Sample Scour Report

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Agenda

- **Scour Reminders**
- **Sample Scour Report**

Basic Scour Reminders

- Still required for bridge rehabs
- Call Hydraulics to look for previous scour calculations
- Use Q_{100} only for bridge rehabs
- If overtopping present, use flow rate just prior to road overflow

Sample Scour Report

- Ease reporting for consultants
- Speed reviews for Hydraulics staff
- Available on Editable Documents webpage

Sample Scour Report

- **Six Main Sections**
  - Cover page
  - Introduction/Project Summary
  - Hydrology
  - Modeling discussion
  - Scour conclusions/countermeasures
  - Appendices with supporting data

Cover Page

- **Basic Project Information**
  - Route
  - Reference Post
  - County
  - Stream name
  - Des number
  - Signed & sealed

Location Map

- Location Map should be early in report
- Cover page is acceptable location for map, if desired
- Helps reviewer get their bearings

Introduction

- General details about the bridge
- Discussion about location
- Other scour related issues

Project Summary

- General discussion of project
- Include permit requirements

Project Summary

- Very similar to Introduction
- Can be combined into one discussion if desired
- Goal is to help the reviewer become familiar with the project

Hydrologic Data

- Discussion of calculations, particularly if multiple methods are used.
- Continue to follow guidance in Design Manual Figure 202-3A

Hydraulic Analysis & Modeling

- Provide source of data (i.e. existing plans, FIS, LiDAR)
- Discuss design decisions, such as the approach cross section

Scour Conclusions

- Scour Critical if low scour elevation is below foundation
- Scour Critical if low scour elevation is within 10 ft of pile tip

Scour Conclusions

- Not scour critical if low structure is above foundation
- Not scour critical if founded on competent rock
- If not scour critical, but piling is exposed, structural or geotechnical analysis may be needed

Scour Countermeasures

- State required countermeasures if scour critical
- Based on Design Manual and Standard Specs
- If sufficient countermeasures are in place, no further countermeasures are needed

Scour Countermeasures

- If structure is not scour critical, recommend no further countermeasures
- Still provide a countermeasure design, in case of future stream changes

Scour Data Requirements

- **Summary Table:**
  - Drainage Area
  - Q_{100} – from hydrology study
  - Q_{100} Water Surface Elevation
  - Q_{100} Maximum Velocity
  - Flowline Elevation

Scour Data Requirements

- **Summary Table:**
  - Q_{100} Contraction Scour Depth
  - Q_{100} Total Scour Depth
  - Q_{100} Low Scour Elevation
  - Foundation Elevations – optional. Can include in Scour Conclusions instead.

Scour Data Requirements

- **Q_{100} Water Surface Elevation**
  - Taken from downstream bridge face
  - Do not need a natural/unconstricted model
- **Q_{100} Maximum Velocity**
  - From HEC-RAS velocity distribution at bridge
  - Highest value from either upstream or downstream
  - Need 20+ data points across channel
  - Used to determine countermeasure size

Scour Data Requirements

- **Q_{100} Total Scour Depth**
  - Summation of Contraction and Pier scour
  - Ignore Abutment scour
- **Q_{100} Low Scour Elevation**
  - Subtract total scour depth from flowline elevation

Appendix A – General Info

- **Pictures of bridge & site**
- **Existing Bridge Plans**
- **Include Layout Sheet and General Plan to verify data**
  - Waterway Opening
  - Pile tip/footing elevations
  - Pier Width
  - Soil borings (if available)

Appendix B – Hydrologic Data

- **Calculations placed here**
- **Follow Design Manual Figure 202-3A for methodology preferences**

Appendix B – Hydrologic Data

- **For ease of review, suggested calculation order**
  - Drainage Area delineation
  - Curve Number calculations
  - Time of Concentration Calculations
  - TR-20 or HEC-HMS input & output

Appendix B – Hydrologic Data

- **Supplemental Support Information**
  - StreamStats maps & output
  - Purdue Regression Equations & supporting output
  - Historic flooding information

Appendix C – Modeling Calcs

- **Cross Section Map**
  - Location & extent of cross sections
  - Cross section labels should match HEC-RAS model
  - Include topographic contours
  - Show ineffective flow lines

Appendix C – Modeling Calcs

- **Starting Water Surface Elevation calculations**
- **Various methods are acceptable**

Appendix C – Modeling Calcs

- **Known water surface elevation:**
  - Clearly document source & include flood profile from FIS
  - Not based on the backwater from a receiving stream.
- **Slope-conveyance method:**
  - Include mapping or profile used to compute slope
  - Include slope computations based on the mapping

Appendix C – Modeling Calcs

- **Slope-conveyance method calculations:**
  - Use USGS topo map and find slope based on 20 ft of fall through the bridge
  - One contour line upstream of bridge to two contour lines downstream
  - Use more detailed mapping – LiDAR from Indiana Spatial Data Portal, county or other local GIS websites
  - Provide profile used for calculation

Appendix C – Modeling Calcs

- **Slope-conveyance method calculations:**
  - Don't use stream profile plot from existing plans
  - Usually distance is too short and local to the bridge
  - A more average slope is needed.

Appendix C – Modeling Calcs

- **Existing condition HEC-RAS outputs**
  - All HEC-RAS data files should be included in the model
  - Plots of cross sections, and profiles not required in the report.

Appendix C – Modeling Calcs

- **HEC- RAS scour outputs:**
  - Include full scour report
  - Highlight approach cross section, pier width, maximum velocity, & scour depths
  - Include plot of the bridge opening with the computed scour depths
  - Include low scour elevation calculation

Summary

- **Use Q100 for bridge rehabilitations**
- **Modify flow rate for road overtopping**
- **Summary report available on INDOT website, with other editable documents**
- **Document goes into more detail**