

# Hydraulic Report

A hydraulic simulation was constructed using the HEC-RAS program. The following flow data was used. The flows were provided by the MaineDOT, and were obtained by using the USGS simplified regression equations for ungaged, unregulated streams in rural drainage basins in Maine.

|                              |             |
|------------------------------|-------------|
| Drainage Area                | 17.96 sq mi |
| Design Discharge (Q50)       | 942 CFS     |
| Check Discharge (Q100)       | 1079.1 CFS  |
| Scour Check Discharge (Q500) | 1408.7 CFS  |
| Ordinary High Water (Q1.1)   | 183.3 CFS   |

A second simulation was run with a 9 inch obstruction along the bottom of the stream bed at the bridge. This was done to represent a concrete cable-mat installed to protect from scour. The following table shows the stream elevations and velocities that were obtained from the two simulations. The water flow is subcritical, which will cause a depression of the water surface elevation over a bump. This is seen by the drop in headwater elevation from the existing structure to the recommended rehabilitated structure.

|                            | Existing Structure | Recommended Rehab Structure |
|----------------------------|--------------------|-----------------------------|
| Headwater El. @ Q50        | 295.5 ft           | 295.49 ft                   |
| Headwater El. @ Q100       | 295.81 ft          | 295.79 ft                   |
| Discharge Velocity @ Q50   | 5.5 ft/s           | 6.37 ft/s                   |
| Discharge Velocity @ Q100  | 6.02 ft/s          | 6.96 ft/s                   |
| Ordinary High Water (Q1.1) | 292.88 ft          | 282.88 ft                   |
| Clearance @ Q50            | 0.7 ft             | 0.9 ft                      |

A scour analysis was done using HEC-18 and Froehlich's Live-Bed Abutment Scour Equation. It was determined that the scour depth at the Q500 flow is down to bedrock. The bedrock elevations are 282.3ft and 277.1ft at abutments 1 and 2 respectively. Scour is the main concern at this location, as the river is bottlenecked by the bridge, causing a rise in water elevation and velocity. A major scour event could cause shifting of the stones and a possible failure of the abutments.