



229294X
October 27, 2023

Town of Royalton
PO Box 680
2460 Vermont Route 14
South Royalton, VT 05068
Attention: Chris Noble, Selectboard Chair

Re: Slope Failure on Broad Brook Road

Dear Mr. Noble:

DuBois & King (D&K) entered into an agreement with the Town on September 20, 2023 to provide engineering services for the stabilization of Broad Brook Road in the area of the slope failure generally between 2640 and 2455 Broad Brook Road. I am writing to provide our preliminary observations and an update on the status of our work.

Engineering Work Status

D&K staff have completed the following tasks:

- Topographic survey of the site.
- Resource inventory of the site to identify the Ordinary High Water elevation of the brook, wetland areas, and other environmental resources that could be impacted by potential construction work.
- Plotting of the topographic survey to create a basemap for the project.
- Scheduling of the geotechnical drilling services.

Drilling work has been scheduled to begin November 6, 2023. We originally had an earlier commitment from the driller, but they have multiple drill rigs on another project that has gone on longer than was expected. We reached out to other drillers who we sometimes work with and their earliest availability was in mid-December, so we have elected to continue with our original driller, New England Boring, at their earliest available date, which is November 6.

This week, we have developed cross sections of the slope and are using the cross sections to begin some preliminary slope stability modeling based on some conservatively assumed soil parameters. We will be using the models to evaluate the feasibility of temporary measures that could be taken to allow the Town to reopen the road for access for the winter, until permanent stabilization measures can be constructed. We will model the site conditions using the information we currently have, and then update the models when the drilling investigation is completed.

Preliminary Observations

While preparing our proposal for the project, Jonathan Ashley, PE, of D&K and Jacob Wimett, PE, of subconsultant partner firm GEODesign, Inc. (GEODesign) visited the site in August 2023. We have each made subsequent site visits in September and October. During each of our site visits, we have observed that more movement and erosion of the slope has occurred. The compromised guardrail at the top of the slope continues to be undermined and sag further down the slope.

The topographic survey results show that the slope between Broad Brook and the roadway is approximately 70 feet high. Sections of the existing slope generally show a grade of 71% to 100% (i.e., roughly 1V:2H to 1V:1H). However, localized sections as steep as 1.3V:1H are present. Generally a soil slope that is steeper than a 1V:2H is considered potentially unstable. Approximately 140 feet of head cut has occurred along the road at the top of the slope. Exposed soils in the slide appear visually consistent with a silt and clay at the top transitioning to a gray silty clay with boulders evident in the sidewalls towards the bottom. The bottom 10 feet of the slope appeared saturated at the time of our site visits, and there is a near-vertical scour at the bottom of the steepest section of the slope.

Based on the conditions we have observed and measured, this slope in its current configuration is not stable. Over time, the slope will continue to move to a less steep condition, and further loss of roadway is expected.

Additionally, the following conditions are present that we expect will lead to further instability and increase the likelihood of an additional near-term failure:

- The unprotected, eroded, near vertical scour at the toe of the slope is unstable. This toe scour will continue to be further eroded by the brook during periods of high-water levels and lead to greater instability. Loss of base support due to toe scour (as is being observed here) is one of the most common causes of slope failure.
- If the roadway were reopened to traffic, additional weight from Jersey barriers to protect vehicles from the crest as well as the effects of additional weight and vibration from vehicular traffic will create additional “head loading” of the slope. Head loading decreases the stability of a slope and will increase the likelihood of additional failures.
- Freeze-thaw cycles (as should be expected in the coming months) are often a catalyst that causes an inherently unstable slope to fail. This process tends to both temporarily increase the moisture (and therefore weight) of the soils in the slope as well as weaken the soils’ frictional and shear characteristics (the internal forces resisting failure) during thawing.

As such, it is our opinion that the existing road is unsafe for vehicular traffic and we strongly recommend that the road remain closed to vehicular traffic at this time.

We will keep you advised of the modeling results that we are currently working on, the potential for temporary measures that could be taken to provide vehicle access through the area until permanent slope stabilization can be achieved, and any changes in the drilling schedule.

Please do not hesitate to contact me with any questions you may have.

Sincerely,
DuBois & King, Inc.



Jonathan B. Ashley, PE
Director, Public Works Division