PDN Stage 2HY2 – Hydraulics QA Checklist

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| **SPOT ID/Project TIP #:** | Click or tap to edit. |
| **County:** | Click or tap to edit. |

2HY2: Drainage Design for Field Inspection

Deliverable: Hydraulic Survey Report(s) for Major Structure(s)

| **Item #** | **Review Item** | **Acceptable** | **Unacceptable** | **N/A** |
| --- | --- | --- | --- | --- |
|  | **Structure Design - General** |  |  |  |
|  | Current version of [Guidelines for Drainage Studies and Hydraulic Design](https://connect.ncdot.gov/resources/hydro/Pages/DrainageStudiesGuidelines.aspx) (Guidelines) used to complete drainage design |  |  |  |
|  | QC procedures have been followed and are complete |  |  |  |
|  | Hydraulic design of structure conforms to agreed design assumptions and direction from Hydraulics Pre-Design Meeting |  |  |  |
|  | Hydraulic design of structure meets or exceeds existing performance and provides an acceptable level of service that meets the Guidelines and/or approved LOS design exceptions. |  |  |  |
|  | For Merger projects, the proposed design satisfies CP2A commitments and adequately addresses comments from CP4B |  |  |  |
|  | NCDOT Pipe Material Selection Guide has been followed appropriately |  |  |  |
|  | Division has been consulted on any potential problematic construction or maintenance issues. |  |  |  |
|  | Drainage design exceptions have been documented and approved by the State Hydraulics Engineer. |  |  |  |
|  | Where drainage design deviates from Hydraulics Unit guidelines, policies, or procedures, documentation is provided to justify the final design and show coordination with appropriate NCDOT staff. |  |  |  |
|  | Computational results appear reasonable, based on engineering judgement |  |  |  |
|  | Existing drainage problems are adequately documented, and drainage design provides adequate remedy for any that may be the responsibility of NCDOT or present future liability issues. |  |  |  |
| **2** | **Bridge Survey Reports** |  |  |  |
| 2.1 | Pier and abutment locations, spacing, and orientation are designed to minimize flow disruption, debris collection and scour potential |  |  |  |
| 2.2 | Bridge meets minimum length requirements |  |  |  |
| 2.3 | Spread on bridge meets Chapter 10 Guidelines |  |  |  |
| 2.4 | Peak discharge design frequency criteria met |  |  |  |
| 2.5 | Scour calculations use appropriate method and abutment scour is evaluated for all vertical abutment bridges or spill-through abutment bridges that have less than the minimum 10-foot setback from any point on the channel bank or bed. |  |  |  |
| 2.6 | Theoretical scour drafting is plotted correctly in elevation, side slope, and lateral extent. Potential channel/thalweg migration is appropriately incorporated. |  |  |  |
| 2.7 | Bridge end bent placement is acceptable relative to theoretical scour envelope. |  |  |  |
| 2.8 | Spill-through abutments are proposed at an appropriate slope. |  |  |  |
| 2.9 | Vertical abutments have appropriate justification, documentation, and approval. |  |  |  |
| 2.10 | Level of service, overtopping, and freeboard requirements are met. |  |  |  |
| 2.11 | Abutment protection is appropriate. |  |  |  |
| 2.12 | Bridge design does not cause adverse impact on property or buildings up or downstream. |  |  |  |
| **3** | **Culvert Survey Reports** |  |  |  |
| 3.1 | The construction phasing plan appears reasonable for installation and has been coordinated with the appropriate disciplines. |  |  |  |
| 3.2 | Culvert alignment, slope, burial etc. conform to avoidance and minimization criteria in Chapter 9 of the Guidelines or variance is acceptable. |  |  |  |
| 3.3 | Proposed culvert dimensions are appropriate for site, considering existing channel geometry and floodplain |  |  |  |
| 3.4 | Proposed culvert size reasonably maintains low flow depths and velocities |  |  |  |
| 3.5 | Peak discharge design frequency criteria met |  |  |  |
| 3.6 | Level of service, overtopping, and freeboard requirements are met |  |  |  |
| 3.7 | Adequate cover is provided |  |  |  |
| 3.8 | Outlet protection is appropriate |  |  |  |
| 3.9 | Culvert design does not cause adverse impact on property or buildings up or downstream |  |  |  |
| **4** | **Detour Survey Reports** |  |  |  |
| 4.1 | Peak discharge design frequency criteria met |  |  |  |
| 4.2 | Detour grade and structure size are appropriate based on evaluation of acceptable level of risk |  |  |  |
| **5** | **HEC-RAS Models** |  |  |  |
| 5.1 | HEC-RAS modeling conforms to guidance on [Hydraulics Highway Floodplain Program Connect page](https://connect.ncdot.gov/resources/hydro/Pages/FEMA-Interagency-Design.aspx) and the Guidelines where appropriate |  |  |  |
| **6** | **FEMA Compliance** |  |  |  |
| 6.1 | Design conforms to FEMA floodplain regulations where applicable |  |  |  |
| 6.2 | State Floodplain Compliance (SFC) or CLOMR is planned where appropriate |  |  |  |
| 6.3 | Design does not increase base flood elevation at any existing structure (building), or existing structure with base flood elevation increase has been coordinated with Project Manager and Hydraulics Unit |  |  |  |
| 6.4 | Evaluation of cost and practicality of avoidance has been made for any existing structure (building) with an increase in base flood elevation |  |  |  |
| 6.5 | Detour structures intended to stay in place longer than 1 year, have been reviewed and coordinated with NCFMP. |  |  |  |

*For items marked* ***Unacceptable****, provide comments or action items in the table below.*

| **Item #** | **Comments and Action Items** |
| --- | --- |
| Click to edit. | Click to edit. |

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| **This checklist may not be comprehensive to every project. All items may not be applicable for smaller projects. It is the responsibility of the reviewer to ensure that all necessary information has been provided and an adequate review performed.** | | | |
| **QA Reviewer Name:** | | Click to edit. | **Date:** | Click to edit. | |
| **QA Reviewer (Signature):** | |  |  |  | |