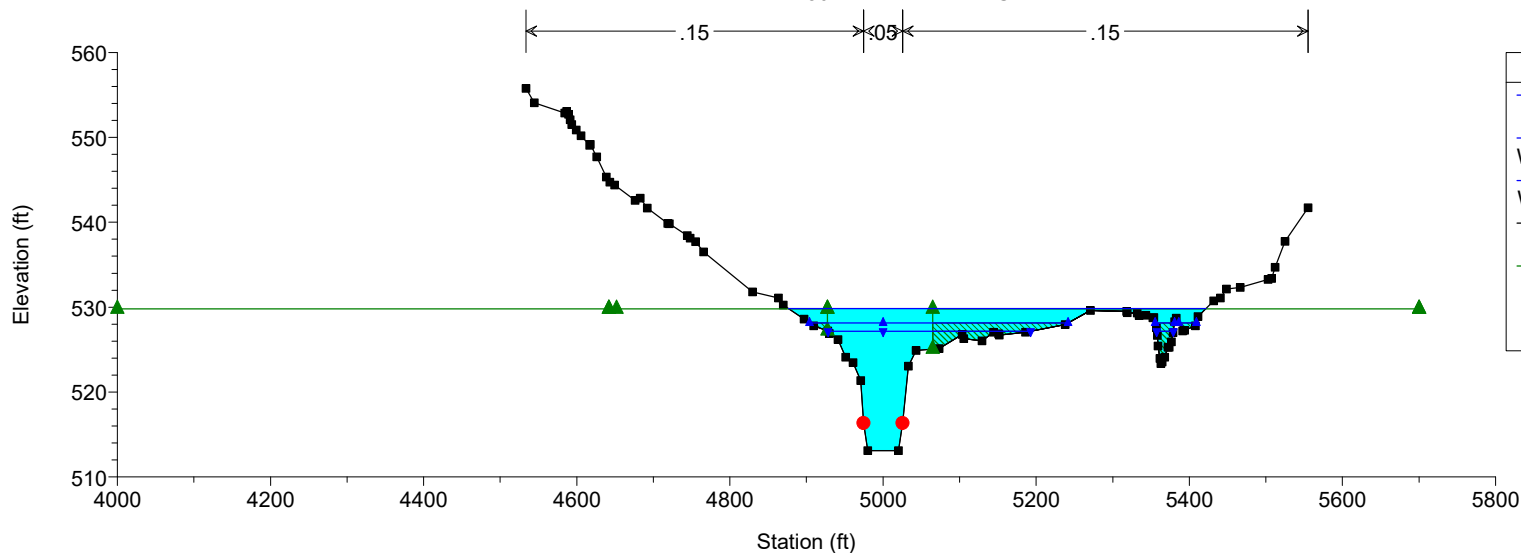
Anderson S-294 25-Year Bridge Cross Sections



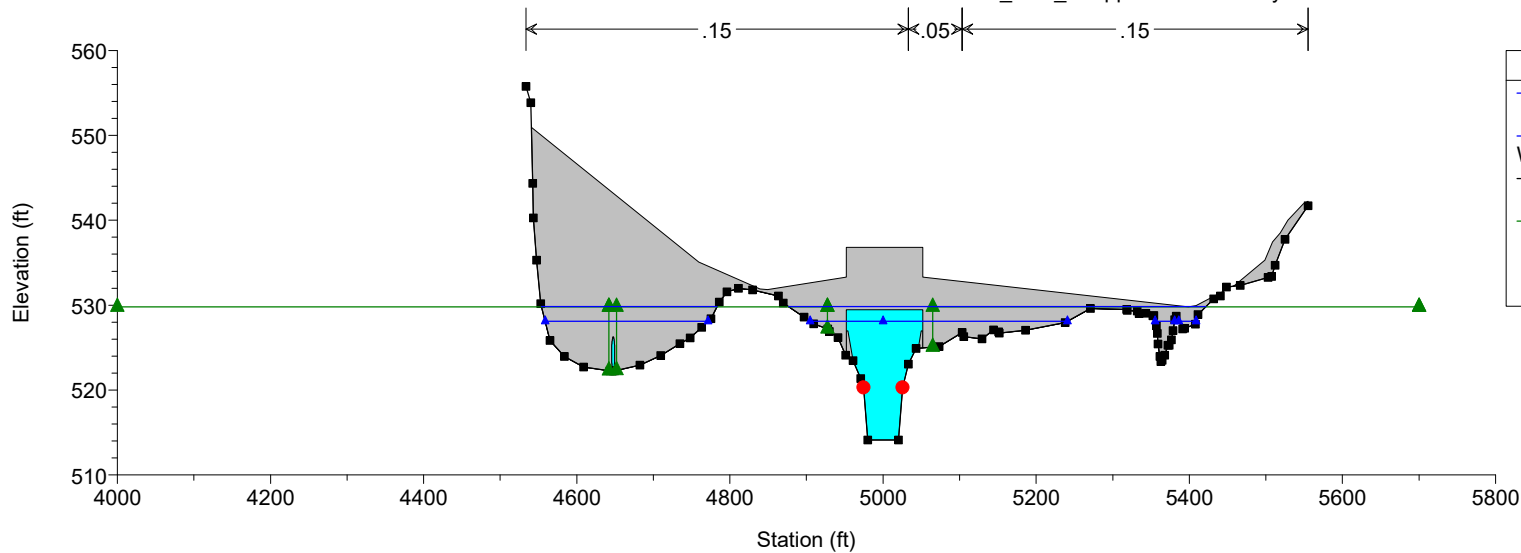
Anderson S-294 25-Year Bridge Cross Sections



A-294HECRAS Plan: 1) CE 1/4/2023 2) REV 1/6/2023 3) NAT 12/14/2022
 RS = 11150 E Broad Street- US

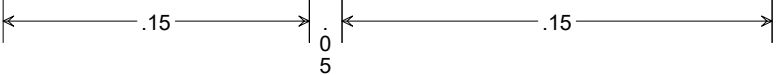


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 RS = 11117 MO E Broad Street- TORStructure ID: LDS_WIC_01Approximate Survey

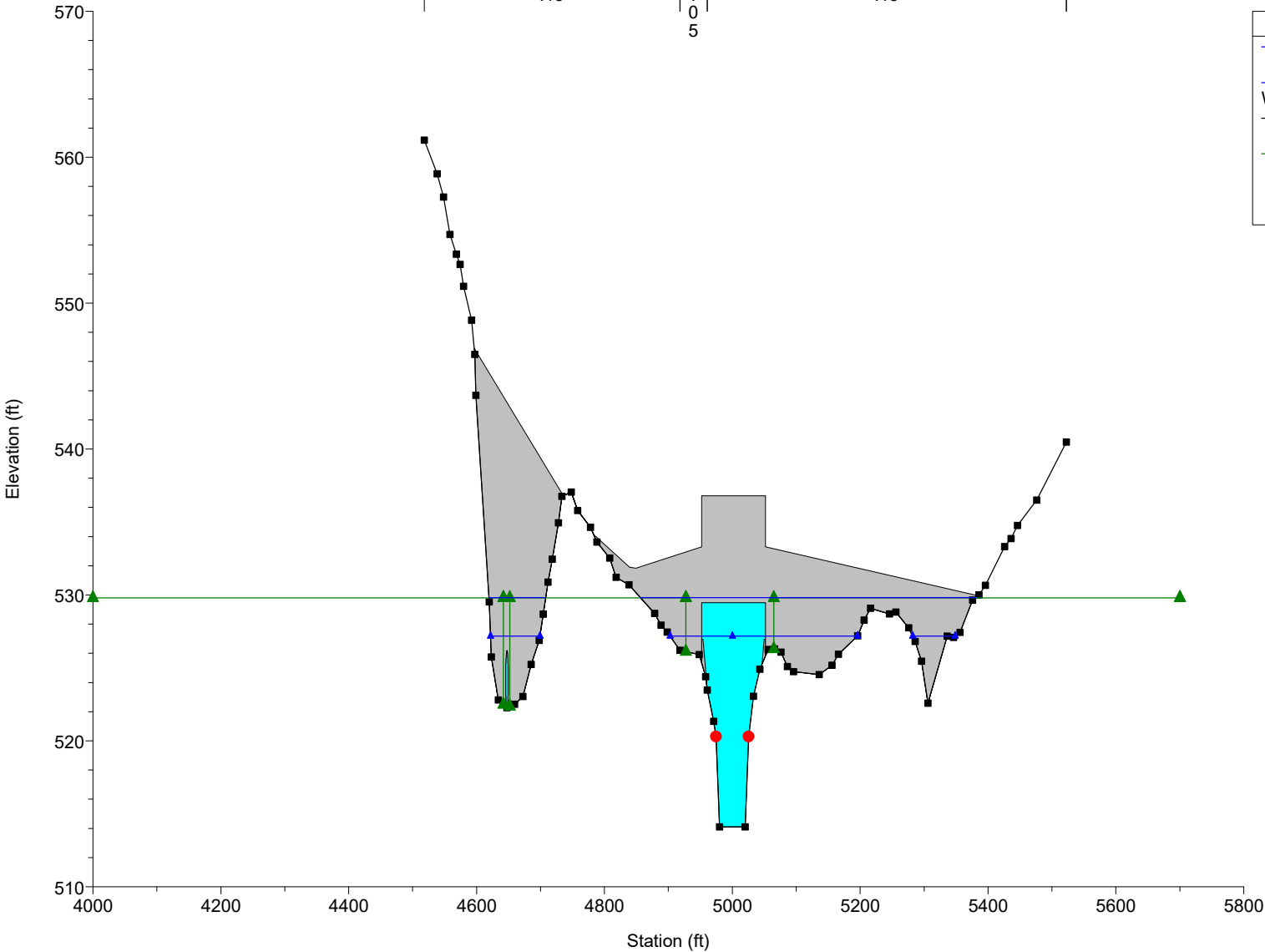


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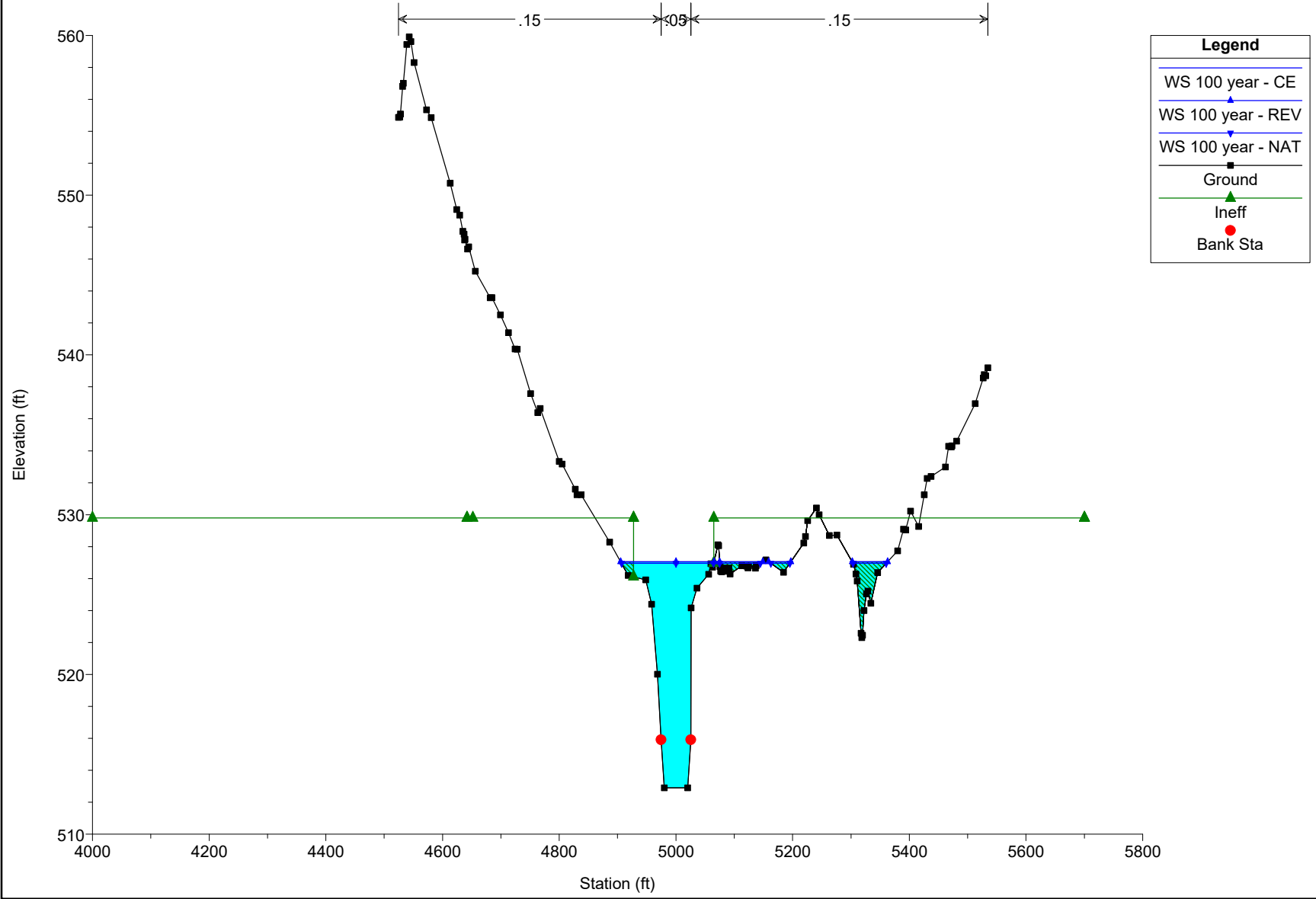
RS = 11117 MO E Broad Street- TORStructure ID: LDS_WIC_01Approximate Survey



Legend	
WS 100 year - CE	
WS 100 year - REV	
Ground	
Ineff	
Bank Sta	



A-294HECRAS Plan: 1) CE 1/4/2023 2) REV 1/6/2023 3) NAT 12/14/2022
RS = 11087 E Broad Street- DS



Anderson 25-Year HEC-RAS Output Table

HEC-RAS River: Wilson Creek Reach: Reach-1 Profile: 25 year

Reach	River Sta	Profile	Plan	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl
Reach-1	15080	25 year	CE	4100.00	519.75	532.52	525.98	533.03	0.001440	5.92	1158.24	373.79	0.30
Reach-1	15080	25 year	REV	4100.00	519.75	532.33	525.98	532.87	0.001547	6.07	1088.83	369.26	0.31
Reach-1	15080	25 year	NAT	4100.00	519.75	532.23	525.98	532.79	0.001603	6.14	1050.95	363.32	0.31
Reach-1	14398	25 year	CE	4100.00	517.94	531.68		532.08	0.001252	5.67	1746.72	448.05	0.27
Reach-1	14398	25 year	REV	4100.00	517.94	531.38		531.84	0.001418	5.95	1614.97	443.56	0.29
Reach-1	14398	25 year	NAT	4100.00	517.94	531.21		531.70	0.001527	6.12	1538.15	440.92	0.30
Reach-1	13847	25 year	CE	4100.00	517.07	531.34		531.52	0.000681	4.29	2833.24	565.15	0.20
Reach-1	13847	25 year	REV	4100.00	517.07	530.98		531.19	0.000797	4.56	2631.81	562.72	0.22
Reach-1	13847	25 year	NAT	4100.00	517.07	530.76		531.00	0.000879	4.74	2509.19	561.24	0.23
Reach-1	13357	25 year	CE	4100.00	515.88	530.43		531.01	0.001428	6.30	927.12	141.09	0.29
Reach-1	13357	25 year	REV	4100.00	515.88	529.97		530.61	0.001621	6.57	863.18	137.81	0.31
Reach-1	13357	25 year	NAT	4100.00	515.88	529.68		530.36	0.001759	6.75	823.68	135.75	0.32
Reach-1	12867	25 year	CE	4100.00	515.12	529.71		530.31	0.001450	6.36	868.37	120.65	0.29
Reach-1	12867	25 year	REV	4100.00	515.12	529.13		529.80	0.001692	6.68	799.81	116.46	0.32
Reach-1	12867	25 year	NAT	4100.00	515.12	528.75		529.47	0.001879	6.91	756.00	113.71	0.33
Reach-1	12390	25 year	CE	4100.00	514.45	529.03		529.61	0.001429	6.31	980.23	208.19	0.29
Reach-1	12390	25 year	REV	4100.00	514.45	528.31		528.98	0.001734	6.72	850.47	166.02	0.32
Reach-1	12390	25 year	NAT	4100.00	514.45	527.83		528.55	0.001951	6.96	775.41	138.60	0.34
Reach-1	11708	25 year	CE	4170.00	513.46	528.03		528.63	0.001452	6.36	889.98	137.40	0.29
Reach-1	11708	25 year	REV	4170.00	513.46	526.99		527.73	0.001927	6.98	752.06	127.22	0.34
Reach-1	11708	25 year	NAT	4170.00	513.46	526.21		527.06	0.002407	7.49	656.17	117.15	0.37
Reach-1	11507	25 year	CE	4170.00	513.70	527.78		528.33	0.001403	6.18	988.06	184.17	0.29
Reach-1	11507	25 year	REV	4170.00	513.70	526.61		527.32	0.002000	6.96	791.91	151.08	0.34
Reach-1	11507	25 year	NAT	4170.00	513.70	525.67		526.55	0.002679	7.66	670.30	106.92	0.39
Reach-1	11314	25 year	CE	4170.00	513.93	527.50	520.40	528.05	0.001441	6.18	1016.48	198.83	0.30
Reach-1	11314	25 year	REV	4170.00	513.93	526.18	520.40	526.92	0.002153	7.05	781.89	146.97	0.36
Reach-1	11314	25 year	NAT	4170.00	513.93	525.06	520.40	525.99	0.003058	7.87	642.20	107.79	0.42
Reach-1	11150	25 year	CE	4170.00	513.10	527.33	519.40	527.80	0.001115	5.61	959.56	306.21	0.27
Reach-1	11150	25 year	REV	4170.00	513.10	525.94	519.40	526.54	0.001649	6.35	814.73	163.60	0.32
Reach-1	11150	25 year	NAT	4170.00	513.10	524.73	519.40	525.50	0.002365	7.11	676.15	104.09	0.37
Reach-1	11117			Mult Open									
Reach-1	11087	25 year	CE	4170.00	512.90	524.67	519.15	525.42	0.002252	7.02	653.68	88.14	0.37
Reach-1	11087	25 year	REV	4170.00	512.90	524.67	519.15	525.42	0.002252	7.02	653.68	88.14	0.37
Reach-1	11087	25 year	NAT	4170.00	512.90	524.59	519.15	525.36	0.002305	7.07	647.90	85.50	0.37
Reach-1	10970	25 year	CE	4170.00	512.11	523.88	518.93	524.99	0.003521	8.48	518.22	70.21	0.44
Reach-1	10970	25 year	REV	4170.00	512.11	523.88	518.93	524.99	0.003521	8.48	518.22	70.21	0.44
Reach-1	10970	25 year	NAT	4170.00	512.11	523.88	518.93	524.99	0.003521	8.48	518.13	69.93	0.44
Reach-1	10835	25 year	CE	4170.00	512.10	523.42		524.50	0.003627	8.44	567.73	87.85	0.44
Reach-1	10835	25 year	REV	4170.00	512.10	523.42		524.50	0.003627	8.44	567.73	87.85	0.44
Reach-1	10835	25 year	NAT	4170.00	512.10	523.42		524.50	0.003628	8.44	567.71	87.82	0.44
Reach-1	10672	25 year	CE	4170.00	511.90	522.61		523.84	0.004353	8.96	516.64	74.00	0.49
Reach-1	10672	25 year	REV	4170.00	511.90	522.61		523.84	0.004353	8.96	516.64	74.00	0.49
Reach-1	10672	25 year	NAT	4170.00	511.90	522.61		523.84	0.004353	8.96	516.64	73.99	0.49
Reach-1	10386	25 year	CE	4170.00	509.47	521.58		522.70	0.003461	8.52	521.26	61.70	0.43
Reach-1	10386	25 year	REV	4170.00	509.47	521.58		522.70	0.003461	8.52	521.26	61.70	0.43
Reach-1	10386	25 year	NAT	4170.00	509.47	521.58		522.70	0.003461	8.52	521.27	61.76	0.43
Reach-1	10227	25 year	CE	4170.00	508.66	521.16		522.15	0.002938	8.02	545.42	61.38	0.40
Reach-1	10227	25 year	REV	4170.00	508.66	521.16		522.15	0.002938	8.02	545.42	61.38	0.40
Reach-1	10227	25 year	NAT	4170.00	508.66	521.16		522.15	0.002938	8.02	545.36	61.37	0.40
Reach-1	10047	25 year	CE	4170.00	508.00	520.75		521.64	0.002472	7.57	598.46	67.84	0.38
Reach-1	10047	25 year	REV	4170.00	508.00	520.75		521.64	0.002472	7.57	598.46	67.84	0.38
Reach-1	10047	25 year	NAT	4170.00	508.00	520.75		521.64	0.002473	7.57	598.44	67.83	0.38
Reach-1	9772	25 year	CE	4170.00	507.00	520.03		520.96	0.002457	7.79	614.04	69.52	0.38
Reach-1	9772	25 year	REV	4170.00	507.00	520.03		520.96	0.002457	7.79	614.04	69.52	0.38
Reach-1	9772	25 year	NAT	4170.00	507.00	520.03		520.96	0.002457	7.79	614.11	69.54	0.38
Reach-1	9466	25 year	CE	4170.00	506.43	519.38		520.20	0.002272	7.35	661.94	84.40	0.36
Reach-1	9466	25 year	REV	4170.00	506.43	519.38		520.20	0.002272	7.35	661.94	84.40	0.36
Reach-1	9466	25 year	NAT	4170.00	506.43	519.38		520.20	0.002272	7.35	661.91	84.39	0.36
Reach-1	9248	25 year	CE	4170.00	505.10	518.86		519.71	0.002182	7.48	638.97	90.53	0.36
Reach-1	9248	25 year	REV	4170.00	505.10	518.86		519.71	0.002182	7.48	638.97	90.53	0.36
Reach-1	9248	25 year	NAT	4170.00	505.10	518.86		519.71	0.002182	7.48	638.98	90.53	0.36
Reach-1	9045	25 year	CE	4170.00	504.52	518.62		519.27	0.001631	6.61	779.31	90.49	0.31
Reach-1	9045	25 year	REV	4170.00	504.52	518.62		519.27	0.001631	6.61	779.31	90.49	0.31

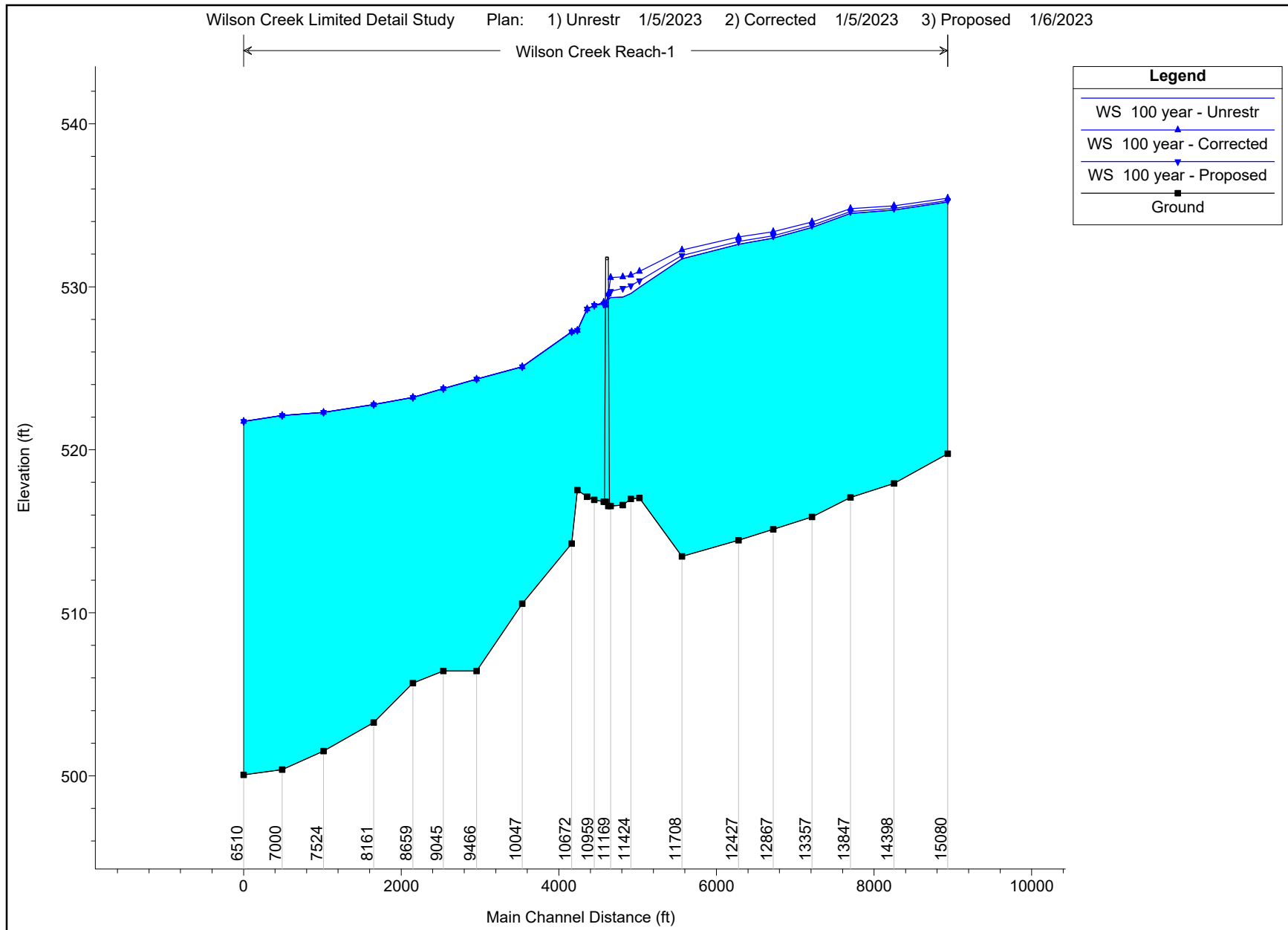
Anderson 100-Year HEC-RAS Output Table

HEC-RAS River: Wilson Creek Reach: Reach-1 Profile: 100 year

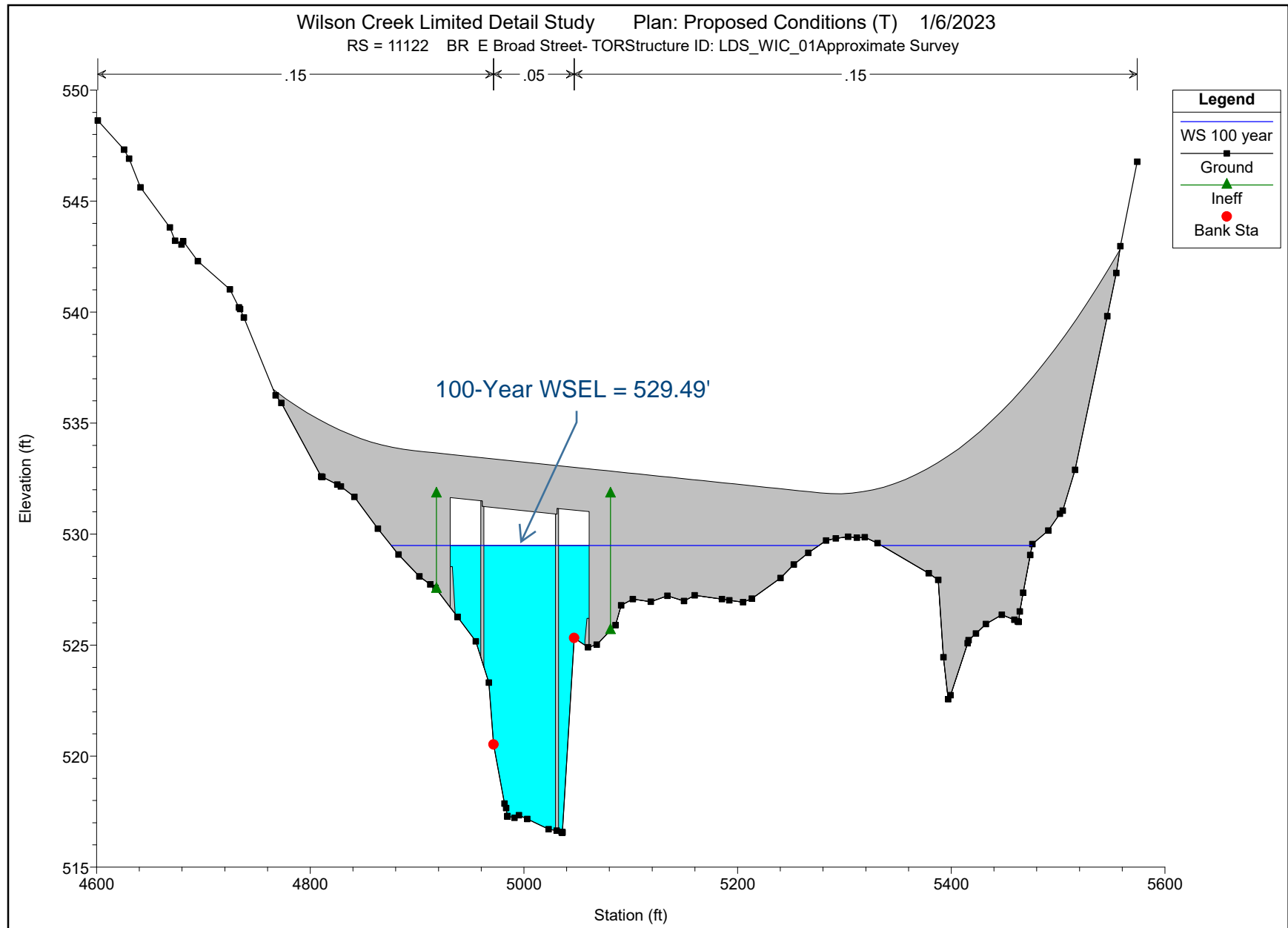
Reach	River Sta	Profile	Plan	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl
Reach-1	15080	100 year	CE	5690.00	519.75	534.76	527.40	535.24	0.001222	6.10	2080.26	456.45	0.28
Reach-1	15080	100 year	REV	5690.00	519.75	534.46	527.40	534.99	0.001359	6.34	1945.29	447.99	0.30
Reach-1	15080	100 year	NAT	5690.00	519.75	534.35	527.40	534.89	0.001419	6.45	1892.64	444.65	0.30
Reach-1	14398	100 year	CE	5690.00	517.94	534.16		534.47	0.000929	5.46	2900.95	482.10	0.24
Reach-1	14398	100 year	REV	5690.00	517.94	533.77		534.12	0.001068	5.76	2713.61	477.07	0.26
Reach-1	14398	100 year	NAT	5690.00	517.94	533.61		533.98	0.001132	5.89	2637.25	475.00	0.26
Reach-1	13847	100 year	CE	5690.00	517.07	533.92		534.05	0.000490	4.07	4313.06	581.50	0.18
Reach-1	13847	100 year	REV	5690.00	517.07	533.49		533.64	0.000569	4.31	4063.31	578.82	0.19
Reach-1	13847	100 year	NAT	5690.00	517.07	533.31		533.47	0.000606	4.42	3959.51	577.71	0.19
Reach-1	13357	100 year	CE	5690.00	515.88	532.92		533.61	0.001456	7.07	1298.54	157.75	0.30
Reach-1	13357	100 year	REV	5690.00	515.88	532.37		533.14	0.001663	7.39	1213.16	154.09	0.32
Reach-1	13357	100 year	NAT	5690.00	515.88	532.13		532.94	0.001763	7.54	1177.21	152.52	0.33
Reach-1	12867	100 year	CE	5690.00	515.12	532.12		532.87	0.001539	7.26	1179.90	136.89	0.31
Reach-1	12867	100 year	REV	5690.00	515.12	531.44		532.28	0.001808	7.65	1087.55	132.41	0.34
Reach-1	12867	100 year	NAT	5690.00	515.12	531.13		532.02	0.001947	7.84	1047.42	130.42	0.35
Reach-1	12390	100 year	CE	5690.00	514.45	531.53		532.15	0.001345	6.81	1635.62	283.31	0.29
Reach-1	12390	100 year	REV	5690.00	514.45	530.64		531.42	0.001736	7.46	1389.08	272.61	0.33
Reach-1	12390	100 year	NAT	5690.00	514.45	530.22		531.08	0.001966	7.80	1275.16	267.52	0.35
Reach-1	11708	100 year	CE	5780.00	513.46	530.41		531.16	0.001533	7.24	1240.77	158.87	0.31
Reach-1	11708	100 year	REV	5780.00	513.46	529.18		530.11	0.002069	7.99	1053.15	146.16	0.36
Reach-1	11708	100 year	NAT	5780.00	513.46	528.52		529.57	0.002454	8.46	957.52	141.09	0.39
Reach-1	11507	100 year	CE	5780.00	513.70	530.22		530.83	0.001351	6.75	1496.42	228.76	0.29
Reach-1	11507	100 year	REV	5780.00	513.70	528.85		529.67	0.001976	7.70	1197.84	206.23	0.35
Reach-1	11507	100 year	NAT	5780.00	513.70	528.07		529.05	0.002478	8.32	1041.96	192.29	0.39
Reach-1	11314	100 year	CE	5780.00	513.93	529.95	521.93	530.56	0.001365	6.73	1583.65	262.92	0.30
Reach-1	11314	100 year	REV	5780.00	513.93	528.40	521.93	529.27	0.002115	7.82	1207.42	222.92	0.37
Reach-1	11314	100 year	NAT	5780.00	513.93	527.45	521.92	528.53	0.002806	8.61	1007.75	197.77	0.42
Reach-1	11150	100 year	CE	5780.00	513.10	529.84	520.84	530.29	0.000990	5.90	2219.96	545.37	0.26
Reach-1	11150	100 year	REV	5780.00	513.10	528.14	520.84	528.90	0.001718	7.23	1107.96	386.12	0.33
Reach-1	11150	100 year	NAT	5780.00	513.10	527.15	520.84	528.07	0.002253	7.90	938.64	286.33	0.38
Reach-1	11117			Mult Open									
Reach-1	11087	100 year	CE	5780.00	512.90	527.05	520.59	528.01	0.002241	7.95	885.71	333.04	0.38
Reach-1	11087	100 year	REV	5780.00	512.90	527.05	520.59	528.01	0.002249	7.96	903.77	332.29	0.38
Reach-1	11087	100 year	NAT	5780.00	512.90	526.96	520.59	527.93	0.002295	8.01	856.80	316.92	0.38
Reach-1	10970	100 year	CE	5780.00	512.11	526.17	520.58	527.55	0.003528	9.57	794.40	148.17	0.45
Reach-1	10970	100 year	REV	5780.00	512.11	526.17	520.58	527.55	0.003528	9.57	794.40	148.17	0.45
Reach-1	10970	100 year	NAT	5780.00	512.11	526.17	520.58	527.55	0.003529	9.57	794.14	148.15	0.45
Reach-1	10835	100 year	CE	5780.00	512.10	525.84	520.46	527.04	0.003284	9.14	1090.65	346.37	0.44
Reach-1	10835	100 year	REV	5780.00	512.10	525.84	520.46	527.04	0.003284	9.14	1090.65	346.37	0.44
Reach-1	10835	100 year	NAT	5780.00	512.10	525.83	520.46	527.04	0.003285	9.14	1090.60	346.37	0.44
Reach-1	10672	100 year	CE	5780.00	511.90	525.25		526.49	0.003476	9.29	1062.45	276.20	0.45
Reach-1	10672	100 year	REV	5780.00	511.90	525.25		526.49	0.003476	9.29	1062.45	276.20	0.45
Reach-1	10672	100 year	NAT	5780.00	511.90	525.25		526.49	0.003477	9.29	1062.40	276.20	0.45
Reach-1	10386	100 year	CE	5780.00	509.47	524.18		525.52	0.003268	9.43	826.78	152.29	0.43
Reach-1	10386	100 year	REV	5780.00	509.47	524.18		525.52	0.003268	9.43	826.78	152.29	0.43
Reach-1	10386	100 year	NAT	5780.00	509.47	524.18		525.51	0.003268	9.43	826.76	152.29	0.43
Reach-1	10227	100 year	CE	5780.00	508.66	523.76		525.00	0.002888	9.03	787.30	120.84	0.41
Reach-1	10227	100 year	REV	5780.00	508.66	523.76		525.00	0.002888	9.03	787.30	120.84	0.41
Reach-1	10227	100 year	NAT	5780.00	508.66	523.76		525.00	0.002888	9.03	787.21	120.81	0.41
Reach-1	10047	100 year	CE	5780.00	508.00	523.39		524.48	0.002419	8.50	862.61	122.02	0.38
Reach-1	10047	100 year	REV	5780.00	508.00	523.39		524.48	0.002419	8.50	862.61	122.02	0.38
Reach-1	10047	100 year	NAT	5780.00	508.00	523.39		524.48	0.002419	8.50	862.57	122.02	0.38
Reach-1	9772	100 year	CE	5780.00	507.00	522.65		523.81	0.002441	8.78	883.82	127.80	0.39
Reach-1	9772	100 year	REV	5780.00	507.00	522.65		523.81	0.002441	8.78	883.82	127.80	0.39
Reach-1	9772	100 year	NAT	5780.00	507.00	522.65		523.81	0.002441	8.78	883.91	127.79	0.39
Reach-1	9466	100 year	CE	5780.00	506.43	522.05		523.05	0.002201	8.21	960.53	133.83	0.37
Reach-1	9466	100 year	REV	5780.00	506.43	522.05		523.05	0.002201	8.21	960.53	133.83	0.37
Reach-1	9466	100 year	NAT	5780.00	506.43	522.05		523.05	0.002201	8.21	960.50	133.83	0.37
Reach-1	9248	100 year	CE	5780.00	505.10	521.51		522.57	0.002190	8.43	929.65	125.59	0.37
Reach-1	9248	100 year	REV	5780.00	505.10	521.51		522.57	0.002190	8.43	929.65	125.59	0.37
Reach-1	9248	100 year	NAT	5780.00	505.10	521.51		522.57	0.002190	8.43	929.64	125.58	0.37
Reach-1	9045	100 year	CE	5780.00	504.52	521.28		522.11	0.001669	7.52	1058.58	114.58	0.32
Reach-1	9045	100 year	REV	5780.00	504.52	521.28		522.11	0.001669	7.52	1058.58	114.58	0.32

Appendix B: Preliminary Study Comparisons

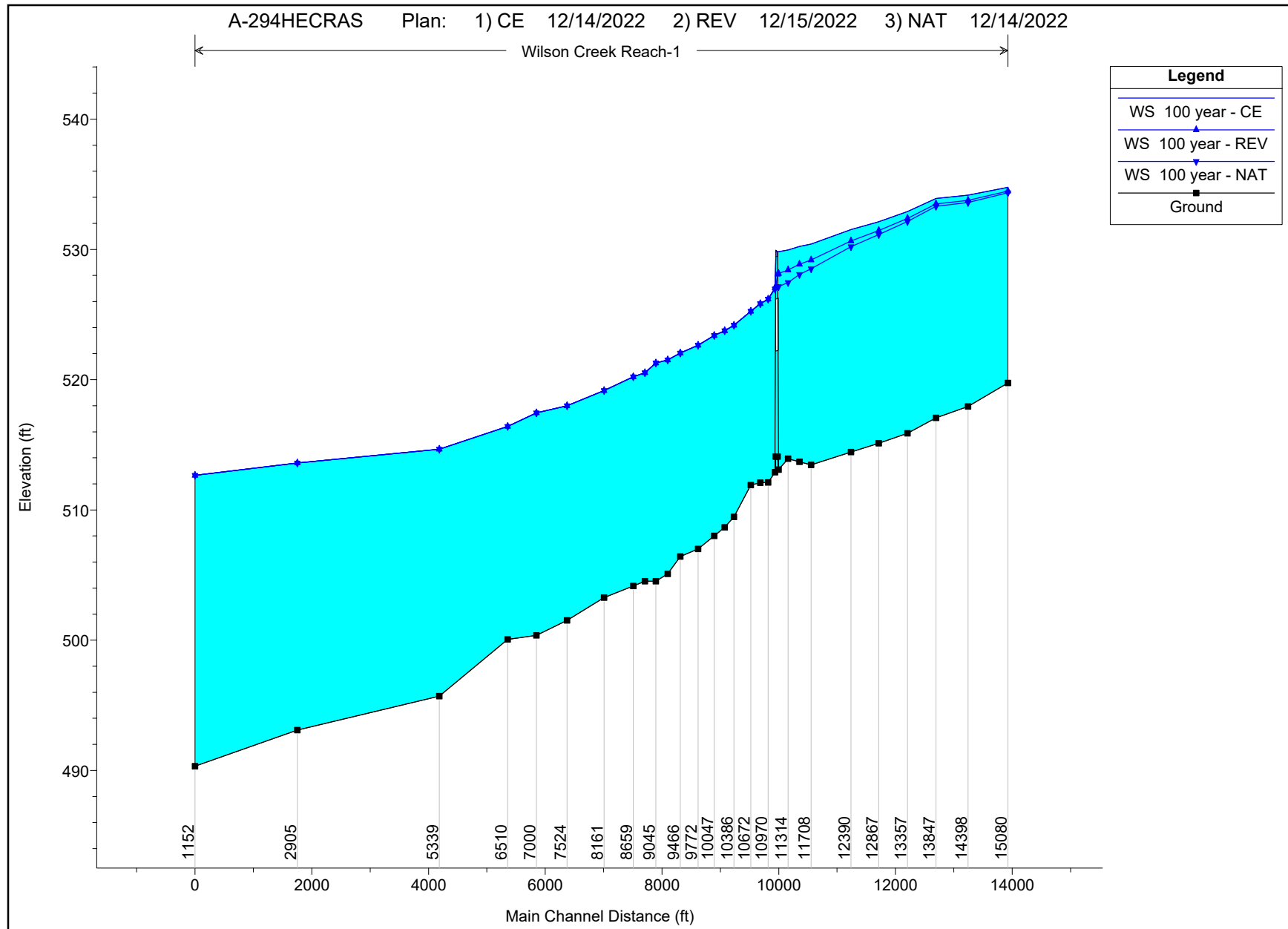
Anderson S-294 100-Year Profile Preliminary Study



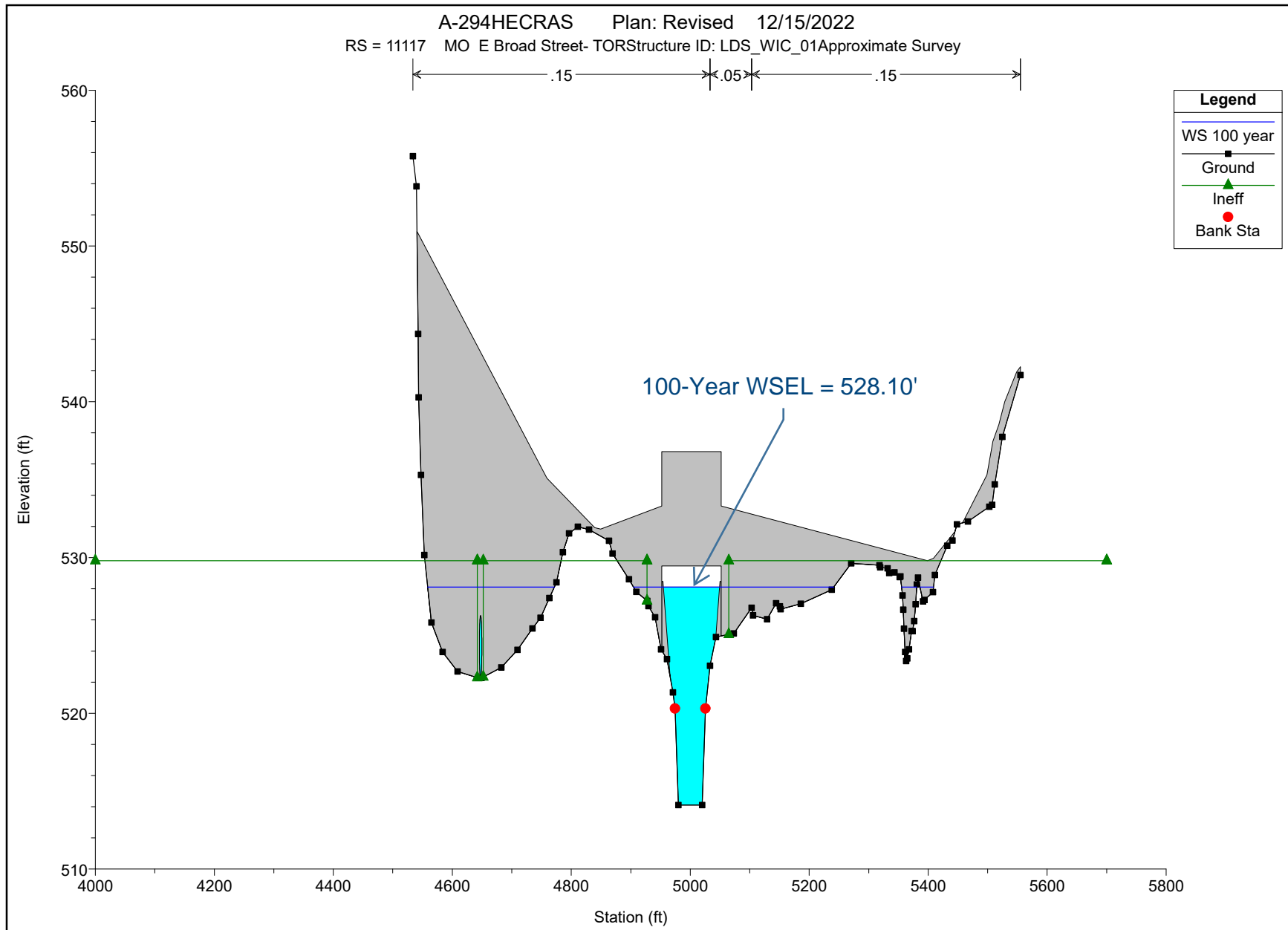
Anderson S-294 100-Year Bridge Cross Section Preliminary Study



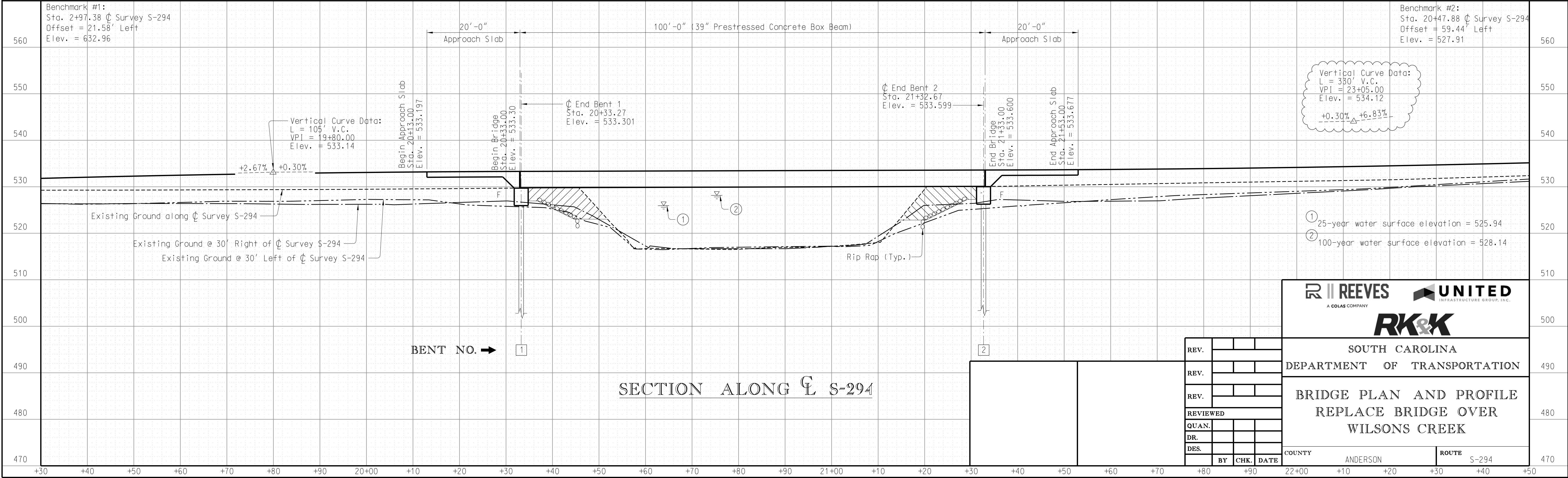
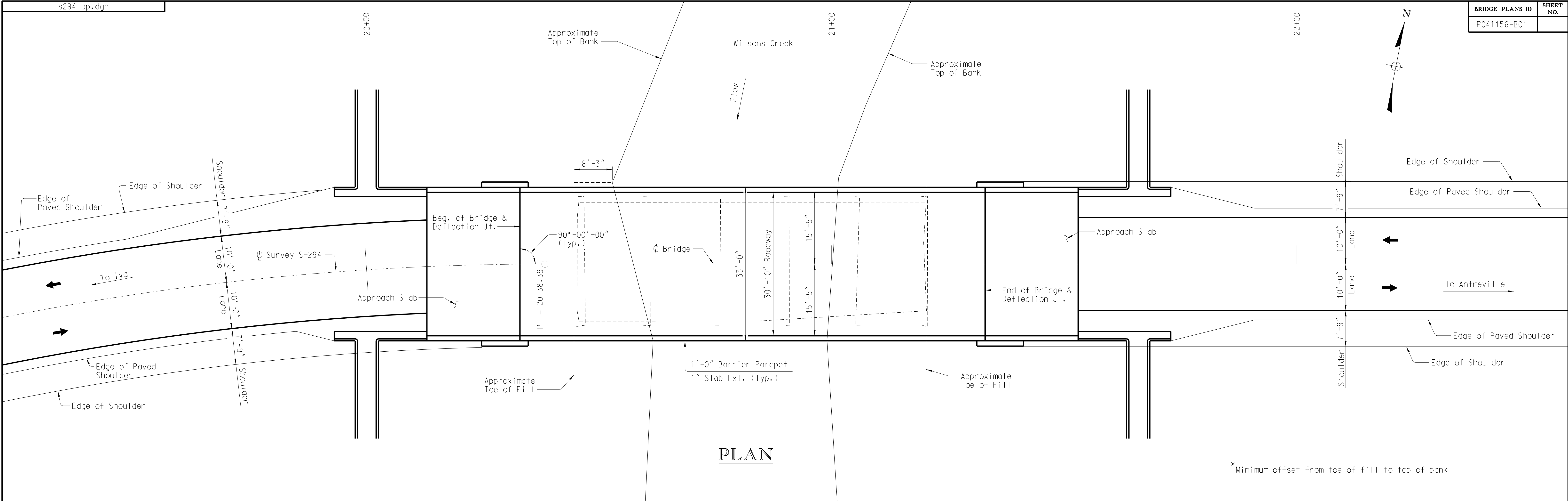
Anderson S-294 100-Year Profile RK&K Proposed Model

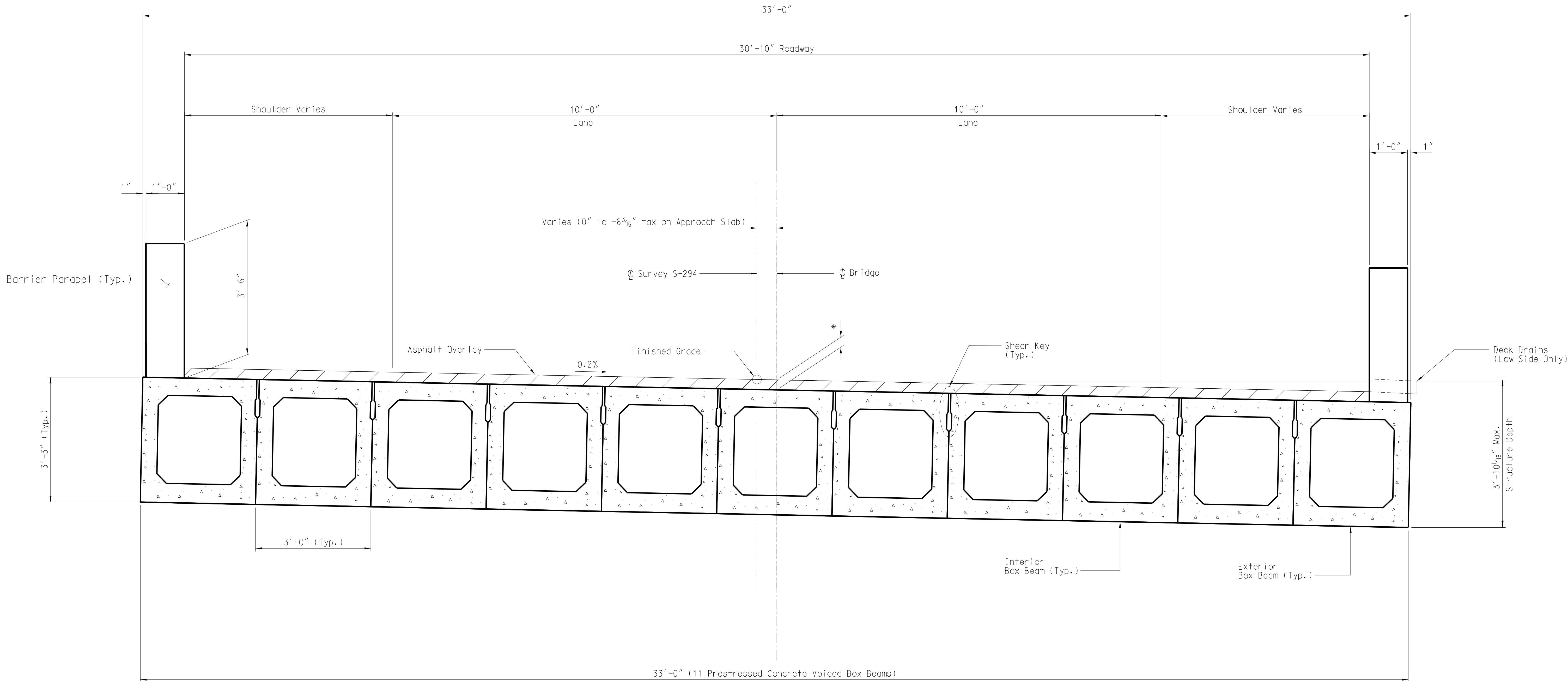


Anderson S-294 100-Year Bridge Cross Section
RK&K Proposed Model






Appendix C: Bridge Plansheet





SECTION THRU SUPERSTRUCTURE

* 2" Min. at midspan
3 1/8" Max. ϕ Bearing



SOUTH CAROLINA
DEPARTMENT OF TRANSPORTATION

SUPERSTRUCTURE
TYPICAL SECTION

COUNTY		ANDERSON		ROUTE		S-294	
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REV.			
REV.			
REV.			
REVIEWED			
QUAN.			
DR.			
DES.			
BY	CHK.	DATE	

Appendix D: Roadway Profile

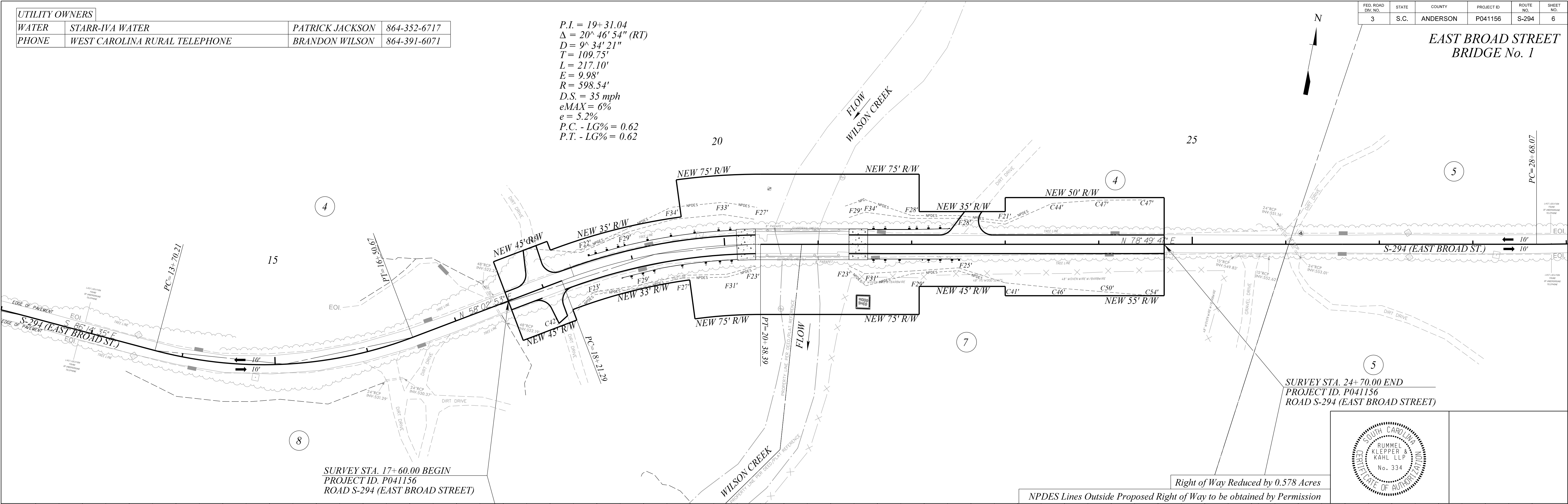
UTILITY OWNERS

WATER	STARR-IVA WATER	PATRICK JACKSON	864-352-6717
PHONE	WEST CAROLINA RURAL TELEPHONE	BRANDON WILSON	864-391-6071

P.I. = 19+31.04
 $\Delta = 20^{\circ} 46' 54''$ (RT)
D = 9° 34' 21"
T = 109.75'
L = 217.10'
E = 9.98'
R = 598.54'
D.S. = 35 mph
eMAX = 6%
e = 5.29%
P.C. - LG% = 0.62
P.T. - LG% = 0.62

FED. ROAD DIST. NO.	STATE	COUNTY	PROJECT ID	ROUTE NO.	SHEET NO.
3	S.C.	ANDERSON	P041156	S-294	6

EAST BROAD STREET
BRIDGE No. 1

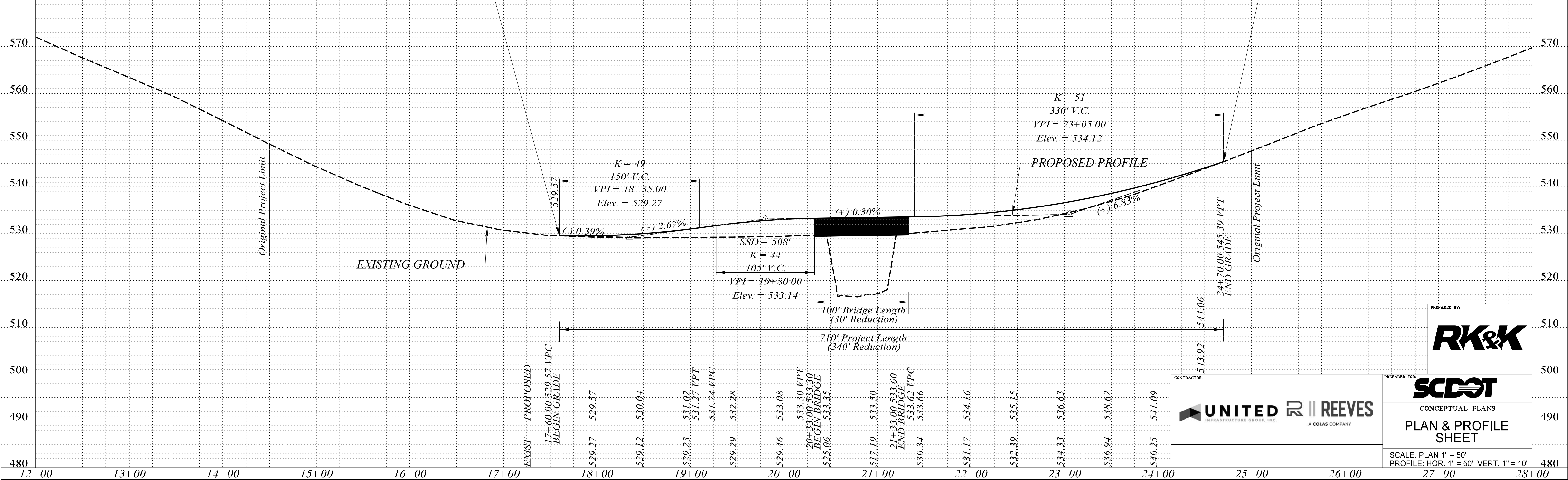


SURVEY STA. 17+60.00 BEGIN
PROJECT ID. P041156
ROAD S-294 (EAST BROAD STREET)

SURVEY STA. 24+70.00 END
PROJECT ID. P041156
ROAD S-294 (EAST BROAD STREET)



Right of Way Reduced by 0.578 Acres
NPDES Lines Outside Proposed Right of Way to be obtained by Permission



PREPARED BY:

RK&K

PREPARED FOR:

SCDOT

CONCEPTUAL PLANS

PLAN & PROFILE
SHEET

SCALE: PLAN 1" = 50'
PROFILE: HOR. 1" = 50', VERT. 1" = 10'

CONTRACTOR:
UNITED REEVES
INFRASTRUCTURE GROUP, INC. A COLAS COMPANY

Formal Alternative Technical Concepts Submittal Form

Project: Bridge Package 15

Project ID: 8862230

ATC No.: 2

Priority: High

Team: United-Reeves JV/RK&K

Date: 1/9/23

Description (required):

This ATC seeks to modify the span arrangement with an overall reduced bridge length at S-53 (Ross Dye Road) over Little Rocky Creek in Chester County.

Usage:

Our team is proposing to use a 325' four-span bridge for S-53 over Little Rocky Creek Creek with a 90' span over the channel.

Deviations (required):

This bridge length would deviate from the minimum lengths dictated in Attachment B of the RFP of 345 feet minimum total bridge length and minimum channel span of 100 feet for this site.

Justification:

Upon an in-depth review of the site and the model, our team determined that a 90' span over the channel would be achievable at this site. Included with this ATC is a Bridge Hydraulic Analysis Report, Bridge Plan and Profile, Bridge Typical Section showing superstructure depth, and Roadway Plan and Profile for supporting justification. These documents show we meet the minimum setbacks of face of drilled shaft to top of bank and the hydro requirements for freeboard and backwater.

Schedule:

Approval of this ATC would allow a construction schedule savings of 4 weeks due to reduced roadway and bridge work.

Impacts:

This ATC will reduce impacts to total roadway length and required right-of-way.

History:

Box beams of varying lengths have had good performance in other states and now, as well, in South Carolina.

Risks:

No risks to SCDOT or others are anticipated.

Costs (required):

This ATC would provide a cost savings of roughly \$85,000 by saving bridge length, roadway length, and right-of-way impacts.

Quality:

No adverse impact to quality or performance with the implementation of this ATC.



Formal Alternative Technical Concepts Submittal Form

Project: Bridge Package 15

Project ID: 8862230

ATC No.: 2

Priority: High

Team: United-Reeves JV/RK&K

Date: 1/9/23

Operations & Maintenance:

No negative impact to long-term operation and maintenance is anticipated with this ATC.



Chester S-53 over Little Rocky Creek

Bridge Hydraulics Analysis for Alternative Technical Concept (ATC 2)

The analysis presented in this document covers evaluation and comparison of bridge hydraulic performance of the original SCDOT proposed design and the ATC 2 design option under consideration for the Chester S-53 bridge replacement over Little Rocky Creek.

I. INTRODUCTION

RK&K performed a bridge hydraulics analysis for the bridge replacement of the bridge in Chester County along S-53 over Little Rocky Creek. A preliminary bridge analysis was completed to determine the minimum bridge length provided in the Request for Proposals dated December 5, 2022. The results of this preliminary study were used to determine the minimum bridge length of 345'. Based on the analysis and the information provided in this memorandum, RK&K proposes an Alternative Technical Concept of a bridge length of 325'. All pertinent data and supporting documentation are provided below.

II. DESIGN CRITERIA

- Design Storm: 25-Year
- S-53 must meet standard SCDOT design criteria.
- Overtopping: If the design flood overtops the existing road grade, the proposed bridge may be designed to account for a comparable amount of overtopping flow on the roadway approaches in accordance with Exhibit 4b. Bridge structure overtopping for the design storm event is not allowed.
- Freeboard: Shall not be less than 2 feet above the 25-year event unless the existing freeboard clearance is less than 2 feet.
- Backwater: Shall be 1 foot or less unless the hydraulic model results demonstrate the existing backwater is greater than 1 foot. When the existing backwater is greater than 1 foot, this level of hydraulic performance can be improved or maintained, provided the EOR researches and certifies to the best of his/her knowledge and belief that the existing backwater is not causing adverse impacts to upstream and adjacent properties.
- Low Chord: Shall not be less than the existing bridge low chord elevation unless the hydraulic model results demonstrate the low chord elevation passes the 500-year return storm event without putting the bridge under pressure flow. Additionally, the EOR shall research and certify to the best of his/her knowledge and belief that a reduction in elevation should not cause adverse impacts to upstream, adjacent, and downstream properties.
- Abutments: S-53 will require 10-foot setback from the top of the channel bank to the face of the pier (pile or column) on the overbanks.

III. MODEL UPDATES

The preliminary model was updated using the guidance of the HEC-RAS Hydraulic Reference Manual Version 5.0 dated February 2016. Below is a list of updates that were completed by RK&K during the hydraulic design process. All models and subsequent updates were run in HEC-RAS version 6.2.

- The cross sections were updated to be perpendicular to the stream.
- A downstream face cross section for the bridge was added to the model.
- Manning's n values were updated near the bridge cross section to ensure that the 0.045 manning's value was only in the channel.
- A sensitivity test was completed to verify the extents of the truncated model that was provided.
- Channel geometry was updated in the cross sections based on the existing survey.
- In existing and proposed conditions, ineffective flow locations and elevations were adjusted using the ratios provided in the HEC-RAS Hydraulic Reference Manual.
- In existing conditions, the low chord of the bridge was revised to 339.98' as determined from the existing road survey and measured structure depth, compared to 338.98' in the provided study. It was noted the existing low chord in the HECRAS model does not match the low chord elevation provided in the preliminary hydraulic analysis.
- In existing conditions, the pier locations were edited to reflect the correct span arrangement as determined from the RK&K field inspection and SCDOT survey. The span arrangement for the existing bridge is 9 @ 15'-4 @ 30'-3 @ 15'.
- Pier widths were edited in existing conditions to be consistent with the span arrangement and pile type. Wooden piles were set to 1' in diameter and steel h-piles were verified to be 0.83' (10").
- The existing 1' bridge rail was added to the model.
- Contraction and expansion coefficients were updated in accordance with the HEC-RAS Hydraulic Reference Manual.
- The bridge modeling approach was edited to use the greater of the Momentum and Energy equations during low flow conditions and to use the Pressure and/or Weir Equation during high flow conditions.
- The pier coefficient for the Momentum equation was updated to be a weighted average of round and square piles. The coefficient used was 1.4.
- The proposed bridge model was edited for the correct structure depth and correct bridge rail height determined from RK&K's structures department. The structure depth was revised to a total depth of 3.44' and the bridge rail height was revised to 3.5'.
- The internal bridge cross sections were updated using the most recent SCDOT survey information.
- In proposed conditions, the remnant pier wall located on the left overbank was removed per the direction in the RFP dated December 5, 2022.
- The proposed bridge was revised to an overall bridge length of 325' with a span arrangement of 85'-90'-90'-60'.
- The proposed roadway grade was added to the deck cross section.
- The proposed lowest low chord of the bridge was revised to 339.98', as compared to 340.17' in the provided model. It was noted the proposed low chord in the HECRAS model does not match the low chord elevation provided in the preliminary hydraulic analysis.

IV. CONCLUSION AND RESULTS

The HEC-RAS analysis showed that a 325' (85'-90'-90'-60') bridge meets the RFP requirements from December 5, 2022. No adverse effects are present at the adjacent, upstream, and downstream properties due to the shortening of the bridge. No residential homes are in the floodplain within the limits of the study. Table 1 shows a summary of the design criteria for the Chester County bridge along S-53.

Table 1: Summary of Results

<u>CRITERIA</u>	<u>SCDOT RFP Existing Model*</u>	<u>SCDOT RFP Model*</u>	<u>RK&K Existing Model</u>	<u>RK&K Revised Model</u>
25-Year WSEL	337.08	337.05	336.75	336.52
100-Year WSEL	338.68	338.67	338.33	338.10
100-Year Backwater (ft)	0.73	0.81	0.57	0.34
25-Year Freeboard (ft)	2.69	1.99	3.23	3.46
Low Chord Elevation	339.77	339.77	339.98	339.98
Bridge Length (ft)	300	345	300	325
Span Arrangement	9@15'-4@30'- 3@15'	90'-90'-100'-65'	9@15'-4@30'- 3@15'	85'-90'-90'-60'

*All values were pulled from the Preliminary Hydraulic Analysis dated September 9, 2022, per Addendum 1 dated January 5, 2023.

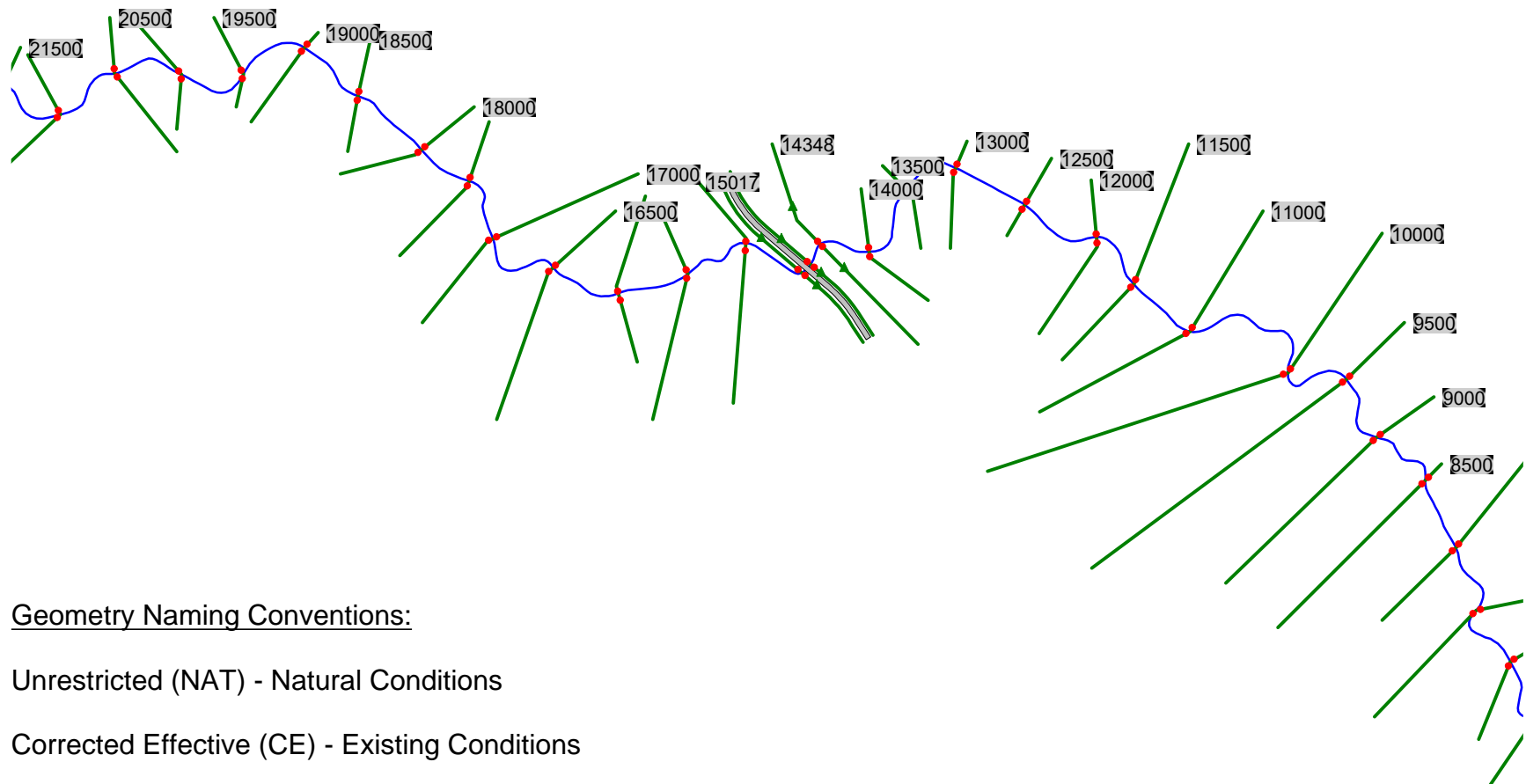
See Appendix B for bridge plan and profile showing that all setback requirements are met.

V. ATTACHMENTS

- Attachment A: RK&K Proposed Model HEC-RAS Outputs
- Attachment B: Bridge Plan and Profile
- Attachment C: Roadway Profile

Appendix A: RK&K Proposed Model HEC-RAS Outputs

Chester S-53 HEC-RAS Schematic



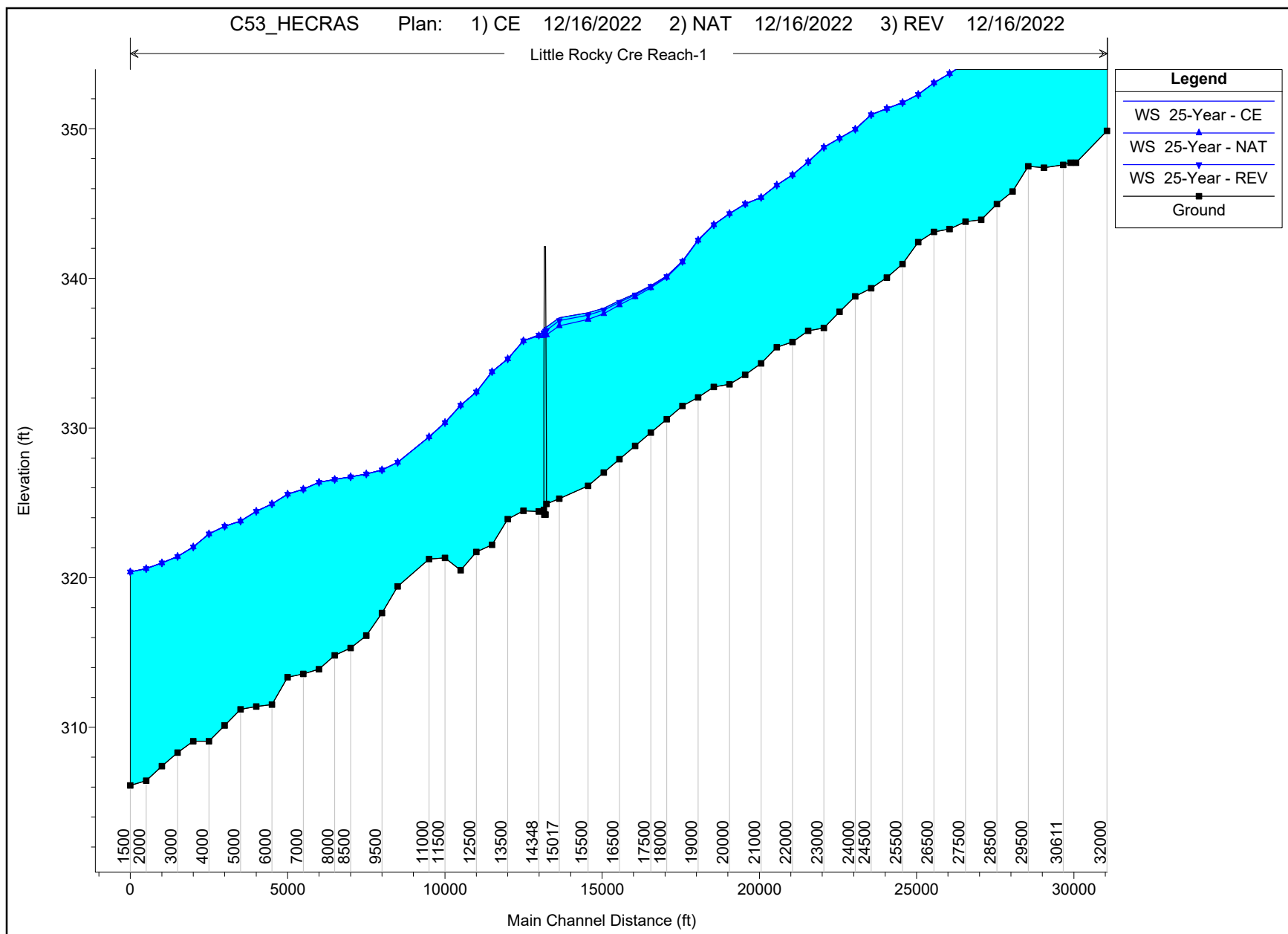
Geometry Naming Conventions:

Unrestricted (NAT) - Natural Conditions

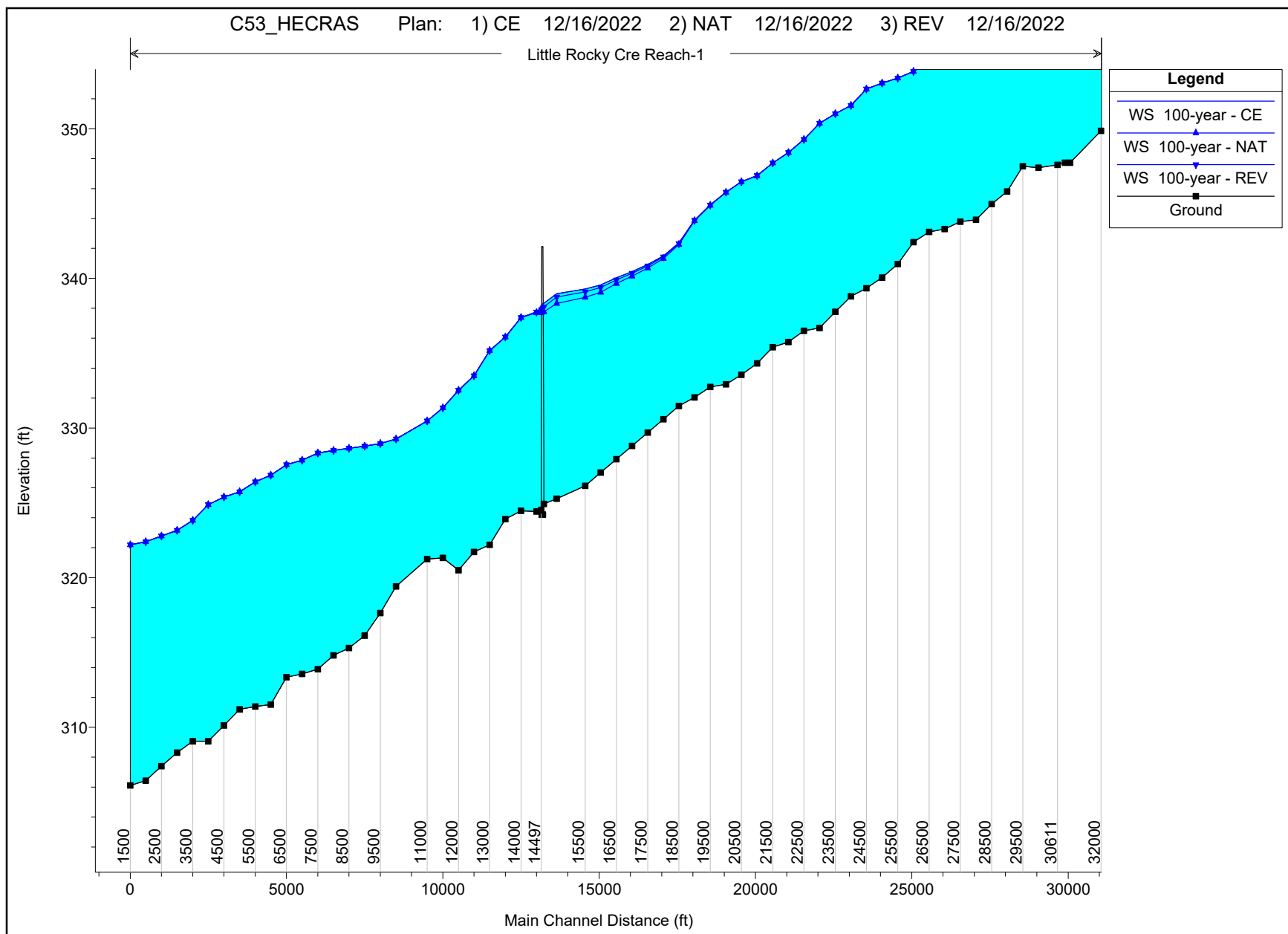
Corrected Effective (CE) - Existing Conditions

Revised (REV) - Proposed Conditions

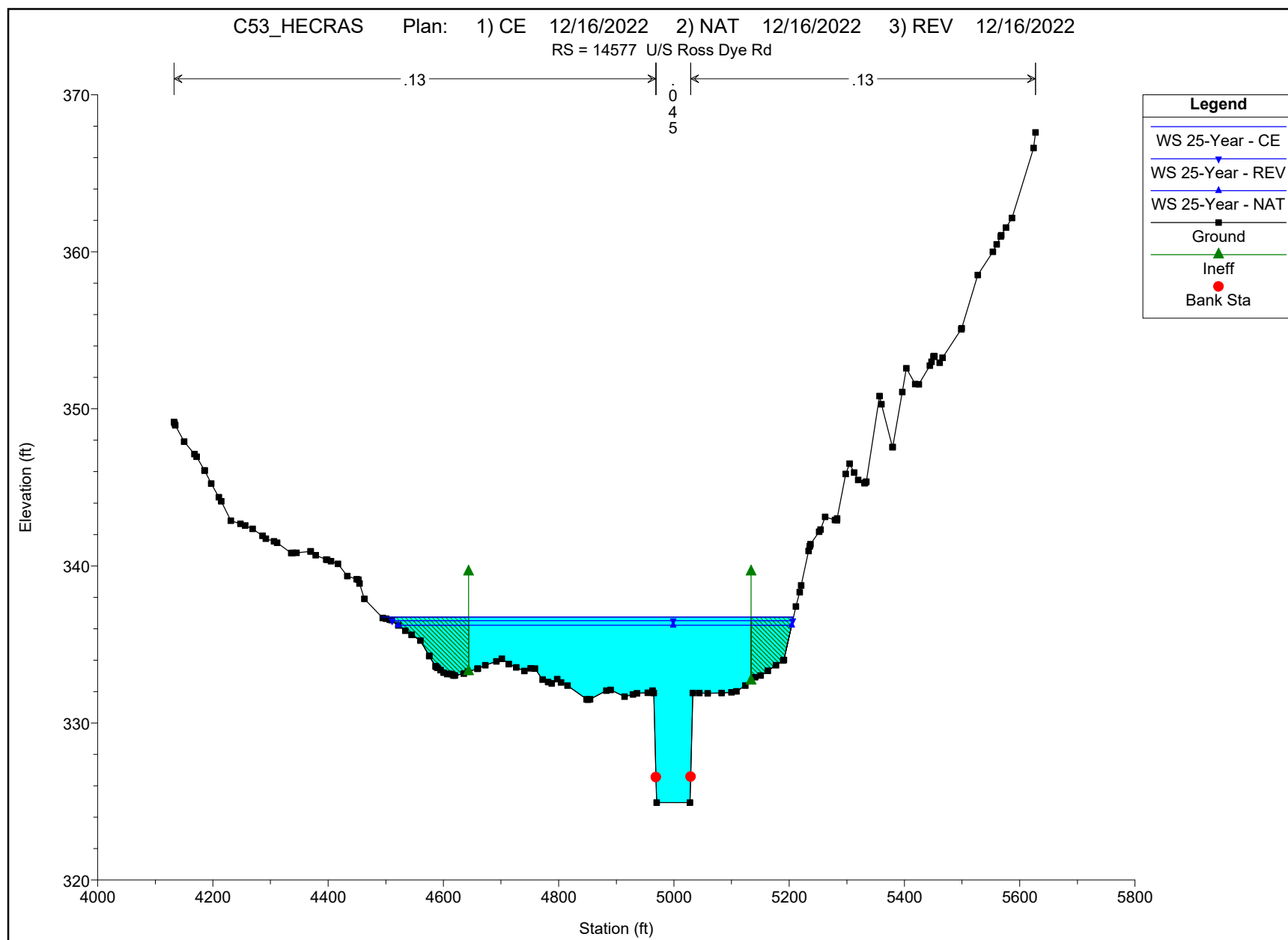
Chester S-53 25-year Profile

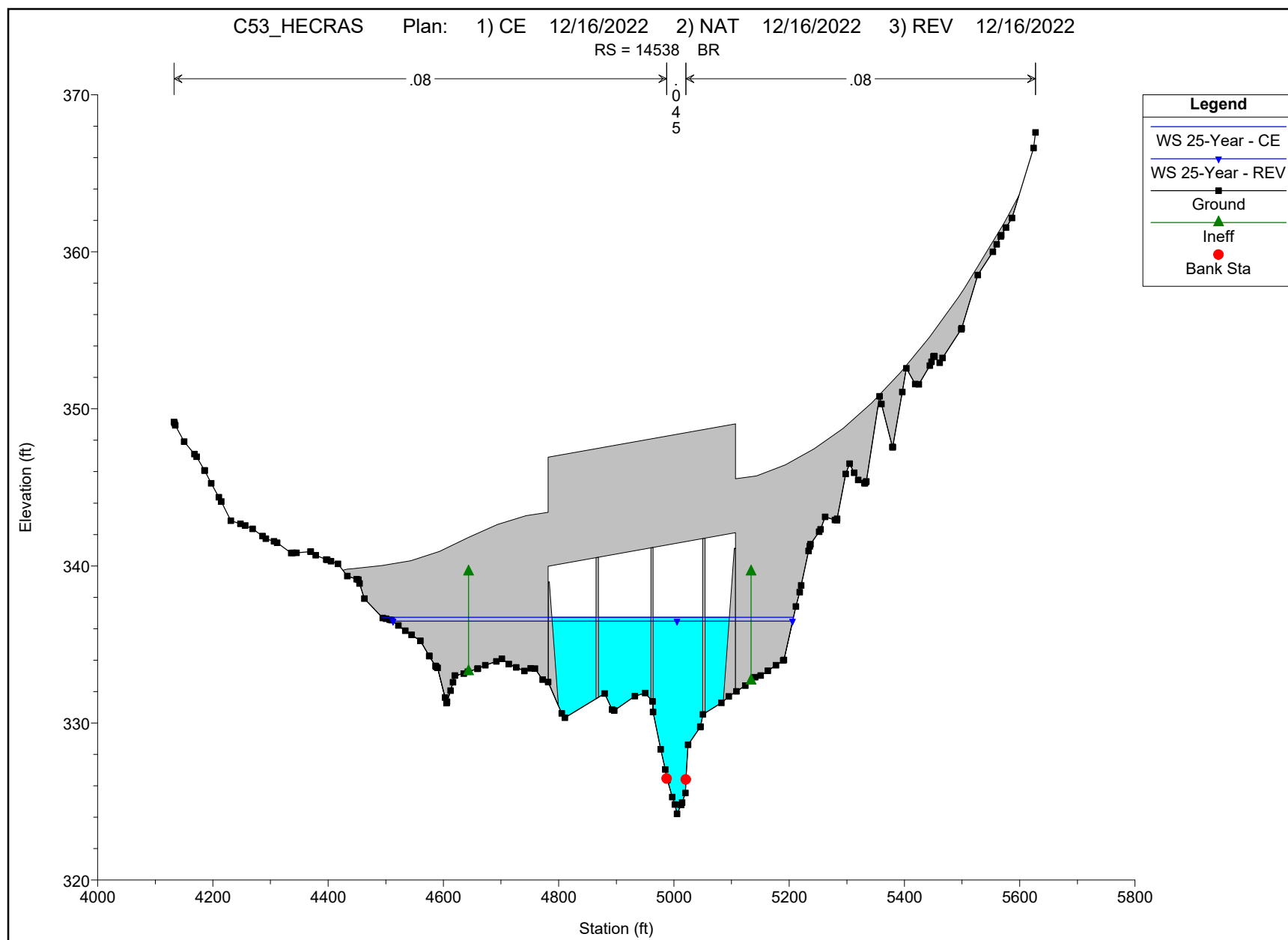


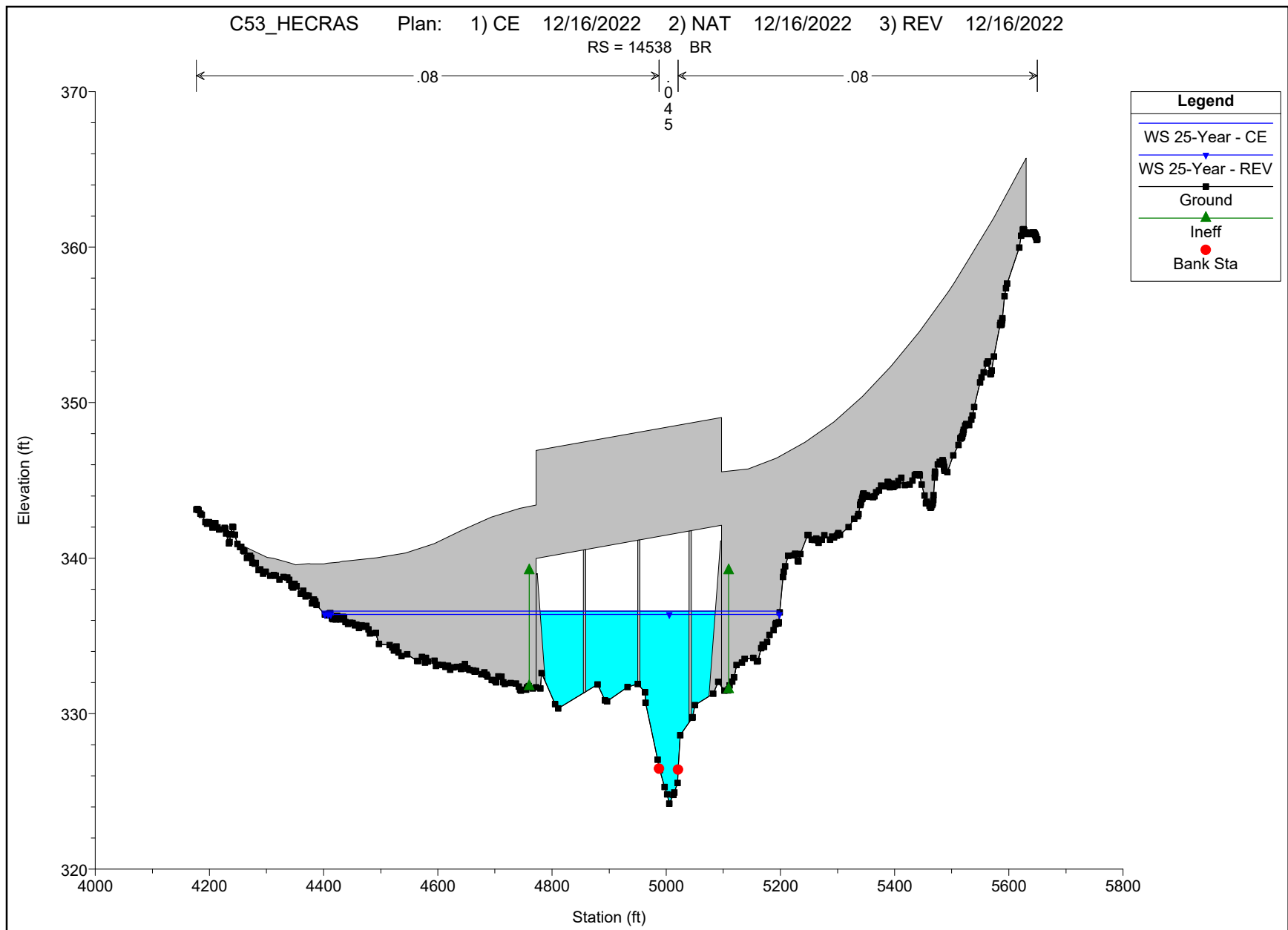
Chester S-53 100-year Profile



Chester S-53 25-year Cross Sections

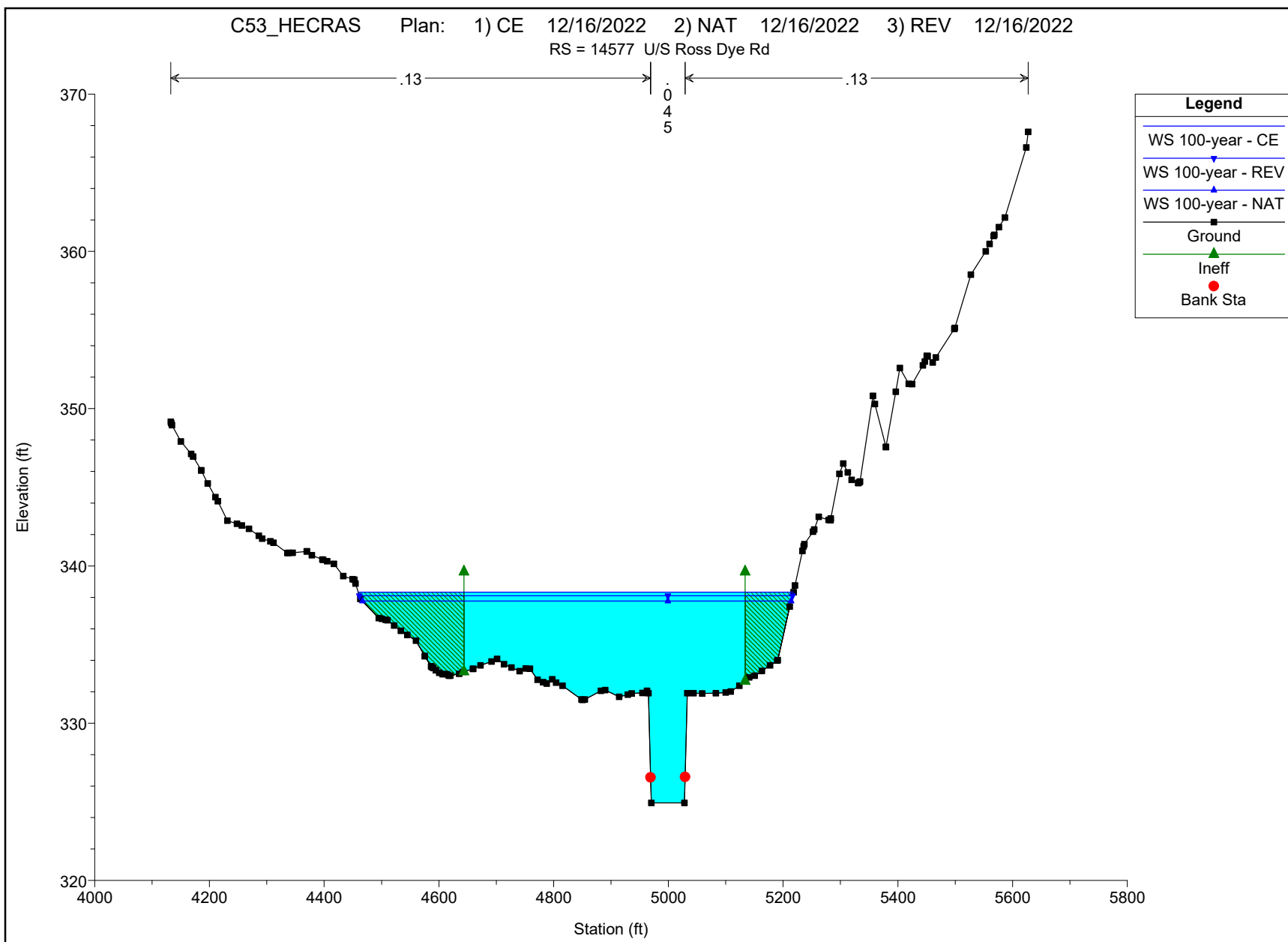


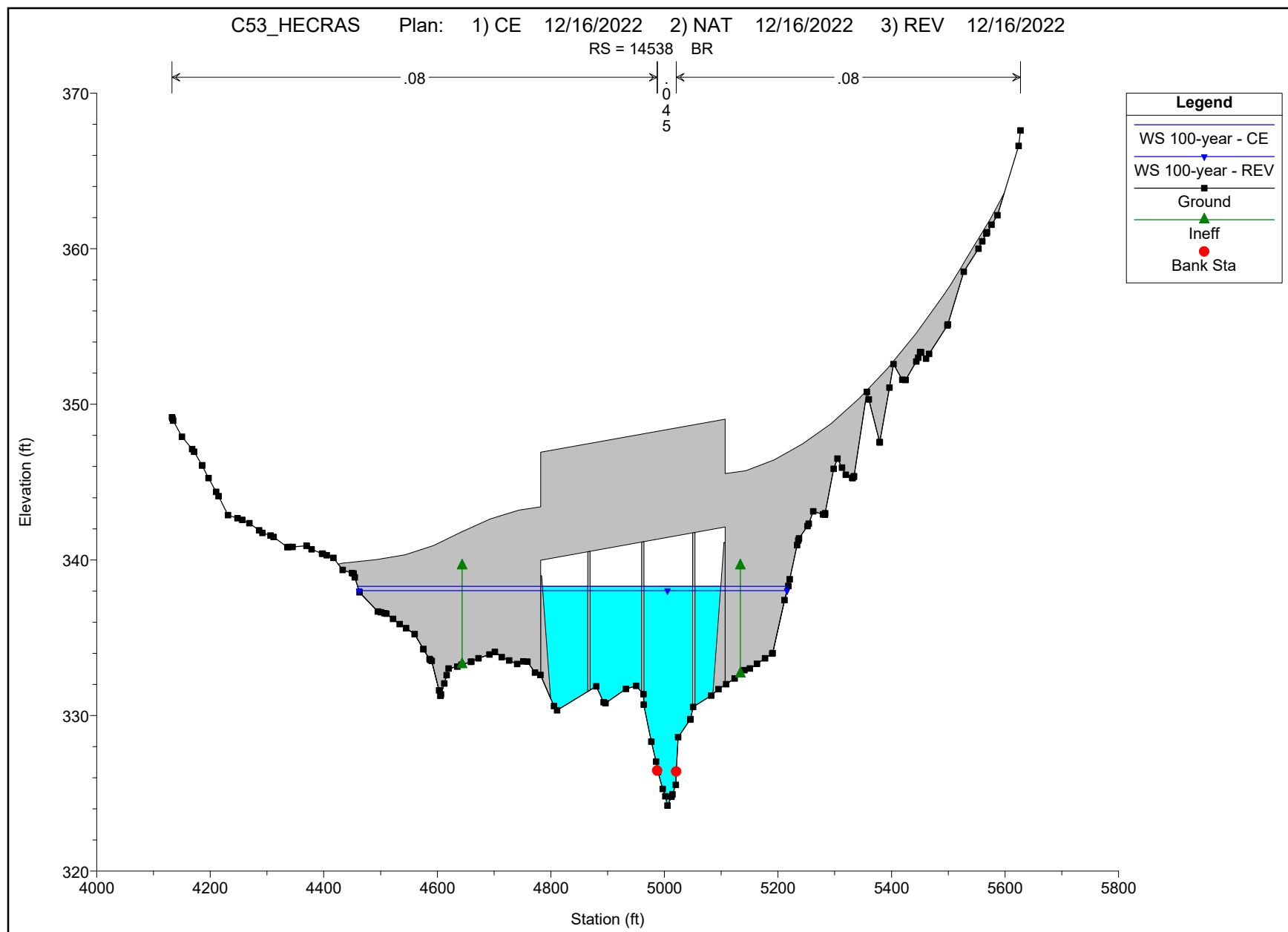


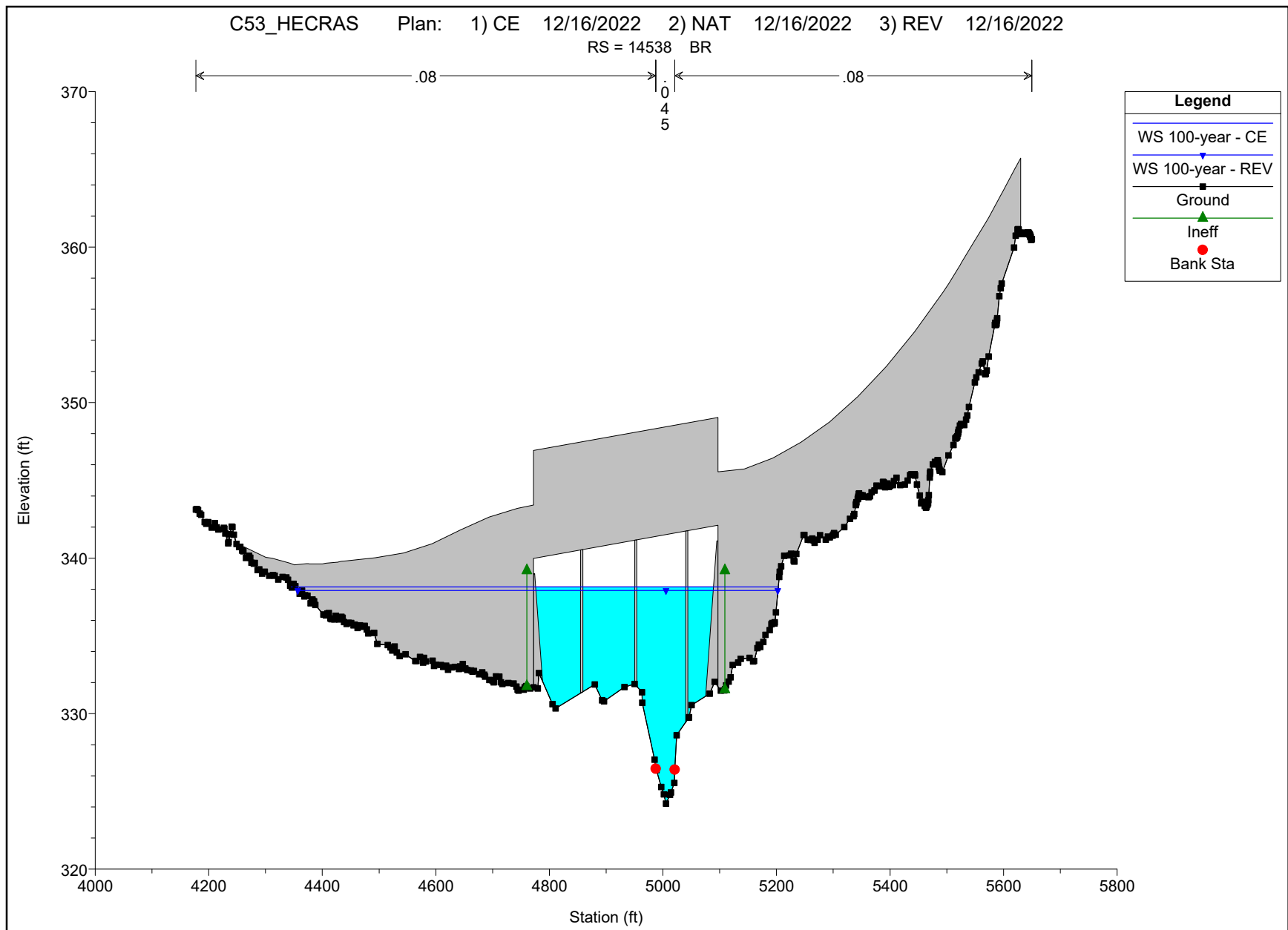


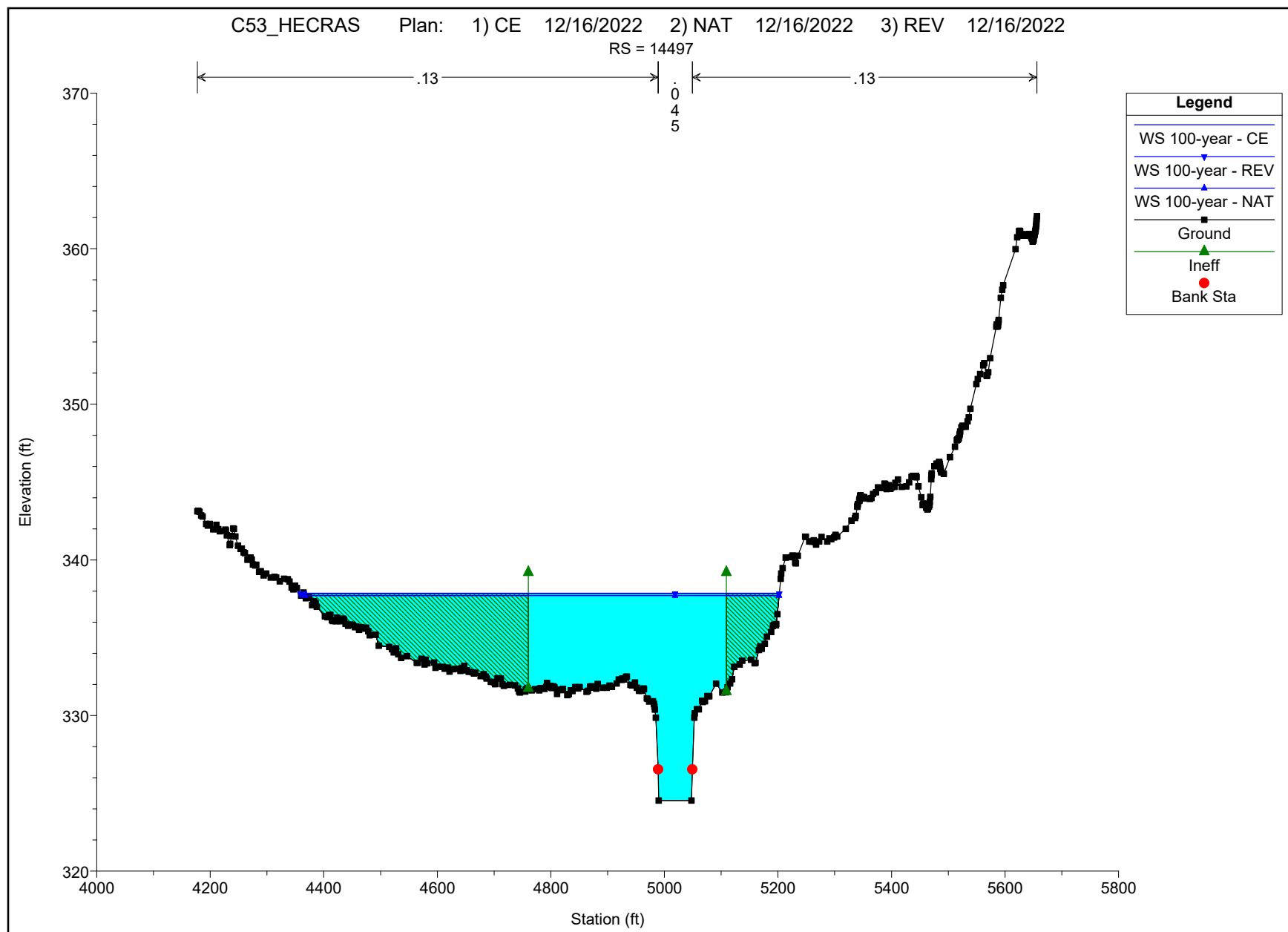


Chester S-53 25-year Cross Sections









Chester S-53 25-Year HEC-RAS Output Table

HEC-RAS River: Little Rocky Cre Reach: Reach-1 Profile: 25-Year (Continued)

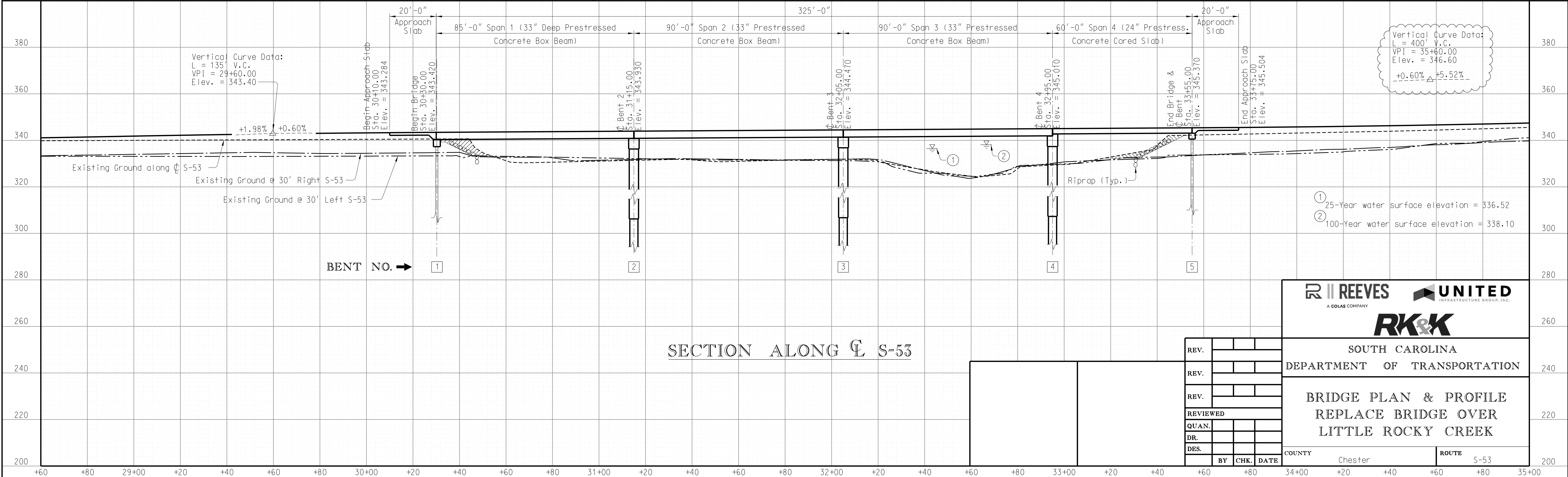
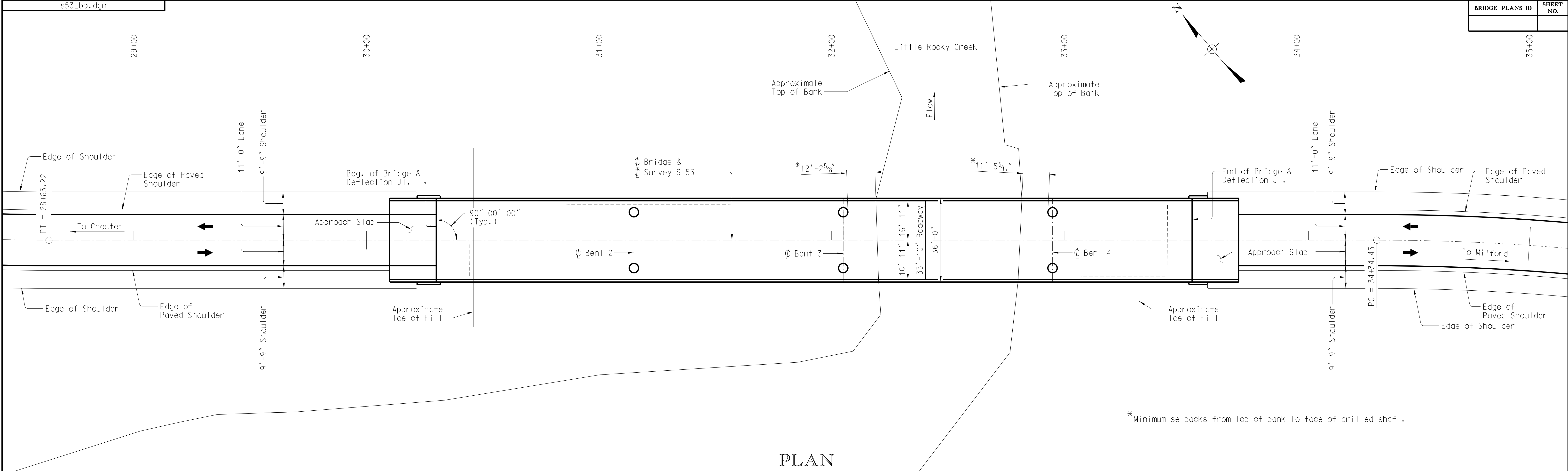
Reach	River Sta	Profile	Plan	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl
Reach-1	16000	25-Year	CE	6038.00	327.02	338.01	334.19	338.22	0.000948	4.90	3490.08	655.93	0.26
Reach-1	16000	25-Year	NAT	6038.00	327.02	337.64	334.19	337.88	0.001134	5.24	3247.46	650.06	0.28
Reach-1	16000	25-Year	REV	6038.00	327.02	337.87	334.19	338.09	0.001013	5.02	3398.31	653.51	0.27
Reach-1	15500	25-Year	CE	6038.00	326.13	337.70	333.84	337.81	0.000548	3.86	5024.43	939.18	0.20
Reach-1	15500	25-Year	NAT	6038.00	326.13	337.26	333.84	337.39	0.000688	4.21	4606.56	934.45	0.22
Reach-1	15500	25-Year	REV	6038.00	326.13	337.54	333.84	337.66	0.000596	3.98	4869.12	937.36	0.21
Reach-1	15017	25-Year	CE	6038.00	325.27	337.37	332.53	337.42	0.000285	2.90	6719.32	1036.28	0.15
Reach-1	15017	25-Year	NAT	6038.00	325.27	336.83	332.53	336.89	0.000362	3.17	6173.05	1013.94	0.16
Reach-1	15017	25-Year	REV	6038.00	325.27	337.17	332.53	337.22	0.000310	3.00	6518.79	1020.11	0.15
Reach-1	14577	25-Year	CE	6038.00	324.93	336.75	332.88	337.13	0.001229	5.89	2460.44	714.32	0.30
Reach-1	14577	25-Year	NAT	6038.00	324.93	336.23	331.80	336.62	0.001384	6.07	2729.47	683.14	0.32
Reach-1	14577	25-Year	REV	6038.00	324.93	336.52	332.92	336.91	0.001319	6.02	2448.90	695.14	0.31
Reach-1	14538			Bridge									
Reach-1	14497	25-Year	CE	6105.00	324.53	336.35	332.30	336.82	0.001468	6.39	1979.19	788.95	0.33
Reach-1	14497	25-Year	NAT	6105.00	324.53	336.16	332.67	336.48	0.001181	5.67	3111.04	774.61	0.29
Reach-1	14497	25-Year	REV	6105.00	324.53	336.31	332.47	336.76	0.001418	6.27	2087.16	785.80	0.32
Reach-1	14348	25-Year	CE	6105.00	324.42	336.22	333.28	336.52	0.001348	6.04	2898.53	1236.07	0.32
Reach-1	14348	25-Year	NAT	6105.00	324.42	336.15	332.39	336.23	0.000505	3.68	6242.86	1235.21	0.19
Reach-1	14348	25-Year	REV	6105.00	324.42	336.21	333.19	336.47	0.001216	5.73	3140.28	1235.92	0.30
Reach-1	14000	25-Year	CE	6105.00	324.47	335.83	331.36	335.95	0.000602	4.04	4366.87	679.57	0.21
Reach-1	14000	25-Year	NAT	6105.00	324.47	335.83	331.36	335.95	0.000602	4.04	4366.87	679.57	0.21
Reach-1	14000	25-Year	REV	6105.00	324.47	335.83	331.36	335.95	0.000602	4.04	4366.87	679.57	0.21
Reach-1	13500	25-Year	CE	6105.00	323.91	334.62	331.21	335.40	0.002466	7.81	1537.21	329.00	0.42
Reach-1	13500	25-Year	NAT	6105.00	323.91	334.62	331.21	335.40	0.002466	7.81	1537.21	329.00	0.42
Reach-1	13500	25-Year	REV	6105.00	323.91	334.62	331.21	335.40	0.002466	7.81	1537.21	329.00	0.42
Reach-1	13000	25-Year	CE	6105.00	322.19	333.77	329.44	334.30	0.001642	6.68	1946.29	366.58	0.35
Reach-1	13000	25-Year	NAT	6105.00	322.19	333.77	329.44	334.30	0.001642	6.68	1946.29	366.58	0.35
Reach-1	13000	25-Year	REV	6105.00	322.19	333.77	329.44	334.30	0.001642	6.68	1946.29	366.58	0.35
Reach-1	12500	25-Year	CE	6105.00	321.72	332.41	328.75	333.26	0.002631	8.01	1362.21	270.10	0.43
Reach-1	12500	25-Year	NAT	6105.00	321.72	332.41	328.75	333.26	0.002631	8.01	1362.21	270.10	0.43
Reach-1	12500	25-Year	REV	6105.00	321.72	332.41	328.75	333.26	0.002631	8.01	1362.21	270.10	0.43
Reach-1	12000	25-Year	CE	6105.00	320.49	331.52	327.42	332.06	0.001792	6.80	2278.91	610.76	0.36
Reach-1	12000	25-Year	NAT	6105.00	320.49	331.52	327.42	332.06	0.001792	6.80	2278.91	610.76	0.36
Reach-1	12000	25-Year	REV	6105.00	320.49	331.52	327.42	332.06	0.001792	6.80	2278.91	610.76	0.36
Reach-1	11500	25-Year	CE	6105.00	321.32	330.35	328.88	330.96	0.002804	7.52	2320.54	765.90	0.44
Reach-1	11500	25-Year	NAT	6105.00	321.32	330.35	328.88	330.96	0.002804	7.52	2320.54	765.90	0.44
Reach-1	11500	25-Year	REV	6105.00	321.32	330.35	328.88	330.96	0.002804	7.52	2320.54	765.90	0.44
Reach-1	11000	25-Year	CE	6105.00	321.24	329.40	327.77	329.67	0.001950	5.86	3458.65	1047.22	0.36
Reach-1	11000	25-Year	NAT	6105.00	321.24	329.40	327.77	329.67	0.001950	5.86	3458.65	1047.22	0.36
Reach-1	11000	25-Year	REV	6105.00	321.24	329.40	327.77	329.67	0.001950	5.86	3458.65	1047.22	0.36
Reach-1	10000	25-Year	CE	6105.00	319.41	327.70	326.30	327.90	0.001546	5.27	4552.16	1639.97	0.32
Reach-1	10000	25-Year	NAT	6105.00	319.41	327.70	326.30	327.90	0.001546	5.27	4552.16	1639.97	0.32
Reach-1	10000	25-Year	REV	6105.00	319.41	327.70	326.30	327.90	0.001546	5.27	4552.16	1639.97	0.32
Reach-1	9500	25-Year	CE	6105.00	317.63	327.19	325.00	327.30	0.000746	4.03	6076.10	1777.79	0.23
Reach-1	9500	25-Year	NAT	6105.00	317.63	327.19	325.00	327.30	0.000746	4.03	6076.10	1777.79	0.23
Reach-1	9500	25-Year	REV	6105.00	317.63	327.19	325.00	327.30	0.000746	4.03	6076.10	1777.79	0.23
Reach-1	9000	25-Year	CE	6105.00	316.13	326.92	323.76	326.99	0.000438	3.35	6837.27	1498.12	0.18
Reach-1	9000	25-Year	NAT	6105.00	316.13	326.92	323.76	326.99	0.000438	3.35	6837.27	1498.12	0.18
Reach-1	9000	25-Year	REV	6105.00	316.13	326.92	323.76	326.99	0.000438	3.35	6837.27	1498.12	0.18
Reach-1	8500	25-Year	CE	6173.00	315.30	326.74	322.68	326.79	0.000325	3.00	7114.69	1242.19	0.16
Reach-1	8500	25-Year	NAT	6173.00	315.30	326.74	322.68	326.79	0.000325	3.00	7114.69	1242.19	0.16
Reach-1	8500	25-Year	REV	6173.00	315.30	326.74	322.68	326.79	0.000325	3.00	7114.69	1242.19	0.16
Reach-1	8000	25-Year	CE	6173.00	314.81	326.57	321.85	326.63	0.000339	3.12	6585.67	1107.92	0.16
Reach-1	8000	25-Year	NAT	6173.00	314.81	326.57	321.85	326.63	0.000339	3.12	6585.67	1107.92	0.16
Reach-1	8000	25-Year	REV	6173.00	314.81	326.57	321.85	326.63	0.000339	3.12	6585.67	1107.92	0.16
Reach-1	7500	25-Year	CE	6173.00	313.89	326.37	319.14	326.45	0.000367	3.38	5637.14	846.23	0.17
Reach-1	7500	25-Year	NAT	6173.00	313.89	326.37	319.14	326.45	0.000367	3.38	5637.14	846.23	0.17
Reach-1	7500	25-Year	REV	6173.00	313.89	326.37	319.14	326.45	0.000367	3.38	5637.14	846.23	0.17
Reach-1	7000	25-Year	CE	6173.00	313.57	325.90	321.03	326.17	0.000872	5.16	2911.00	445.09	0.26
Reach-1	7000	25-Year	NAT	6173.00	313.57	325.90	321.03	326.17	0.000872	5.16	2911.00	445.09	0.26
Reach-1	7000	25-Year	REV	6173.00	313.57	325.90	321.03	326.17	0.000872	5.16	2911.00	445.09	0.26
Reach-1	6500	25-Year	CE	6173.00	313.34	325.57	320.50	325.76	0.000690	4.57	3418.89	479.41	0.23

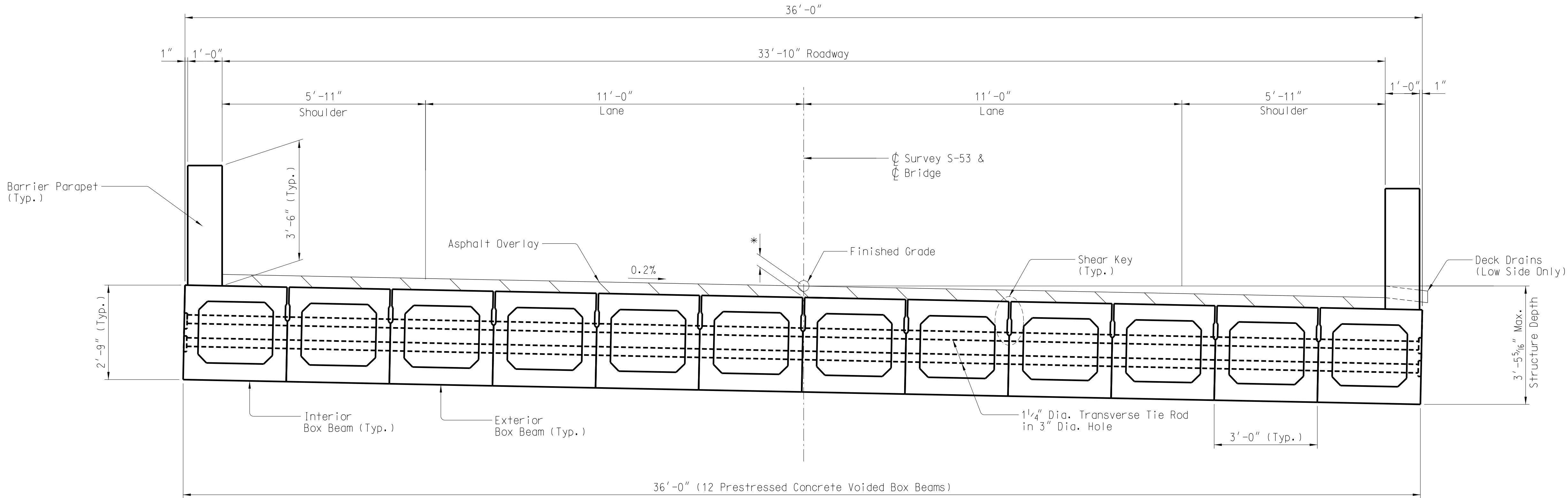
Chester S-53 100-Year HEC-RAS Output Table

HEC-RAS River: Little Rocky Cre Reach: Reach-1 Profile: 100-year (Continued)

Reach	River Sta	Profile	Plan	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl
Reach-1	16000	100-year	CE	8191.00	327.02	339.56	335.18	339.77	0.000899	5.21	4532.63	688.39	0.26
Reach-1	16000	100-year	NAT	8191.00	327.02	339.07	335.18	339.33	0.001097	5.61	4200.52	681.19	0.29
Reach-1	16000	100-year	REV	8191.00	327.02	339.39	335.18	339.62	0.000961	5.34	4418.57	685.17	0.27
Reach-1	15500	100-year	CE	8191.00	326.13	339.28	334.62	339.39	0.000499	4.01	6526.39	963.79	0.20
Reach-1	15500	100-year	NAT	8191.00	326.13	338.73	334.62	338.86	0.000629	4.38	5993.69	953.86	0.22
Reach-1	15500	100-year	REV	8191.00	326.13	339.10	334.62	339.21	0.000539	4.13	6345.95	959.74	0.20
Reach-1	15017	100-year	CE	8191.00	325.27	338.97	333.07	339.02	0.000276	3.10	8458.51	1109.64	0.15
Reach-1	15017	100-year	NAT	8191.00	325.27	338.33	333.07	338.39	0.000353	3.40	7750.15	1094.75	0.17
Reach-1	15017	100-year	REV	8191.00	325.27	338.75	333.07	338.81	0.000299	3.20	8221.94	1106.16	0.15
Reach-1	14577	100-year	CE	8191.00	324.93	338.33	334.39	338.73	0.001206	6.35	3193.08	759.01	0.31
Reach-1	14577	100-year	NAT	8191.00	324.93	337.76	334.53	338.13	0.001255	6.29	3832.45	747.37	0.31
Reach-1	14577	100-year	REV	8191.00	324.93	338.10	334.42	338.51	0.001261	6.42	3224.25	755.34	0.31
Reach-1	14538			Bridge									
Reach-1	14497	100-year	CE	8280.00	324.53	337.85	333.76	338.41	0.001567	7.15	2466.98	842.88	0.35
Reach-1	14497	100-year	NAT	8280.00	324.53	337.70	334.08	338.00	0.001059	5.84	4362.69	835.36	0.28
Reach-1	14497	100-year	REV	8280.00	324.53	337.82	333.76	338.34	0.001494	6.98	2614.27	841.60	0.34
Reach-1	14348	100-year	CE	8280.00	324.42	337.76	334.03	338.07	0.001290	6.44	3673.97	1271.34	0.32
Reach-1	14348	100-year	NAT	8280.00	324.42	337.71	332.95	337.77	0.000434	3.72	8182.22	1269.85	0.18
Reach-1	14348	100-year	REV	8280.00	324.42	337.75	333.90	338.01	0.001155	6.09	3981.51	1271.16	0.30
Reach-1	14000	100-year	CE	8280.00	324.47	337.38	332.17	337.52	0.000599	4.38	5431.48	690.47	0.22
Reach-1	14000	100-year	NAT	8280.00	324.47	337.38	332.17	337.52	0.000599	4.38	5431.48	690.47	0.22
Reach-1	14000	100-year	REV	8280.00	324.47	337.38	332.17	337.52	0.000599	4.38	5431.48	690.47	0.22
Reach-1	13500	100-year	CE	8280.00	323.91	336.08	333.24	336.96	0.002531	8.62	2025.31	342.63	0.44
Reach-1	13500	100-year	NAT	8280.00	323.91	336.08	333.24	336.96	0.002531	8.62	2025.31	342.63	0.44
Reach-1	13500	100-year	REV	8280.00	323.91	336.08	333.24	336.96	0.002531	8.62	2025.31	342.63	0.44
Reach-1	13000	100-year	CE	8280.00	322.19	335.17	331.43	335.80	0.001785	7.52	2472.65	386.81	0.37
Reach-1	13000	100-year	NAT	8280.00	322.19	335.17	331.43	335.80	0.001785	7.52	2472.65	386.81	0.37
Reach-1	13000	100-year	REV	8280.00	322.19	335.17	331.43	335.80	0.001785	7.52	2472.65	386.81	0.37
Reach-1	12500	100-year	CE	8280.00	321.72	333.49	330.79	334.61	0.003181	9.40	1660.68	279.04	0.48
Reach-1	12500	100-year	NAT	8280.00	321.72	333.49	330.79	334.61	0.003181	9.40	1660.68	279.04	0.48
Reach-1	12500	100-year	REV	8280.00	321.72	333.49	330.79	334.61	0.003181	9.40	1660.68	279.04	0.48
Reach-1	12000	100-year	CE	8280.00	320.49	332.53	330.01	333.16	0.002055	7.72	2906.28	645.81	0.39
Reach-1	12000	100-year	NAT	8280.00	320.49	332.53	330.01	333.16	0.002055	7.72	2906.28	645.81	0.39
Reach-1	12000	100-year	REV	8280.00	320.49	332.53	330.01	333.16	0.002055	7.72	2906.28	645.81	0.39
Reach-1	11500	100-year	CE	8280.00	321.32	331.35	329.93	331.96	0.002801	8.06	3120.36	860.96	0.45
Reach-1	11500	100-year	NAT	8280.00	321.32	331.35	329.93	331.96	0.002801	8.06	3120.36	860.96	0.45
Reach-1	11500	100-year	REV	8280.00	321.32	331.35	329.93	331.96	0.002801	8.06	3120.36	860.96	0.45
Reach-1	11000	100-year	CE	8280.00	321.24	330.47	328.32	330.72	0.001744	6.02	4603.44	1082.71	0.35
Reach-1	11000	100-year	NAT	8280.00	321.24	330.47	328.32	330.72	0.001744	6.02	4603.44	1082.71	0.35
Reach-1	11000	100-year	REV	8280.00	321.24	330.47	328.32	330.72	0.001744	6.02	4603.44	1082.71	0.35
Reach-1	10000	100-year	CE	8280.00	319.41	329.26	326.83	329.37	0.000873	4.45	7163.48	1701.89	0.25
Reach-1	10000	100-year	NAT	8280.00	319.41	329.26	326.83	329.37	0.000873	4.45	7163.48	1701.89	0.25
Reach-1	10000	100-year	REV	8280.00	319.41	329.26	326.83	329.37	0.000873	4.45	7163.48	1701.89	0.25
Reach-1	9500	100-year	CE	8280.00	317.63	328.96	325.54	329.02	0.000441	3.47	9284.41	1854.02	0.18
Reach-1	9500	100-year	NAT	8280.00	317.63	328.96	325.54	329.02	0.000441	3.47	9284.41	1854.02	0.18
Reach-1	9500	100-year	REV	8280.00	317.63	328.96	325.54	329.02	0.000441	3.47	9284.41	1854.02	0.18
Reach-1	9000	100-year	CE	8280.00	316.13	328.79	324.23	328.83	0.000305	3.11	9650.73	1521.61	0.15
Reach-1	9000	100-year	NAT	8280.00	316.13	328.79	324.23	328.83	0.000305	3.11	9650.73	1521.61	0.15
Reach-1	9000	100-year	REV	8280.00	316.13	328.79	324.23	328.83	0.000305	3.11	9650.73	1521.61	0.15
Reach-1	8500	100-year	CE	8371.00	315.30	328.65	323.17	328.69	0.000257	2.95	9488.19	1250.43	0.14
Reach-1	8500	100-year	NAT	8371.00	315.30	328.65	323.17	328.69	0.000257	2.95	9488.19	1250.43	0.14
Reach-1	8500	100-year	REV	8371.00	315.30	328.65	323.17	328.69	0.000257	2.95	9488.19	1250.43	0.14
Reach-1	8000	100-year	CE	8371.00	314.81	328.50	322.52	328.56	0.000280	3.14	8766.03	1148.57	0.15
Reach-1	8000	100-year	NAT	8371.00	314.81	328.50	322.52	328.56	0.000280	3.14	8766.03	1148.57	0.15
Reach-1	8000	100-year	REV	8371.00	314.81	328.50	322.52	328.56	0.000280	3.14	8766.03	1148.57	0.15
Reach-1	7500	100-year	CE	8371.00	313.89	328.32	319.67	328.40	0.000338	3.57	7339.92	911.21	0.17
Reach-1	7500	100-year	NAT	8371.00	313.89	328.32	319.67	328.40	0.000338	3.57	7339.92	911.21	0.17
Reach-1	7500	100-year	REV	8371.00	313.89	328.32	319.67	328.40	0.000338	3.57	7339.92	911.21	0.17
Reach-1	7000	100-year	CE	8371.00	313.57	327.85	321.96	328.14	0.000829	5.55	3812.82	478.58	0.26
Reach-1	7000	100-year	NAT	8371.00	313.57	327.85	321.96	328.14	0.000829	5.55	3812.82	478.58	0.26
Reach-1	7000	100-year	REV	8371.00	313.57	327.85	321.96	328.14	0.000829	5.55	3812.82	478.58	0.26
Reach-1	6500	100-year	CE	8371.00	313.34	327.54	321.36	327.74	0.000653	4.91	4382.65	500.35	0.23

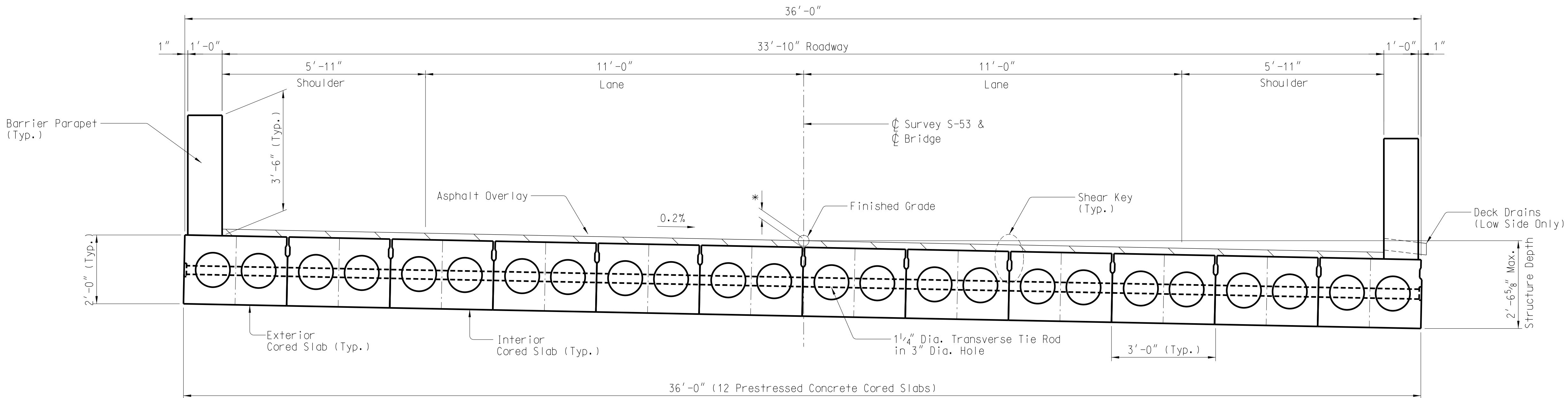
Appendix B: Bridge Plansheet





*2" Min. at midspan
4" Max. at ϕ Bearing

SECTION THROUGH SUPERSTRUCTURE - SPANS 1-3






* 2" Min. at midspan
2 5/16" Max. at ϕ Bearing

SECTION THROUGH SUPERSTRUCTURE - SPAN 4

PRELIMINARY

REV.			
REV.			
REV.			
REVIEWED			
QUAN.			
DR.			
DES.			
BY	CHK.	DATE	



SOUTH CAROLINA
DEPARTMENT OF TRANSPORTATION

SUPERSTRUCTURE
TYPICAL SECTION

COUNTY	Chester	ROUTE	S-53
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Appendix C: Roadway Profile

PLAN	DATE	BY	DATE	BY	DATE
NOTE BOOK					
No.					

UTILITY OWNERS			
GAS	CHESTER COUNTY NATURAL GAS	JASON STEWART	803-385-3157
TELCOM	CHESTER TELEPHONE (TRUVISTA)	JAMIE MILLIS	803-581-9130
ELECTRIC	FAIRFIELD ELECTRIC COOPERATIVE	BRUCE BACON	803-691-3605

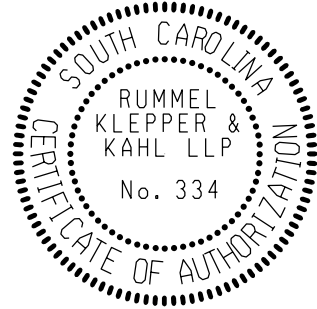
P.I. = 26+23.60
 $\Delta = 35^\circ 02' 22''$ (LT)
 $D = 7^\circ 03' 57''$
 $T = 255.97'$
 $L = 495.89'$
 $E = 39.44'$
 $R = 810.87'$
 $D.S. = 45$ mph
 $eMAX = 6\%$
 $e = 5.8\%$
 $P.C. - LG\% = 0.54$
 $P.T. - LG\% = 0.54$

SURVEY STA. 26+80.00 BEGIN
PROJECT ID. P041153
ROAD S-53 (ROSS DYE ROAD)

FED. ROAD DIV. NO.	STATE	COUNTY	PROJECT ID	ROUTE NO.	SHEET NO.
3	S.C.	CHESTER	P041153	S-53	6

ROSS DYE ROAD
BRIDGE No. 3

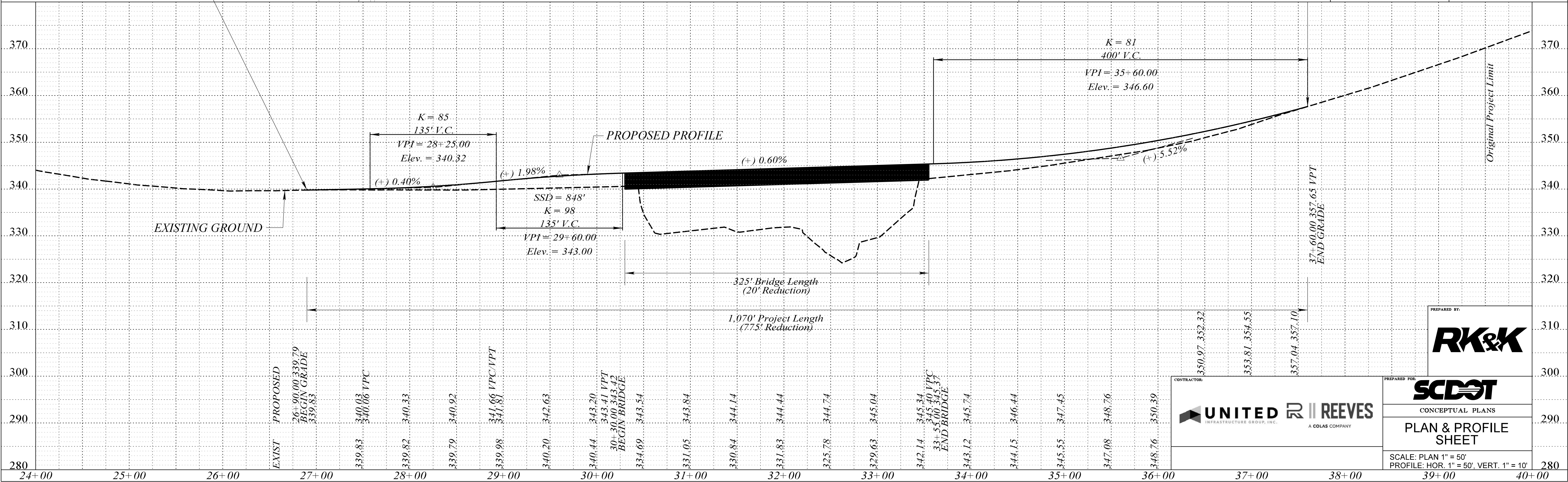
P.I. = 35+73.84
 $\Delta = 16^\circ 30' 42''$ (RT)
 $D = 5^\circ 57' 49''$
 $T = 139.40'$
 $L = 276.87'$
 $E = 10.06'$
 $R = 960.75'$
 $D.S. = 45$ mph
 $eMAX = 6\%$
 $e = 5.6\%$
 $P.C. - LG\% = 0.54$
 $P.T. - LG\% = 0.54$



Right of Way Reduced by 0.769 Acres

NPDES Lines Outside Proposed Right of Way to be obtained by Permission

PLAN	DATE	BY	DATE	BY	DATE
NOTE BOOK					
No.					



Formal Alternative Technical Concepts Submittal Form

Project: Bridge Package 15

Project ID: 8862230

ATC No.: 3

Priority: High

Team: United-Reeves JV/RK&K

Date: 1/9/23

Description (required):

This ATC seeks to reduce the bridge length at S-108 (Outen Road) over Brown Creek in Chesterfield County.

Usage:

Our team is proposing to use a 80' single span bridge for S-108 over Brown Creek.

Deviations (required):

This bridge length would deviate from the minimum lengths dictated in Attachment B of the RFP of 100 feet for total bridge length and minimum channel span for this site.

Justification:

Upon an in-depth review of the site and hydro model, our team determined that a 80' single span bridge would be achievable at this site. Included with this ATC is a Bridge Hydraulic Analysis Report, Bridge Plan and Profile, Bridge Typical Section showing superstructure depth, and Roadway Plan and Profile for supporting justification. These documents show we meet the minimum toe of fill set backs to top of bank and the hydro requirements for freeboard and backwater.

Schedule:

Approval of this ATC will allow a construction schedule savings of 2 weeks due to the elimination of setting multiple spans of girders and constructing drilled shafts.

Impacts:

This ATC will significantly reduce impacts to total roadway length, required right-of-way, and environmental resources.

History:

Many states have a great success rate of using and constructing 80' single span box beam bridges. The Reeves/RK&K team has previously designed and constructed a 80' single span box beam bridge at S-342 over Big Beaver Dam Creek in Newberry County.

Risks:

No risks to SCDOT or others are anticipated.

Costs (required):

This single span bridge would provide a cost savings of roughly \$50,000 by not requiring multiple spans and drilled shafts.

Quality:

No adverse impact to quality or performance with the implementation of this ATC.

Formal Alternative Technical Concepts Submittal Form

Project: Bridge Package 15

Project ID: 8862230

ATC No.: 3

Priority: High

Team: United-Reeves JV/RK&K

Date: 1/9/23

Operations & Maintenance:

No negative impact to long-term operation and maintenance is anticipated with this ATC. This single span bridge ATC will reduce operation and maintenance costs with the removal of one joint.

Bridge Hydraulics Analysis for Alternative Technical Concept (ATC 3)

The analysis presented in this document covers evaluation and comparison of bridge hydraulic performance of the original SCDOT proposed design and the ATC 3 design option under consideration for the Chesterfield S-108 bridge replacement over Brown Creek.

I. INTRODUCTION

RK&K performed a bridge hydraulics analysis for the bridge replacement of the bridge in Chesterfield County along S-108 over Brown Creek. A preliminary bridge analysis was completed to determine the minimum bridge length provided in the Request for Proposals dated December 5, 2022 addended January 5, 2022. The results of this preliminary study were used to determine the minimum bridge length of 100'. Based on the analysis and the information provided in this memorandum, RK&K proposes an Alternative Technical Concept of a bridge length of 80'. All pertinent data and supporting documentation are provided below.

II. DESIGN CRITERIA

- Design Storm: 25-Year
- Overtopping: If the design flood overtops the existing road grade, the proposed bridge may be designed to account for a comparable amount of overtopping flow on the roadway approaches in accordance with Exhibit 4b. Bridge structure overtopping for the design storm event is not allowed.
- Freeboard: Shall not be less than 2 feet above the 25-year event unless the existing freeboard clearance is less than 2 feet.
- Backwater: Shall be 1 foot or less unless the hydraulic model results demonstrate the existing backwater is greater than 1 foot. When the existing backwater is greater than 1 foot, this level of hydraulic performance can be improved or maintained, provided the EOR researches and certifies to the best of his/her knowledge and belief that the existing backwater is not causing adverse impacts to upstream and adjacent properties.
- Low Chord: Shall not be less than the existing bridge low chord elevation unless the hydraulic model results demonstrate the low chord elevation passes the 500-year return storm event without putting the bridge under pressure flow. Additionally, the EOR shall research and certify to the best of his/her knowledge and belief that a reduction in elevation should not cause adverse impacts to upstream, adjacent, and downstream properties.
- Abutments: Provide a minimum 5' abutment toe setback from the top of the channel bank.

III. MODEL UPDATES

The preliminary model was updated using the guidance of the HEC-RAS Hydraulic Reference Manual Version 5.0 dated February 2016. Below is a list of updates that were completed by RK&K during the hydraulic design process. All models and subsequent updates were run in HEC-RAS version 6.2.

- Naming conventions of the plans and geometries in the model were updated to match SCDOT standard (Natural, Existing, Proposed)
- Cross sections were added upstream and downstream of the bridge to represent the channel characteristics more accurately and to eliminate occurrences along the river reach where the water surface elevation was reaching critical depth. Critical depth indicates a switch from subcritical to supercritical flow. The RK&K proposed model contains 16 cross sections upstream and 27 cross sections downstream as compared to 8 upstream and 6

downstream in the provided study. Downstream cross sections were added to meet the requirements of the sensitivity test.

- Manning's n values were updated for both the channel and the overbanks. The channel manning's n value was updated from 0.035 to 0.045 to reflect the presence of vegetation and small obstructions in the channel. The overbank manning's value was changed from 0.045 to 0.08. Based on the field investigation completed by RK&K, 0.045 is an unreasonably low overbank manning's value that is typically used in channel beds. A value of 0.08 was selected as a reasonable estimate for pastures with dense grass and shrubs scattered throughout. Where heavier vegetation and tree cover was present, the manning's n value was reduced from 0.12 to 0.10 based on the lack of density in these forested areas. RAS Mapper and aerial imagery were used to determine the overbank manning's n breaks.
- Typical channel geometry was input into all cross sections based on the existing project survey.
- In existing and proposed conditions, ineffective flow locations and elevations were adjusted using the ratios provided in the HEC-RAS Hydraulic Reference Manual.
- The existing 72" pipe was revised in both the existing and proposed models to be a projecting corrugated metal pipe instead of a projecting concrete pipe.
- The existing bridge was modified to have a vertical abutment on the left side and a spill through abutment on the right. The spill through abutment was set at a 1:1 slope beginning at the low chord of the bridge.
- The existing 1' bridge rail was added to the model.
- Contraction and expansion coefficients were updated in accordance with the HEC-RAS Hydraulic Reference Manual.
- The bridge modeling approach was edited to use the greater of the Momentum and Energy equations during low flow conditions and to use the Pressure and/or Weir Equation during high flow conditions. Energy Only was used for the high flow conditions in the provided study. Energy only is optimal only when there is significant overtopping of the bridge and roadway. Pressure and/or Weir Equations take into account losses and is the more conservative of the two high flow methods.
- The proposed bridge model was edited for the correct structure depth and correct bridge rail height determined from RK&K's structures department. The structure depth was revised to a total depth of 3.30' and the bridge rail height was revised to 3.5'.
- The internal bridge cross sections were updated using the most recent SCDOT survey information.
- The proposed bridge was revised to a single span 80' bridge from a 100' single span bridge.
- The proposed roadway grade was added to the deck cross section.
- The proposed lowest low chord of the bridge was revised to 396.30', as compared to 396.70' in the provided model.

A 0.18' rise in water surface elevation from existing to proposed is present in the preliminary study at upstream cross section 5715.

IV. CONCLUSION AND RESULTS

The HEC-RAS analysis showed that an 80' single span bridge meets the RFP requirements from December 5, 2022. RK&K's proposed bridge model shows a reduction in 100-year backwater from 2.00' to 1.53' in proposed conditions. Table 1 shows a summary of the design criteria for the Chesterfield County bridge along S-108.

Table 1: Summary of Results

<u>CRITERIA</u>	<u>SCDOT RFP Existing Model*</u>	<u>SCDOT RFP Model*</u>	<u>RK&K Existing Model</u>	<u>RK&K Revised Model</u>
25-Year WSEL	392.75	392.56	393.35	393.08
100-Year WSEL	394.22	393.96	394.41	394.18
100-Year Backwater (ft)	1.86	1.60	1.76	1.53
25-Year Freeboard (ft)	3.95	3.28	3.35	3.22
500-Year Freeboard (ft)	n/a	1.35	0.71	0.89
Low Chord Elevation	396.70	394.49	396.70	396.30
Bridge Length (ft)	45	100	45	80
Span Arrangement	3 @ 15'	Single Span	3 @ 15'	Single Span

**All values for the SCDOT RFP Model were pulled from the Preliminary Hydraulics Report.*

See Appendix B for bridge plan and profile showing that all setback requirements are met.

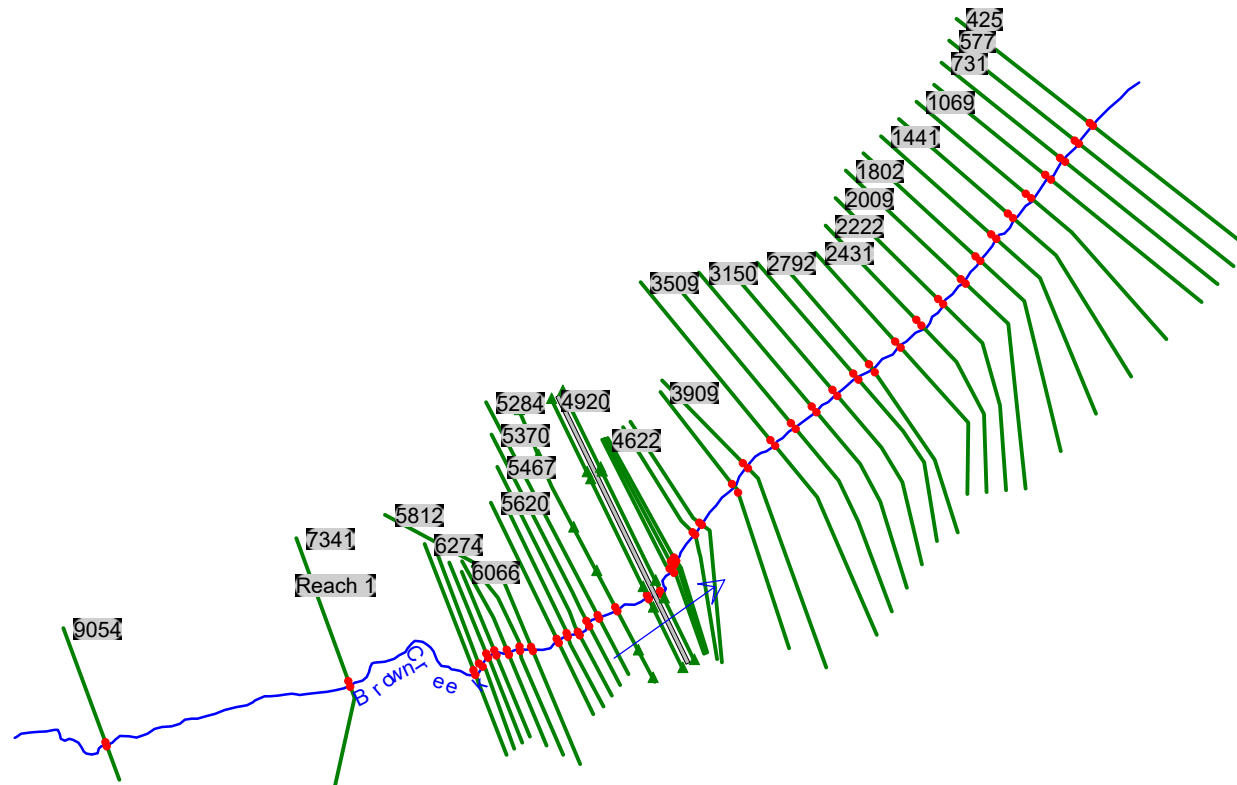
Water surface elevations and freeboard are based on the approach cross section.

V. ATTACHMENTS

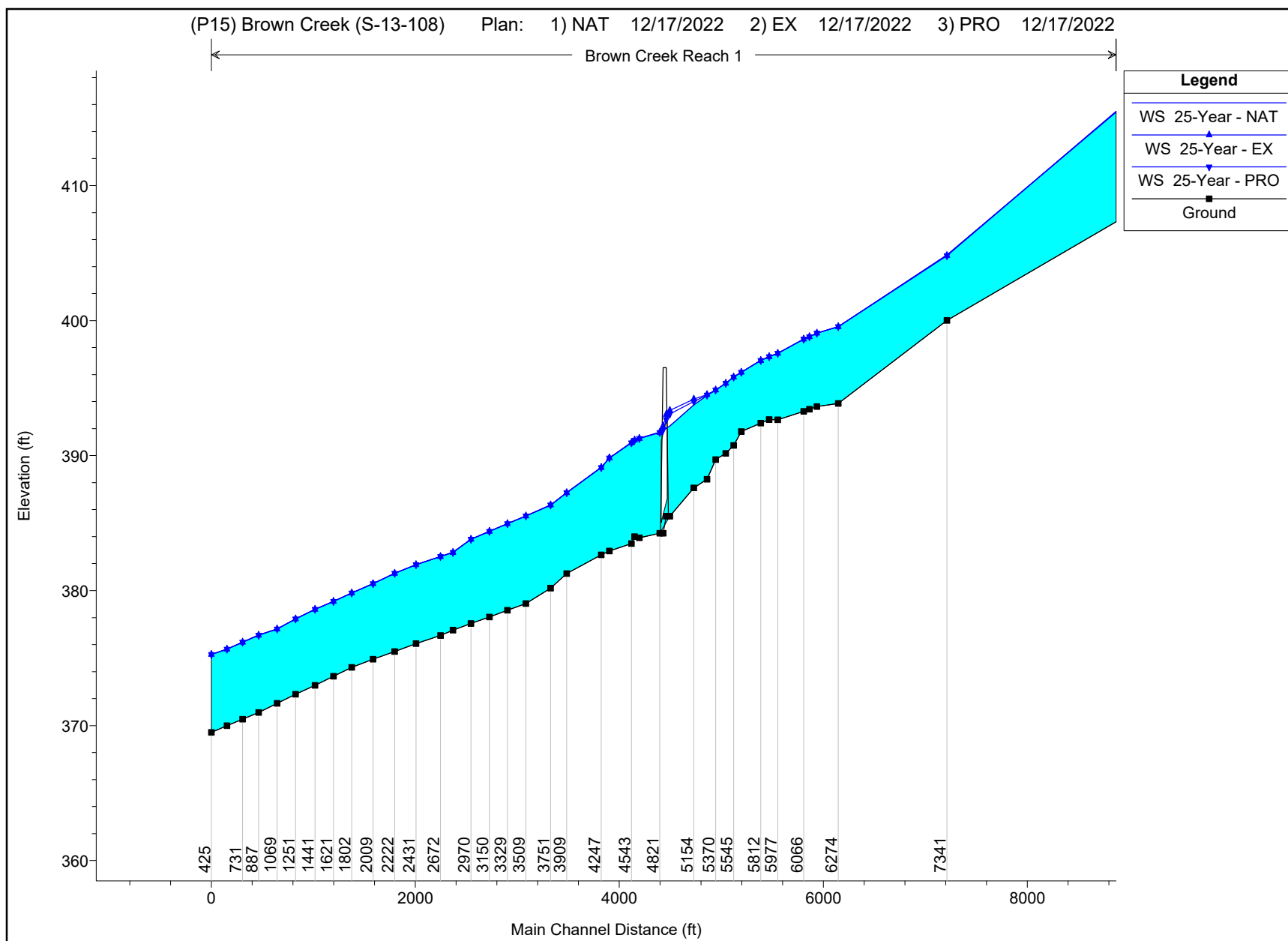
- Attachment A: RK&K Proposed Model HEC-RAS Outputs
- Attachment B: Bridge Plan and Profile
- Attachment C: Roadway Profile

Appendix A: RK&K Proposed Model HEC-RAS Outputs

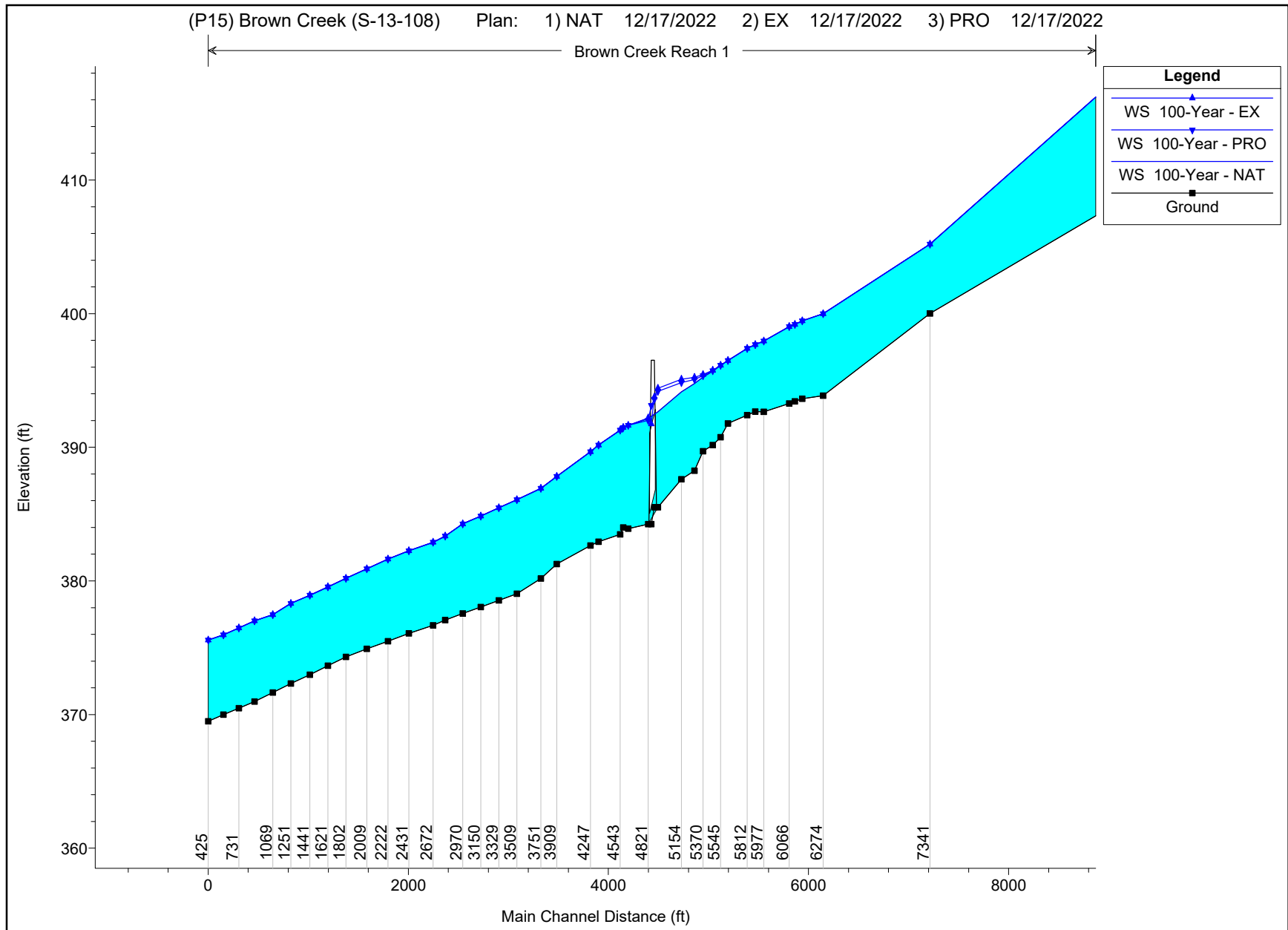
Chesterfield S-108 HEC-RAS Schematic



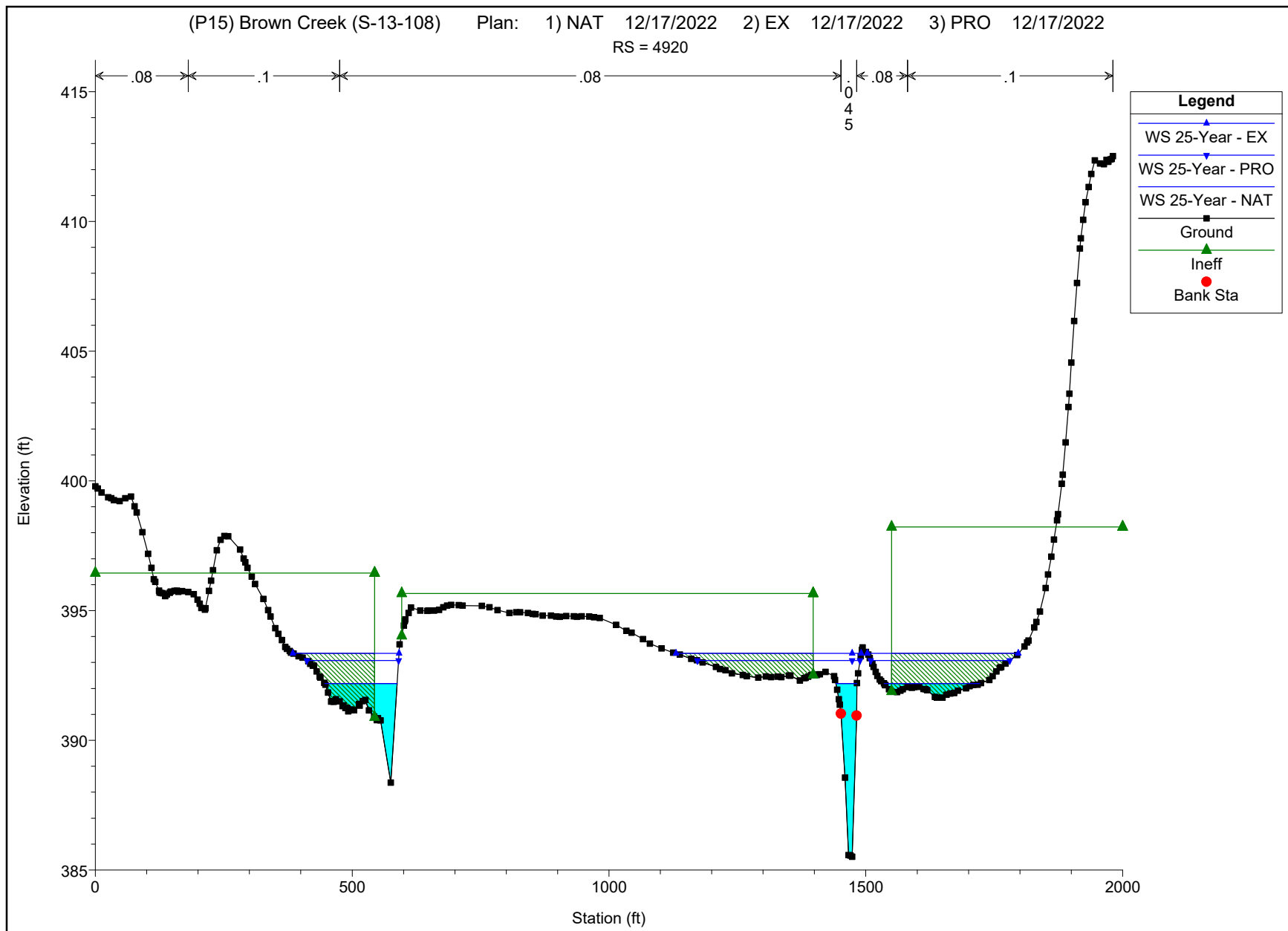
Chesterfield S-108 HEC-RAS 25-Year Profile

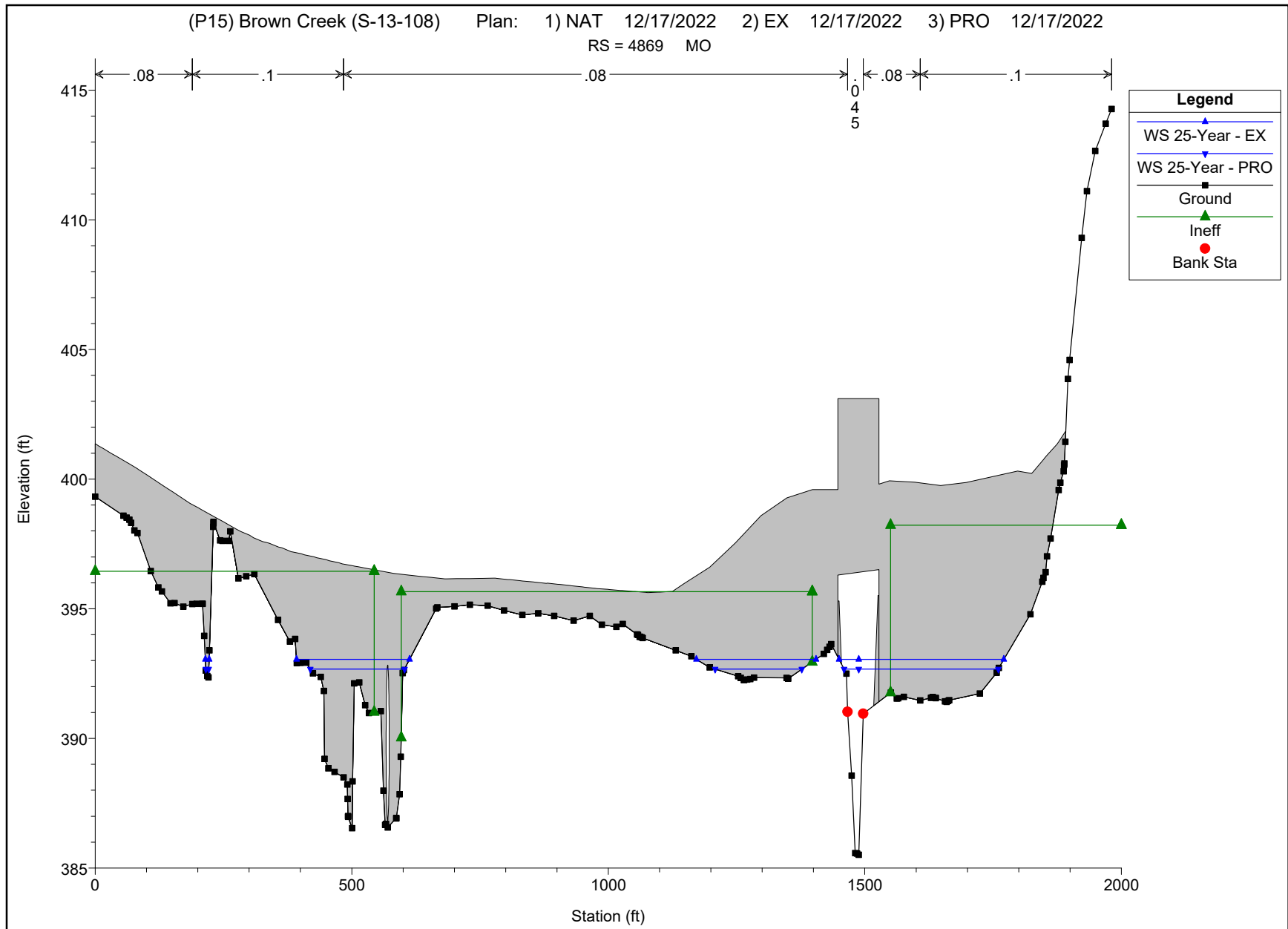


Chesterfield S-108 HEC-RAS 100-Year Profile

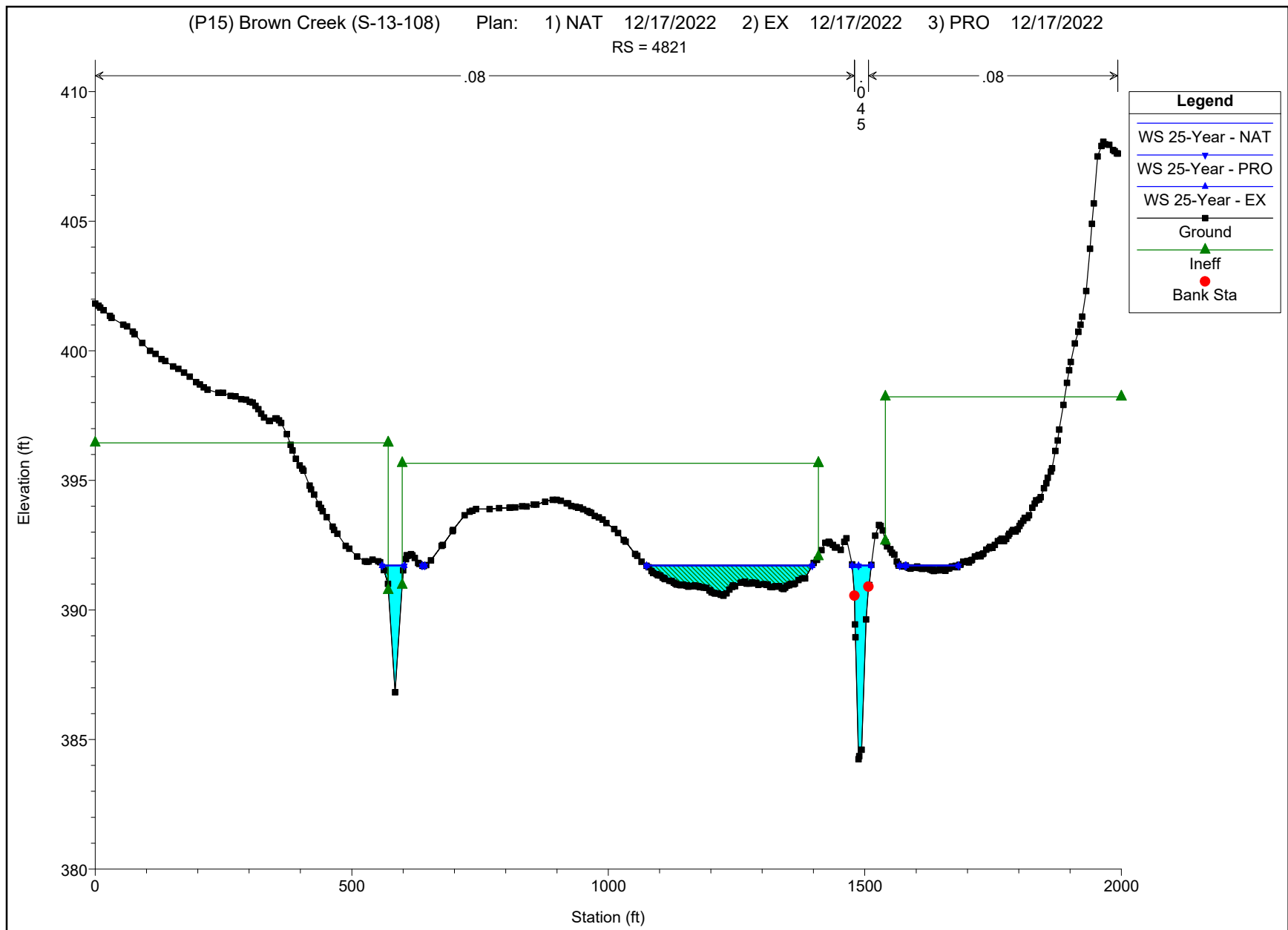


Chesterfield S-108 HEC-RAS 25-Year Cross Sections

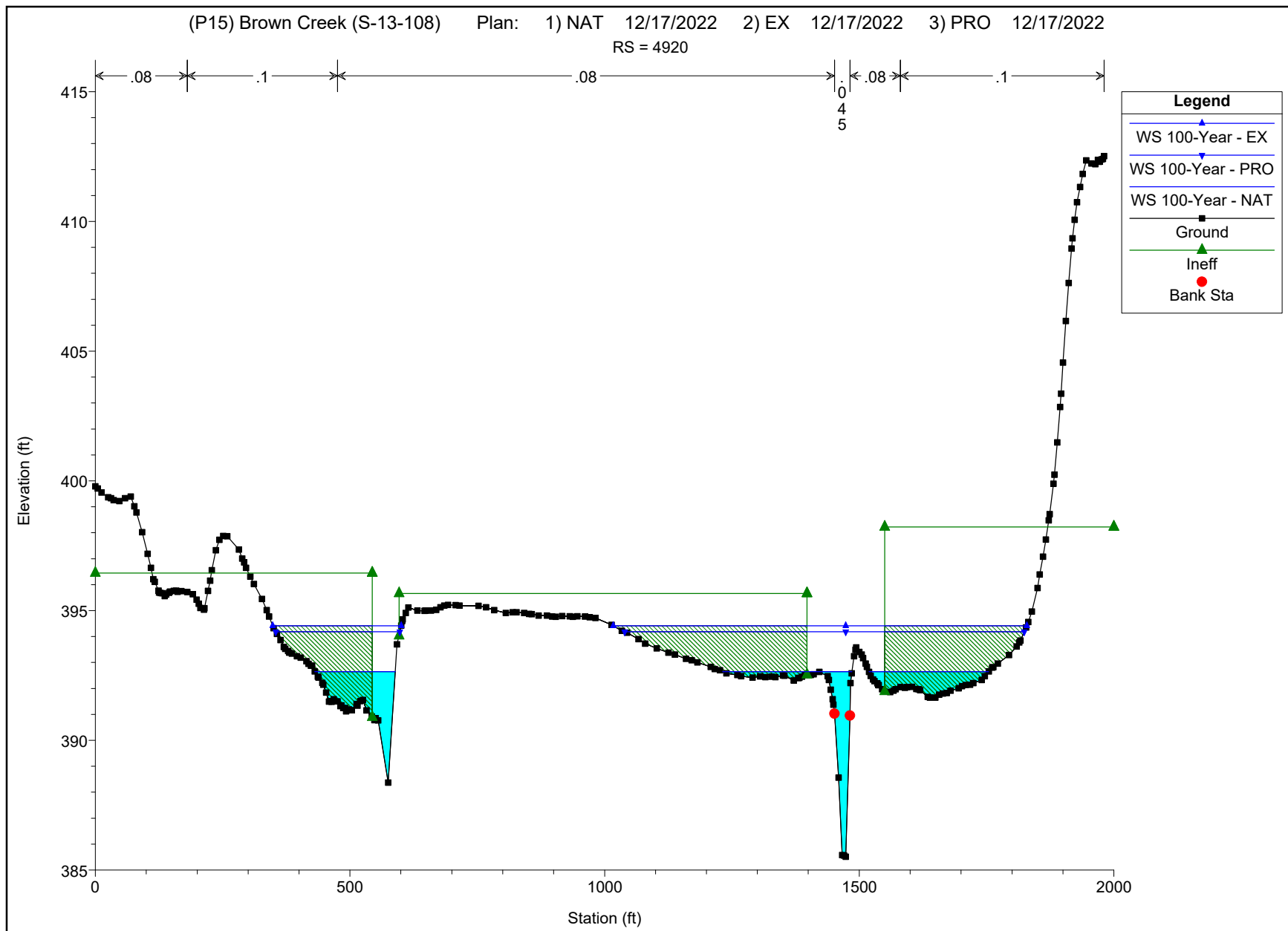


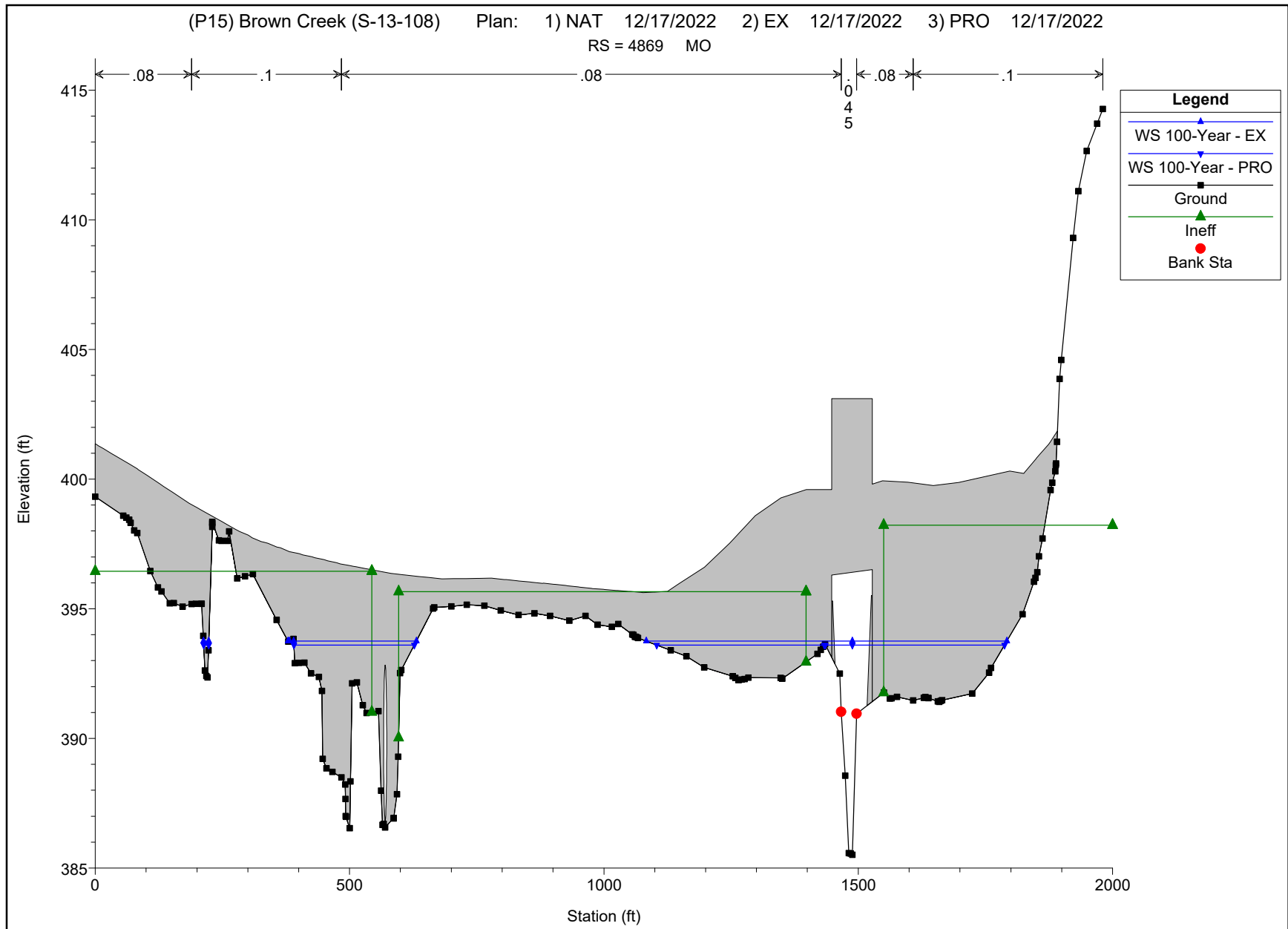


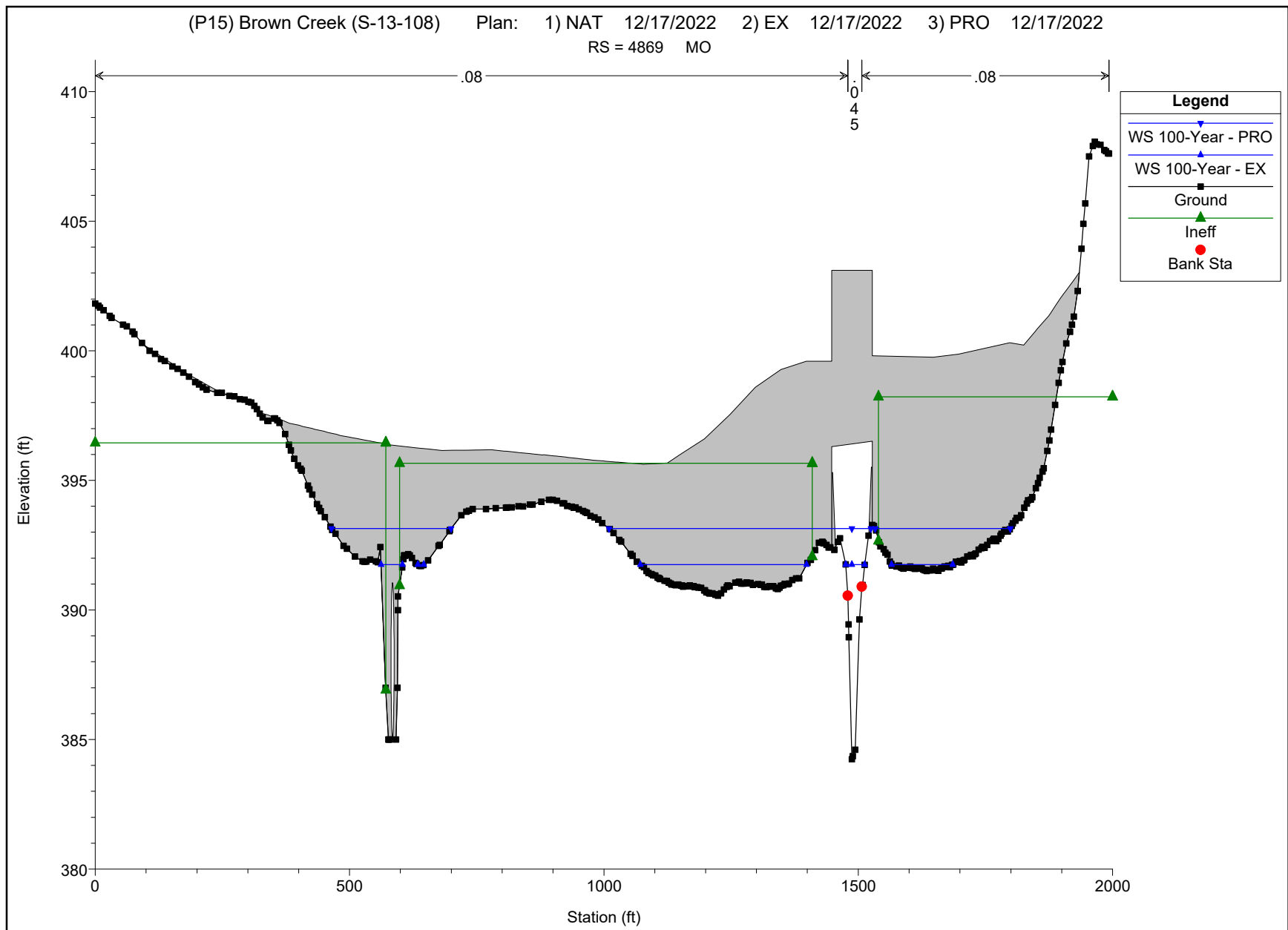


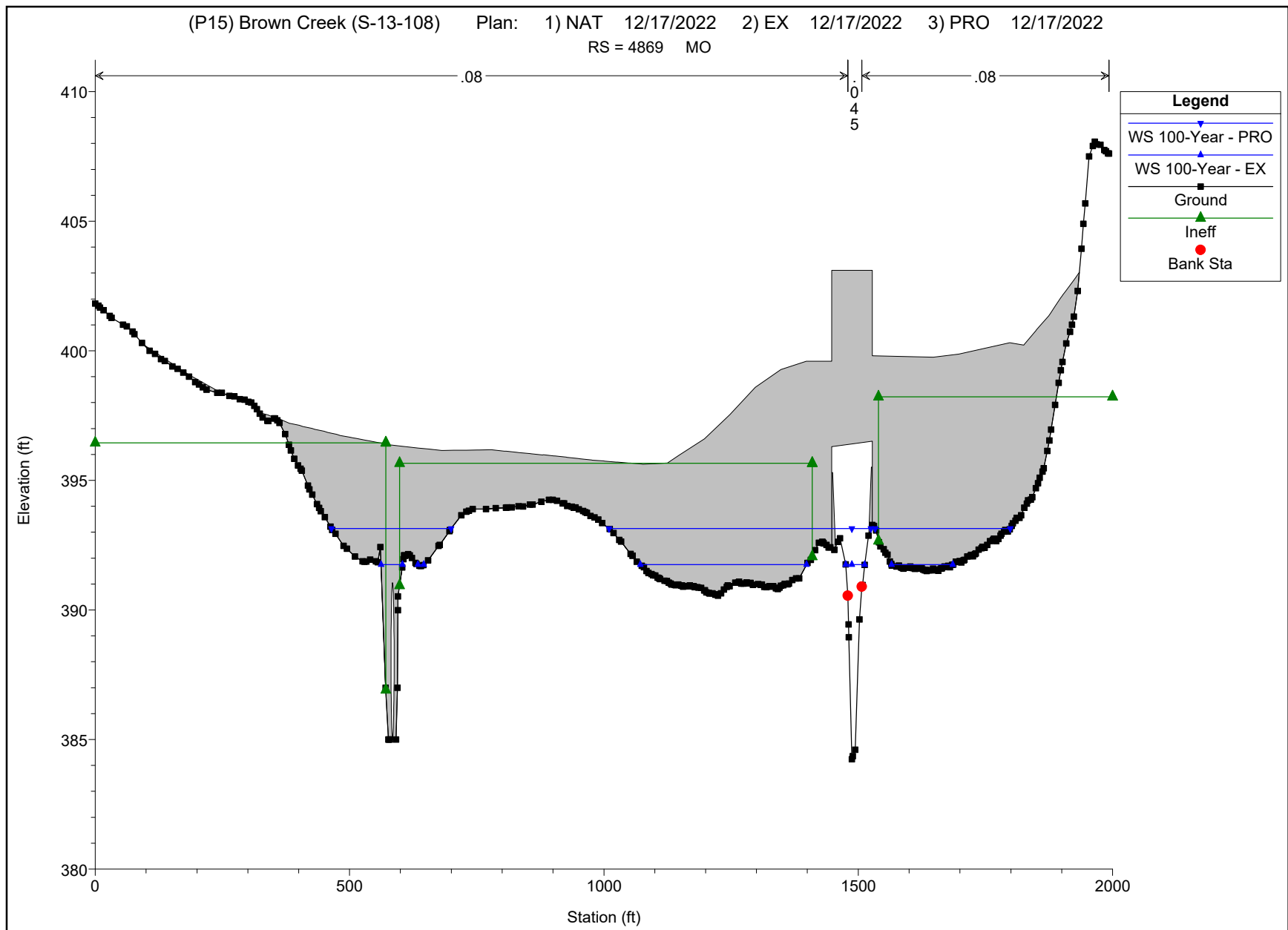


Chesterfield S-108 HEC-RAS 100-Year Cross Sections









Chesterfield S-108 HEC-RAS 25-Year Output Table

HEC-RAS River: Brown Creek Reach: Reach 1 Profile: 25-Year

Reach	River Sta	Profile	Plan	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl
Reach 1	9054	25-Year	NAT	1060.00	407.56	415.79	413.51	416.39	0.004407	6.33	218.46	148.45	0.47
Reach 1	9054	25-Year	EX	1060.00	407.56	415.85	413.54	416.43	0.004202	6.22	227.55	157.25	0.46
Reach 1	9054	25-Year	PRO	1060.00	407.56	415.85	413.54	416.43	0.004207	6.23	227.30	157.07	0.46
Reach 1	7341	25-Year	NAT	1060.00	400.01	404.86	404.86	405.40	0.010143	6.68	328.40	398.02	0.68
Reach 1	7341	25-Year	EX	1060.00	400.01	404.81	404.81	405.40	0.011098	6.90	307.89	388.79	0.71
Reach 1	7341	25-Year	PRO	1060.00	400.01	404.81	404.81	405.40	0.011098	6.90	307.89	388.79	0.71
Reach 1	6274	25-Year	NAT	1060.00	393.86	399.55	398.11	399.75	0.002593	4.45	585.35	512.16	0.37
Reach 1	6274	25-Year	EX	1060.00	393.86	399.56	398.09	399.75	0.002569	4.43	588.36	514.67	0.37
Reach 1	6274	25-Year	PRO	1060.00	393.86	399.56		399.75	0.002569	4.43	588.36	514.67	0.37
Reach 1	6197	25-Year	NAT	1060.00	393.64	399.07	397.78	399.17	0.002765	3.76	586.58	495.43	0.36
Reach 1	6197	25-Year	EX	1060.00	393.64	399.07	397.77	399.17	0.002763	3.76	586.78	495.68	0.36
Reach 1	6197	25-Year	PRO	1060.00	393.64	399.07		399.17	0.002763	3.76	586.78	495.68	0.36
Reach 1	6123	25-Year	NAT	1060.00	393.43	398.80	397.75	398.93	0.003822	4.22	562.13	465.62	0.42
Reach 1	6123	25-Year	EX	1060.00	393.43	398.80	397.74	398.93	0.003811	4.22	562.88	466.11	0.42
Reach 1	6123	25-Year	PRO	1060.00	393.43	398.80		398.93	0.003811	4.22	562.88	466.11	0.42
Reach 1	6066	25-Year	NAT	1060.00	393.27	398.63	397.56	398.72	0.003094	3.64	637.72	494.34	0.38
Reach 1	6066	25-Year	EX	1060.00	393.27	398.63	397.56	398.72	0.003087	3.64	638.31	494.63	0.38
Reach 1	6066	25-Year	PRO	1060.00	393.27	398.63		398.72	0.003087	3.64	638.31	494.63	0.38
Reach 1	5977	25-Year	NAT	1060.00	392.65	397.58	396.92	397.79	0.004357	4.74	489.52	407.15	0.46
Reach 1	5977	25-Year	EX	1060.00	392.65	397.58	397.01	397.79	0.004339	4.73	490.42	407.34	0.45
Reach 1	5977	25-Year	PRO	1060.00	392.65	397.58		397.79	0.004339	4.73	490.42	407.34	0.45
Reach 1	5893	25-Year	NAT	1060.00	392.67	397.32	396.63	397.40	0.003945	3.58	640.11	510.27	0.41
Reach 1	5893	25-Year	EX	1060.00	392.67	397.33	396.62	397.40	0.003928	3.58	641.11	510.61	0.41
Reach 1	5893	25-Year	PRO	1060.00	392.67	397.33		397.40	0.003928	3.58	641.11	510.61	0.41
Reach 1	5812	25-Year	NAT	1060.00	392.41	397.06	396.30	397.13	0.002904	3.43	720.34	545.64	0.36
Reach 1	5812	25-Year	EX	1060.00	392.41	397.05	396.30	397.12	0.002983	3.47	713.23	545.41	0.37
Reach 1	5812	25-Year	PRO	1060.00	392.41	397.05		397.12	0.002983	3.47	713.25	545.42	0.37
Reach 1	5620	25-Year	NAT	1060.00	391.78	396.18	395.70	396.34	0.005810	4.83	570.49	571.04	0.51
Reach 1	5620	25-Year	EX	1060.00	391.78	396.18	395.69	396.34	0.005801	4.83	570.89	571.38	0.51
Reach 1	5620	25-Year	PRO	1060.00	391.78	396.18		396.34	0.005801	4.83	570.87	571.36	0.51
Reach 1	5545	25-Year	NAT	1060.00	390.75	395.82	395.41	395.96	0.004225	4.58	653.97	661.45	0.44
Reach 1	5545	25-Year	EX	1060.00	390.75	395.83	395.40	395.97	0.004198	4.57	655.75	662.33	0.44
Reach 1	5545	25-Year	PRO	1060.00	390.75	395.82		395.97	0.004200	4.57	655.61	662.26	0.44
Reach 1	5467	25-Year	NAT	1060.00	390.16	395.36	395.17	395.59	0.005273	5.41	617.89	698.26	0.49
Reach 1	5467	25-Year	EX	1060.00	390.16	395.36	395.16	395.59	0.005335	5.44	614.44	696.56	0.50
Reach 1	5467	25-Year	PRO	1060.00	390.16	395.36		395.59	0.005308	5.43	615.88	697.05	0.49
Reach 1	5370	25-Year	NAT	1060.00	389.70	394.86	394.55	395.09	0.004937	4.93	532.01	655.13	0.49
Reach 1	5370	25-Year	EX	1060.00	389.70	394.87	394.54	395.10	0.004816	4.88	539.01	656.51	0.48
Reach 1	5370	25-Year	PRO	1060.00	389.70	394.85		395.09	0.004963	4.94	530.49	654.83	0.49
Reach 1	5284	25-Year	NAT	1060.00	388.24	394.45	394.00	394.70	0.004042	5.24	512.73	513.41	0.43
Reach 1	5284	25-Year	EX	1060.00	388.24	394.52	394.01	394.74	0.003552	4.96	550.31	522.40	0.40
Reach 1	5284	25-Year	PRO	1060.00	388.24	394.48		394.72	0.003818	5.12	529.13	517.30	0.42
Reach 1	5154	25-Year	NAT	1060.00	387.60	393.76	393.67	393.99	0.007639	5.47	552.16	645.01	0.57
Reach 1	5154	25-Year	EX	1060.00	387.60	394.19	393.66	394.28	0.003004	3.76	772.54	703.04	0.36
Reach 1	5154	25-Year	PRO	1060.00	387.60	394.01	393.67	394.14	0.004272	4.32	682.64	681.23	0.43
Reach 1	4920	25-Year	NAT	1060.00	385.51	392.19	390.76	392.58	0.004738	5.81	357.07	368.21	0.49
Reach 1	4920	25-Year	EX	1060.00	385.51	393.35	391.01	393.62	0.002258	4.69	346.16	860.86	0.35
Reach 1	4920	25-Year	PRO	1060.00	385.51	393.08	391.15	393.35	0.002473	4.75	364.37	765.59	0.36
Reach 1	4821	25-Year	NAT	1170.00	384.24	391.73	390.61	392.09	0.004996	5.94	462.55	534.76	0.49
Reach 1	4821	25-Year	EX	1170.00	384.24	391.70	390.57	392.39	0.007604	7.30	208.47	522.27	0.60
Reach 1	4821	25-Year	PRO	1170.00	384.24	391.70	390.58	392.39	0.007599	7.30	208.53	522.35	0.60
Reach 1	4622	25-Year	NAT	1170.00	383.91	391.28	388.99	391.45	0.001926	3.93	709.63	727.97	0.32
Reach 1	4622	25-Year	EX	1170.00	383.91	391.27	388.99	391.44	0.001972	3.97	698.58	722.58	0.32
Reach 1	4622	25-Year	PRO	1170.00	383.91	391.27		391.44	0.001971	3.97	698.80	722.71	0.32
Reach 1	4574	25-Year	NAT	1170.00	384.00	391.16	389.14	391.36	0.002017	4.32	693.02	744.46	0.33
Reach 1	4574	25-Year	EX	1170.00	384.00	391.14	389.20	391.34	0.002089	4.38	676.85	736.05	0.34
Reach 1	4574	25-Year	PRO	1170.00	384.00	391.14		391.34	0.002088	4.38	677.19	736.28	0.34
Reach 1	4543	25-Year	NAT	1170.00	383.48	390.99	390.21	391.27	0.003257	5.18	584.28	717.82	0.40
Reach 1	4543	25-Year	EX	1170.00	383.48	390.95	390.27	391.25	0.003499	5.34	555.89	709.24	0.42
Reach 1	4543	25-Year	PRO	1170.00	383.48	390.95	390.27	391.25	0.003491	5.33	556.82	709.51	0.42
Reach 1	4326	25-Year	NAT	1170.00	382.93	389.81	389.81	390.29	0.005908	6.62	470.12	712.62	0.53
Reach 1	4326	25-Year	EX	1170.00	382.93	389.84	389.84	390.28	0.005621	6.48	487.94	738.56	0.52
Reach 1	4326	25-Year	PRO	1170.00	382.93	389.83	389.83	390.28	0.005638	6.49	486.90	737.12	0.52

HEC-RAS River: Brown Creek Reach: Reach 1 Profile: 25-Year (Continued)

Reach	River Sta	Profile	Plan	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl
Reach 1	4247	25-Year	NAT	1170.00	382.65	389.13	388.76	389.36	0.004260	5.36	598.10	720.03	0.44
Reach 1	4247	25-Year	EX	1170.00	382.65	389.12	388.76	389.36	0.004332	5.40	592.37	718.36	0.44
Reach 1	4247	25-Year	PRO	1170.00	382.65	389.12		389.36	0.004328	5.40	592.64	718.43	0.44
Reach 1	3909	25-Year	NAT	1170.00	381.27	387.24	386.23	387.62	0.006104	5.13	269.18	163.99	0.54
Reach 1	3909	25-Year	EX	1170.00	381.27	387.25	386.28	387.62	0.006057	5.12	270.21	171.61	0.53
Reach 1	3909	25-Year	PRO	1170.00	381.27	387.25		387.62	0.006058	5.12	270.20	171.59	0.53
Reach 1	3751	25-Year	NAT	1170.00	380.17	386.33	384.06	386.79	0.004507	5.53	257.18	240.87	0.47
Reach 1	3751	25-Year	EX	1170.00	380.17	386.34	384.06	386.80	0.004467	5.51	259.32	243.31	0.47
Reach 1	3751	25-Year	PRO	1170.00	380.17	386.34	384.06	386.80	0.004466	5.51	259.33	243.31	0.47
Reach 1	3509	25-Year	NAT	1170.00	379.04	385.53	383.43	385.87	0.003143	4.85	359.38	370.28	0.40
Reach 1	3509	25-Year	EX	1170.00	379.04	385.52	383.45	385.87	0.003143	4.85	359.34	370.25	0.40
Reach 1	3509	25-Year	PRO	1170.00	379.04	385.52		385.87	0.003143	4.85	359.34	370.25	0.40
Reach 1	3329	25-Year	NAT	1170.00	378.55	384.95	382.93	385.30	0.003175	4.85	366.30	399.04	0.40
Reach 1	3329	25-Year	EX	1170.00	378.55	384.95	382.96	385.29	0.003177	4.85	366.14	398.95	0.40
Reach 1	3329	25-Year	PRO	1170.00	378.55	384.95	382.96	385.29	0.003177	4.85	366.13	398.94	0.40
Reach 1	3150	25-Year	NAT	1170.00	378.05	384.39	382.46	384.72	0.003230	4.85	379.79	445.94	0.41
Reach 1	3150	25-Year	EX	1170.00	378.05	384.39	382.48	384.72	0.003232	4.85	379.59	445.76	0.41
Reach 1	3150	25-Year	PRO	1170.00	378.05	384.39	382.48	384.72	0.003231	4.85	379.60	445.77	0.41
Reach 1	2970	25-Year	NAT	1170.00	377.56	383.80	381.97	384.13	0.003319	4.83	408.18	545.35	0.42
Reach 1	2970	25-Year	EX	1170.00	377.56	383.80	382.00	384.13	0.003344	4.84	405.20	543.09	0.42
Reach 1	2970	25-Year	PRO	1170.00	377.56	383.80	382.00	384.13	0.003345	4.84	405.19	543.08	0.42
Reach 1	2792	25-Year	NAT	1170.00	377.07	382.84	381.57	383.35	0.005682	5.80	259.74	418.96	0.53
Reach 1	2792	25-Year	EX	1170.00	377.07	382.83	381.56	383.35	0.005755	5.83	255.58	413.83	0.54
Reach 1	2792	25-Year	PRO	1170.00	377.07	382.83	381.56	383.35	0.005756	5.83	255.57	413.82	0.54
Reach 1	2672	25-Year	NAT	1170.00	376.68	382.52	380.39	382.81	0.002750	4.33	294.18	333.38	0.38
Reach 1	2672	25-Year	EX	1170.00	376.68	382.53	380.38	382.81	0.002741	4.33	295.31	336.90	0.38
Reach 1	2672	25-Year	PRO	1170.00	376.68	382.53	380.38	382.81	0.002741	4.33	295.32	336.87	0.38
Reach 1	2431	25-Year	NAT	1170.00	376.08	381.92	380.76	382.11	0.002879	4.08	668.08	873.46	0.38
Reach 1	2431	25-Year	EX	1170.00	376.08	381.93	380.74	382.11	0.002856	4.07	671.69	877.35	0.38
Reach 1	2431	25-Year	PRO	1170.00	376.08	381.93		382.11	0.002856	4.07	671.69	877.35	0.38
Reach 1	2222	25-Year	NAT	1170.00	375.49	381.28	379.93	381.50	0.002967	4.35	641.51	886.29	0.39
Reach 1	2222	25-Year	EX	1170.00	375.49	381.27	379.93	381.50	0.002987	4.36	638.67	885.03	0.39
Reach 1	2222	25-Year	PRO	1170.00	375.49	381.27		381.50	0.002987	4.36	638.67	885.03	0.39
Reach 1	2009	25-Year	NAT	1170.00	374.91	380.52	379.16	380.80	0.003485	4.81	541.90	778.73	0.43
Reach 1	2009	25-Year	EX	1170.00	374.91	380.52	379.18	380.80	0.003478	4.81	543.31	783.89	0.43
Reach 1	2009	25-Year	PRO	1170.00	374.91	380.52	379.18	380.80	0.003478	4.81	543.31	783.89	0.43
Reach 1	1802	25-Year	NAT	1170.00	374.32	379.83	378.36	380.10	0.003334	4.80	565.24	702.69	0.42
Reach 1	1802	25-Year	EX	1170.00	374.32	379.82	378.44	380.09	0.003350	4.81	563.38	701.39	0.42
Reach 1	1802	25-Year	PRO	1170.00	374.32	379.82		380.09	0.003350	4.81	563.38	701.39	0.42
Reach 1	1621	25-Year	NAT	1170.00	373.65	379.20	377.88	379.48	0.003517	4.86	562.88	731.18	0.43
Reach 1	1621	25-Year	EX	1170.00	373.65	379.21	377.86	379.48	0.003452	4.82	570.01	735.23	0.42
Reach 1	1621	25-Year	PRO	1170.00	373.65	379.21		379.48	0.003452	4.82	570.01	735.23	0.42
Reach 1	1441	25-Year	NAT	1170.00	372.98	378.62	378.19	378.86	0.003316	4.66	617.43	866.18	0.42
Reach 1	1441	25-Year	EX	1170.00	372.98	378.61	378.18	378.86	0.003328	4.66	615.95	865.17	0.42
Reach 1	1441	25-Year	PRO	1170.00	372.98	378.61		378.86	0.003328	4.66	615.95	865.17	0.42
Reach 1	1251	25-Year	NAT	1170.00	372.32	377.90	377.17	378.18	0.003906	4.88	581.17	848.96	0.45
Reach 1	1251	25-Year	EX	1170.00	372.32	377.90	377.22	378.18	0.003900	4.87	581.79	849.43	0.45
Reach 1	1251	25-Year	PRO	1170.00	372.32	377.90	377.22	378.18	0.003900	4.87	581.79	849.43	0.45
Reach 1	1069	25-Year	NAT	1170.00	371.65	377.15	376.98	377.51	0.003392	5.42	530.06	729.63	0.52
Reach 1	1069	25-Year	EX	1170.00	371.65	377.16	376.98	377.51	0.003371	5.41	532.31	732.26	0.51
Reach 1	1069	25-Year	PRO	1170.00	371.65	377.16	376.98	377.51	0.003371	5.41	532.31	732.26	0.51
Reach 1	887	25-Year	NAT	1170.00	370.98	376.70	376.30	376.87	0.003062	4.11	759.26	986.92	0.39
Reach 1	887	25-Year	EX	1170.00	370.98	376.70	376.30	376.87	0.003075	4.12	757.37	985.50	0.39
Reach 1	887	25-Year	PRO	1170.00	370.98	376.70		376.87	0.003075	4.12	757.37	985.50	0.39
Reach 1	731	25-Year	NAT	1170.00	370.48	376.18	375.84	376.37	0.003163	4.47	727.58	992.44	0.40
Reach 1	731	25-Year	EX	1170.00	370.48	376.18	375.84	376.37	0.003159	4.46	728.16	992.69	0.40
Reach 1	731	25-Year	PRO	1170.00	370.48	376.18		376.37	0.003159	4.46	728.16	992.69	0.40
Reach 1	577	25-Year	NAT	1170.00	369.99	375.66	375.40	375.89	0.003190	4.77	723.19	1036.99	0.41
Reach 1	577	25-Year	EX	1170.00	369.99	375.66	375.46	375.89	0.003190	4.77	723.16	1036.98	0.41
Reach 1	577	25-Year	PRO	1170.00	369.99	375.66		375.89	0.003190	4.77	723.16	1036.98	0.41
Reach 1	425	25-Year	NAT	1170.00	369.49	375.27	374.97	375.44	0.002500	4.52	861.44	1123.97	0.36
Reach 1	425	25-Year	EX	1170.00	369.49	375.27	374.96	375.44	0.002502	4.52	861.09	1123.89	0.36

Chesterfield S-108 HEC-RAS 100-Year Output Table

HEC-RAS River: Brown Creek Reach: Reach 1 Profile: 100-Year

Reach	River Sta	Profile	Plan	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl
Reach 1	9054	100-Year	NAT	1510.00	407.56	416.57	414.55	417.25	0.004631	7.09	379.08	287.48	0.50
Reach 1	9054	100-Year	EX	1510.00	407.56	416.57	414.57	417.25	0.004632	7.09	379.02	287.44	0.50
Reach 1	9054	100-Year	PRO	1510.00	407.56	416.57	414.57	417.25	0.004632	7.09	379.02	287.44	0.50
Reach 1	7341	100-Year	NAT	1510.00	400.01	405.20	405.20	405.76	0.010501	7.30	468.25	425.27	0.71
Reach 1	7341	100-Year	EX	1510.00	400.01	405.20	405.20	405.76	0.010501	7.30	468.25	425.27	0.71
Reach 1	7341	100-Year	PRO	1510.00	400.01	405.20	405.20	405.76	0.010501	7.30	468.25	425.27	0.71
Reach 1	6274	100-Year	NAT	1510.00	393.86	399.99	398.84	400.20	0.002743	4.87	833.98	590.47	0.38
Reach 1	6274	100-Year	EX	1510.00	393.86	400.00	398.83	400.20	0.002722	4.85	837.19	591.11	0.38
Reach 1	6274	100-Year	PRO	1510.00	393.86	400.00		400.20	0.002721	4.85	837.21	591.11	0.38
Reach 1	6197	100-Year	NAT	1510.00	393.64	399.47	398.14	399.59	0.002920	4.17	802.93	566.02	0.38
Reach 1	6197	100-Year	EX	1510.00	393.64	399.47	398.14	399.59	0.002917	4.17	803.24	566.18	0.38
Reach 1	6197	100-Year	PRO	1510.00	393.64	399.47		399.59	0.002917	4.17	803.26	566.19	0.38
Reach 1	6123	100-Year	NAT	1510.00	393.43	399.20	398.09	399.34	0.003888	4.61	755.36	520.76	0.43
Reach 1	6123	100-Year	EX	1510.00	393.43	399.20	398.12	399.34	0.003880	4.61	756.01	521.11	0.43
Reach 1	6123	100-Year	PRO	1510.00	393.43	399.20		399.34	0.003880	4.61	756.03	521.11	0.43
Reach 1	6066	100-Year	NAT	1510.00	393.27	399.02	397.89	399.13	0.003119	3.98	846.71	569.26	0.39
Reach 1	6066	100-Year	EX	1510.00	393.27	399.03	398.02	399.13	0.003113	3.98	847.39	569.43	0.39
Reach 1	6066	100-Year	PRO	1510.00	393.27	399.03		399.13	0.003113	3.98	847.40	569.44	0.39
Reach 1	5977	100-Year	NAT	1510.00	392.65	397.95	397.41	398.17	0.004584	5.21	647.84	452.24	0.48
Reach 1	5977	100-Year	EX	1510.00	392.65	397.95	397.48	398.17	0.004565	5.20	648.94	452.52	0.47
Reach 1	5977	100-Year	PRO	1510.00	392.65	397.95		398.17	0.004565	5.20	648.96	452.53	0.47
Reach 1	5893	100-Year	NAT	1510.00	392.67	397.88	396.83	397.77	0.004013	3.96	831.58	570.75	0.42
Reach 1	5893	100-Year	EX	1510.00	392.67	397.88	396.82	397.77	0.003997	3.96	832.82	571.48	0.42
Reach 1	5893	100-Year	PRO	1510.00	392.67	397.88		397.77	0.003997	3.96	832.85	571.50	0.42
Reach 1	5812	100-Year	NAT	1510.00	392.41	397.41	396.48	397.49	0.003113	3.84	914.08	603.38	0.38
Reach 1	5812	100-Year	EX	1510.00	392.41	397.40	396.50	397.48	0.003163	3.86	908.76	602.99	0.38
Reach 1	5812	100-Year	PRO	1510.00	392.41	397.40		397.48	0.003163	3.86	908.77	602.99	0.38
Reach 1	5620	100-Year	NAT	1510.00	391.78	396.50	396.06	396.66	0.005855	5.22	771.48	697.04	0.53
Reach 1	5620	100-Year	EX	1510.00	391.78	396.50	396.05	396.67	0.005816	5.21	775.02	700.04	0.52
Reach 1	5620	100-Year	PRO	1510.00	391.78	396.50		396.67	0.005829	5.22	774.25	699.64	0.52
Reach 1	5545	100-Year	NAT	1510.00	390.75	396.13	395.62	396.28	0.004558	5.04	874.96	825.12	0.46
Reach 1	5545	100-Year	EX	1510.00	390.75	396.14	395.64	396.29	0.004378	4.96	889.98	834.99	0.46
Reach 1	5545	100-Year	PRO	1510.00	390.75	396.14		396.28	0.004415	4.98	886.83	833.01	0.46
Reach 1	5467	100-Year	NAT	1510.00	390.16	395.69	395.36	395.90	0.005077	5.62	876.51	866.75	0.49
Reach 1	5467	100-Year	EX	1510.00	390.16	395.76	395.40	395.94	0.004476	5.33	935.16	890.75	0.46
Reach 1	5467	100-Year	PRO	1510.00	390.16	395.72		395.92	0.004906	5.55	898.99	873.34	0.48
Reach 1	5370	100-Year	NAT	1510.00	389.70	395.25	394.85	395.45	0.004237	4.94	807.13	724.28	0.46
Reach 1	5370	100-Year	EX	1510.00	389.70	395.45	394.88	395.58	0.002857	4.20	954.04	753.91	0.38
Reach 1	5370	100-Year	PRO	1510.00	389.70	395.35		395.51	0.003502	4.57	875.66	736.24	0.42
Reach 1	5284	100-Year	NAT	1510.00	388.24	394.76	394.46	395.05	0.004833	5.98	679.46	549.26	0.47
Reach 1	5284	100-Year	EX	1510.00	388.24	395.24	394.45	395.36	0.002215	4.30	953.29	600.02	0.32
Reach 1	5284	100-Year	PRO	1510.00	388.24	395.07		395.23	0.002892	4.81	851.69	577.47	0.37
Reach 1	5154	100-Year	NAT	1510.00	387.60	394.15	393.81	394.32	0.005924	5.24	813.94	698.74	0.51
Reach 1	5154	100-Year	EX	1510.00	387.60	395.09	393.87	395.13	0.001184	2.78	1380.70	788.13	0.24
Reach 1	5154	100-Year	PRO	1510.00	387.60	394.84	393.86	394.89	0.001687	3.18	1249.15	761.01	0.28
Reach 1	4920	100-Year	NAT	1510.00	385.51	392.85	392.25	393.05	0.004919	6.33	583.13	646.62	0.50
Reach 1	4920	100-Year	EX	1510.00	385.51	394.41	391.71	394.70	0.002089	5.06	508.85	1064.44	0.35
Reach 1	4920	100-Year	PRO	1510.00	385.51	394.18	391.80	394.42	0.001951	4.78	580.53	1028.44	0.33
Reach 1	4821	100-Year	NAT	1670.00	384.24	392.16	391.86	392.53	0.005333	6.52	740.32	737.87	0.51
Reach 1	4821	100-Year	EX	1670.00	384.24	392.19	391.46	392.58	0.005440	6.61	654.93	745.89	0.52
Reach 1	4821	100-Year	PRO	1670.00	384.24	392.01	391.45	393.18	0.012050	9.60	229.09	671.75	0.76
Reach 1	4622	100-Year	NAT	1670.00	383.91	391.64	390.70	391.82	0.002231	4.44	980.40	818.28	0.34
Reach 1	4622	100-Year	EX	1670.00	383.91	391.64	390.69	391.82	0.002226	4.43	981.48	818.67	0.34
Reach 1	4622	100-Year	PRO	1670.00	383.91	391.64		391.82	0.002226	4.43	981.45	818.66	0.34
Reach 1	4574	100-Year	NAT	1670.00	384.00	391.48	390.91	391.70	0.002435	4.93	945.08	803.63	0.37
Reach 1	4574	100-Year	EX	1670.00	384.00	391.49	390.90	391.71	0.002424	4.92	947.54	804.57	0.37
Reach 1	4574	100-Year	PRO	1670.00	384.00	391.49		391.71	0.002424	4.92	947.54	804.57	0.37
Reach 1	4543	100-Year	NAT	1670.00	383.48	391.26	390.95	391.59	0.004178	6.07	790.04	792.33	0.46
Reach 1	4543	100-Year	EX	1670.00	383.48	391.29	391.06	391.60	0.003981	5.94	811.64	798.92	0.45
Reach 1	4543	100-Year	PRO	1670.00	383.48	391.29	391.05	391.60	0.003979	5.94	811.84	798.96	0.45
Reach 1	4326	100-Year	NAT	1670.00	382.93	390.18	390.18	390.56	0.005571	6.75	782.58	932.97	0.52
Reach 1	4326	100-Year	EX	1670.00	382.93	390.16	390.16	390.56	0.005752	6.84	768.49	928.16	0.53
Reach 1	4326	100-Year	PRO	1670.00	382.93	390.16	390.16	390.56	0.005752	6.84	768.49	928.16	0.53

HEC-RAS River: Brown Creek Reach: Reach 1 Profile: 100-Year (Continued)

Reach	River Sta	Profile	Plan	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl
Reach 1	4247	100-Year	NAT	1670.00	382.65	389.67	389.11	389.83	0.003188	5.00	1041.95	962.18	0.39
Reach 1	4247	100-Year	EX	1670.00	382.65	389.67	389.17	389.83	0.003186	5.00	1042.30	962.42	0.39
Reach 1	4247	100-Year	PRO	1670.00	382.65	389.67		389.83	0.003186	5.00	1042.30	962.42	0.39
Reach 1	3909	100-Year	NAT	1670.00	381.27	387.82	386.84	388.31	0.006417	5.95	427.77	383.69	0.57
Reach 1	3909	100-Year	EX	1670.00	381.27	387.81	386.83	388.31	0.006473	5.97	425.36	381.68	0.57
Reach 1	3909	100-Year	PRO	1670.00	381.27	387.81	386.83	388.31	0.006474	5.97	425.34	381.67	0.57
Reach 1	3751	100-Year	NAT	1670.00	380.17	386.92	384.94	387.44	0.004729	6.18	463.66	429.25	0.49
Reach 1	3751	100-Year	EX	1670.00	380.17	386.93	384.96	387.44	0.004694	6.16	466.31	430.68	0.49
Reach 1	3751	100-Year	PRO	1670.00	380.17	386.93	384.96	387.44	0.004694	6.16	466.30	430.68	0.49
Reach 1	3509	100-Year	NAT	1670.00	379.04	386.09	384.19	386.45	0.003309	5.37	616.17	551.90	0.42
Reach 1	3509	100-Year	EX	1670.00	379.04	386.09	384.19	386.45	0.003309	5.37	616.14	551.86	0.42
Reach 1	3509	100-Year	PRO	1670.00	379.04	386.09		386.45	0.003309	5.37	616.12	551.85	0.42
Reach 1	3329	100-Year	NAT	1670.00	378.55	385.47	383.68	385.84	0.003424	5.42	623.18	595.90	0.43
Reach 1	3329	100-Year	EX	1670.00	378.55	385.47	383.71	385.84	0.003425	5.42	623.07	595.84	0.43
Reach 1	3329	100-Year	PRO	1670.00	378.55	385.47		385.84	0.003425	5.42	623.09	595.85	0.43
Reach 1	3150	100-Year	NAT	1670.00	378.05	384.86	383.21	385.22	0.003497	5.40	649.51	697.34	0.43
Reach 1	3150	100-Year	EX	1670.00	378.05	384.86	383.21	385.22	0.003491	5.40	650.43	698.40	0.43
Reach 1	3150	100-Year	PRO	1670.00	378.05	384.86	383.21	385.22	0.003491	5.40	650.40	698.37	0.43
Reach 1	2970	100-Year	NAT	1670.00	377.56	384.28	382.74	384.60	0.003321	5.19	738.77	871.07	0.42
Reach 1	2970	100-Year	EX	1670.00	377.56	384.26	382.74	384.59	0.003401	5.24	725.35	857.75	0.43
Reach 1	2970	100-Year	PRO	1670.00	377.56	384.26	382.74	384.59	0.003401	5.24	725.38	857.78	0.43
Reach 1	2792	100-Year	NAT	1670.00	377.07	383.34	382.31	383.84	0.005451	6.19	568.53	835.31	0.53
Reach 1	2792	100-Year	EX	1670.00	377.07	383.37	382.28	383.84	0.005226	6.08	588.71	849.51	0.52
Reach 1	2792	100-Year	PRO	1670.00	377.07	383.37	382.28	383.84	0.005226	6.08	588.66	849.47	0.52
Reach 1	2672	100-Year	NAT	1670.00	376.68	382.89	381.12	383.29	0.003670	5.30	518.53	773.17	0.45
Reach 1	2672	100-Year	EX	1670.00	376.68	382.90	381.10	383.30	0.003621	5.28	526.14	779.21	0.44
Reach 1	2672	100-Year	PRO	1670.00	376.68	382.90	381.10	383.30	0.003621	5.28	526.13	779.19	0.44
Reach 1	2431	100-Year	NAT	1670.00	376.08	382.26	381.74	382.44	0.002993	4.41	990.27	1006.09	0.39
Reach 1	2431	100-Year	EX	1670.00	376.08	382.26	381.73	382.44	0.002970	4.40	994.08	1006.97	0.39
Reach 1	2431	100-Year	PRO	1670.00	376.08	382.26		382.44	0.002970	4.40	994.08	1006.97	0.39
Reach 1	2222	100-Year	NAT	1670.00	375.49	381.63	381.23	381.83	0.002891	4.55	977.38	977.08	0.39
Reach 1	2222	100-Year	EX	1670.00	375.49	381.63	381.29	381.83	0.002896	4.55	976.57	977.00	0.39
Reach 1	2222	100-Year	PRO	1670.00	375.49	381.63		381.83	0.002896	4.55	976.57	977.00	0.39
Reach 1	2009	100-Year	NAT	1670.00	374.91	380.90	380.62	381.16	0.003392	5.04	890.16	981.46	0.43
Reach 1	2009	100-Year	EX	1670.00	374.91	380.91	380.62	381.16	0.003379	5.03	892.14	982.18	0.43
Reach 1	2009	100-Year	PRO	1670.00	374.91	380.91		381.16	0.003379	5.03	892.14	982.18	0.43
Reach 1	1802	100-Year	NAT	1670.00	374.32	380.20	379.84	380.45	0.003419	5.14	860.13	888.97	0.43
Reach 1	1802	100-Year	EX	1670.00	374.32	380.19	379.87	380.45	0.003429	5.14	858.78	888.34	0.43
Reach 1	1802	100-Year	PRO	1670.00	374.32	380.19		380.45	0.003429	5.14	858.78	888.34	0.43
Reach 1	1621	100-Year	NAT	1670.00	373.65	379.55	379.26	379.81	0.003658	5.23	863.84	952.28	0.44
Reach 1	1621	100-Year	EX	1670.00	373.65	379.55	379.25	379.82	0.003610	5.20	870.12	953.81	0.44
Reach 1	1621	100-Year	PRO	1670.00	373.65	379.55		379.82	0.003610	5.20	870.15	953.82	0.44
Reach 1	1441	100-Year	NAT	1670.00	372.98	378.92	378.71	379.17	0.003542	5.06	905.44	981.21	0.43
Reach 1	1441	100-Year	EX	1670.00	372.98	378.94	378.70	379.17	0.003451	5.00	918.10	985.07	0.43
Reach 1	1441	100-Year	PRO	1670.00	372.98	378.94		379.17	0.003451	5.00	918.16	985.09	0.43
Reach 1	1251	100-Year	NAT	1670.00	372.32	378.33	377.99	378.53	0.003258	4.78	984.70	1045.84	0.42
Reach 1	1251	100-Year	EX	1670.00	372.32	378.32	378.01	378.53	0.003299	4.80	978.07	1042.88	0.42
Reach 1	1251	100-Year	PRO	1670.00	372.32	378.32		378.53	0.003308	4.81	976.71	1042.52	0.42
Reach 1	1069	100-Year	NAT	1670.00	371.65	377.47	377.32	377.86	0.003848	6.11	814.24	1035.94	0.56
Reach 1	1069	100-Year	EX	1670.00	371.65	377.47	377.32	377.86	0.003843	6.11	814.81	1036.07	0.56
Reach 1	1069	100-Year	PRO	1670.00	371.65	377.47	377.32	377.86	0.003843	6.11	814.81	1036.07	0.56
Reach 1	887	100-Year	NAT	1670.00	370.98	377.01	376.63	377.16	0.003086	4.37	1083.00	1086.25	0.40
Reach 1	887	100-Year	EX	1670.00	370.98	377.01	376.66	377.16	0.003105	4.38	1080.08	1085.90	0.40
Reach 1	887	100-Year	PRO	1670.00	370.98	377.01		377.16	0.003105	4.38	1080.08	1085.90	0.40
Reach 1	731	100-Year	NAT	1670.00	370.48	376.48	376.19	376.66	0.003226	4.74	1055.24	1124.14	0.41
Reach 1	731	100-Year	EX	1670.00	370.48	376.48	376.17	376.66	0.003226	4.74	1055.24	1124.14	0.41
Reach 1	731	100-Year	PRO	1670.00	370.48	376.48		376.66	0.003226	4.74	1055.24	1124.14	0.41
Reach 1	577	100-Year	NAT	1670.00	369.99	375.97	375.72	376.17	0.003181	4.99	1068.15	1158.12	0.41
Reach 1	577	100-Year	EX	1670.00	369.99	375.97	375.70	376.17	0.003181	4.99	1068.12	1158.11	0.41
Reach 1	577	100-Year	PRO	1670.00	369.99	375.97		376.17	0.003181	4.99	1068.12	1158.11	0.41
Reach 1	425	100-Year	NAT	1670.00	369.49	375.57	375.25	375.73	0.002505	4.71	1223.31	1228.50	0.36
Reach 1	425	100-Year	EX	1670.00	369.49	375.57	375.24	375.73	0.002504	4.71	1223.35	1228.51	0.36

Appendix B: Bridge Plansheet



** $5\frac{3}{8}"$ min. at midspan
 $6\frac{5}{8}"$ max. at ϕ Bearing

REV.			
REV.			
REV.			
REVIEWED			
QUAN.			
DR.			
DES.			
	BY	CHK.	DAT

SUPERSTRUCTURE
TYPICAL SECTION

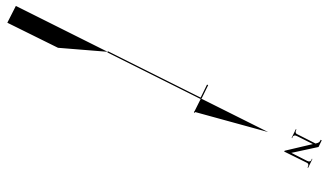
	COUNTY	ROUTE
FE	Chesterfield	S-108

Appendix C: Roadway Profile

UTILITY OWNERS			
ELECTRIC	LYNCHES RIVER ELECTRIC COOPERATIVE	BRYAN BROUGHTON	843-675-3274
PHONE	SANDHILL TELEPHONE COOPERATIVE	KIRBY WAYNE	843-658-9003

FED. ROAD DIST. NO.	STATE	COUNTY	PROJECT ID	ROUTE NO.	SHEET NO.
3	S.C.	CHESTERFIELD	P041181	S-108	6

OUTEN STREET
BRIDGE No. 4



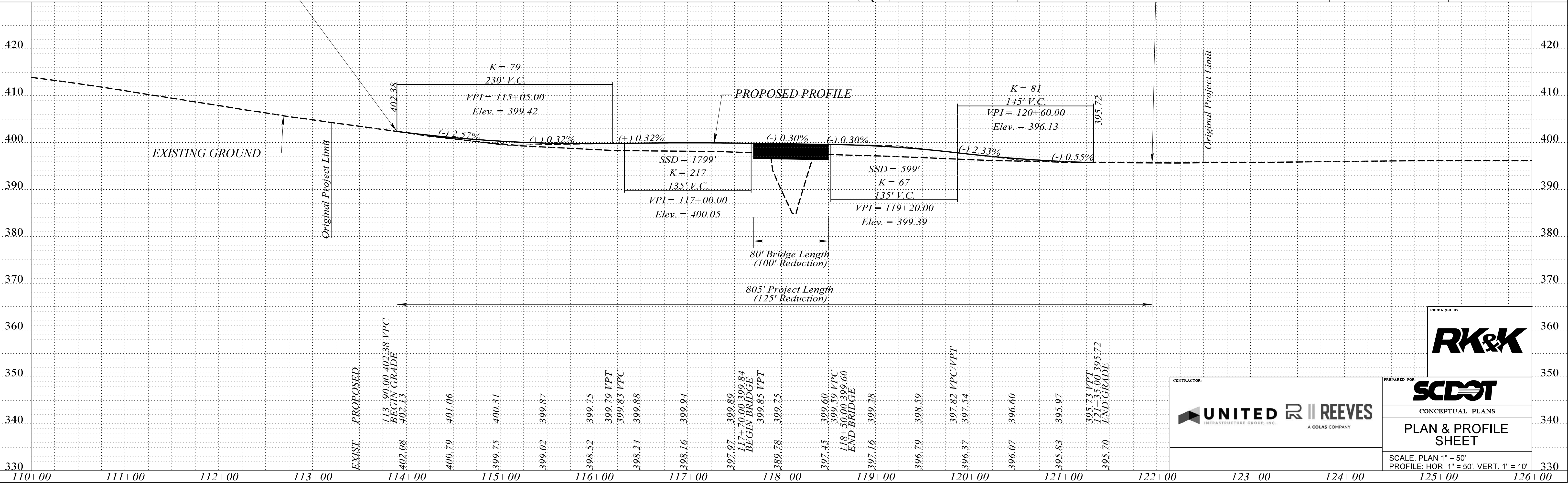
PLAN	DATE	BY	DATE	BY
NOTE BOOK				
No.				

P.I. = 110+50.60
Δ = 76° 28' 36" (LT)
D = 8° 00' 00"
T = 564.37'
L = 955.96'
E = 195.64'
R = 716.20'
D.S. = 45 mhp
eMAX = MATCH EXIST.
e = MATCH EXIST.
P.C. - LG% = MATCH EXIST.
P.T. - LG% = MATCH EXIST.

9

SURVEY STA. 113+90.00 BEGIN
PROJECT ID. P041181
ROAD S-108 (OUTEN STREET)

PLAN	DATE	BY	DATE	BY
NOTE BOOK				
No.				



CONTRACTOR:
UNITED REEVES
INFRASTRUCTURE GROUP, INC. A COLAS COMPANY

PREPARED FOR:
SCDOT
CONCEPTUAL PLANS
PLAN & PROFILE SHEET

SCALE: PLAN 1" = 50'
PROFILE: HOR. 1" = 50', VERT. 1" = 10'

Formal Alternative Technical Concepts Submittal Form

Project: Bridge Package 15

Project ID: 8862230

ATC No.: 4

Priority: High

Team: United-Reeves JV/RK&K

Date: 1/9/23

Description (required):

This ATC seeks to reduce the bridge length at S-765 (Hanging Rock Church Road) over Hanging Rock Creek in Lancaster County.

Usage:

Our team is proposing to use a 130' two-span bridge for S-765 over Hanging Rock Creek.

Deviations (required):

This bridge length would deviate from the minimum lengths dictated in Attachment B of the RFP of 210 feet minimum total bridge length.

Justification:

Upon an in-depth review of the site and the model, our team determined that a 130' total bridge length with 100' span over the channel would be achievable at this site. Included with this ATC is a Bridge Hydraulic Analysis Report, Bridge Plan and Profile, Bridge Typical Section showing superstructure depth, and Roadway Plan and Profile for supporting justification. These documents show we meet the minimum sets backs of face of drilled shaft to top of bank and the hydro requirements for freeboard and backwater. Reducing the bridge length and tying to the existing roadway profile quicker lessens the impacts to wetlands and may help facilitate maintenance to the existing driveway at the end of the bridge.

Schedule:

Approval of this ATC will allow a construction schedule savings of 6 weeks due to the elimination of one bent and reduction of roadway project length.

Impacts:

Approval of this ATC will reduce impacts to roadway work, required right-of-way, and environmental resources.

History:

Box beams of varying lengths have had good performance in other states and now, as well, in South Carolina.

Risks:

No risks to SCDOT or others are anticipated.

Costs (required):

This ATC would provide a cost savings of roughly \$500,000 by reducing number of spans and drilled shafts and lessening roadway work and right-of-way impacts.

Quality:

No adverse impact to quality or performance with the implementation of this ATC.

Formal Alternative Technical Concepts Submittal Form

Project: Bridge Package 15

Project ID: 8862230

ATC No.: 4

Priority: High

Team: United-Reeves JV/RK&K

Date: 1/9/23

Operations & Maintenance:

No negative impact to long-term operation and maintenance is anticipated with this ATC.

Lancaster S-765 over Hanging Rock Creek

Bridge Hydraulics Analysis for Alternative Technical Concept (ATC 4)

The analysis presented in this document covers evaluation and comparison of bridge hydraulic performance of the original SCDOT proposed design and the ATC 4 design option under consideration for the Lancaster S-765 bridge replacement over Hanging Rock Creek.

I. INTRODUCTION

RK&K performed a bridge hydraulics analysis for the bridge replacement of the bridge in Lancaster County along S-765 over Hanging Rock Creek. A preliminary bridge analysis was completed to determine the minimum bridge length provided in the Request for Proposals dated December 5, 2022, Addendum January 5, 2023. The results of this preliminary study were used to determine the minimum bridge length of 210'. Based on the analysis and the information provided in this memorandum, RK&K proposes an Alternative Technical Concept of a bridge length of 130'. All pertinent data and supporting documentation are provided below.

II. DESIGN CRITERIA

- Design Storm: 25-Year
- Overtopping: If the design flood overtops the existing road grade, the proposed bridge may be designed to account for a comparable amount of overtopping flow on the roadway approaches in accordance with Exhibit 4b. Bridge structure overtopping for the design storm event is not allowed.
- Freeboard: Shall not be less than 2 feet above the 25-year event unless the existing freeboard clearance is less than 2 feet.
- Backwater: Shall be 1 foot or less unless the hydraulic model results demonstrate the existing backwater is greater than 1 foot. When the existing backwater is greater than 1 foot, this level of hydraulic performance can be improved or maintained, provided the EOR researches and certifies to the best of his/her knowledge and belief that the existing backwater is not causing adverse impacts to upstream and adjacent properties. In addition, S-765 backwater modeling shall be based on future replacement of the downstream S-766 Bridge that produces less than 1 foot of backwater.
- Low Chord: Shall not be less than the existing bridge low chord elevation unless the hydraulic model results demonstrate the low chord elevation passes the 500-year return storm event without putting the bridge under pressure flow. Additionally, the EOR shall research and certify to the best of his/her knowledge and belief that a reduction in elevation should not cause adverse impacts to upstream, adjacent, and downstream properties. S-765 minimum low chord elevation of the proposed bridge should be set higher than the 100-year backwater elevation of existing downstream S-766 bridge. The minimum low chord elevation shall be 387.00 feet or as needed to prevent pressure flow.
- Abutments: Provide a minimum 5' abutment toe setback from the top of the channel bank.

III. MODEL UPDATES

The preliminary model was updated using the guidance of the HEC-RAS Hydraulic Reference Manual Version 5.0 dated February 2016. Below is a list of updates that were completed by RK&K during the hydraulic design process. All models and subsequent updates were run in HEC-RAS version 6.2.

- An analysis of the flow at the bridge was conducted using the USGS StreamStats application. RK&K was not able to replicate this drainage area using the StreamStats application. RK&K's flow analysis showed an increase in the flow values as to what was provided in the model. The flows provided in the RFP model do not match the flows provided in the report. Flows at S-766 were also updated in the model to match USGS StreamStats pulled by RK&K. A comparison table of the flow values can be found in Table 1.
- The cross section 35586 was updated to be perpendicular to the stream.
- Face cross sections were adjusted to be parallel to S-765 and S-766. S-766 was updated using the GIS centerline available through SCDOT's GIS database.
- Manning's n values were updated downstream of the bridges to remove the interpolated manning n's between cross section 30696 and 19503.
- A sensitivity test was completed to verify the extents of the truncated model that was provided.
- In existing and proposed conditions, the 24" culvert located at Station 39+33 was added to the model using multiple openings.
- In existing and proposed conditions, ineffective flow locations and elevations were adjusted using the ratios provided in the HEC-RAS Hydraulic Reference Manual. In addition, the culvert ineffective flow locations were added to the model.
- In existing conditions, the low chord of the bridge was revised to 387.76' as determined by the survey, compared to 386.99' in the provided study.
- The existing 1' bridge rail was added to the model.
- Contraction and expansion coefficients were updated in accordance with the HEC-RAS Hydraulic Reference Manual.
- The bridge modeling approach was edited to use the greater of the Momentum and Energy equations during low flow conditions and to use the Pressure and/or Weir Equation during high flow conditions.
- The proposed bridge model was edited for the correct structure depth and correct bridge rail height determined from RK&K's structures department. The structure depth was revised to a total depth of 3.974' and the bridge rail height was revised to 3.5'.
- The internal bridge cross sections were updated using the most recent SCDOT survey information.
- The proposed bridge was revised to an overall bridge length of 130' with a span arrangement of 100'-30'.
- The proposed roadway grade was added to the deck cross section.
- In proposed conditions, the low chord of the bridge was revised to 387' as directed by the RFP, compared to 386.07' in the provided study.
- In existing and proposed conditions, S-766 was modified to reflect the information provided in the Asset ID 05795 Bridge Inspection Report from 8/25/2021. This included using pictures to identify the structure depth and rail height.
- In proposed conditions, S-766 was not modified to reflect future work, in order to ensure that S-765 does not overtop while the existing S-766 remains in place. Changes to S-766 will decrease the backwater on S-765 and reduce the overtopping of the roadway.

IV. CONCLUSION AND RESULTS

The HEC-RAS analysis showed that a 130' (100-30') bridge meets the RFP requirements from December 5, 2022. No adverse effects are present at the adjacent, upstream, and downstream properties due to the shortening of the bridge. No residential homes are in the floodplain within the limits of the study. Table 2 shows a summary of the design criteria for the Lancaster County bridge along S-765.

Table 1: Summary of Flows

Design Event	S-765 Crossing SCDOT RFP Model	S-765 Crossing SCDOT RFP Report	S-765 Crossing RK&K Model	S-766 Crossing SCDOT RFP Model	S-766 Crossing RK&K Model
10-year	1704	2020	1930	1914	2030
25-year	2251	2690	2530	2528	2660
50-Year	2701	3210	3060	3033	3220
100-Year	3215	3750	3550	3611	3720
500-Year	3858	5130	4760	4333.2	4990

Table 2: Summary of Results

CRITERIA	SCDOT RFP <u>Existing Model*</u>	SCDOT RFP <u>Model*</u>	RK&K Existing <u>Model</u>	RK&K Revised <u>Model</u>
25-Year WSEL	385.33	383.97	384.26	384.26
100-Year WSEL	387.06	385.16	385.61	385.61
100-Year Backwater (ft)	+2.68	+0.78	+1.38	+1.38
25-year Freeboard (ft)	1.66	2.00	2.93	2.29
Low Chord Elevation	386.99	385.97	387.76	387.05
Bridge Length (ft)	90	210	90	130
Span Arrangement	3 @ 30'	60'-60'-90'	3 @ 30'	30'-100'

*All values were pulled from the Preliminary Hydraulic Analysis dated September 9, 2022, per Addendum 1 dated January 5, 2023.

See Appendix B for bridge plan and profile showing that all setback requirements are met.

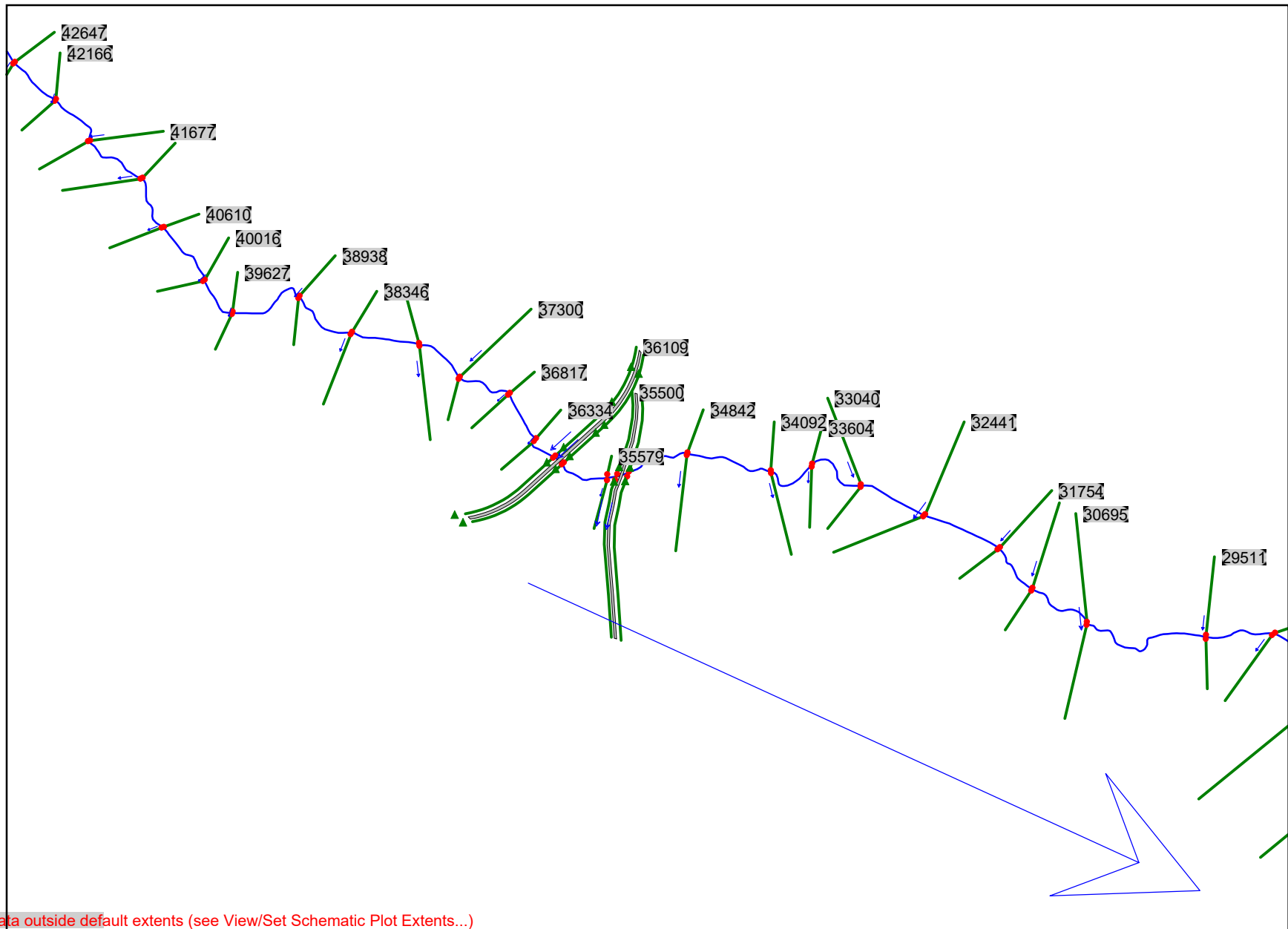
Water surface elevations and freeboard are based on the approach cross section.

V. ATTACHMENTS

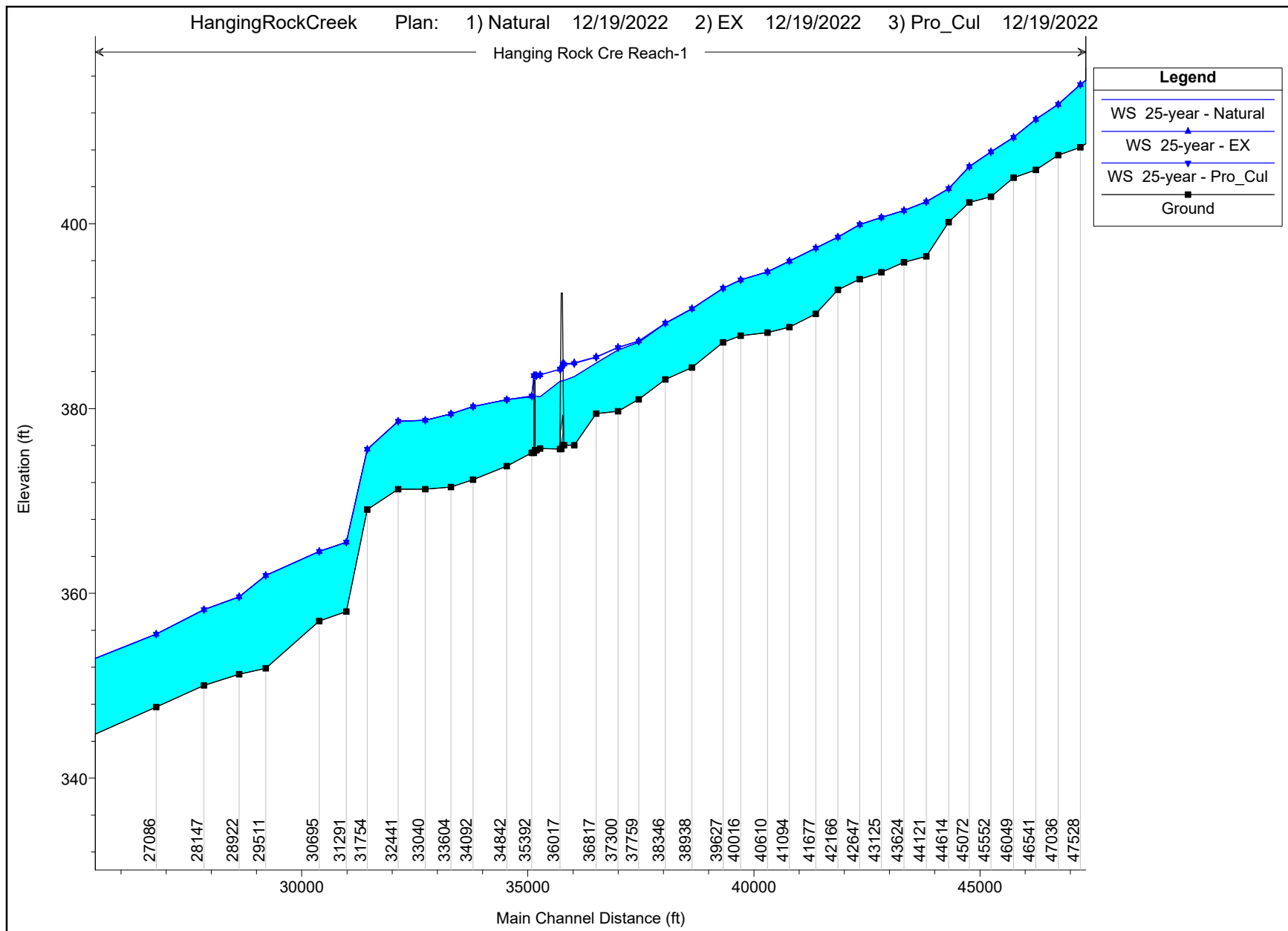
- Attachment A: RK&K Proposed Model HEC-RAS Outputs
- Attachment B: Bridge Plan and Profile
- Attachment C: Roadway Profile

Appendix A: RK&K Proposed Model HEC-RAS Outputs

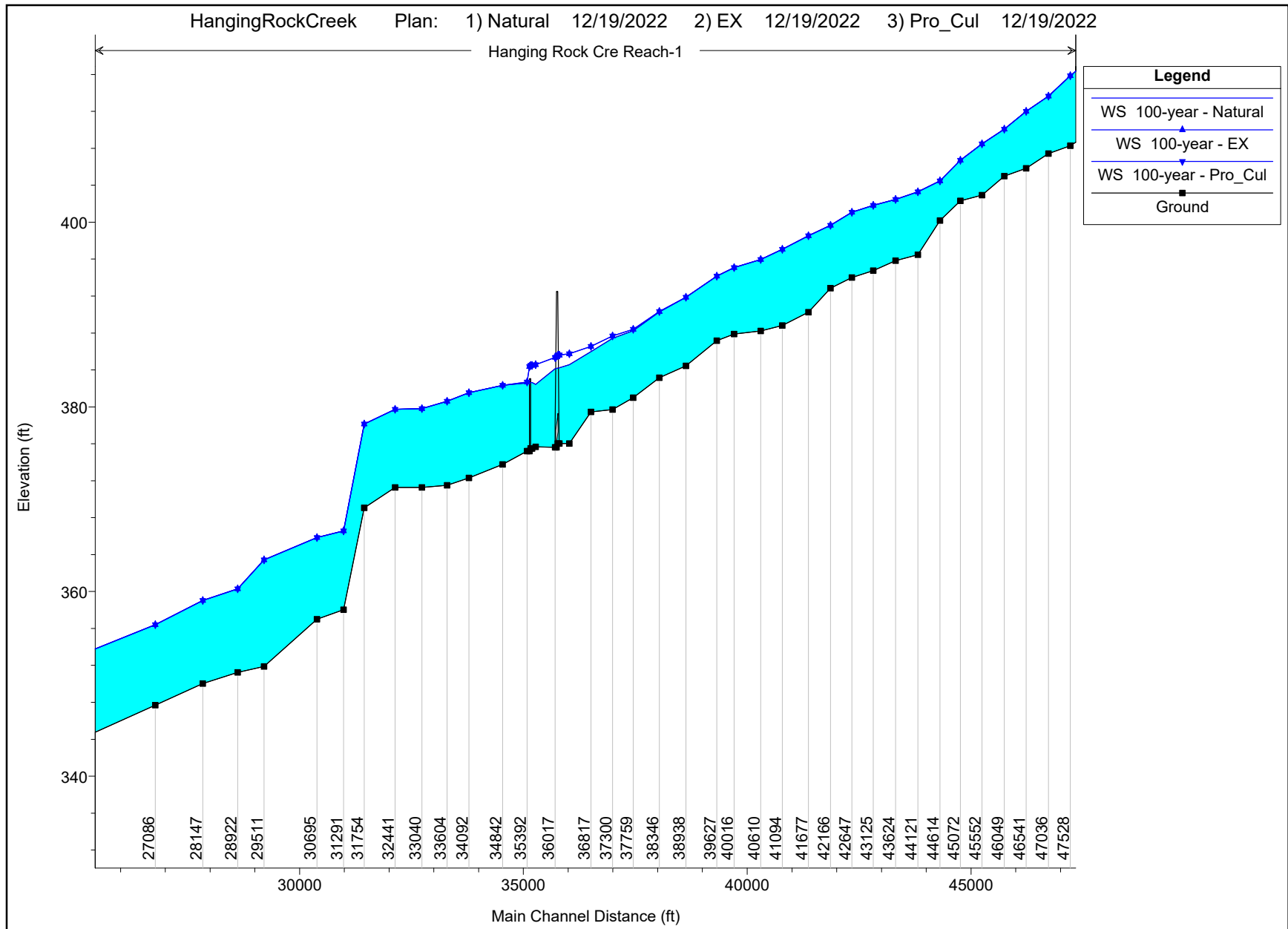
Lancaster S-765 HEC-RAS Schematic



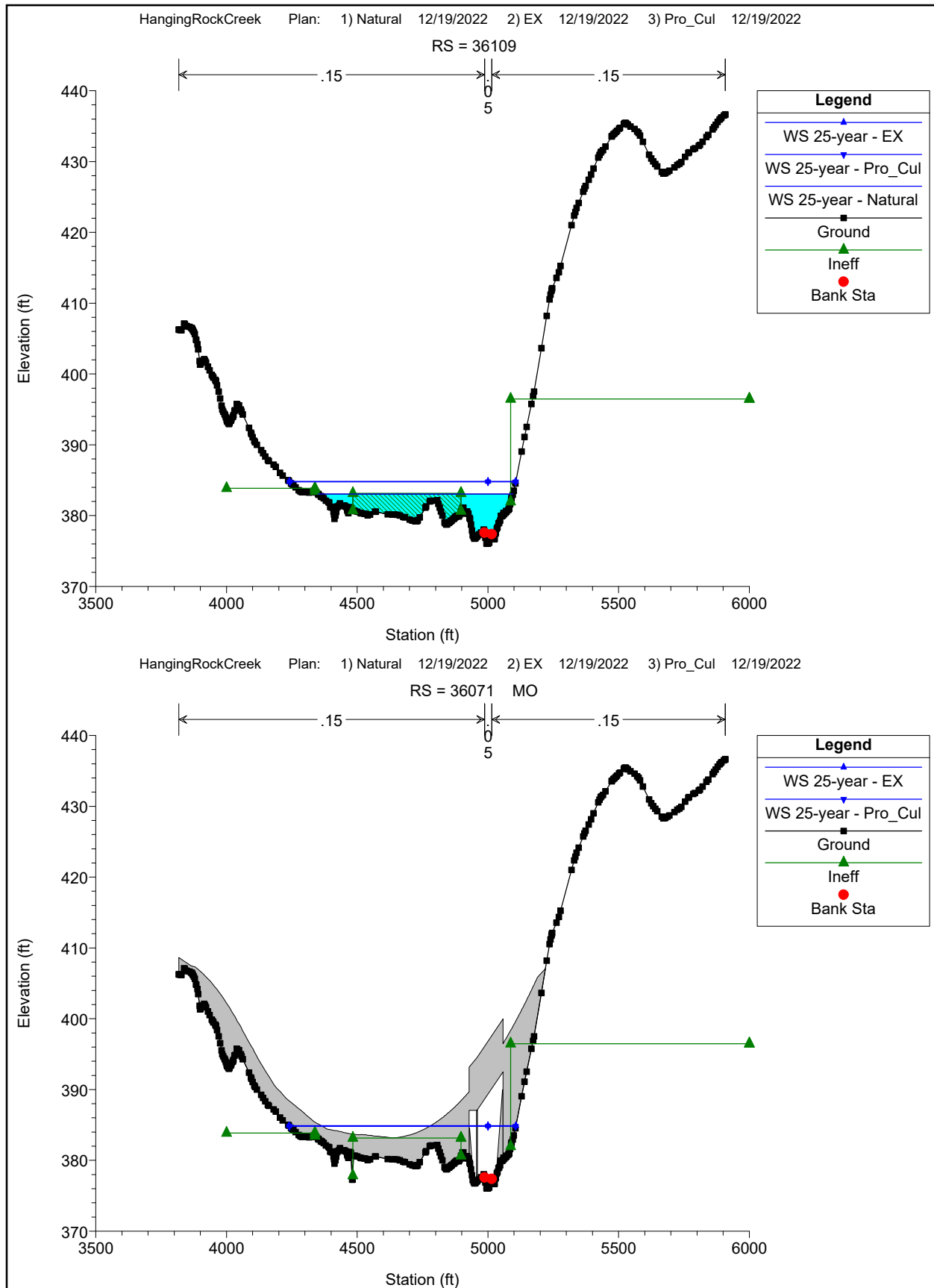
Lancaster S-765 HEC-RAS 25-Year Profile

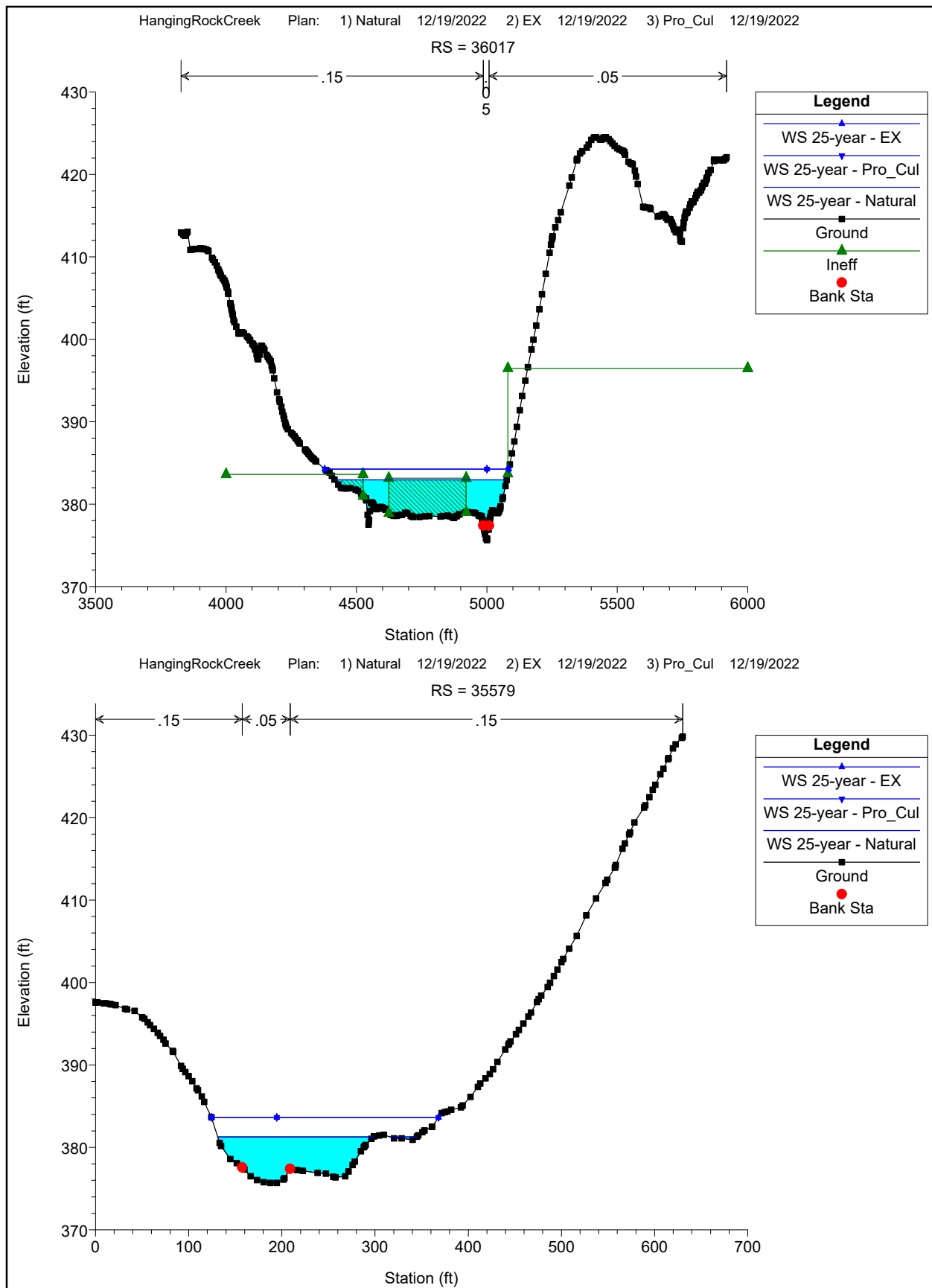


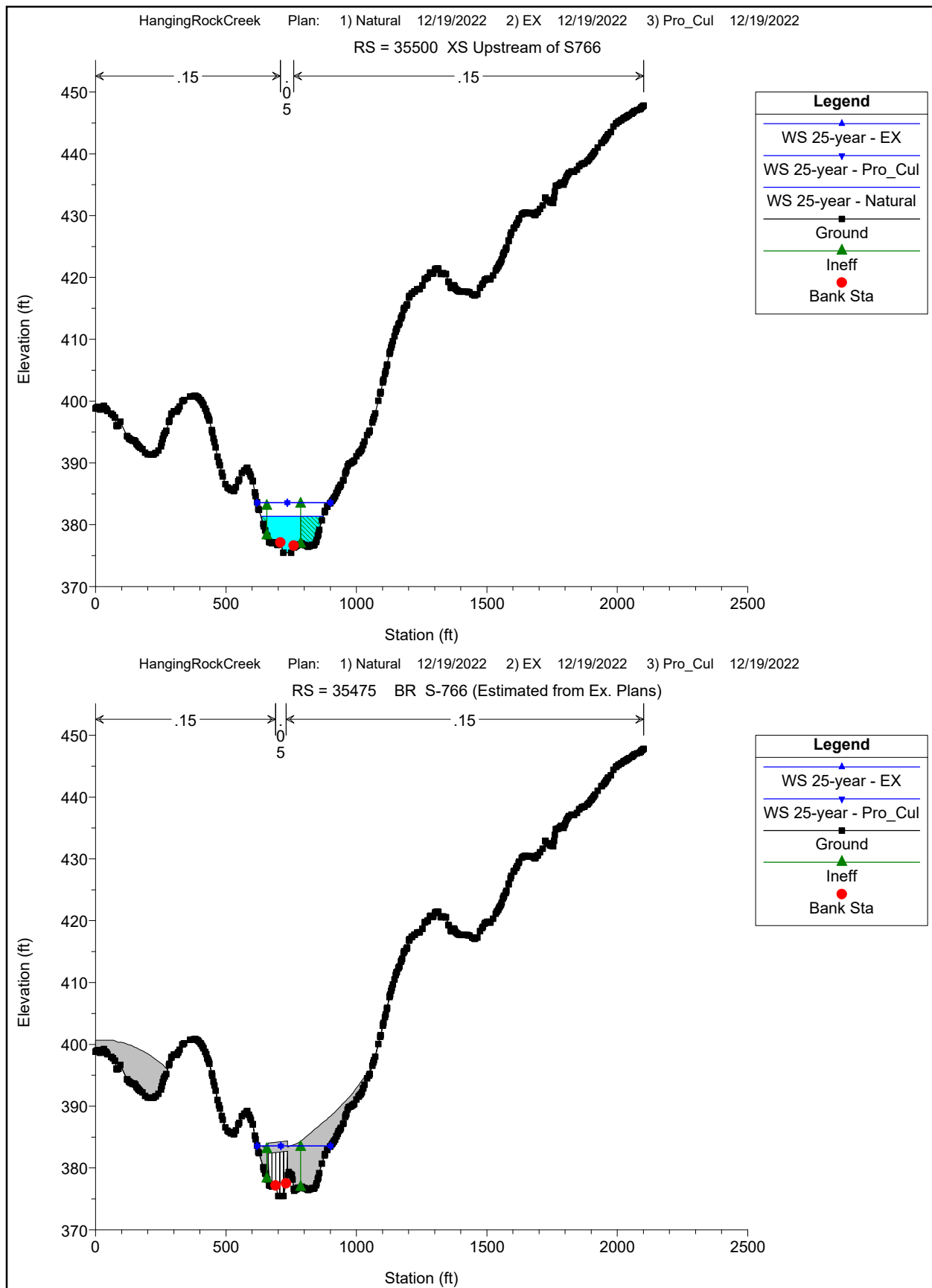
Lancaster S-765 HEC-RAS 100-Year Profile

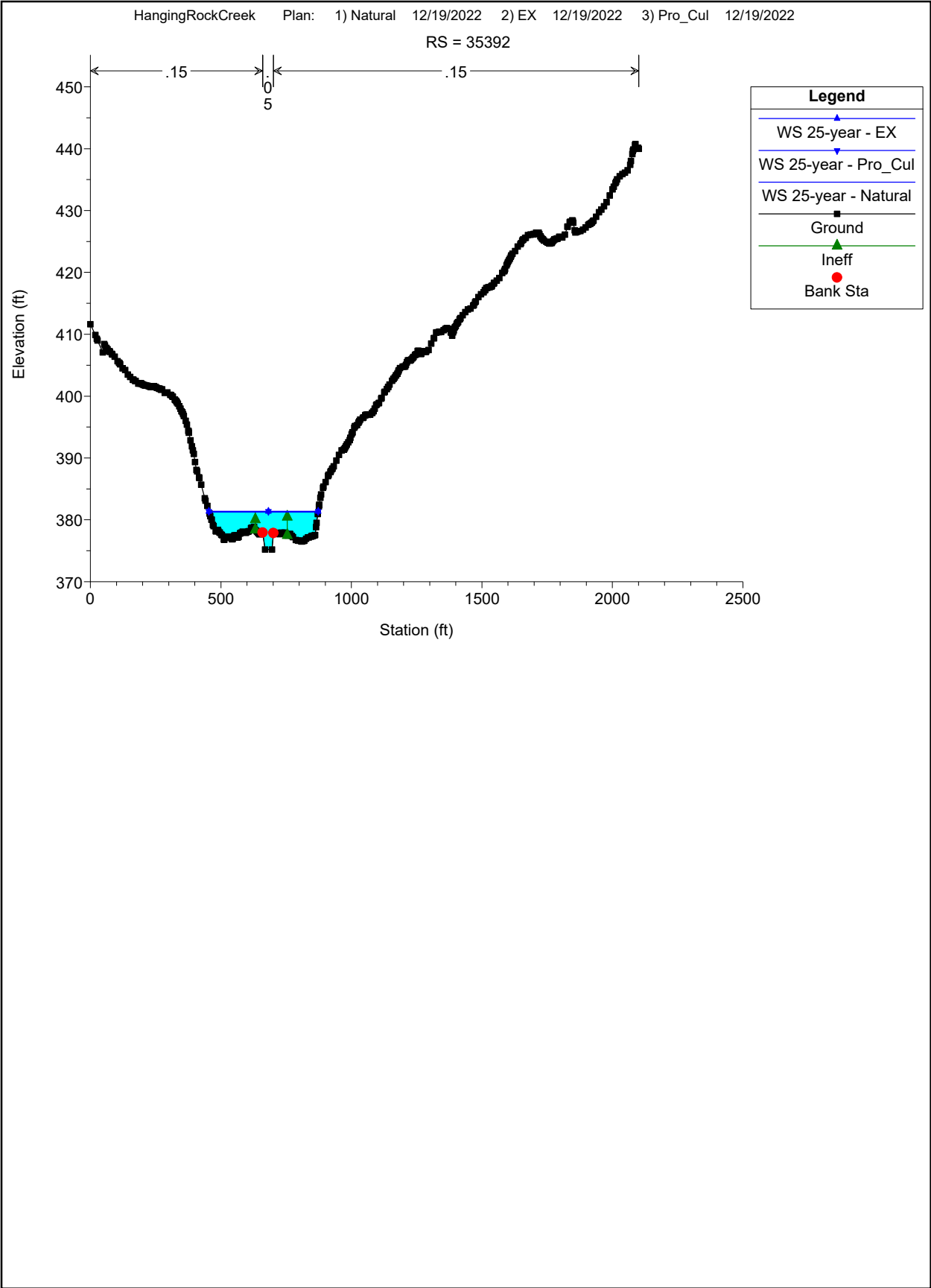


Lancaster S-765 HEC-RAS 25-Year Cross Sections

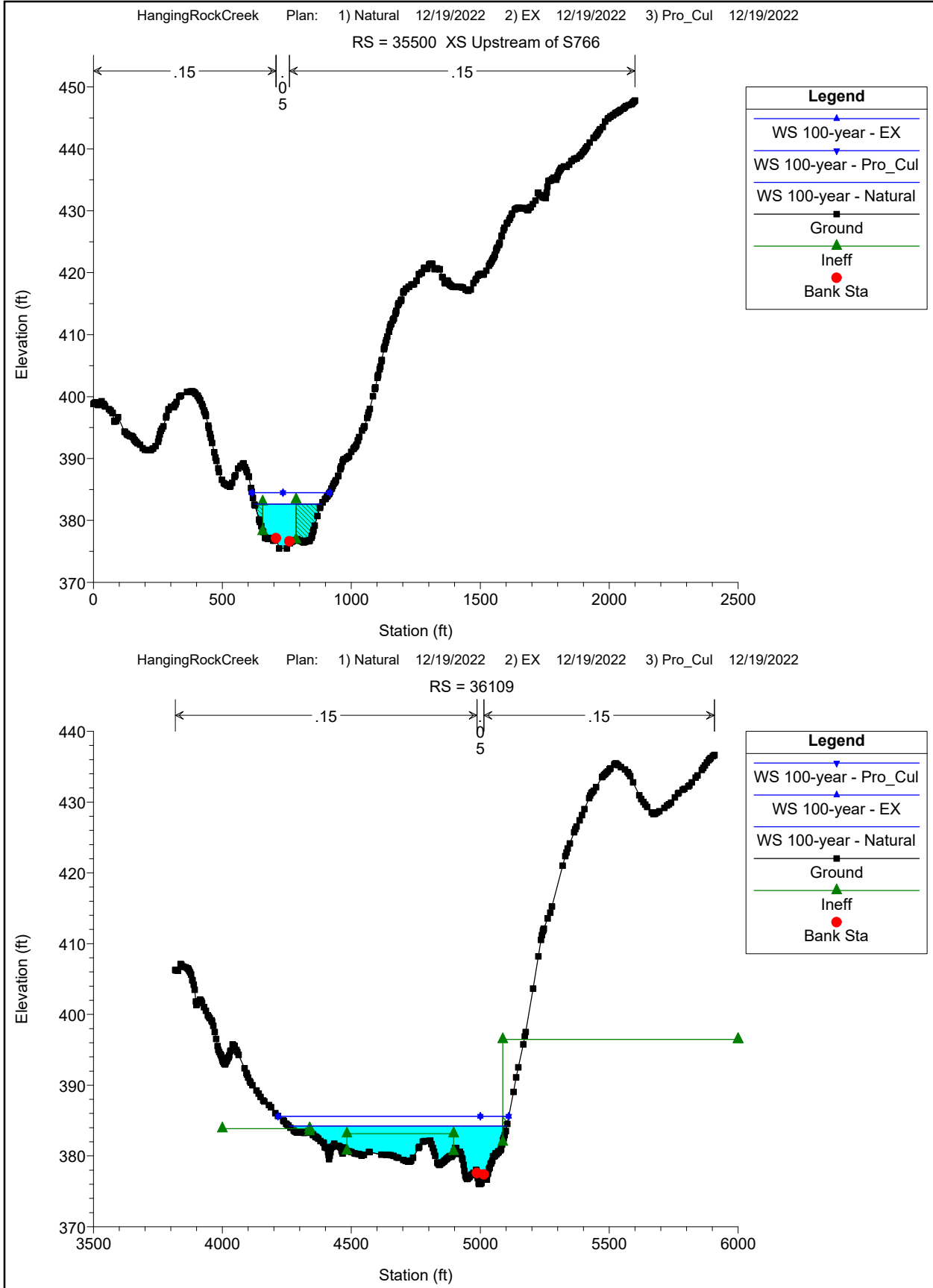


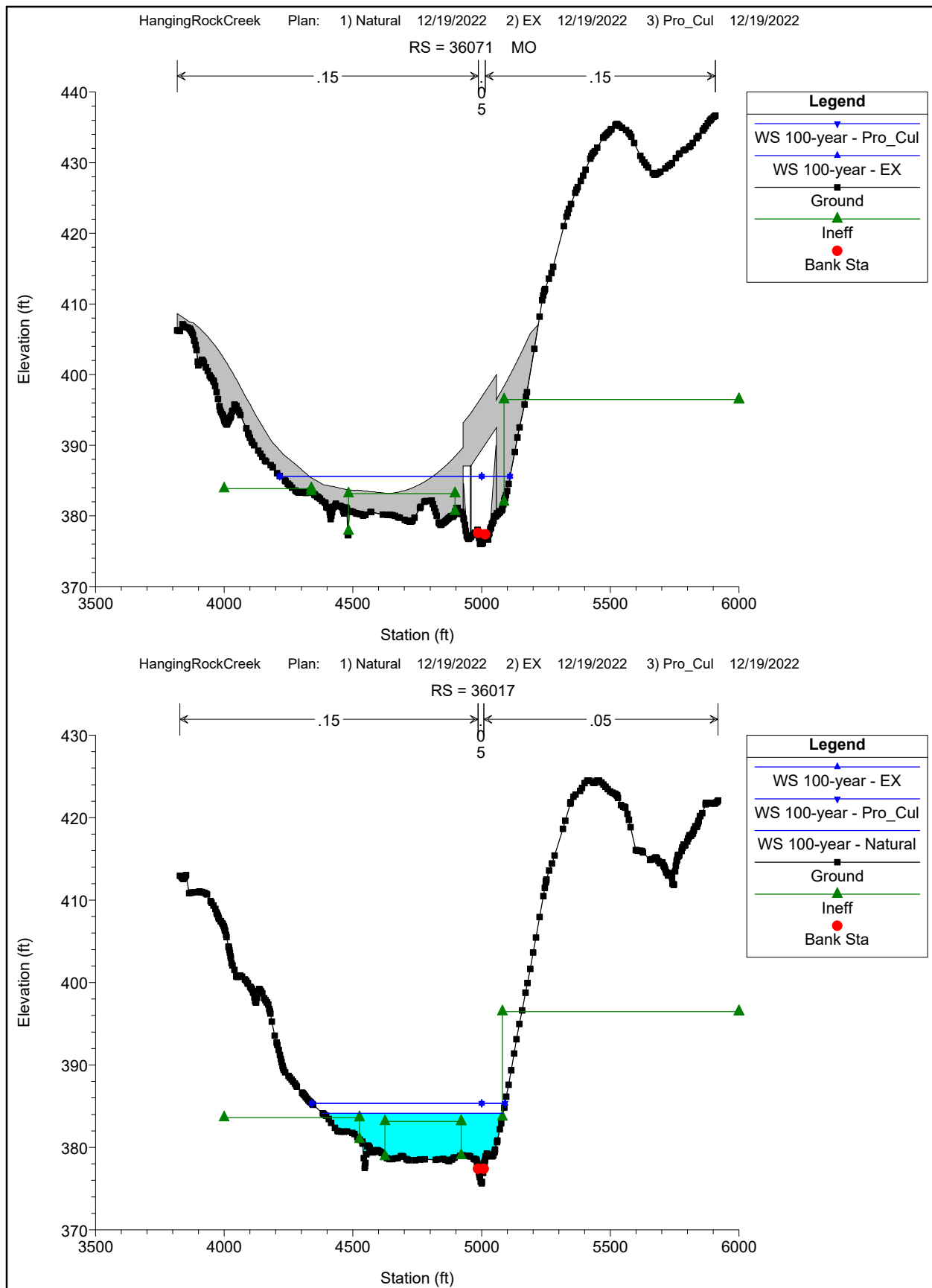


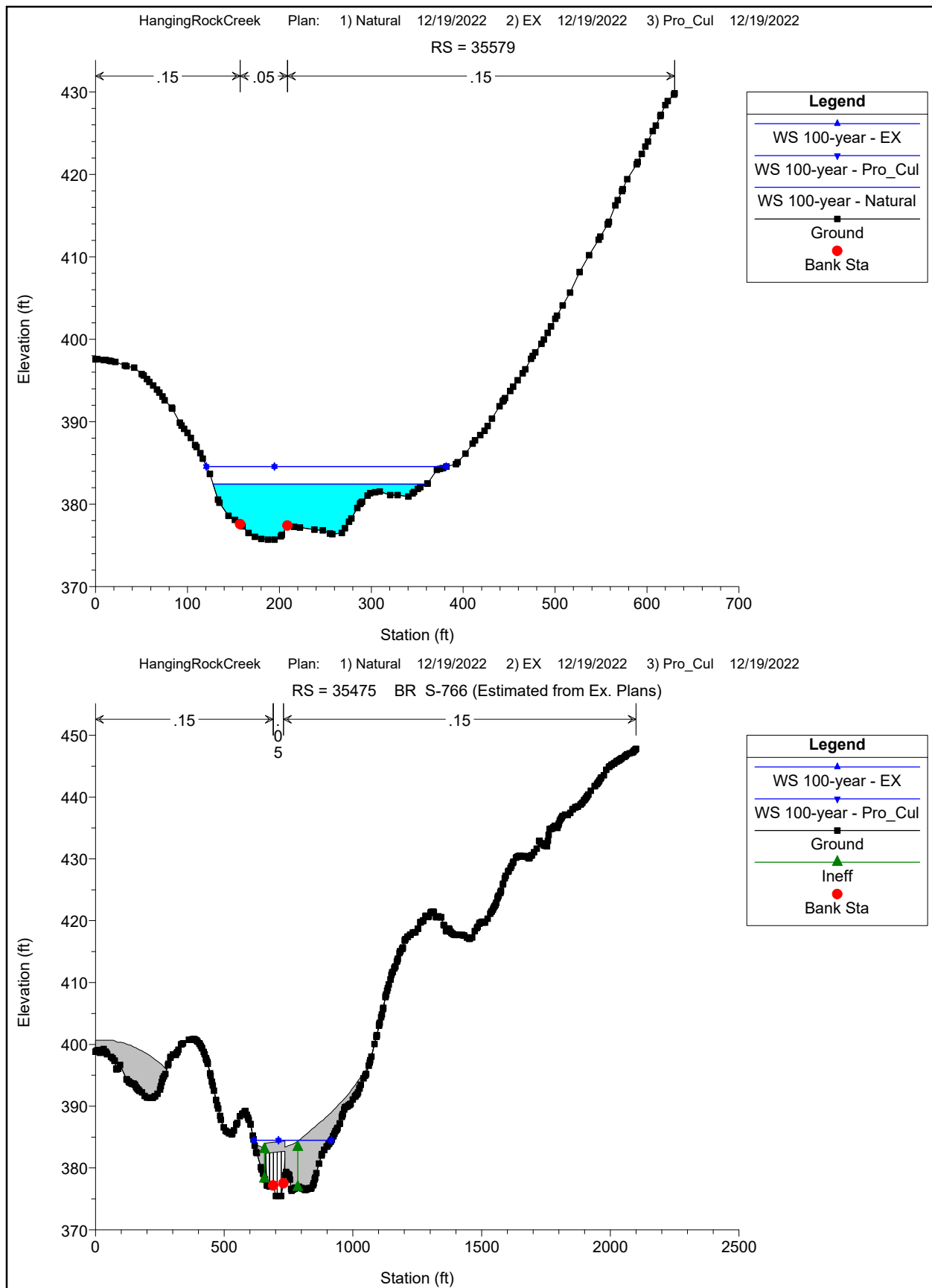


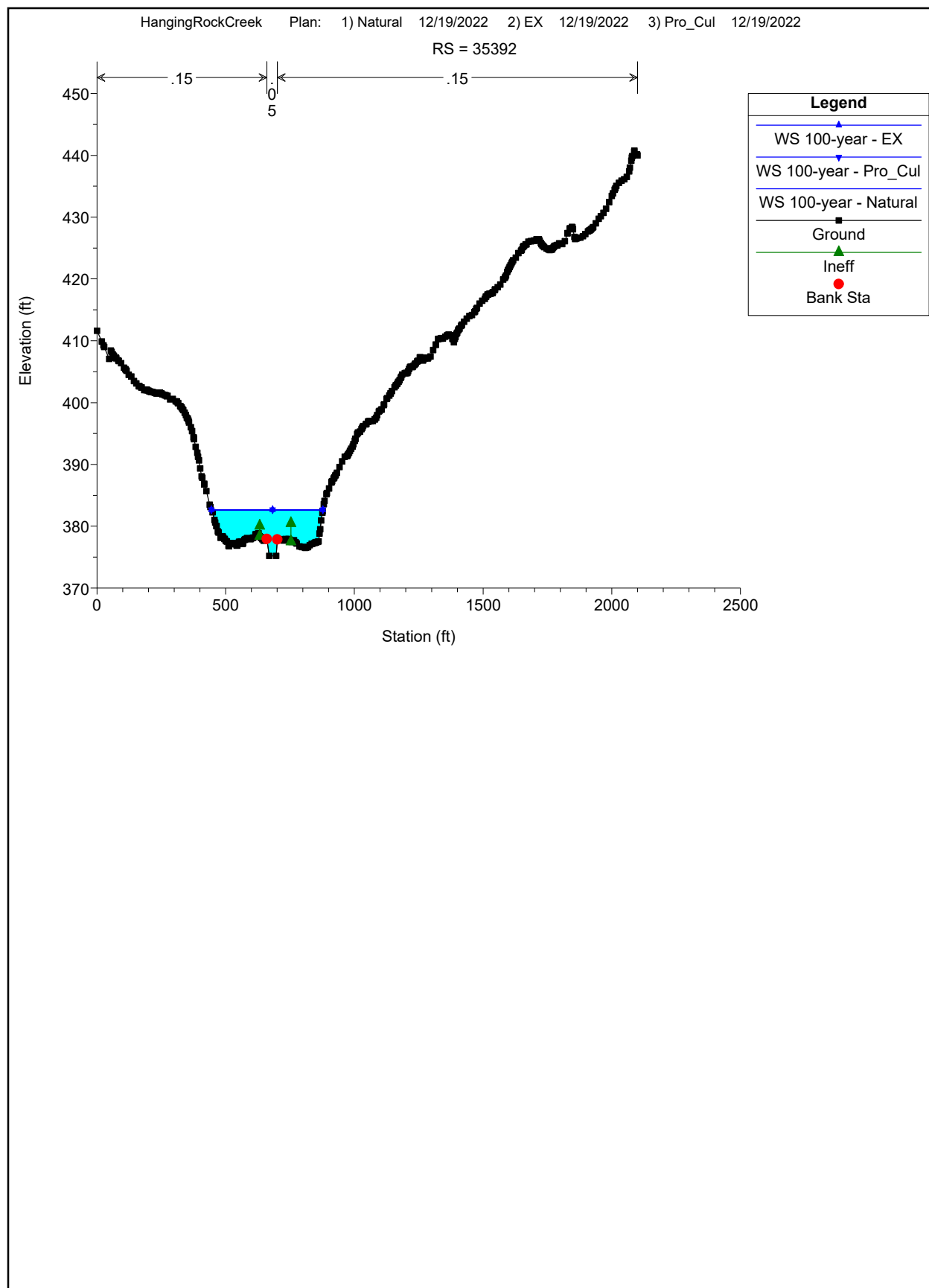


Lancaster S-765 HEC-RAS 100-Year Cross Sections









Lancaster S-765 HEC-RAS 25-Year Output Table

HEC-RAS River: Hanging Rock Cre Reach: Reach-1 Profile: 25-year (Continued)

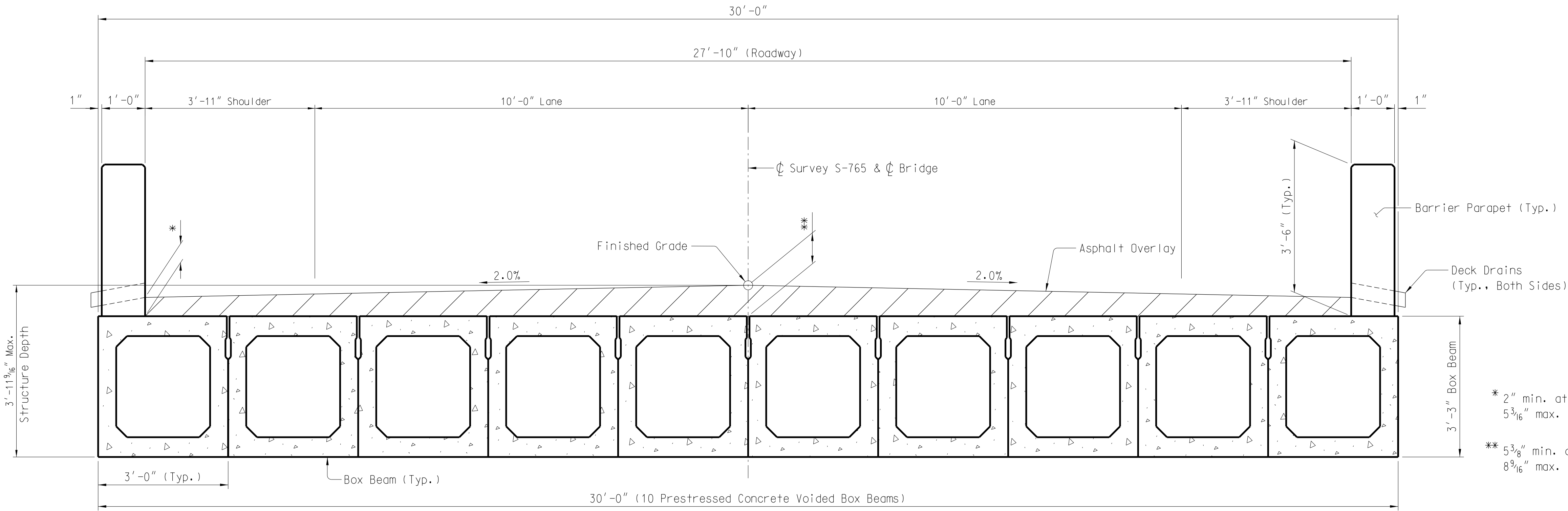
Reach	River Sta	Profile	Plan	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl
Reach-1	42647	25-year	Pro_Cul	1917.00	394.00	399.93	397.06	400.01	0.001859	4.13	1386.50	314.29	0.30
Reach-1	42166	25-year	Natural	1917.00	392.84	398.55	396.27	398.75	0.003882	5.82	901.83	206.77	0.43
Reach-1	42166	25-year	EX	1917.00	392.84	398.55	396.27	398.75	0.003882	5.82	901.83	206.77	0.43
Reach-1	42166	25-year	Pro_Cul	1917.00	392.84	398.55	396.27	398.75	0.003882	5.82	901.83	206.77	0.43
Reach-1	41677	25-year	Natural	1917.00	390.25	397.36	395.13	397.48	0.001800	4.59	1434.39	377.77	0.30
Reach-1	41677	25-year	EX	1917.00	390.25	397.36	395.13	397.48	0.001800	4.59	1434.40	377.77	0.30
Reach-1	41677	25-year	Pro_Cul	1917.00	390.25	397.36	395.13	397.48	0.001800	4.59	1434.40	377.77	0.30
Reach-1	41094	25-year	Natural	2087.00	388.80	395.96	393.50	396.18	0.002741	5.70	1068.28	240.62	0.38
Reach-1	41094	25-year	EX	2087.00	388.80	395.96	393.50	396.18	0.002741	5.70	1068.28	240.62	0.38
Reach-1	41094	25-year	Pro_Cul	2087.00	388.80	395.96	393.50	396.18	0.002741	5.70	1068.28	240.62	0.38
Reach-1	40610	25-year	Natural	2087.00	388.21	394.80	392.43	394.94	0.002297	4.94	1393.52	385.89	0.34
Reach-1	40610	25-year	EX	2087.00	388.21	394.80	392.43	394.94	0.002297	4.94	1393.57	385.89	0.34
Reach-1	40610	25-year	Pro_Cul	2087.00	388.21	394.80	392.43	394.94	0.002297	4.94	1393.56	385.89	0.34
Reach-1	40016	25-year	Natural	2087.00	387.89	393.93	390.73	393.98	0.001152	3.30	1962.13	433.37	0.24
Reach-1	40016	25-year	EX	2087.00	387.89	393.93	390.73	393.98	0.001152	3.30	1962.26	433.37	0.24
Reach-1	40016	25-year	Pro_Cul	2087.00	387.89	393.93	390.73	393.98	0.001152	3.30	1962.24	433.37	0.24
Reach-1	39627	25-year	Natural	2530.00	387.16	393.03	390.57	393.21	0.003452	5.61	1277.02	286.48	0.41
Reach-1	39627	25-year	EX	2530.00	387.16	393.03	390.57	393.21	0.003451	5.61	1277.19	286.48	0.41
Reach-1	39627	25-year	Pro_Cul	2530.00	387.16	393.03	390.57	393.21	0.003451	5.61	1277.17	286.48	0.41
Reach-1	38938	25-year	Natural	2530.00	384.44	390.80	388.13	390.98	0.003035	5.55	1314.05	285.23	0.39
Reach-1	38938	25-year	EX	2530.00	384.44	390.81	388.13	390.98	0.003023	5.54	1315.84	285.29	0.39
Reach-1	38938	25-year	Pro_Cul	2530.00	384.44	390.81	388.13	390.98	0.003024	5.54	1315.66	285.28	0.39
Reach-1	38346	25-year	Natural	2530.00	383.15	389.22	386.68	389.34	0.002486	4.87	1651.11	417.67	0.35
Reach-1	38346	25-year	EX	2530.00	383.15	389.25	386.68	389.36	0.002443	4.84	1661.52	418.38	0.35
Reach-1	38346	25-year	Pro_Cul	2530.00	383.15	389.25	386.68	389.36	0.002447	4.84	1660.50	418.31	0.35
Reach-1	37759	25-year	Natural	2530.00	380.99	387.16	385.12	387.43	0.004356	6.52	1178.48	305.64	0.46
Reach-1	37759	25-year	EX	2530.00	380.99	387.32	385.12	387.56	0.003913	6.28	1225.13	308.54	0.44
Reach-1	37759	25-year	Pro_Cul	2530.00	380.99	387.30	385.12	387.55	0.003950	6.30	1220.97	308.28	0.44
Reach-1	37300	25-year	Natural	2530.00	379.71	386.34	383.34	386.40	0.001248	3.66	2275.83	513.57	0.25
Reach-1	37300	25-year	EX	2530.00	379.71	386.63	383.34	386.67	0.001032	3.42	2423.95	517.68	0.23
Reach-1	37300	25-year	Pro_Cul	2530.00	379.71	386.60	383.34	386.65	0.001048	3.44	2411.77	517.27	0.23
Reach-1	36817	25-year	Natural	2530.00	379.45	384.93	383.29	385.23	0.005933	7.02	1033.52	272.75	0.53
Reach-1	36817	25-year	EX	2530.00	379.45	385.59	383.29	385.81	0.003671	5.96	1218.17	280.44	0.42
Reach-1	36817	25-year	Pro_Cul	2530.00	379.45	385.55	383.29	385.77	0.003787	6.03	1205.24	279.92	0.43
Reach-1	36334	25-year	Natural	2530.00	376.04	383.47	381.10	383.60	0.002069	4.65	1626.49	393.80	0.32
Reach-1	36334	25-year	EX	2530.00	376.04	384.96	381.10	385.02	0.000838	3.38	2230.70	414.97	0.21
Reach-1	36334	25-year	Pro_Cul	2530.00	376.04	384.88	381.10	384.95	0.000872	3.43	2200.81	414.35	0.21
Reach-1	36109	25-year	Natural	2530.00	376.02	383.05	381.05	383.15	0.001842	4.42	2215.18	745.03	0.31
Reach-1	36109	25-year	EX	2530.00	376.02	384.83	381.15	384.86	0.000489	2.68	3575.86	865.88	0.16
Reach-1	36109	25-year	Pro_Cul	2530.00	376.02	384.76	381.42	384.79	0.000499	2.69	3591.53	863.73	0.17
S-765 Bridge													
Reach-1	36017	25-year	Natural	2530.00	375.63	382.95	380.37	383.01	0.001151	3.48	2367.84	659.52	0.24
Reach-1	36017	25-year	EX	2530.00	375.63	384.26	381.36	384.29	0.000472	2.52	3180.21	706.06	0.16
Reach-1	36017	25-year	Pro_Cul	2530.00	375.63	384.26	381.32	384.28	0.000449	2.46	3254.39	705.75	0.15
Reach-1	35579	25-year	Natural	2660.00	375.68	381.28	379.73	381.90	0.007140	7.38	654.28	195.70	0.58
Reach-1	35579	25-year	EX	2660.00	375.68	383.63	379.73	383.87	0.001728	4.68	1194.62	243.79	0.30
Reach-1	35579	25-year	Pro_Cul	2660.00	375.68	383.63	379.73	383.87	0.001728	4.68	1194.62	243.79	0.30
S-766 Bridge													
Reach-1	35500	25-year	Natural	2660.00	375.49	381.37	378.80	381.52	0.001678	3.71	921.25	238.91	0.28
Reach-1	35500	25-year	EX	2660.00	375.49	383.58	379.51	383.72	0.001086	3.84	1565.46	281.75	0.24
Reach-1	35500	25-year	Pro_Cul	2660.00	375.49	383.58	379.51	383.72	0.001086	3.84	1565.46	281.75	0.24
Reach-1	35392	25-year	Natural	2660.00	375.21	381.27	378.81	381.36	0.001092	3.06	1552.62	417.43	0.23
Reach-1	35392	25-year	EX	2660.00	375.21	381.36	380.50	381.51	0.002482	4.65	1594.08	418.39	0.34
Reach-1	35392	25-year	Pro_Cul	2660.00	375.21	381.36	380.50	381.51	0.002482	4.65	1594.08	418.39	0.34
Reach-1	34842	25-year	Natural	2660.00	373.78	380.97	376.34	380.98	0.000421	2.24	3690.28	649.39	0.15
Reach-1	34842	25-year	EX	2660.00	373.78	380.97	376.34	380.98	0.000421	2.24	3690.28	649.39	0.15
Reach-1	34842	25-year	Pro_Cul	2660.00	373.78	380.97	376.34	380.98	0.000421	2.24	3690.28	649.39	0.15
Reach-1	34092	25-year	Natural	2660.00	372.29	380.23	376.01	380.39	0.001793	4.95	1390.20	217.46	0.31
Reach-1	34092	25-year	EX	2660.00	372.29	380.23	376.01	380.39	0.001793	4.95	1390.20	217.46	0.31
Reach-1	34092	25-year	Pro_Cul	2660.00	372.29	380.23	376.01	380.39	0.001793	4.95	1390.20	217.46	0.31
Reach-1	33604	25-year	Natural	2660.00	371.51	379.42	375.33	379.55	0.001626	4.70	1506.67	242.85	0.29
Reach-1	33604	25-year	EX	2660.00	371.51	379.42	375.33	379.55	0.001626	4.70	1506.67	242.85	0.29
Reach-1	33604	25-year	Pro_Cul	2660.00	371.51	379.42	375.33	379.55	0.001626	4.70	1506.67	242.85	0.29
Reach-1	33040	25-year	Natural	2660.00	371.28	378.72	373.84	378.79	0.001096	3.70	2102.45	369.30	0.24

Lancaster S-765 HEC-RAS 100-Year Output Table

HEC-RAS River: Hanging Rock Cre Reach: Reach-1 Profile: 100-year (Continued)

Reach	River Sta	Profile	Plan	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl
Reach-1	42647	100-year	Pro_Cul	2738.00	394.00	401.09	397.48	401.19	0.001836	4.63	1754.71	321.89	0.31
Reach-1	42166	100-year	Natural	2738.00	392.84	399.67	396.83	399.92	0.003914	6.59	1136.31	211.75	0.45
Reach-1	42166	100-year	EX	2738.00	392.84	399.67	396.83	399.92	0.003914	6.59	1136.33	211.75	0.45
Reach-1	42166	100-year	Pro_Cul	2738.00	392.84	399.67	396.83	399.92	0.003914	6.59	1136.33	211.75	0.45
Reach-1	41677	100-year	Natural	2738.00	390.25	398.54	395.70	398.67	0.001718	4.97	1897.22	407.56	0.30
Reach-1	41677	100-year	EX	2738.00	390.25	398.54	395.70	398.67	0.001717	4.97	1897.34	407.56	0.30
Reach-1	41677	100-year	Pro_Cul	2738.00	390.25	398.54	395.70	398.67	0.001717	4.97	1897.34	407.56	0.30
Reach-1	41094	100-year	Natural	2981.00	388.80	397.08	394.18	397.35	0.002950	6.51	1343.76	252.05	0.40
Reach-1	41094	100-year	EX	2981.00	388.80	397.08	394.18	397.35	0.002950	6.51	1343.85	252.05	0.40
Reach-1	41094	100-year	Pro_Cul	2981.00	388.80	397.08	394.18	397.35	0.002950	6.51	1343.85	252.05	0.40
Reach-1	40610	100-year	Natural	2981.00	388.21	395.95	393.01	396.10	0.002168	5.34	1841.66	403.10	0.34
Reach-1	40610	100-year	EX	2981.00	388.21	395.95	393.01	396.10	0.002167	5.34	1841.98	403.12	0.34
Reach-1	40610	100-year	Pro_Cul	2981.00	388.21	395.95	393.01	396.10	0.002167	5.34	1841.98	403.12	0.34
Reach-1	40016	100-year	Natural	2981.00	387.89	395.09	391.15	395.14	0.001175	3.74	2470.04	452.63	0.25
Reach-1	40016	100-year	EX	2981.00	387.89	395.09	391.15	395.14	0.001174	3.74	2470.67	452.65	0.25
Reach-1	40016	100-year	Pro_Cul	2981.00	387.89	395.09	391.15	395.14	0.001174	3.74	2470.67	452.65	0.25
Reach-1	39627	100-year	Natural	3550.00	387.16	394.16	391.07	394.37	0.003425	6.28	1604.14	296.96	0.42
Reach-1	39627	100-year	EX	3550.00	387.16	394.16	391.07	394.37	0.003421	6.28	1604.82	296.98	0.42
Reach-1	39627	100-year	Pro_Cul	3550.00	387.16	394.16	391.07	394.37	0.003421	6.28	1604.82	296.98	0.42
Reach-1	38938	100-year	Natural	3550.00	384.44	391.86	388.68	392.08	0.003206	6.32	1621.77	295.50	0.41
Reach-1	38938	100-year	EX	3550.00	384.44	391.87	388.68	392.09	0.003184	6.31	1625.49	295.61	0.41
Reach-1	38938	100-year	Pro_Cul	3550.00	384.44	391.87	388.68	392.09	0.003184	6.31	1625.51	295.61	0.41
Reach-1	38346	100-year	Natural	3550.00	383.15	390.28	387.19	390.41	0.002431	5.36	2101.52	435.83	0.35
Reach-1	38346	100-year	EX	3550.00	383.15	390.32	387.19	390.45	0.002373	5.31	2118.81	436.46	0.35
Reach-1	38346	100-year	Pro_Cul	3550.00	383.15	390.32	387.19	390.45	0.002373	5.31	2118.91	436.47	0.35
Reach-1	37759	100-year	Natural	3550.00	380.99	388.23	385.73	388.54	0.004285	7.19	1517.11	327.91	0.47
Reach-1	37759	100-year	EX	3550.00	380.99	388.40	385.73	388.68	0.003887	6.95	1570.72	330.57	0.45
Reach-1	37759	100-year	Pro_Cul	3550.00	380.99	388.40	385.73	388.68	0.003885	6.95	1571.01	330.59	0.45
Reach-1	37300	100-year	Natural	3550.00	379.71	387.42	383.72	387.48	0.001281	4.10	2838.91	536.53	0.26
Reach-1	37300	100-year	EX	3550.00	379.71	387.69	383.72	387.75	0.001105	3.89	2985.86	548.17	0.24
Reach-1	37300	100-year	Pro_Cul	3550.00	379.71	387.69	383.72	387.75	0.001104	3.89	2986.61	548.24	0.24
Reach-1	36817	100-year	Natural	3550.00	379.45	385.97	383.88	386.32	0.005639	7.69	1325.42	284.25	0.53
Reach-1	36817	100-year	EX	3550.00	379.45	386.54	383.88	386.81	0.003984	6.84	1488.35	287.95	0.45
Reach-1	36817	100-year	Pro_Cul	3550.00	379.45	386.55	383.88	386.81	0.003978	6.83	1489.11	287.97	0.45
Reach-1	36334	100-year	Natural	3550.00	376.04	384.56	381.60	384.72	0.002057	5.13	2068.82	411.26	0.32
Reach-1	36334	100-year	EX	3550.00	376.04	385.76	381.60	385.85	0.001092	4.11	2565.71	421.80	0.24
Reach-1	36334	100-year	Pro_Cul	3550.00	376.04	385.76	381.60	385.86	0.001090	4.11	2567.50	421.83	0.24
Reach-1	36109	100-year	Natural	3550.00	376.02	384.23	381.58	384.31	0.001448	4.38	3165.66	845.35	0.28
Reach-1	36109	100-year	EX	3550.00	376.02	385.61	382.01	385.65	0.000598	3.14	4224.31	894.44	0.18
Reach-1	36109	100-year	Pro_Cul	3550.00	376.02	385.61	382.10	385.65	0.000576	3.08	4327.34	894.80	0.18
S-765 Bridge													
Reach-1	36017	100-year	Natural	3550.00	375.63	384.14	380.68	384.20	0.000960	3.56	3173.76	700.75	0.23
Reach-1	36017	100-year	EX	3550.00	375.63	385.36	381.94	385.40	0.000503	2.84	3939.57	751.37	0.17
Reach-1	36017	100-year	Pro_Cul	3550.00	375.63	385.34	381.86	385.38	0.000466	2.73	4040.12	750.83	0.16
Reach-1	35579	100-year	Natural	3720.00	375.68	382.43	380.50	383.22	0.006891	8.32	908.38	232.22	0.59
Reach-1	35579	100-year	EX	3720.00	375.68	384.57	380.50	384.90	0.002142	5.65	1428.97	260.97	0.34
Reach-1	35579	100-year	Pro_Cul	3720.00	375.68	384.57	380.50	384.90	0.002142	5.65	1428.97	260.97	0.34
S-766 Bridge													
Reach-1	35500	100-year	Natural	3720.00	375.49	382.65	379.33	382.82	0.001393	3.90	1241.07	261.01	0.27
Reach-1	35500	100-year	EX	3720.00	375.49	384.50	380.28	384.70	0.001405	4.71	1835.12	302.21	0.28
Reach-1	35500	100-year	Pro_Cul	3720.00	375.49	384.50	380.28	384.70	0.001405	4.71	1835.12	302.21	0.28
Reach-1	35392	100-year	Natural	3720.00	375.21	382.59	379.20	382.68	0.000847	3.11	2113.89	432.08	0.21
Reach-1	35392	100-year	EX	3720.00	375.21	382.69	380.30	382.84	0.001998	4.79	2159.17	433.43	0.32
Reach-1	35392	100-year	Pro_Cul	3720.00	375.21	382.69	380.30	382.84	0.001998	4.79	2159.17	433.43	0.32
Reach-1	34842	100-year	Natural	3720.00	373.78	382.33	376.79	382.35	0.000415	2.50	4580.78	660.45	0.15
Reach-1	34842	100-year	EX	3720.00	373.78	382.33	376.79	382.35	0.000415	2.50	4580.78	660.45	0.15
Reach-1	34842	100-year	Pro_Cul	3720.00	373.78	382.33	376.79	382.35	0.000415	2.50	4580.78	660.45	0.15
Reach-1	34092	100-year	Natural	3720.00	372.29	381.53	376.66	381.74	0.002001	5.78	1675.19	223.98	0.34
Reach-1	34092	100-year	EX	3720.00	372.29	381.53	376.66	381.74	0.002001	5.78	1675.19	223.98	0.34
Reach-1	34092	100-year	Pro_Cul	3720.00	372.29	381.53	376.66	381.74	0.002001	5.78	1675.19	223.98	0.34
Reach-1	33604	100-year	Natural	3720.00	371.51	380.60	375.93	380.79	0.001867	5.53	1798.76	249.93	0.32
Reach-1	33604	100-year	EX	3720.00	371.51	380.60	375.93	380.79	0.001867	5.53	1798.76	249.93	0.32
Reach-1	33604	100-year	Pro_Cul	3720.00	371.51	380.60	375.93	380.79	0.001867	5.53	1798.76	249.93	0.32
Reach-1	33040	100-year	Natural	3720.00	371.28	379.82	374.73	379.91	0.001248	4.33	2512.23	378.58	0.26

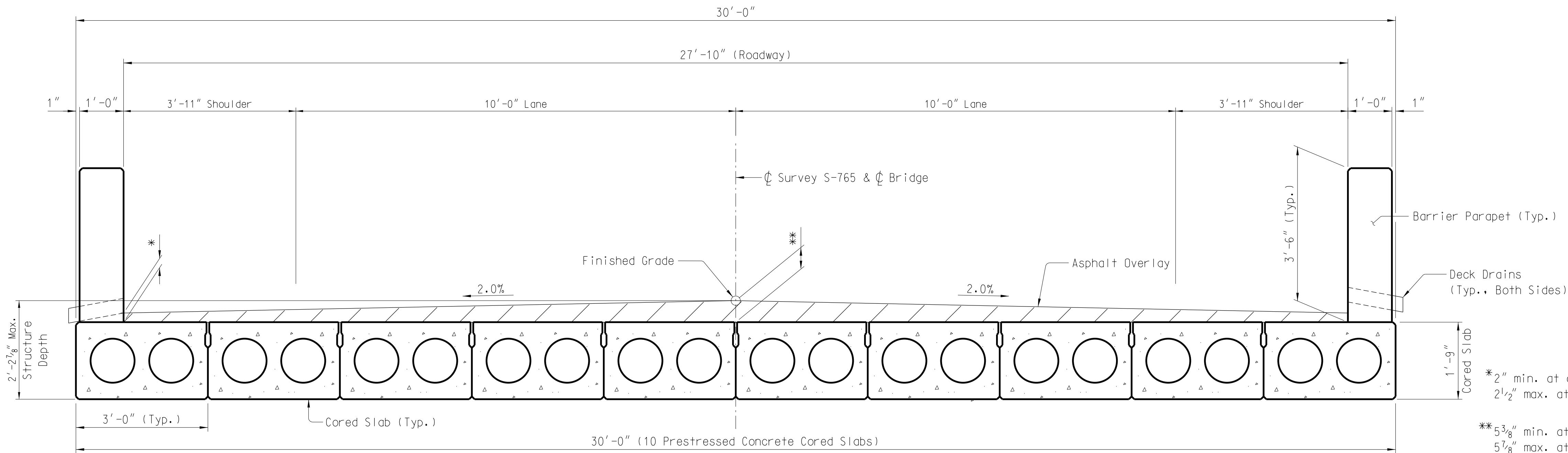
Appendix B: Bridge Plansheet



SECTION THRU SPAN 1

* 2" min. at center of span
5 3/16" max. at ϕ Bearing (account for camber and vertical curve)

** 5 3/8" min. at center of span
8 9/16" max. at ϕ Bearing (account for camber and vertical curve)



SECTION THRU SPAN 3

* 2" min. at center of span
2 1/2" max. at ϕ Bearing (accounting for camber and vertical curve)

** 5 3/8" min. at center of span
5 1/8" max. at ϕ Bearing (accounting for camber and vertical curve)



SOUTH CAROLINA
DEPARTMENT OF TRANSPORTATION

SUPERSTRUCTURE
TYPICAL SECTION

REV.			
REV.			
REV.			
REVIEWED			
QUAN.			
DR.	KSH		12-22
DES.			
BY	CHK.	DATE	

COUNTY ROUTE S-765

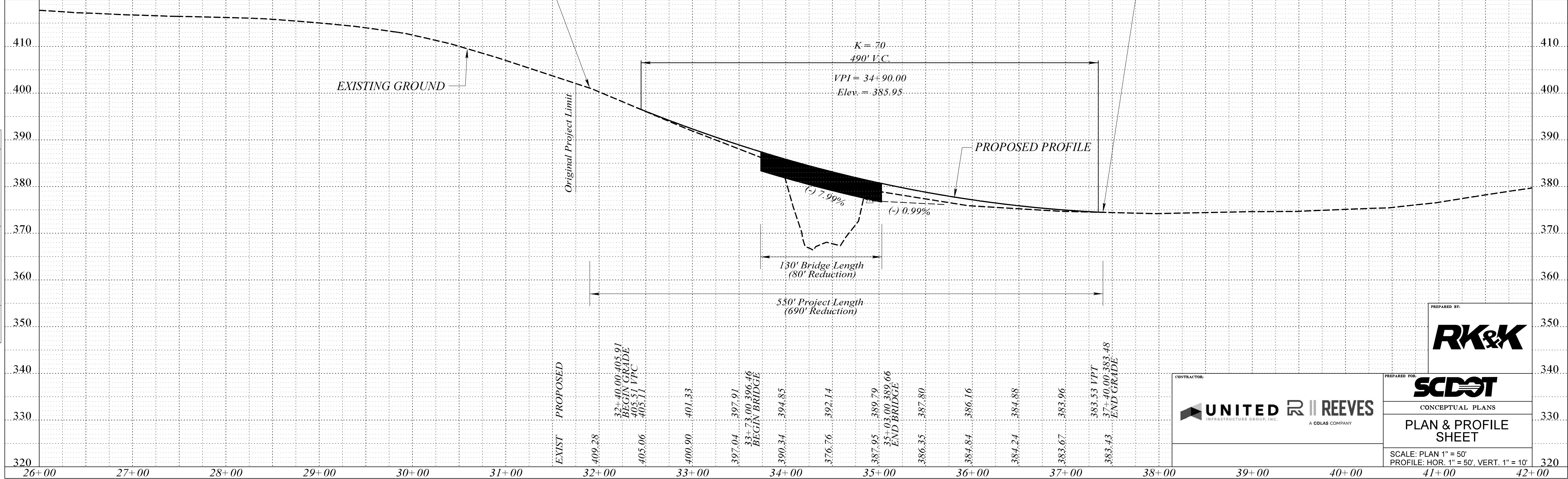
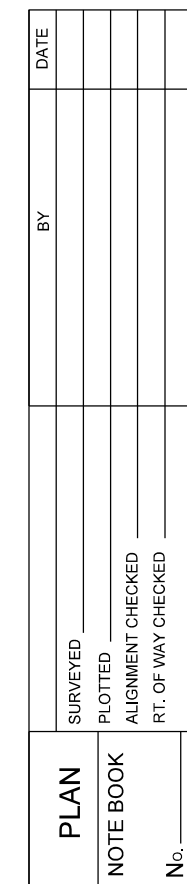
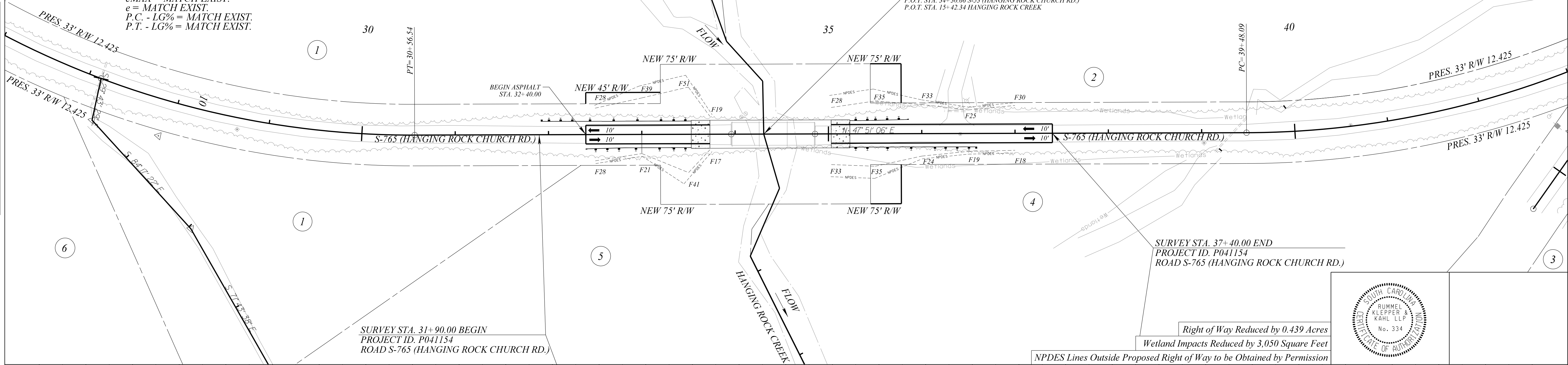
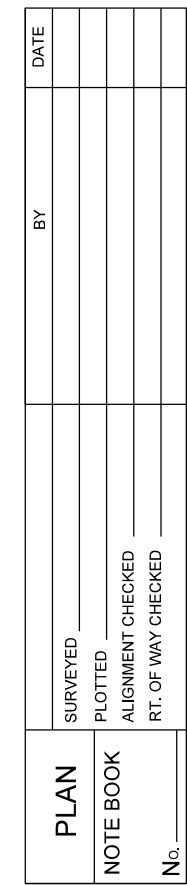
Appendix C: Roadway Profile

<i>GAS</i>	<i>LANCASTER COUNTY NATURAL GAS</i>	<i>QUINTON RODGERS</i>	<i>803-320-1623</i>
<i>PHONE</i>	<i>WINDSTREAM COMMUNICATION</i>	<i>TODD DAVIS</i>	<i>803-957-2651</i>

$P.I. = 42^{\circ} 94.52'$
 $\Delta = 39^{\circ} 52' 47''$ (LT)
 $D = 6^{\circ} 00' 00''$
 $T = 346.43'$
 $L = 664.66'$
 $E = 60.90'$
 $R = 954.93'$
 $D.S. = MATCH\ EXIST.$
 $eMAX = MATCH\ EXIST.$
 $e = MATCH\ EXIST.$
 $P.C. - LG\% = MATCH\ EXIST.$
 $P.T. - LG\% = MATCH\ EXIST.$

FED. ROAD DIV. NO.	STATE	COUNTY	PROJECT ID	ROUTE NO.	SHEET NO.
3	S.C.	LANCASTER	P041154	S-765	6

*HANGING ROCK CHURCH ROAD
BRIDGE No. 2*



\\ad.rkk.com\fs\Cloud\Mktg\Proposals\2022\SC\SCDOT\22-0104_CLRB DB Bridge Package 15 - Dist 1_2_4\Design\Roadway\15-765\141154pf.dgn
zwilson
12/19/2022

engpro.dgn



Technical Proposal



S-294 over Wilsons Creek



S-53 over Little Rocky Creek



S-108 over Brown Creek



S-765 over Hanging Rock Creek



5562 Pendergrass Boulevard
Great Falls, SC 29055



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