

# Town of Belvidere Road Erosion Inventory Report



*Prepared by:*

**Lamoille County Planning Commission**

PO Box 1637

52 Portland Street, Second Floor

Morrisville, Vermont 05661

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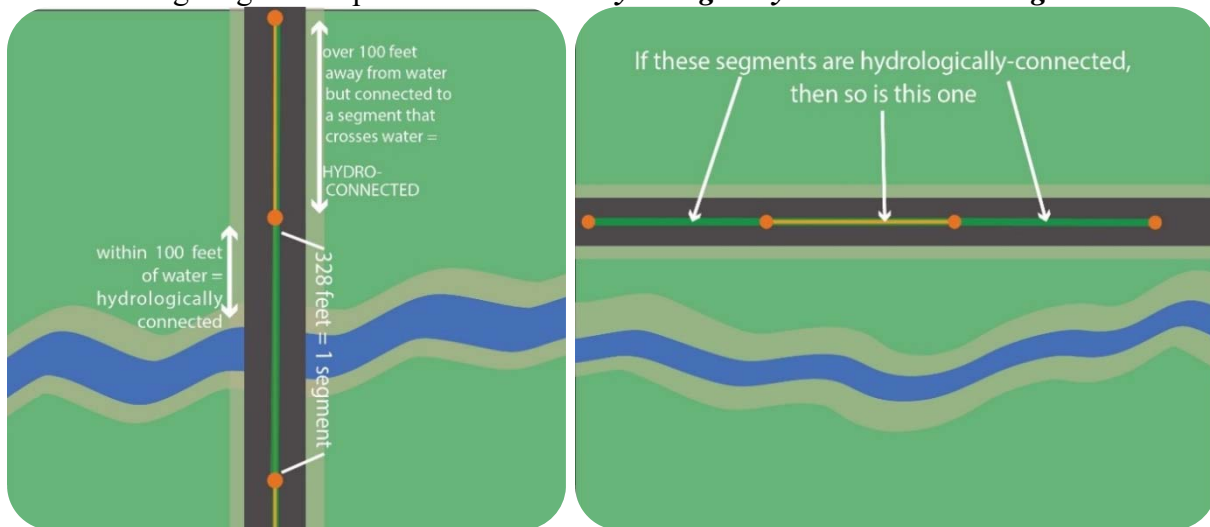
## Introduction

Lamoille County Planning Commission (LCPC) conducted a road erosion inventory (REI) to evaluate “hydrologically connected” road segments in the town of Belvidere during the 2018 field season. This report describes the process, the observed conditions, and the Town priorities.

Hydrologically connected road segments are indicated by one or more of the following:

- Within 100 feet to water resources (streams, rivers, wetlands, lakes, ponds)
- Road segments that bisect a water resource
- Adjacent segments to connected segments (i.e. segment uphill of a connected segment)
- Catch basin outfall pipe at 500 feet or less from a water resource

The following diagrams depict the criteria for *hydrologically connected road segment*:



\*Diagrams created by Two Rivers-Ottauquechee Regional Commission staff

## Background

Many historic settlements and roads in Vermont are near water since these are generally the flattest parts of our State, and proximity to water was historically essential to economic vitality. Erosion has adverse effects on water resources. During rain events, road sediment sometimes is deposited directly into the water resources. In the context of this report, water resources are defined as perennial and intermittent streams, rivers, wetlands, lakes, and ponds. Road sediment in water resources contributes to a spectrum of ecological problems related to water pollution.

Solutions for road erosion concerns are taking shape in the form of state regulations and grants. Grants should support installation and maintenance of road Best Management Practices (BMPs), while regulations should establish minimum BMP requirements. The goal is to minimize road erosion caused by storm runoff and ensure the sediment that does erode is sufficiently filtered before reaching the water. In optimum circumstances surface water runoff should be prevented (or disconnected) from directly reaching water resources.

The Road Erosion Inventory and Implementation Schedule (REI) is required for both grant funding and permit compliance. The purpose of the REI is to identify locations susceptible to road erosion. These are usually the places that require regular attention by town road crews to maintain safe travel or repeatedly fix erosion issues. Only hydrologically connected road segments are assessed in the REI.

The Department of Environmental Conservation (DEC) provides GIS data via the Agency of Natural Resources (ANR) Natural Resource Atlas (Atlas) identifying the hydrologically connected road segments for each municipality. This REI reflects the criteria set by DEC's Municipal Roads General Permit (MRGP), which intends to be congruous with the Better Roads Manual provided by the Vermont Agency of Transportation (VTrans). The MRGP is required by the Vermont Clean Water Act (Act 64), and the permit took effect July 31, 2018.

### **Road Erosion Inventory Methodology**

- The DEC identified hydrologically connected municipal road segments (all surface types and all classes of roads) based on proximity to water
- The hydrologically connected roads were divided into approximately 100-meter segments (~328 feet) and assigned a segment identification number by DEC
- All hydrologically connected segments were inspected by LCPC staff and given a score of Fully Meets, Partially Meets, or Does Not Meet based on the MRGP guidance

LCPC staff inspected each hydrologically connected road segment during the 2018 field season, and collected data using a portable tablet device. ANR Atlas data was loaded onto the tablet and integrated into a field inventory application created with ESRI ArcGIS Collector software. The roadway surface, shoulders, and ditches of each DEC-identified hydrologically connected road segment were inspected for erosion. Culverts were also examined for erosion issues. Stream culvert issues are exempt from the MRGP if in-stream work permits are required by any local, state or federal regulatory agency. Non-stream culvert issues and driveway culverts were noted if they were contributing to erosion.

### **Town Report**

The Town of Belvidere is just over 32.1 square miles of with approximately 14.5 miles of public roads. The Atlas identifies 177 road segments as hydrologically connected, or approximately 11 miles. Fifty-one (51) segments were identified to be in full compliance with the MRGP, or approximately 3.2 miles. Three (3) segments were field identified as not hydrologically connected. The resulting estimated quantity of hydrologically connected, municipally owned, not fully compliant road segments in need of work before the MRGP 2036 deadline is **123 segments, or approximately 7.6 miles.**

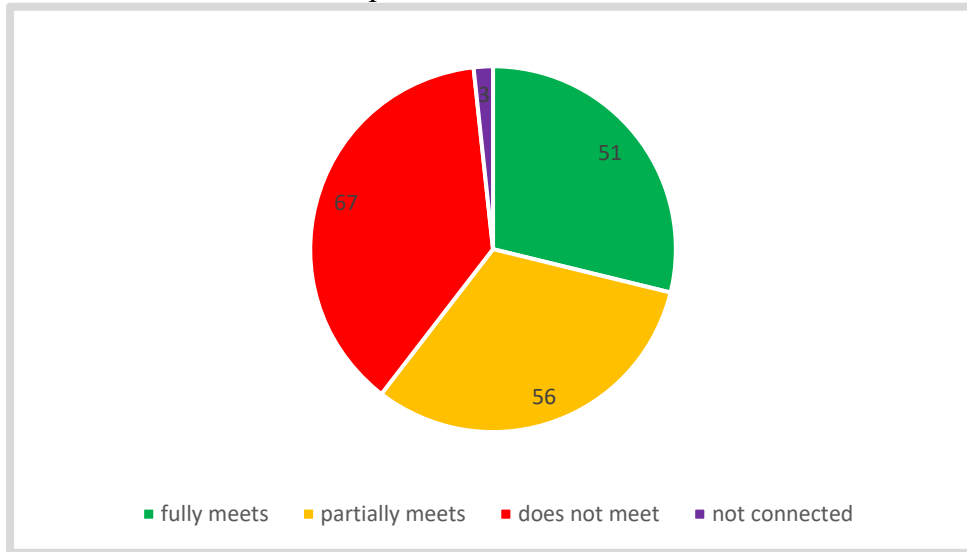
Maps and spreadsheets depicting the details of the REI is contained in Appendix A and B, respectively. Appendix C contains excerpts of typical BMP construction details from the Better Back Roads Manual. It is common to find roads flanked by a steep grade on one side and a water source on the other. This creates extra challenges and emphasizes the importance of proper road drainage installation and maintenance.

Common causes for erosion issues are as follows:

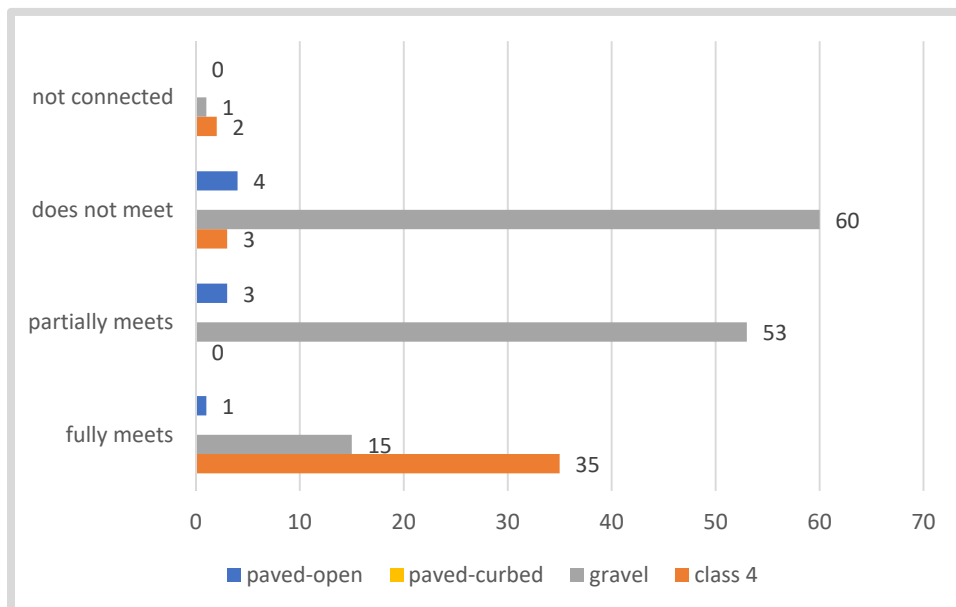
- Inadequate infiltration and disconnection practices
- Unstable river and stream banks adjacent to roads
- Unstable swales or no swales where they are needed
- Lack of, or inadequate culverts or headwalls
- Inadequate compaction or cohesiveness of road surface material

Results: Snapshot of Current Condition

This pie-chart summarizes MRGP compliance status:



The following bar chart depicts the scoring breakdown (fully meets, partially meets, does not meet) by road type for hydrologically connected road miles within the town’s total road miles.



Implementation Plan

It is important to note this report represents a snapshot in time. It is based on a combination of desktop geographic analysis by DEC staff, plus field observations made by LCPC staff. It is known that some site-specific conditions have changed since the field work was conducted. The work conducted in this assessment was consistent with DEC training provided for Regional Planning Commission staff. The findings in this report are a clear indication of the likelihood of conditions that may be observed at any snapshot in time, at various locations around Town. This report is also useful in framing the order of magnitude of work which will be required under the Municipal Road General Permit, and therefore should be helpful in projecting general budgeting needs.

Thirty-six (36) segments have been identified by the Town for implementation in the first five years of the MRGP, at an estimated cost of \$200,000. Some sites may be determined by Town Staff to need a fully engineered design, or a design created by the Town. However, most sites can be addressed by implementing typical BMPs found in the Better Roads Guidance Manual published by VTrans. Town volunteers met with LCPC on numerous occasions, both in the office and at example erosion locations; possible erosion management options were discussed, to be consistent with the Town’s available resources. Specific techniques to be applied to each location, including estimates of materials, equipment, and personnel needs will be determined by the Town prior to implementation of corrective actions.

The data and this report will help the Town track erosion problem areas over time, and identify project locations and schedules. Some sites may require full engineering design to repair. The typical designs can also be used as supplementary documentation for future grant applications.

The Town priorities, project descriptions, schedule, and costs in the following table are subject to change.

<b>Road Name</b>	<b>Segment ID #</b>	<b>Estimated Project Description</b>	<b>Est Project Cost</b>	<b>Est Time</b>
LARAWAY MOUNTAIN RD	123279	Install stone ditches and small culverts on steep road. Improve nearby segments with problems related to crown, shoulders, swales & conveyances, and non-stream culverts	\$20,000	Year 1, 2020
	123280			
	123281			
	123282			
	123283			
	123284			
BACK RD	1631	Replace multiple existing culverts of < 3ft diameter with new larger culverts. Improve nearby segments with problems related to crown, shoulders, swales & conveyances, and non-stream culverts	\$40,000	Year 2, 2021
	1632			
	1629			
	2846			
	2847			
	2848			
	2849			

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BOG RD	10642	Replace multiple existing culverts of < 3ft diameter with new larger culverts. Improve nearby segments with problems related to crown, shoulders, swales & conveyances, and non-stream culverts	\$40,000	Year 3, 2022
	10643			
	10644			
	10645			
	10646			
	10647			
	10648			
	10649			
	10650			
	10651			
SMITHVILLE RD	168814	Install stone ditches and small culverts on steep road. Improve nearby segments with problems related to crown, shoulders, swales & conveyances, and non-stream culverts	\$30,000	Year 4, 2023
	168813			
	168812			
	168811			
	168810			
	168809			
BACK RD	2857	Replace 1 existing culvert of > 3ft diameter with new larger culvert. Improve nearby segments with problems related to crown, shoulders, swales & conveyances, and non-stream culverts	\$70,000	Year 5, 2024
	2858			
	2859			
	2861			
	2862			
	2863			
	2864			

## **Conclusion**

While the existence of roads in proximity to water poses a risk for water quality, adequate road maintenance practices will reduce the rate of unmanaged runoff reaching our valuable natural resources. Recommended BMPs to improve current conditions are detailed in Appendix C and include measures such as grass and stone-lined drainage swales, sheet flow infiltration, disconnection practices, road crowning, improving culvert outlets and headwalls, and stabilizing exposed soil.

The Road Erosion Inventory for the Town of Belvidere accomplished the following objectives: (1) an increased understanding of erosion concerns along municipal roads, (2) an inventory of hydrologically connected road segments, and (3) five-year work plan with cost estimates. The identification and prioritization of road erosion sites will help the Town budget for and implement the necessary repairs.

Road segments not identified in the ANR Atlas as hydrologically connected, but are connected, were documented by LCPC staff. Additionally, there were segments identified in the ANR Atlas as hydrologically connected but they are not connected. The REI should be updated every five

years in accordance with the MRGP to document progress, impacts from specific weather events, and re-evaluation of the Town's priorities. Sites identified for a full engineering design should also be reviewed by the Town and prioritized for inclusion in Capital Budgets.

There are sections of Class 4 roads where erosion issues were documented. Town highway budgets are limited and more traveled roads usually receive higher priority by the voting public and taxpayers. Due to the MRGP requirements, LCPC will collaborate with the partners – Vermont Department of Environmental Conservation, Vermont Youth Conservation Corps, and involved Towns – to identify available funding sources and develop appropriate implementation measures for selected Class 4 roads in the future.