



SPREAD ANALYSIS
 I = 4.0 FT.
 DA = 0.07 AC
 C = 0.9
 Q = 0.25 CFS
 LONGITUDINAL SLOPE = 0.0138 H/H
 CROSS SLOPE = 0.02 H/H
 SHOULDER WIDTH = 4.3 FT.
 SPREAD = 3.9 FT.
 NO DECK DRAINS REQUIRED

PERFORMANCE TABLE
 FEMA SECTION 2006.3
 27.8 FT. FROM US FACE OF BRIDGE

REVISION	DATE	DESCRIPTION
REVISED	6/45/9	
CORRECTED EFFECTIVE	6/46/8	
DUPLICATE EFFECTIVE	6/46/8	
100yr.		

PERFORMANCE TABLE
 NCDOT SECTION 2006.3
 27.8 FT. FROM US FACE OF BRIDGE

FREQUENCY	10yr.	25yr.	50yr.	100yr.	500yr.
NATURAL	644.2	643.8	644.3	645.4	645.4
EXISTING	644.2	645.1	646.3	646.8	647.5
PROPOSED	643.1	643.8	644.4	645.9	646.6

BRIDGE OPENING
 EXISTING = 222 SF
 PROPOSED = 481 SF
 EXCAVATION = 350 CY
 THE CHANNEL IS STABLE AND
 THE BED MATERIAL IS
 COMPOSED OF SAND/SILT.

NO UPSTREAM OR DOWNSTREAM STRUCTURES THAT
 WERE IN PLACE AT THE TIME THAT THIS PROJECT
 WAS DESIGNED WILL BE ADVERSELY IMPACTED BY
 THE PROPOSED STRUCTURE.
 BEGIN DITCH RT
 STA. 13+00.00
 ELEV. = 646.6
 END DITCH RT
 STA. 13+50.00
 ELEV. = 644.6
 MILL TO EXIST
 PI = 15+20.00
 EL = 645.25
 VC = 340
 K = 131

INFORMATION TO BE SHOWN ON PLANS

WS EL. Taken @ River Station 20063

Design:	Discharge	1942	c.f.s.	Frequency	25	yr.	Elev.	643.8	ft.
Base Flood:	Discharge	2734	c.f.s.	Frequency	100	yr.	Elev.	645.9	ft.
Overtopping:	Discharge	3682	c.f.s.	Frequency	500 +/-	yr.	Elev.	646.6	ft.

*OT @ STA 14+84 @ SP ON RT

ADDITIONAL INFORMATION AND COMPUTATIONS

HYDROLOGY
 DRAINAGE AREA 7.5 QS. MI. - REGION I
 RURAL RIDGE and VALLEY-PIEDMONT
 SIR 2009-5158

Q	Q ₁₀	Q ₂₅	Q ₅₀	Q ₁₀₀	Q ₅₀₀
398 (7.5)	1380	1821	2214	2568	3470
1400 CFS	1474 CFS	1800 CFS	2200 CFS	2600 CFS	3500 CFS

FEMA DISCHARGES USED FOR DESIGN AND COMPLIANCE
 DESIGN FOLLOWS SUB-REGIONAL TIER GUIDELINES

FEMA DISCHARGES USED FOR DESIGN AND COMPLIANCE
 DESIGN FOLLOWS SUB-REGIONAL TIER GUIDELINES

CONTRACTION SCOUR:
 $Y_s = Y_1 [Q_1/Q_0]^{0.57} [W_1/W_0]$
 $Y_s = Y_2 - Y_0$

100 YR SCOUR CALCULATIONS

Q1 = 974 CFS (SEC 20256)	Q2 = 2495.2 CFS (SEC 20026 BR U)	K1 = 0.64
W1 = 25.0' (SEC 20256)	W2 = 25.2' (SEC 20026 BR U)	
Y1 = 9.2' (SEC 20256)	Y0 = 12.9' (SEC 20026 BR U)	
Ys = 20.5' - 12.9' = 7.6'		

SITE DATA

Drainage Area 7.5 SQ. MI. Source USGS QUAD: CLIMAX NE
 River Basin CAPE FEAR Character RURAL - REGION I
 Stream Classification (Such as Trout, High Quality Water, etc.) WS-IV: NSW
 Data on Existing Structure 1032'-6" REINFORCED CONCRETE DECK GIRDERS
 ABUTMENTS: REINFORCED CONCRETE FULL HEIGHT Total Waterway Opening 222 s.f.
 Waterway Opening Below 100yr. WS EL. 429 s.f.
 Debris Potential: Low Moderate X High
 Data on Structures Up and Down Stream US - 400272 - SR 3368 - 1067'-3.15/16' PCPS CONC.
 CORED SLAB EBTS: RC CAPON STEEL PILES DS - 400234 - SR 1005 - 1041'-5"
 STEEL PLANK DECK ON I-BEAMS ABUTMENTS: MASS CONCRETE
 Design Control Elev. MAINTAIN OR IMPROVE EXISTING LEVEL OF SERVICE
 Gage Station No. NONE Period of Records N/A yrs.
 Max. Discharge N/A c.f.s. Date N/A Frequency N/A

Historical Flood Information:
 TWICE BOTH OVER +/- 646.6 ft. Est. Freq. 500 +/-
 30 YEARS AGO ROAD NEVER OVERTOPPED LOCAL RESIDENT RAY COBLE Period of Knowledge 63 yrs.
 Date Elev. ft. Est. Freq. yr. Source LOCAL WARDEN DALE WARDEN Period of Knowledge 25 yrs.
 Date Elev. ft. Est. Freq. yr. Source LOCAL RESIDENT LOCAL RESIDENT Period of Knowledge yrs.

Historical Scour Info. : General N/A ft. Contraction N/A ft. Local N/A ft.
 Channel Slope 0.0036 f/ft Source USGS QUAD/FEMA Normal Water Surface Elev. 635.7 ft.
 Manning's n: Left O.B. 0.08-0.14 Channel 0.04 Right O.B. 0.035-0.14 Source FEMA/FIELD RECON
 Flood Study /Status REDELINATION Floodway Established? YES
 With Floodway 647.3 ft. Without Floodway 646.8 ft.
 Flood Study 100yr. Discharge 2736 c.f.s. WS Elev.: @ River Station 20063

DESIGN DATA

Hydrological Method FEMA DISCHARGES
 Hydraulic Design Method HEC-RAS 4.1.0

Floods Evaluated:	Freq. (yr.)	Q (c.f.s.)	Elev. (ft.)	Backwater (ft.)	Bridge Opening Velocity (f.p.s.)
@ River Station 20063	10	1474	643.1	0.7	4.1
	25	1942	643.8	0.7	4.7
	50	2359	644.4	0.6	5.2
	100	2736	645.9	1.6	5.4
	500	3690	646.6	1.2	7.3

Waterway Opening Provided Below Design W.S. Elev. 410 s.f., 100yr W.S. Elev. 488 s.f., Total 504 s.f.,
 Average Channel Velocity (Design) 6.7 f.p.s. Average Overbank Velocity (Design) 1.4 f.p.s.
 Computed Scour: General N/A ft. Contraction 7.6 ft. Local N/A ft.
 Is a Floodway Revision Required? NO. MQA TYPE 2b. (MAX. DEC. 0.9' @ RS. 20063)

REDELINED STUDY BRIDGE SURVEY & HYDRAULIC DESIGN REPORT

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

I.D. No. SF-400267... Project No. J7BP.7.R.J36... Proj. Station 17+05.00 -L-
 County GUILFORD... Bridge Over CLIMAX CREEK... Bridge Inv. No. 0267...
 On Highway (COBLE CHURCH RD.) Between SR 3381 (MONNETT RD.) and SR 3337 (AMICK RD.)
 Recommended Structure 1080' .33' BOX BEAM W/4'-0" CAPS
 Recommended Width of Roadway 30'-6" CLEAR ROADWAY... Skew 90°
 Recommended Location is (Up, At) Down Stream from Existing Crossing... AT EXISTING
 Latitude 35.96513 Longitude -79.65043

Statewide Tier Regional Tier Sub-Regional Tier
 Bench Mark is BMI - BENCH TIE IN 15' MAPLE 70' RT. OF -L- STA. 17+53
 Northing 806751 Easting 1807513 Elev. 641.83 ft. Datum: NAVD 88
 Temporary Crossing IS NOT REQUIRED - OFF SITE DETOUR



Designed by: vhb
 Assisted by: DGL M.S. RSS
 Project Engineer: REID B. ROBOL, PE
 Reviewed by: WJG 6/27/19
 Date 6/26/2019
 VHB Engineering NC, P.C. (C-3705)
 940 Main Campus Drive, Suite 500
 Raleigh, NC 27606
 SEAL 043870
 ENGINEER REID B. ROBOL
 6/26/2019