



NO DECK DRAINS REQUIRED
 SPREAD ANALYSIS
 DA = 0.07ac
 I = 4.0
 C = 0.9
 Q = 0.25ds
 LONGITUDINAL SLOPE = 0.02 FH
 CROSS SLOPE = 0.02 FH
 SHOULDER WIDTH = 5.42 FT.
 SPREAD = 5.1 FT.

PERFORMANCE TABLE
 FEMA
 100yr.
 563.8'
 CORRECTED EFFECTIVE
 561.7'
 REVISOR

PERFORMANCE TABLE
 NCDOT
 FREQUENCY
 500yr.
 560.9'
 NATURAL
 559.8'
 560.1'
 560.9'
 500yr.
 100yr.
 561.6'
 562.7'
 563.8'
 500yr.
 561.7'
 562.7'
 563.8'
 500yr.
 561.7'
 562.7'
 563.8'

INFORMATION TO BE SHOWN ON PLANS
 WS EL. Taken @ River Station 623

Design:	Discharge	4,100	c.f.s.	Frequency	25	yr.	Elev.	560.1	ft.
Base Flood:	Discharge	5,700	c.f.s.	Frequency	100	yr.	Elev.	561.5	ft.
Overtopping:	Discharge	8,300	c.f.s.	Frequency	500yr.+	yr.	Elev.	562.30*	ft.

*SAG@ +/-16+50-L-EL=562.30'

ADDITIONAL INFORMATION AND COMPUTATIONS

RURAL RIDGE and VALLEY-PIEDMONT SIR 2009-5158	FEMA DISCHARGES
$Q_{10} = 398 (28.5) = 3144cfs$ (3100cfs)	3070cfs
$Q_{25} = 537 (28.5) = 4089cfs$ (4100cfs)	4130cfs
$Q_{50} = 661 (28.5) = 4933cfs$ (4900cfs)	5050cfs
$Q_{100} = 776 (28.5) = 5676cfs$ (5700cfs)	6043cfs
$Q_{500} = 1,072 (28.5) = 7557cfs$ (7600cfs)	8800cfs

100yr. CONTRACTION SCOUR:
 $Y_s = Y_1(Q_1/Q_2)^{0.21} [W_1/W_2]$
 $Y_s = 10.39 [5222.12/2791.03]^{0.21} [88.68/78.0]$
 $Y_s = Y_2 - Y_0 = 8.5' = 19.42' - 10.88'$

100yr. LOCAL SCOUR (CSU EQUATION):
 $Y_s = 2.0(K_1)(K_2)(K_3)(a) (Y_1) (Fr_1)^{0.65} (Fr_2)^{0.35}$
 $Y_s = ? = 4.4'$

BED MATERIAL: SAND, EXPOSED BED ROCK

NOTE: NO UP STREAM OR DOWN STREAM STRUCTURES THAT WERE IN PLACE AT THE TIME THIS PROJECT WAS DESIGNED WILL BE ADVERSELY AFFECTED BY THE PROPOSED BRIDGE.

SITE DATA

Drainage Area 28.5 SQUARE MILES Source USGS STREAMSTATS
 River Basin ROANOKE Character RURAL; PREDOMINANTLY AGRICULTURAL OR FORESTED
 Stream Classification (Such as Trout, High Quality Water, etc.) CLASS C
 Data on Existing Structure 1@30'6", 3@30'0", 1@30'6" PRECAST PRESTRESSED CONCRETE CHANNELS ON CONCRETE CAPS AND TIMBER PILES
 Total Waterway Opening 1349.7 s.f.
 Waterway Opening Below 100yr. WS EL. 972.9 s.f.

Debris Potential: Low Moderate X High
 Data on Structures Up and Down Stream BRIDGE 97: 1@40'4", 1@46'1", 1@44'2", 1@40'4" TIMBER DECK ON PILES APPROX. 1.6 MILES DOWNSTREAM ON SR1925 (WORSHAM MILL ROAD); BRIDGE 79: 1@31'2", 1@40'1", 1@30'9" CORED SLAB ON PILES APPROX. 1.8 MILES UPSTREAM ON SR1931 (BURTON ROAD)

Design Control Elev. 561.88 ft. (CORRECTED EFFECTIVE 100yr. @ SECTION 623)

Gage Station No. NA Period of Records NA yrs.
 Max. Discharge NA c.f.s. Date NA Frequency NA

Historical Flood Information:
 TO BOTTOM OF BRG. BRG. MAINT. SUPER. Period of Knowledge 17+ yrs.
 Date 4/20/15 Elev. 362.0 ft. Est. Freq. 500-yr. Source W.K. HOWERTON
 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 NA ft. Contraction NA ft. Local NA ft.

Channel Slope 0.0034 f/ft Source HEC-RAS MODEL Normal Water Surface Elev. FIS AND FIELD SURVEYS
 Manning's n: Left O.B. 0.035-0.11 Channel 0.04-0.06 Right O.B. 0.035-0.11 Source FIS FEMA
 Flood Study/Status LIMITED DETAILED STUDY, 7/3/2007, REVISED 1/2/2009 Non-Encroachment Established? YES
 Flood Study 100yr. Discharge 6,043 c.f.s. WS Elev.: With Non-Encroachment 561.9 ft. Without Non-Encroachment 561.9 ft. @ River Station 62339

DESIGN DATA

Hydrological Method USGS RURAL REGRESSION EQUATIONS (SIR 2009-5158)
 Hydraulic Design Method HEC-RAS VERSION 4.1.0

Floods Evaluated:	Freq. (yr.)	Q (c.f.s.)	Elev. (ft.)	Backwater (ft.)	Bridge Opening Velocity (f.p.s.)
@ River Station 62339	10	3,200	559.1	0.6	4.2
	25	4,100	560.1	0.9	4.6
	100	5,700	561.5	1.3	5.3
	100 (FEMA)	6,043	561.7	NA	5.5
	500	7,600	563.1	2.2	5.6

Waterway Opening Provided Below Design W.S. Elev. 909.2 s.f., 100yr W.S. Elev. 1094.4 s.f., Total 1280.2 s.f.
 Average Channel Velocity (Design) 4.0 f.p.s. Average Overbank Velocity (Design) 1.1 f.p.s.
 Computed Scour: General NA ft. Contraction 4.4 ft. Local 4.0 ft.
 Is a Floodway Revision Required? MOA TYPE 2a

BRIDGE SURVEY & HYDRAULIC DESIGN REPORT
 N. C. DEPARTMENT OF TRANSPORTATION
 DIVISION OF HIGHWAYS
 HYDRAULICS UNIT
 RALEIGH, N. C.

I.D. No. B-4624 Project No. 38441.1.2 Proj. Station 22+31-L-
 County ROCKINGHAM Bridge Over WOLF ISLAND CREEK Bridge Inv. No. 0080
 On Highway SR 1929 (ESTES ROAD) Between SR 2024 and US-29
 Recommended Structure 1@45', 1@70', 1@45', 24-INCH PRESTRESSED CONCRETE CORED SLAB ON 4-FOOT BENT CAPS
 Recommended Width of Roadway 33'0" OUT TO OUT; 30'10" CLEAR ROADWAY Skew 90 DEGREES
 Recommended Location is (Up, At, Down) Stream from Existing Crossing. AT THE EXISTING CROSSING.
 Longitude -079.5764670° Latitude 36.4427597°
 Statewide Tier Regional Tier Sub-Regional Tier
 Bench Mark is (BM#1) RAILROAD SPIKE SET IN BASE OF 27" GUM TREE; 85' LT. STA. 23+57-L-
 Elev. 558.50 ft. Datum: NAVD 88
 Temporary Crossing NOT REQUIRED; OFFSITE DETOUR PROVIDED



Designed by: M. KELLY
 Assisted by: E. HAHN, PE
 Project Engineer: W.H. ELAM, Jr., PE
 Reviewed by: [Signature] 7/1/2016

Date JUNE, 2016
 REVISION 03/23/2017
 ROUNDED ELEVATIONS
 ADDED LONGITUDE AND
 LATITUDE

Seal: NORTH CAROLINA PROFESSIONAL SEAL 019721 ENGINEER W. H. ELAM