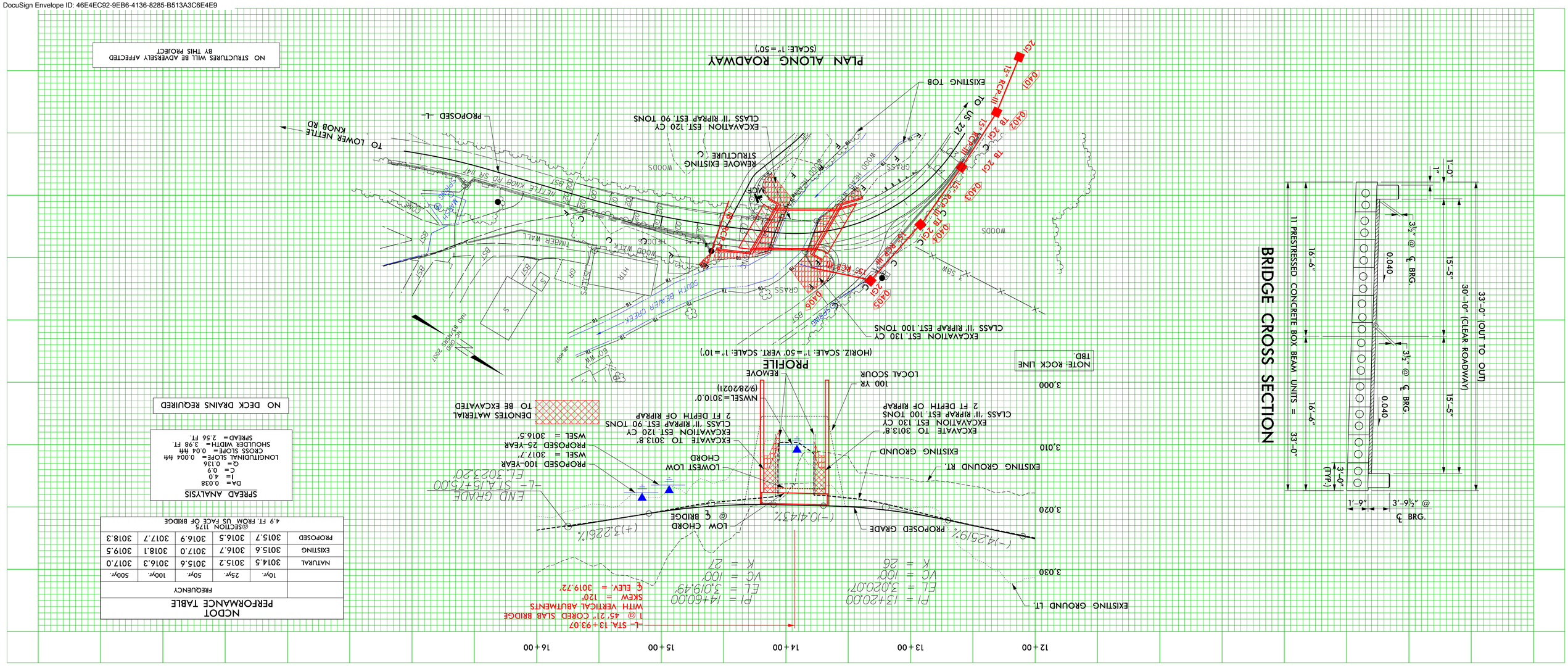
DocuSign Envelope ID: 46E4EC92-9EB6-4136-8285-B513A3C6E4E9



	10yr.	25yr.	50yr.	100yr.	500yr.
	FREQUENCY				
NATURAL	3014.5	3015.2	3015.6	3016.3	3017.0
EXISTING	3015.6	3016.7	3017.0	3018.1	3019.5
PROPOSED	3015.7	3016.5	3016.9	3017.7	3018.3

INFORMATION TO BE SHOWN ON PLANS

WS EL. Taken @ River Station 1175

Design:	Discharge	870	c.f.s.	Frequency	25 yr.	Elev.	3016.5 ft.
Base Flood:	Discharge	1300	c.f.s.	Frequency	100 yr.	Elev.	3017.7 ft.
Overtopping:	Discharge	2307	c.f.s.	Frequency	500+ yr.	Elev.	3020.4 ft.

OVERTOPPING OCCURS AT END OF GUARDRAIL AT RT ABUTMENT

ADDITIONAL INFORMATION AND COMPUTATIONS

RURAL BLUE RIDGE (REGION 2) DRAINAGE AREA = 2.96 SQ MI
SIR 2009–5158

$Q_{10} = 288\ (DA)^{0.736} = 641 => 640$

$Q_{25} = 398\ (DA)^{0.724} = 873 => 870$

$Q_{50} = 479\ (DA)^{0.718} = 1040 => 1000$

$Q_{100} = 575\ (DA)^{0.713} = 1250 => 1300$

$Q_{500} = 794\ (DA)^{0.704} = 1710 => 1700$

100–YR ABUTMENT SCOUR (NCHRP 24–20 EQUATION):

Q1 = 798.88

W1 = 27.31

q1 = Q1/W1 = 29.25

Q2 = 1300

W2 = 42.07

q2c = Q2/W2 = 30.90

Y1 = 6.50

Yc = Y1*(q2c/q1)^(6/7) = 6.1

q2/q1 = 1.06 => AlphaA = 1.58

Ymax = AlphaA*Yc = 10.76

Y0 = 6.55

Ys = Ymax – Y0 = 4.21

NOTE: SCOUR DEPTHS MAY BE LIMITED BY THE PRESENSE OF SHALLOW NON–ERODIBLE BEDROCK.

THIS PROJECT FOLLOWS SUB–REGIONAL TIER GUIDELINES.

SITE DATA

Drainage Area 2.96 SQ MI Source USGS STREAMSTATS (GLENDALE SPRINGS QUAD)

River Basin NEW Character RURAL

Stream Classification (Such as Trout, High Quality Water, etc.) C;Tr+

Data on Existing Structure 1 @ 30'–6"
TIMBER POST & CONC. SILLS Total Waterway Opening 149 s.f.
Waterway Opening Below 100yr. WS EL. 149 s.f.

Debris Potential: Low ____ Moderate X High ____

Data on Structures Up and Down Stream
UPSTREAM: 1@108" AND 1@48" CMP; NO HEADWALLS;
DOWNSTREAM: BRIDGE No. 040014 – 1 @ 54'–0" STEEL PLANKS ON STEEL I–BEAMS

Design Control Elev. 3018.1 ft. EXISTING 100YR @ RS 1175

Gage Station No. N/A Period of Records N/A yrs.

Max. Discharge N/A c.f.s. Date N/A Frequency N/A

Historical Flood Information:

Date	N/A	Elev. 3016.5 ft.	Est. Freq. 25 yr.	Source	JIM SHERRAL (RESIDENT)	Period of Knowledge	20 yrs.
Date	—	Elev. — ft.	Est. Freq. — yr.	Source	—	Period of Knowledge	— yrs.
Date	—	Elev. — ft.	Est. Freq. — yr.	Source	—	Period of Knowledge	— yrs.

Historical Scour Info. : General n/a ft. Contraction n/a ft. Local n/a ft.

Channel Slope 0.01137 ft/ft Source LIDAR Normal Water Surface Elev. 3010.0 ft.

Manning's n: Left O.B. 0.035–0.120 Channel 0.045 Right O.B. 0.035–0.120 Source NLCD 2016

Flood Study /Status NON–STUDIED (FIS DATE: 11/04/2009) Floodway Established? NO

Flood Study 100yr. Discharge N/A c.f.s. WS Elev.: With Floodway N/A ft. Without Floodway N/A ft. @ River Station ?

DESIGN DATA

Hydrological Method USGS STREAMSTATS (http://water.usgs.gov/ss/) – SIR 2009–5158

Hydraulic Design Method HEC–RAS V 6.1.0 (SF–040015 S BEAVER CREEK SR 1147)

Floods Evaluated:

@ River Station 1175	Freq. (yr.)	Q (c.f.s)	Elev. (ft.)	Backwater (ft.)	Bridge Opening Velocity (f.p.s.)
	10	640	3015.7	1.2	3.9
	25 (DESIGN)	870	3016.5	1.3	4.0
	50	1000	3016.9	1.3	4.7
	100	1300	3017.7	1.4	5.7
	OT	2307	3020.4	2.5	10.1

Waterway Opening Provided Below Design W.S. Elev. 201 s.f., 100yr W.S. Elev. 227 s.f., Total 227 s.f.,

Average Channel Velocity (Design) 4.5 f.p.s. Average Overbank Velocity (Design) 2.5 f.p.s.

Computed Scour : General — ft. Contraction — ft. Local Ys = 4.2 ft.

Is a Floodway Revision Required? N/A

BRIDGE SURVEY & HYDRAULIC DESIGN REPORT

N. C. DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
HYDRAULICS UNIT
RALEIGH, N. C.

I.D. No. SF–040015 Project No. 17BP.11.R.161 Proj. Station –L– 13+93.07

County ASHE Bridge Over SOUTH BEAVER CREEK Bridge Inv. No. 15

On Highway NETTLE KNOB RD (SR 1147) Between US 221 and LWR NETTLE KNOB RD (SR 1180)

Recommended Structure 1 SPAN @ 50'–0" CORED SLAB BRIDGE W/VERTICAL ABUTMENTS

Recommended Width of Roadway 30'–10" (CLEAR ROADWAY) Skew 120°

Recommended Location is (Up, At, Down) Stream from Existing Crossing. AT EXISTING

Latitude 36.35443 Longitude –81.46785

Statewide Tier ☐ Regional Tier ☐ Sub–Regional Tier ☒

Bench Mark is BM #1: CHISELED SQUARE ON ROCK OUTCROP –L– 14+17.51, 112.00' LT

Northing 956991 Easting 1273048 Elev. 3025.72 ft. Datum: NAVD88

Temporary Crossing N/A (OFF–SITE DETOUR)

Designed by: BRADLEY S. RIDNOUR, P.E.
Assisted by: NICK WARREN
Project Engineer : HARDY WILLIS. P.E.
Reviewed by:
Date 10/12/2021

NORTH CAROLINA PROFESSIONAL SEAL 033023 BRADLEY S. RIDNOUR

DocuSigned by: Bradley Ridnour 73D44D12DAB1E2... 12/7/2021

Vaughn & Melton Consulting Engineers

Stream SOUTH BEAVER CREEK Struc. Inv. No. 15 I.D. No. SF–040015 Project No. 17BP.11.R.161 PDF File 040015 2021 SF–040015 S BEAVER CREEK SR 1147.PDF