

Bridge Survey & Hydraulic Design Report Key

- 1 **State Proj. Reference No.** - Specify ID No. Example: B-4494 (for TIP projects) BD-5112k (For Low Impact bridge project), SF-890095 (State funded bridge projects), FA-770077(Division Force Account projects).
- 2 **WBS Project No.** - Specify Project WBS Number.
- 3 **Proj. Station** - Specify centerline bridge station to the nearest foot along survey line (typically -L- or -y- line).
- 4 **County** - Specify County Name
- 5 **Bridge Over** - Specify name of stream or body of water
- 6 **Bridge Inv. No.** - Specify six digit bridge number, e.g., 500050.
- 7 **On Highway** - Specify Route number bridge is located on and for SR routes specify road name if there is one. (e.g., NC 211, SR 1742 (N. McMullen Rd).
- 8 **Between_____ and _____** - Specify Route bridge is located between. For SR routes specify road name if there is one. (e.g., **Between NC 211 and SR 1742 (N. McMullen Rd)**
- 9 **Recommended Structure** - Specify number of spans and length, type of structure, overall length, and depth of cap. (e.g., 1@40', 1@55' 21" cored slab, w/4.0' deep caps). Note: Overall length no longer specified, so as not to be confused with length specified by Structures Management Unit in plans.
- 10 **Recommended Width of Roadway** - Specify clear roadway width on the bridge (e.g., 27'-10" clear roadway). Note: "Out to out" width no longer need be specified.
- 11 **Skew** - Specify skew of bridge (angle based on line ahead to the right).
- 12 **Recommended Location is** - circle either Up, At, or Down based on location relative to existing bridge and specify location of proposed bridge in relation to existing bridge, e.g., 50 ft. downstream, At Existing, New Location.
- 13 **Longitude/Latitude Coordinates:** Specify as decimal degrees (preferably to the 5th decimal place), e.g. -79.74686, 36.01297. This is useful for locating on GIS maps.
- 14 Specify Statewide, Regional, or Sub-Regional Tier based on transportation facility.
- 15 **Bench Mark** - Specify Bench mark description, should be located outside of the construction limits. Can use L&S Bench marks, preferably referenced to -L- or -Y- line (rather than to -BL- line).
- 16 Specify the Northing and Easting State Plane coordinates of the benchmark.
- 17 **Elev.** - Specify bench mark elevation.
- 18 **Datum** - Specify Vertical Datum used for this project, e.g., NAVD 88, NGVD 29.

- 19 **Temporary Crossing** - Specify whether or not a temporary crossing is required at the project site. e.g., Not Required, Off-Site detour provided, or Required 60' detour bridge downstream of existing bridge.
- 20 **Photo** - Place picture of existing upstream bridge face looking downstream (if no existing bridge use photo of proposed bridge location looking downstream). Include directional arrows for the road alignment and stream flow. See Photo below. If not practicable to provide photo, explain.



- 21 **Designed by** - Specify Design Engineer.
- 22 **Assisted by** - Specify any person who assisted.
- 23 **P.E. Seal** - of responsible NC-licensed Design or Project Engineer
- 24 **Date**- Date project is sealed
- 25 **Company Logo/Name**
- 26 **QA Review by** – The QA reviewer will sign.
- 27 **Date** – Date QA review signed
- 28 **Drainage Area** - Specify Drainage Area at stream crossing. Specify in Square miles if area is 1.0 Square miles or greater. Specify in Acres if less than 1 square mile.
- 29 **Source** - Specify Source of Drainage Area. Typically from USGS Quad Maps or Stream Stats. Can also come from, LIDAR data, drainage areas of Selected Sites verified with Quad Maps, or FEMA FIS. Drainage areas should always be verified for accuracy.
- 30 **River Basin** - Specify River Basin
- 31 **Character** - Specify the character of the drainage area, e.g., Region 3-Sand Hills, rural, urban, etc.

- 32 **Stream Classification** - Specify any classifications listed on the DWQ website or in the NRTR, e.g., B, WS-II, NSW
- 33 **Data on Existing Structure** - Specify the number of spans and length, overall length, type of structure, and pile type.
- 34 **Total Waterway Opening** - Specify total square foot of waterway opening between the low chord of the existing bridge and the stream bed.
- 35 **Waterway Opening below 100yr WSEL** - Specify total square foot of waterway opening between 100yr WSEL and stream bed.
- 36 **Debris Potential** - Specify possible debris severity based on Bridge Inspectors rating of item 41 on the Bridge Inspection Record and Summary and observations made in the field such as large trees leaning on banks, debris build up on the bents, or foliage in existing bridge joists.
- 37 **Data on Structures Up and Down Stream** - Specify distance up or down stream from proposed structure if relatively close (within 1000') otherwise list location by feature carried (eg. SR 1005), type of structure, number of spans, substructure information, and overall length if bridge; if culvert, number of barrels, size, and type. Include 6-digit bridge number, if in NCDOT inventory.
- 38 **Design Control Elev.** - Specify the design control elevation based on Chapter 8 in *Guidelines* concerning backwater, freeboard, FEMA compliance, etc. Provide justification.
- 39 **Gage Station No.** - If available, report nearest gage station I.D. number.
- 40 **Period of Records** - Specify the stream gage periods of activity and total number of active years. (e.g., May 1974 to May 1981, 7 yrs.)
- 41 **Max. Discharge** - Specify the maximum discharge recorded by the stream gage.
- 42 **Date** - Specify the date of the maximum discharge recorded by the stream gage.
- 43 **Frequency** - Specify the frequency of the storm event for maximum discharge recorded by the stream gage.
- Historical Flood Information** - Record any the flood or overtopping events obtained from local residents, county maintenance or bridge inspectors, or other local individuals familiar with area. Also previous Bridge Inspection Reports, past Bridge Survey and Hydraulic Design Reports, or local news sources can be utilized to determine any flood or overtopping events. Record as much information as is available.
- 44 **Date** - Specify date of the flood event.
- 45 **Elev.** - Specify estimated WSEL of the flood event.
- 46 **Est. Freq.** - Specify the estimated storm event frequency of the flood event.
- 47 **Source-** Specify individual or source of flood event information.
- 48 **Period of Knowledge-** If information is from an individual, specify the total number of years the source has been acquainted with the bridge location.

- Historical Scour Info-** Historical scour information can be obtained from the Field Inspection section of the Bridge inspection Report or, if available, the Bridge Scour Report. Examining historical stream bed soundings can also be used to discover any scour trends.
- 49 **General** - Specify any general scour reported for the existing bridge.
- 50 **Contraction** - Specify any contraction scour reported for the existing bridge.
- 51 **Local** - Specify any local scour reported for the existing bridge.
- 52 **Channel Slope** - Specify the slope of the channel. The slope can be measured from, but not limited to, USGS Quad maps, LiDAR, FEMA Detailed Flood study models, or field surveys.
- 53 **Source** - Specify source of channel slope.
- 54 **Normal Water Surface Elev.** - Specify the Normal WSEL (vegetation line) observed during the field inspection. If unavailable report WSEL during day of survey.
- 55 **Manning's n: Left** -Specify Manning's 'n' for the left overbank.
- 56 **Channel** - Specify Manning's 'n' for the channel.
- 57 **Right** - Specify Manning's 'n' for the right overbank.
- 58 **Source** - Specify source of Manning's 'n' value. (e.g., Flood Insurance Study or Field Observation)
- 59 **Flood Study** - Specify the type of Flood Insurance Study (FIS) the bridge crossing is within (e.g., Detailed, Limited). State 'Not in Flood Study' if bridge crossing is not within a study.
- 60 **WSEL with Floodway (or Non-Encroachment)** - Specify the FIS published Base Flood Elev. (100yr).
- 61 **WSEL without Floodway (or Non-Encroachment)** - Specify the FIS published Floodway Elevation
- 62 **Flood Study 100yr Discharge** - Specify the FIS published 100yr discharge
- 63 **@ River Station** - Specify the river station upstream of the bridge used to obtain 'With Floodway / With Non-Encroachment' and 'Without Floodway / Without Non-Encroachment' elevations.
- 64 **Hydrological Method** - Specify the Hydrological Region and method used for the hydraulic design of the bridge, e.g., FEMA Discharges, USGS SIR 2014-5030.
- 65 **Hydraulic Design Method** - Specify the Hydraulic Design method used for design of the bridge, e.g. HEC-RAS 4.1.0.
- 66 **@ River Station?** - Specify the river station at the upstream face used to obtain the hydraulic design and specify the distance in feet the river station is from the Face of the Bridge
- 67 **Freq.** - Specify the flood frequency.
- 68 **Q** - Specify the flood discharge.
- 69 **Elev.** - Specify the event's WSEL (to nearest tenth of a foot for all reported).

- 70 **Backwater** - Specify the increase in the WSEL caused by the highway encroachment relative to the normal computed WSEL under non-encroached conditions, round to the tenth. (e.g., Proposed WSEL minus Natural WSEL at upstream River Station)
- 71 **Bridge Opening Velocity** - Specify the bridge opening velocity at the upstream face, round to the tenth (ft/sec).
- 72 **Waterway Opening Provided Below Design W.S. Elev.** - Specify total square foot of waterway opening between Design WSEL and stream bed.
- 73 **Waterway Opening Provided Below 100yr W.S. Elev.** - Specify total square foot of waterway opening between 100yr WSEL and stream bed.
- 74 **Waterway Opening Provided Below Total** - Specify total square foot of waterway opening between the low chord of the proposed bridge and the stream bed.
- 75 **Average Overbank Velocity (Design)** - Specify the average upstream overbank velocity for the design frequency.
- 76 **Average Channel Velocity (Design)** - Specify the average upstream channel velocity for the design frequency.
- 77 **Computed Scour: General** - Specify the calculated long term degradation scour for the 100yr storm event and any additional required frequencies (per NCDOT Drainage Studies and Hydraulics Guidelines).
- 78 **Computed Scour: Contraction** - Specify the calculated contraction scour for the 100yr storm event and any additional required frequencies (per NCDOT Drainage Studies and Hydraulics Guidelines).
- 79 **Computed Scour: Local** - Specify the calculated local scour for the 100yr storm event and any additional required frequencies (per NCDOT Drainage Studies and Hydraulics Guidelines).
- 80 **State Floodway Compliance Type** – Specify the SFC type (A, B, or C) or N/A
- 81 **Design Discharge** - Specify discharge for the design frequency.
- 82 **Frequency of Design Flood** - Specify the design frequency.
- 83 **Design High Water Elev.** - Specify the WSEL for the design frequency, round to tenth ft.
- 84 **Drainage Area** - Specify Drainage Area at stream crossing. Specify in Square miles if area is 1.0 Square miles or greater. Specify in Acres if less than 1 square mile. (Should match Item 28)
- 85 **Basic Flood Discharge** - Specify the discharge for the base flood (100yr event).
- 86 **Basic High Water Elev.** - Specify the WSEL for the base flood (100yr event), round to tenth ft.
- 87 **Overtopping Discharge** - Specify the discharge for the overtopping event.
- 88 **Frequency of Overtopping Flood** - Specify the overtopping frequency.
- 89 **Overtopping Flood Elev.** - Specify the WSEL for the overtopping event, round to tenth ft
- 90 **Note Location of Overtopping** - Specify the roadway overtopping location, e.g., left shoulder at STA. 15+69 -L- .

- 91 **WS EL. Taken @ River Station** - Specify the river station upstream of the bridge used to obtain the Hydraulic design quantities for the various discharges and WSELS.
- 92 **Discharge Equations used for Hydrological Method and FEMA Discharges** - Specify the method and equations used to calculate the various frequency discharges. Specify discharges used in the FIS.
- 93 **Scour Analysis** - Specify the equations used to calculate the scour for the 100yr storm event and any additional required frequencies. (reported on items 77, 78, 79) Include River Station from which parameters obtained.
- 94 **Additional Information and Computations** - Specify any additional information (e.g., TVA compliance, Datum adjustments) or other pertinent information related to the H&H design.
- 95 **NCDOT Performance Table** – Provide the WSEL to nearest tenth of a foot for each plan and frequency. Also, specify the station at the upstream face used to obtain the WSELS and specify the distance in feet the river station is from the Face of the Bridge
- 96 **FEMA Performance Table** – Provide the 100 yr. WSEL to nearest hundredths of a foot for each plan. Also, specify the station at the upstream face used to obtain the WSELS and specify the distance in feet the river station is from the Face of the Bridge