



STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION

ROY COOPER
GOVERNOR

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SECRETARY

November 30, 2022

MEMORANDUM TO: David Hering, L.G., P.E.
Assistant State Geotechnical Engineer

Eric Williams, P.E.
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Matt Alexander, P.E.
Assistant State Geotechnical Engineer

FROM: John Pilipchuk, P.E.
State Geotechnical Engineer

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John Pilipchuk
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SUBJECT: Design Scour Elevation - Revised Policy

This revised policy replaces the original Design Scour Elevation (DSE) Memorandum that was issued in 2006.

The original policy to determine a DSE was reviewed and agreed upon by members of FHWA, Hydraulics Unit and Structure Design Unit. The procedure has been revised to eliminate the term Geotechnically Adjusted Scour Elevation, treat replacement structures for State Routes differently than NC, US, and Interstate routes, and to document current workflow. This procedure involves documenting the DSE agreed on by the Geotechnical Engineering Unit (GEU) and Hydraulics Unit, because in many cases the calculated theoretical scour elevations are conservative since they do not incorporate site characterization from the subsurface investigation. For this procedure, the Hydraulics Design Engineering Supervisor will normally approve the DSE for the Hydraulics Unit, the Regional Geological Engineer will normally approve the DSE for the GEU and the DSE will be reported to Structure Design with a memorandum. In addition, I should be notified when the DSE is excessive or impacts the end bents or when the Hydraulics Design Engineering Supervisor and the Regional Geological Engineer cannot reach an agreement on the DSE.

Procedure for determining DSE

1. Calculate a DSE per section 5.1.3.4 of the Geotechnical Investigations and Recommendations Manual for each bent and compare to the criteria detailed in bullets 2 through 5 below:
 - a. For replacement structures on State Routes identify the depth of alluvium and determine the Historical Scour Elevation (HSE). If the calculated DSE is more

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- than 5 feet below the HSE and the opening of the bridge is the same or larger than existing, or an overflow structure is added, then use 5 feet below the HSE for the DSE.
- b. For replacement bridge projects on NC, US, or Interstate routes, or for all new structures, use the calculated DSE.
 - c. For all routes, if the proposed bridge opening is smaller than the existing structure, use the calculated DSE.
2. If the DSE is within 5 feet of the theoretical scour elevations calculated by the Hydraulics Unit and the theoretical scour does not impact the end bents, report the DSE to Structure Design with a memorandum from only the Regional Geological Engineer.
 3. If the DSE is within 5 feet of the theoretical scour elevations and the theoretical scour does impact the end bents, notify the Hydraulics Unit and the State Geotechnical Engineer before proceeding further. The Hydraulics Unit will need to coordinate with the Project Manager to determine if any mitigation measures are needed to resolve the impacts to the end bents.
 4. If the DSE is not within 5 feet of the theoretical scour elevations, discuss the flood history of the existing structure or region, bridge inspection records of the existing structure or nearby structures, floods of record, debris potential and any other relevant information with the Hydraulics Design Engineering Supervisor to reach a consensus on a DSE. If the agreed upon DSE does not impact the end bents, report the DSE to the Structures Management Unit with a memorandum from the Regional Geological Engineer and state that the Hydraulics Design Engineering Supervisor concurs.
 5. If an agreement on the DSE cannot be reached or the agreed upon DSE impacts the end bents, notify the State Geotechnical Engineer before proceeding further or changing the original span arrangement proposed by the Hydraulics Unit. If the State Geotechnical Engineer and the State Hydraulics Engineer reach a consensus on a DSE, the DSE will be reported to the Structures Management Unit with a memorandum from both unit heads.
 6. After the DSE memo is received by the Hydraulics Unit the Bridge Survey & Hydraulic Design Report (BSR) shall be re-issued with the DSE and rock line (if rock is encountered) plotted.

A flowchart is attached that summarizes this procedure. With this procedure, a DSE will be determined, recorded, and reported to the Structures Management Unit for every bridge. The DSE should be reported as soon as possible after the necessary subsurface information is collected and before the foundation design begins. In addition, design the foundations based on the DSE and do not change the DSE without revised documentation.

I appreciate your cooperation with this revised process. Let me know if you have any questions.

cc: Matt Clarke, P.E., Director of Technical Services
Stephen Morgan, P.E., State Hydraulics Engineer
Brian Hanks, P.E., State Structures Engineer

Attachment: DSE Flowchart

Design Scour Elevation Process

