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**TO:** Marc Pickering, District 2 Project Manager  
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**FROM:** Myles Sornborger, Hydraulics Technician  
**DATE:** June 3, 2026  
**SUBJECT:** Brookline, TH-10, Grassy Brook Road, over Grassy Brook  
Site location: C57, 2.8 miles south of TH-14, Valley Cemetery Road  
Coordinates: 43.051395, -72.59101

Thank you for your request for a hydraulics study in Brookline for C57 on Grassy Brook Road, TH-10.

A bridge and drainage area of this size **warrants a more detailed hydraulics study** to be designed to meet both hydraulic and regulatory standards (i.e.; bankfull width). To perform this with confidence, a detailed hydraulics model using site survey will be needed. Example hydraulic modeling software programs that can be used are SMS:SRH-2D and HEC-RAS.

We recommend hiring a consultant to perform this work along with the site and structural design. All engineering bridge plans prepared by the consultant should be retained by the town and a copy should be furnished to the VTrans Bridge Inspection Unit.

### Hydrology

The following physical characteristics are descriptive of this drainage basin:

|                                       |                  |
|---------------------------------------|------------------|
| Drainage Area                         | 2.8 square miles |
| Land Cover                            | Forested         |
| Water Bodies and Wetlands (NLCD 2006) | 2.2 %            |
| Mean Annual Precipitation             | 50.6 inches      |

Using the USGS (2025) hydrologic method, the following design flow rates were selected:

| Annual Exceedance Probability (AEP) | Flow Rate in Cubic Feet per Second (cfs) |
|-------------------------------------|------------------------------------------|
| 50 % (Q2)                           | 150                                      |
| 10 % (Q10)                          | 310                                      |
| 4 % (Q25)                           | 420                                      |
| 2 % (Q50)                           | 510 Design Flow – Minor                  |
| 1 % (Q100)                          | 610 Check Flow                           |

### Channel Morphology

The channel for this perennial stream is straight with an estimated local channel slope of 1.4%. Field measurements of bankfull width varied from 17 to 21 feet upstream and 20 to 23 feet downstream of the structure.



## **Replacement Guidelines**

Based on a desktop review and field visit, we anticipate a structure with a minimum 20-foot span and 6-foot clear height may be used for planning purposes, but will need to be verified to confirm it meets current standards of the VTrans Hydraulic Manual and state stream equilibrium standards for bankfull width at this location. Any new structure should be properly aligned with the channel, spanning the natural channel width, and constructed on a grade that matches the channel. It is always desirable for a new structure to have flared wingwalls, matched into the channel banks at the inlet and outlet, to smoothly transition flow and protect the structure and roadway approaches from erosion.

The VTrans Hydraulics Manual requires a minimum of 1-foot of freeboard at the design AEP for open bottom structure (bridges).

A bridge scour evaluation is necessary to adequately design the foundation for any open bottom 3-sided structure. The bottom of abutment footings (spread footing on soil) shall be the minimum of the calculated scour elevation or 6 feet below the channel thalweg, or to ledge, to prevent undermining. Abutments on piles should be designed to be free standing during the calculated scour elevation.

**Prior to any action toward the implementation of any recommendations received from VTrans the project must obtain all necessary permits. Specifically, structure size must be confirmed by the VT ANR River Management Engineer to ensure compliance with state environmental standards for stream crossing structures.**

Please contact us if you have any questions or if we may be of further assistance.