

Municipal Class 4 Road Erosion Remediation and Demonstration Project Report



Lynch Hill Road (before BMP)



Lynch Hill Road (after BMP)

Photos taken by CVRPC staff

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Table of Contents

Executive Summary.....	3
Best Management Practices Implemented.....	4
Calais:	6
Apple Hill Road South End	6
Apple Hill Road North End	6
Woodbury Mountain Road	7
Moretown	8
Lynch Hill Road Lower Half	8
Lynch Hill Road Upper Half	9
Bathenes Road	9
Worcester	10
Hancock Brook Road	10
BMP Cost Breakdown	11
Conclusions	11

Executive Summary

Central Vermont Regional Planning Commission (CVRPC), working closely with the Department of Environmental Conservation and the Towns of Calais, Worcester, and Moretown, successfully implemented and demonstrated the importance of fixing severe erosion on Class 4 roads. The primary objective of this project was to reduce sediment and phosphorus runoff by implementing road Best Management Practices (BMPs) on hydrologically-connected municipal road segments, specifically Class 4 roads, within the Lake Champlain watershed. Hydrologically-connected road segments are those sections of road at high risk to impact adjacent surface waters, lakes, ponds, perennial and intermittent streams, and wetlands. The State has developed a hydrologically-connected road segment GIS layer that is available on the **VT ANR Natural Resources Atlas** - <http://anr.vermont.gov/maps/nr-atlas>. Secondary benefits of implementing road BMPs are improved flood resilience and road safety.

BMPs implemented during this project include drainage culvert upgrades, turn out installations, culvert outlet stabilizations, culvert headwall stabilizations, grass and stone-lined drainage ditch installations, roadside berm removal, and road resurfacing. All of these practices promote road stormwater disconnection, infiltration, and conveyance stability.

Calais, Worcester, and Moretown, enrolled in the program and committed to implementing road BMPs on certain segments of hydrologically-connected municipal Class 4 roads. Each town was awarded a portion of the grant funding and a share of the segments. Calais worked on 8 segments, Worcester works on 7 segments, and Moretown worked on 8 segments.

Beyond the implementation work, CVRPC also organized and hosted two workshops highlighting the completed municipal Class 4 road erosion remediation work. The workshops were held on August 27th and 28th and a total of thirty-five people attended the workshops. Each workshop incorporated a field site visit to a project demonstration location, one in Moretown and one in Calais, to showcase the successful implementation of the various BMPs used and completed by the towns. By sharing the project remediation and demonstration components and having a “lessons learned” discussion, other municipalities across the state learned how to replicate these Class 4 erosion BMPs on their roads.



Moretown Workshop

The workshop on August 27th was held in Moretown, VT on Lynch Hill Road. Eighteen people, including presenters, attended this workshop. The people attending included representatives from the Towns of Moretown, Washington, Lyndon, and Waterbury, engineers from the DuBois and King consulting firm, along with staff from the Vermont DEC and CVRPC. The location of

the workshop was held adjacent to the implemented BMP work allowing for an easy transition from the presentation and “lessons learned” discussion to the field site visit.



Calais Workshop

The workshop on August 28th was held in Calais, VT at the Town Highway Garage. Seventeen people, including presenters, attended this workshop. The people attending included representatives from the Towns of Calais, East Montpelier, Worcester, Woodbury, and Hardwick along with staff from the Vermont DEC, Vermont Local Roads and CVRPC. Attendees traveled by bus from the Town Highway Garage to Apple Hill Road for the field site visit.

The workshops helped to highlight the BMPs utilized to address significant erosion sources from Class 4 roads, the cost and time expended for the specific BMP installed by road and segment, and how each road segment now meets the Municipal Roads General Permit (MRGP) standards. The “lessons learned” discussion helped attendees talk over their own issues and successes with the towns that implemented the BMPs. The issues discussed included that many of the Class 4 roads have been minimally maintained for years leaving so much work to do that there is no clear path forward to fix the road. There is an overall reluctance to work on the Class 4 roads because it may lead to more demand from the residents to fix other Class 4 roads. The towns already have so much to do to maintain their Class 1, 2 and 3 roads that the Class 4 roads are a very low priority. The successes discussed included a strong need or desire by the Town for the Class 4 roads to be in better condition and better match the use of the road(s). The road(s) serve other purposes including emergency access to residents and providing local connections.

Best Management Practices Implemented

Twenty-six segments (1.6 miles) of hydrologically-connected Class 4 roads were brought up to MRGP standards: 1.6 miles of road was resurfaced with new gravel, eight new stone-lined turn outs were installed, eight new culverts were installed with new or improved headers, and 5,800 linear feet of stone-lined and grassed ditching was installed.

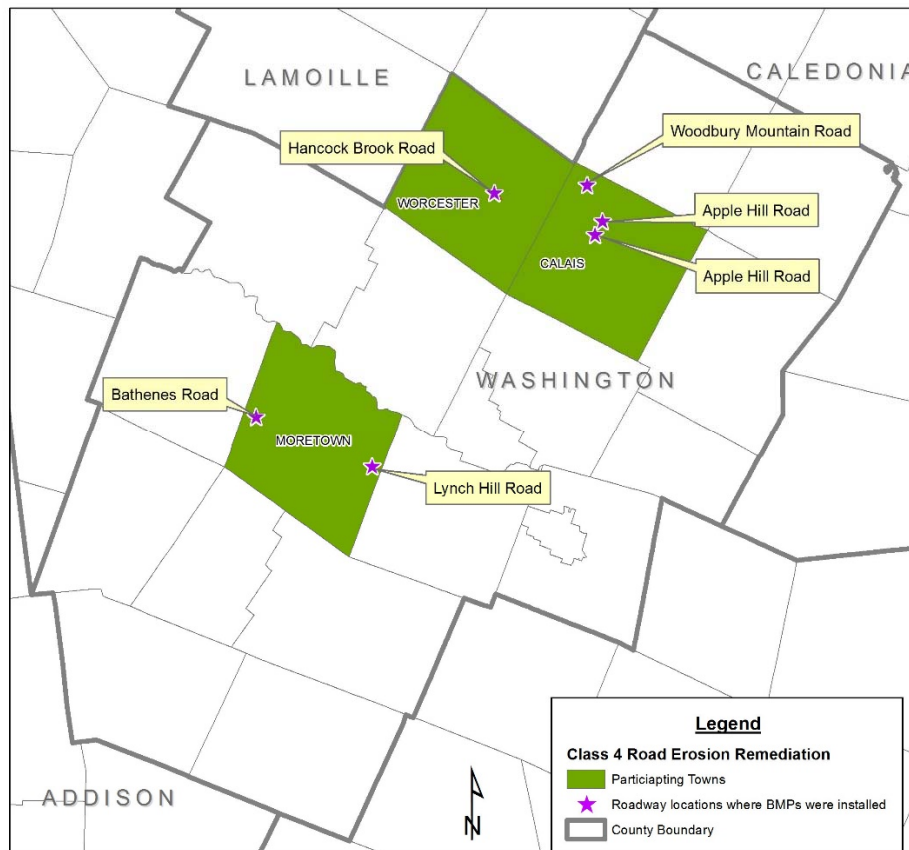
The Town of Calais worked on eight hydrologically connected road segments including six on Apple Hill Road (segments 1934, 1935, 1936, 1929, 1928, and 1927) and two on Woodbury Mountain Road (segments 200159 and 200142).

Apple Hill was a classic sunken road with over 10% grade and high shoulders on both sides, which created severe erosion and gullying in the roadway after each rain event. Woodbury

Mountain Road's problems stemmed from a road grade over 10% and road side berms preventing the water from exiting the road surface.

The Town of Moretown worked on eleven hydrologically connected road segments, including seven on Lynch Hill Road (segments 128321, 128322, 128323, 128324, 128325, 128326, and 128327, 128328, 128329, 128330) and one on Bathenes Road (segment 5392). Lynch Hill had two distinct issues: the upper half is a classic sunken road with over 10% grade and high shoulders on both sides, which gullied out the road after rain events. The lower half had a road grade over 10% with little or no stable drainage. Bathenes Road is a well maintained Class 4 road except for a culvert at the top of the road. The culvert was poorly installed causing water to top over it each year causing severe erosion. Erosion occurring on Lynch Hill road caused significant sedimentation of the newly constructed stoned-lined ditches on the Jones Brook Road located at the base of Lynch Hill road, negating the improvements made to Jones Brook Road.

The Town of Worcester worked on seven hydrologically connected road segments on Hancock Brook Road (segment 108226, 108225, 108221, 108220, 108219, 108218, and 108217). Although Hancock Brook Road has a number of steep sections over 8% grade, it is really quite flat. This road had become sunken and experienced severe erosion from water running down the middle of the road because of the presence of berms and no ditch.



Calais:

Apple Hill Road South End

The first three segments are on the south end of Apple Hill. Apple Hill is a steep road that is sunken and experiences severe erosion. As you can see in the before photo, the road had no ditch, with berms along both sides, and an undersized culvert in the middle. The work done to fix this road included berm removal, resurfacing with new gravel on the roadway, installing a stone lined ditch and a new culvert with stone headers and outlets.

Before



After



Apple Hill Road North End

The next three segments in Calais are on the north end of Apple Hill. Apple Hill at this end is a steep road that is sunken and experiences severe erosion. As pictured in the before photo, the road had no ditch and there were high berms along both sides. The work done to fix this road included berm removal, resurfacing with new gravel on the roadway, installing a stone lined ditch, installing stone lined turnouts, and installing a new culvert at the bottom of the road.

Before



After



Woodbury Mountain Road

The last two segments in Calais are on Woodbury Mountain Road. Woodbury Mountain Road is a steep road that is sunken and experiences severe erosion. The before photo shows an eroding turn out that was cut in with a grader. There is also no ditch along the road and berms exist along both sides. The work done to fix this road included berm removal, resurfacing with new gravel on the roadway, installing a stone lined ditch and stone lined turnouts.

Before



After



Moretown

Moretown worked on a total of eight segments. The first seven segments are on Lynch Hill Road, which is a steep road that is sunken and experiences severe erosion. The before photo shows how water would run down the middle of the road because of berms and no ditch. The work done to fix this road included berm removal, resurfacing with new gravel on the roadway, installation of stone and grass lined ditches, stone lined turnout, and water bars.

Lynch Hill Road Lower Half

Before



After



Lynch Hill Road Upper Half

Before



After



Bathenes Road

The eighth segment in Moretown is on Bathenes Road, which is a well maintained Class 4 road except for a culvert at the top of the road. The culvert had been poorly installed causing water to top over it each year and cause severe erosion. The work done to fix this issue included installing a new culvert with elbow and stone headers.

Before



After



Worcester

Hancock Brook Road

Worcester worked on a total of seven segments, all on Hancock Brook Road. Although Hancock Brook Road has a number of steep sections, it is really quite flat. This road became sunken and experienced severe erosion. The before photo shows how water would run down the middle of the road because of berms and no ditch. The work done to fix this road included berm removal, resurfacing with new gravel on the roadway, installation of stone and grass lined ditches, and new culverts with stone headers.

Before



After



BMP Cost Breakdown

All costs are based on one segment length of road of about 300 feet and include labor, trucking, materials and erosion control.

Best Management Practice	Cost per segment
Gravel Road Surface (300 feet long, 16 feet wide, 4 inches deep)	\$1,100
Culvert (18 inch steel, 20 feet wide) with stone header and outlet	\$600
Stone lined ditch along one side of the road	\$1,600
Stone lined turnout	\$470

NOTE: All costs are calculated based on the municipal rates and material cost of the towns enrolled in the program. Individual town costs may differ.

This project demonstrated that towns will need to consider tree removal, which is often a hidden cost, when implementing road BMPs.

Conclusions

CVRPC, DEC, and the Towns that participated would all agree that the Class 4 roads demonstration and remediation project was a success. The project helped to showcase the BMPs that towns can utilize to correct severe erosion on Class 4 roads to help improve water quality by reducing levels of sediment, phosphorus, and toxic substances from eroding into streams. In addition to the improved water quality are the improved flood resilience and reduced maintenance costs of these roadways. The Town of Calais reports that the work done on Apple Hill's south end in 2017 has helped immensely and has eliminated the yearly washouts to the roadway there by reducing maintenance costs.

The resiliency of the BMPs installed on Apple Hill Roads south end in 2017 to withstand numerous heavy rain events and a Vermont winter are a testament to project success. The picture on the right showcases this. As you can see, both the stone lined ditch and roadway show very little evidence of erosion and sediment transport. The project team expects to see similar resiliency with all the BMPs installed for years to come.

The work done under this project to find and correct 1.6 miles of severe erosion on Class 4 roads offers a great opportunity to all Vermont



Calais - Apple Hill Road south end one year after BMP installation

towns to better understand how and why they can approach fixing severe erosion on their own Class 4 roads.

CVRPC would like to thank the Towns of Calais, Worcester, and Moretown for all the work completed, as well as the Department of Environmental Conservation and the Lake Champlain Basin Program for the opportunity to collaborate on this project.