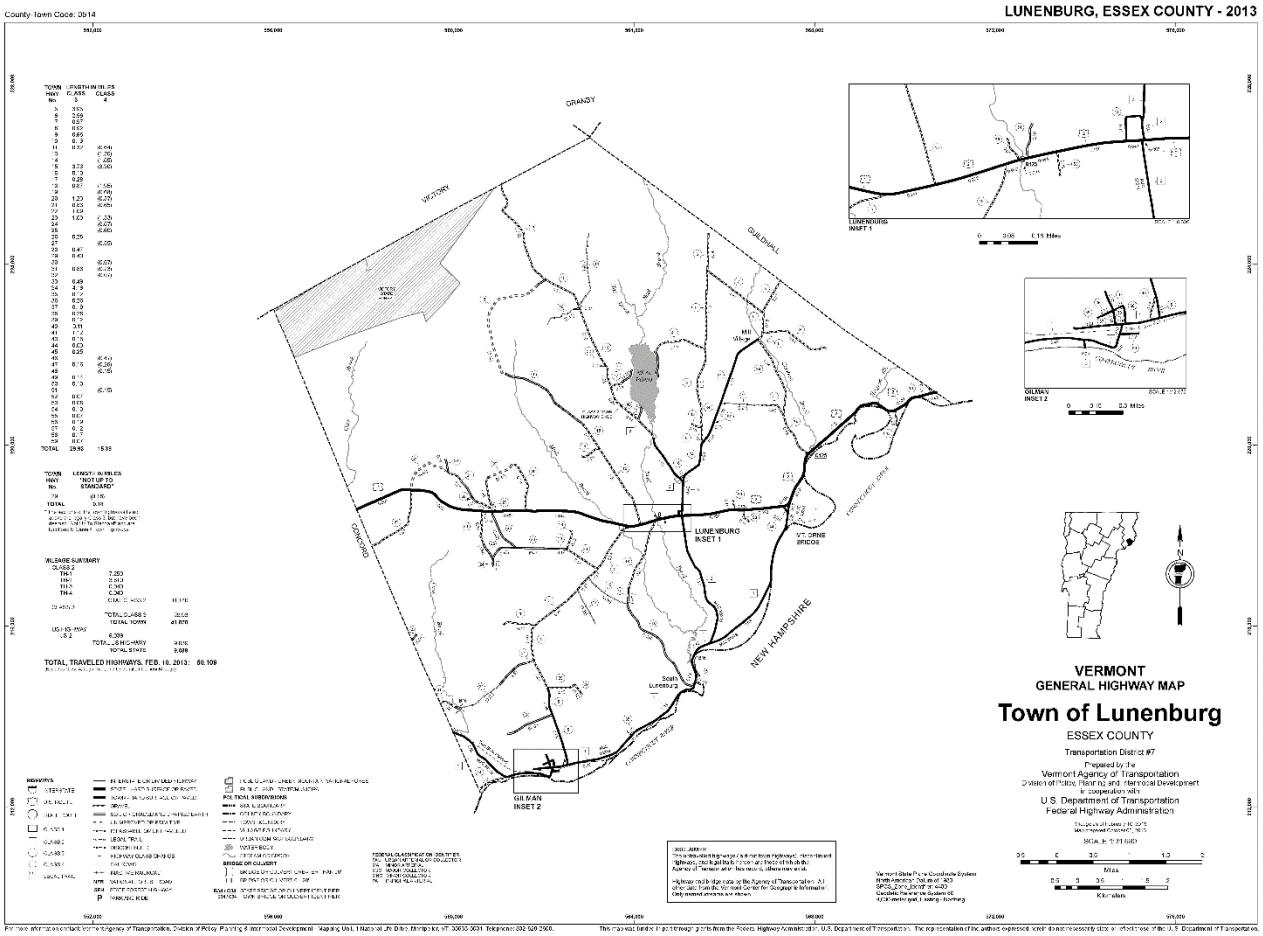
TOWN OF LUNENBURG

Road Erosion Inventory and Capital Budget Plan



Prepared by: *Sam Mayne*
Assisted by: *Heather Johnson*

Funded by: *Vermont Better Roads*

Essex County Natural Resources Conservation District

Clean Water You Can Afford

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Project Background

The Town of Lunenburg's Road Erosion Inventory and Capital Budget Plan was funded by the Vermont Agency of Transportation's Better Roads Program. This project falls under "Category A" grants of the Better Roads Program, and "Categories B, C, and D" provide grants for towns to implement road improvement projects, specifically those identified in this inventory. This road erosion inventory identifies priority hydrologically connected road segments in the Town of Lunenburg. It provides a design for corrective measures, and outlines cost estimates for each project to assist the Town in budgeting for project implementation. This inventory is not intended to be comprehensive of all road erosion in town, but it mainly gathers projects that are an appropriate scope to receive funding support through Category B, C, and D Better Roads grants. Additional priorities for larger projects, such as culvert replacements, are also outlined in this report, but will require further project development and fundraising.

This inventory is intended to provide a budget framework for a 5-year plan to implement these projects. A Road Erosion Inventory and Capital Budget Plan is recommended every 5-years, to create a budget cycle for road improvement projects as well as a tool for town officials to track road improvement progress. More projects are included than are likely to be implemented in the next 5 years, but those that aren't can be implemented in the future.

Acknowledgements

This report is written by:
Sam Mayne, District Manager, Essex County Natural Resources Conservation District.
Additional assistance for this inventory was provided by:
Alan Amadon, Cameron Brown, Wayne Sterling – Town of Lunenburg; Heather Johnson – ECNRCD

General Observations

General observations of the roads in the Town of Lunenburg are included below to assist with the overall understanding of road erosion and how the town can remediate simple issues. Ditching is needed in many locations where sediment has filled existing ditches or no ditches have been established. In segments with greater than 5% grade, stone lining, check dams, or frequent turnouts are required. We have suggested stone lining in all situations based on feedback from the town road crew. In segments with greater than 8% grade, stone lining is required. Several locations, especially Baptist Hill Rd have steep hills with no stone lining and less crown than recommended. Stone lining will reduce erosion of the ditches, and improving crowning will reduce the speed at which ditches fill with sediment and require additional maintenance. The town may also consider a roller to compact graded roads. A number of segments meet MRGP standards except for the presence of a grader berm. These areas are mostly not represented in this report but are a cost-effective way to meet the MRGP implementation requirement of 7.5% of segments per year. The other MRGP implementation requirement the Town of Lunenburg should keep in mind is the need to address all Very High priority segments by the end of 2025. Lunenburg currently has 5 segments that are ranked as Very High priority, all of which are noted in this report. Due to recent (2023) changes to the MRGP, if another town-wide Road Erosion Inventory is conducted, the Very High priority implementation requirement will change to 20% of Very High segments each year. While project descriptions do not differentiate the priority of individual segments, the segment status table below shows the priority ranking of each segment.

Hydrologically Connected Road Segments

Hydrologically connected road segments are those that have the potential to add sediment to a water of the state (waterbodies and wetlands) through erosion. These include any road within 100' of a water of the state and those that are considered to be within the direct drainage of a water of the state. The MRGP describes hydrologically connected road segments as follows.

Municipal road within 100' to a water of the state or wetland

Municipal road that bisects a water of the state or wetland or a defined channel

The municipal road segment is uphill from, and drains to, a municipal road that bisects a water of the state or wetland, or defined channel and should be included in the REI to accurately capture the extent of the stormwater watershed. The ANR Atlas connected roads layer is a GIS-based proximity analysis and often will underestimate these types of connected segments. Please be sure to add these segments in the field if you find them, especially if adjacent to ANR Atlas connected mapped segments.

If a road segment appears on the ANR Atlas and none of the above conditions are observed in the field, persons conducting inventories may propose to re-classify a segment as not connected. Alternately, if none of the above conditions are observed in the field, but the segment is likely to discharge to waters or wetlands, a permittee shall propose to add this segment to the inventory following a field evaluation.

All municipal roads are divided into 328' segments that are each determined separately to be hydrologically connected or not connected. Through a Road Erosion Inventory, all hydrologically connected segments are determined to either Fully Meet, Partially Meet, or Not Meet MRGP standards. In the maps in this report, segments that are not hydrologically connected are shown in gray, and hydrologically connected segments are shown in green (Fully Meets), Orange (Partially Meets), or green (Does Not Meet). MRGP compliance is based on a similar Fully Meets, Partially Meets, Does Not Meet scale for each of four road attributes – crown, grader berm, drainage (shoulders and ditches), and conveyance (water passing structures). Segments are then given a priority ranking based on their estimated impact on water quality according to the data collected in the REI. In several tables in this report, segment priority levels are shown in magenta (Very High), red (High), orange (Moderate), and green (Low). The overall and attribute-specific MRGP compliance is also shown in the following implementation table (blue columns). ECNRCD has further classified the erosion occurring at driveway and drainage culverts (gray columns) as Very High (VH), High (H), Low (L), or None Present (N).

Implementation Table Legend

Abbr.	Full meaning	Description
F	Fully Meets	Fully meets MRGP standards
P	Partially Meets	Partially meets MRGP standards
D	Does Not Meet	Does not meet MRGP standards
N	None Present	No conveyance present, or no erosion present
VH	Very High	Very high priority for project implementation
H	High	High priority for project implementation
L	Low	Low priority for project implementation

Municipal Roads General Permit Segment Status (January 2023)

Table 1: Implementation table for Lunenburg road segments.

Segment ID	Road Name	Slope	Crown	Berm	Drainage	Conveyance	Driveway	Drainage	Segment Status	Segment Priority	Comments	Date
2380	AUBURN STAR RD	1	F	P	P	N			Partially Meets	Low		11/18/2020
2384	AUBURN STAR RD	10			F	N			Fully Meets			11/18/2020
2385	AUBURN STAR RD	7.8			F	N			Fully Meets			11/18/2020
1924.1	BAPTIST HILL RD	7.5	D	P	D	D	H	VH	Does Not Meet	High	Steep road section with flow down road. Ditches filled with sediment, need to be reestablished and stoned. No crossnculvert on Gilman Farm Rd, material being lost at turn. Need upsized all culverts. Need better crown. Wall on west limits turnouts.	11/22/2022
1925.1	BAPTIST HILL RD	4.4	F	F	P	N			Partially Meets	Low		11/25/2020
1926.1	BAPTIST HILL RD	5			P	N			Partially Meets	Moderate		11/25/2020
1927.1	BAPTIST HILL RD	4.3			P	N	N		Partially Meets	Low		11/25/2020
1928.1	BAPTIST HILL RD	5.5	F	F	P	N			Partially Meets	Moderate		11/25/2020
1929.1	BAPTIST HILL RD	5	F	P	P	D			Does Not Meet	High		11/25/2020
1930.1	BAPTIST HILL RD	6	P	F	D	N			Does Not Meet	High		11/25/2020
1931.1	BAPTIST HILL RD	5.8	F	P	D	N	N		Does Not Meet	High		11/25/2020
1932.1	BAPTIST HILL RD	7	P	F	D	N			Does Not Meet	High	Needs ditching and stone	11/25/2020
1933.1	BAPTIST HILL RD	8.5	F	F	P	F	N		Partially Meets	Moderate		11/25/2020
1934.1	BAPTIST HILL RD	9.8	F	F	P	D		N	Does Not Meet	High	Washing around outlet with pipe. Needs ditching and stone	11/25/2020
1935.1	BAPTIST HILL RD	11	F	F	D	N		N	Does Not Meet	Very High		11/25/2020
1936.1	BAPTIST HILL RD	10	F	F	D	F			Does Not Meet	High	Needs ditching and stone	11/25/2020
1937.1	BAPTIST HILL RD	9.5	F	F	D	F		N	Does Not Meet	High	No stone in ditch lines	11/25/2020
1938.1	BAPTIST HILL RD	10.5	F	P	D	N			Does Not Meet	Very High	No stone in ditches	11/25/2020
1939.1	BAPTIST HILL RD	5.5	F	F	P	N		H	Partially Meets	Moderate		11/25/2020

Segment ID	Road Name	Slope	Crown	Berm	Drainage	Conveyance	Driveway	Drainage	Segment Status	Segment Priority	Comments	Date
1941.1	BAPTIST HILL RD	7.9	D	P	D	D			Does Not Meet	High	Reestablish and stone ditches.	11/22/2022
4127	BAPTIST HILL RD	8.5	D	P	D	D		L	Does Not Meet	High	Steep. Needs stone in ditches. Cross culvert mostly plugged and undersized. Backed up runoff enters road and erodes. Should be resited to next segment downhill.	11/22/2022
4139	BAPTIST HILL RD	6.7	P	F	D	D			Does Not Meet	High	Needs ditching and stone line ditches	11/18/2020
4140	BAPTIST HILL RD	7.8	F	F	D	D			Does Not Meet	High	Needs to be ditched and stone lined	11/18/2020
4156	BAPTIST HILL RD	11	F	F	D	N	H	H	Does Not Meet	Very High	Needs to be ditched and stone lined	11/18/2020
4157	BAPTIST HILL RD	3.3	P	P	P	D	H	H	Does Not Meet	Moderate		11/18/2020
4158	BAPTIST HILL RD	2.8	P	P	P	N	H	H	Does Not Meet	Moderate		11/18/2020
4166	BAPTIST HILL RD	8.2	P	F	P	N	H	H	Does Not Meet	High	Ditch is stone lined but still some slight erosion in the bottom. Drive culvert to be cleaned out and little stone work	11/18/2020
4170	BAPTIST HILL RD	10.2	D	F	D	D	H		Does Not Meet	Very High	Ditch line needs to be stonelined	11/18/2020
4171	BAPTIST HILL RD	6.3	P	F	P	D		L	Does Not Meet	High		11/18/2020
3257.1	BEECH ST	3.95			F	N			Fully Meets		Shoulders have slide build up	11/16/2020
10504	BOBBIN MILL RD	4.1	F	D	P	N			Does Not Meet	Moderate		11/24/2020
10505	BOBBIN MILL RD	6.5	P	F	P	N			Partially Meets	Moderate		11/25/2020
10507	BOBBIN MILL RD	2	P	F	F	N	N	N	Partially Meets	Low		11/24/2020
10508	BOBBIN MILL RD	1.5	P	F	F	N	N		Partially Meets	Low		11/24/2020
10509	BOBBIN MILL RD	3.6	P	F	D	N	N	N	Does Not Meet	Moderate		11/24/2020
10511	BOBBIN MILL RD	4.3	F	F	F	N			Fully Meets			11/24/2020
10512	BOBBIN MILL RD	2	F	F	F	N			Fully Meets			11/24/2020
10516	BOBBIN MILL RD	4.3	F	F	F	N	N	L	Partially Meets	Low		11/24/2020
10517	BOBBIN MILL RD	2.6	F	F	F	N	N	N	Fully Meets			11/24/2020
10518	BOBBIN MILL RD	2.3	F	F	P	N	N	N	Partially Meets	Low		11/24/2020
10519	BOBBIN MILL RD	4.4	P	F	F	N			Partially Meets	Low		11/24/2020
10523	BOBBIN MILL RD	3	F	F	F	N		N	Fully Meets			11/24/2020

Segment ID	Road Name	Slope	Crown	Berm	Drainage	Conveyance	Driveway	Drainage	Segment Status	Segment Priority	Comments	Date
10524	BOBBIN MILL RD	4.8	P	F	F	N			Partially Meets	Low		11/24/2020
4562.1	BOBBIN MILL RD	3.67			P	N			Partially Meets	Low		11/24/2020
4563.1	BOBBIN MILL RD	6.1			F	N			Fully Meets			11/24/2020
4564.1	BOBBIN MILL RD	4.1			F	N	H	N	Partially Meets	Low		11/24/2020
4565.1	BOBBIN MILL RD	5			D	N			Does Not Meet	High	All the shoulders need to be cut and some ditching.	11/24/2020
4566.1	BOBBIN MILL RD	4.1			P	N			Partially Meets	Low	Shoulders could be pulled	11/24/2020
4567.1	BOBBIN MILL RD	5.5			D	N			Does Not Meet	High	Needs shoulders pulled and re ditched	11/24/2020
4573.1	BOBBIN MILL RD	4.8			F	N	N	N	Fully Meets		Shoulders need to be pulled	11/24/2020
4574.1	BOBBIN MILL RD	3.1			P	N	N		Partially Meets	Low	Shoulders need to be pulled	11/24/2020
4582.1	BOBBIN MILL RD	1.9	D	D	P	N	N	N	Does Not Meet	Moderate		11/24/2020
4583.1	BOBBIN MILL RD	6.8	F	F	P	N			Partially Meets	Moderate	There is grass and small trees in ditch line no erission	11/24/2020
4584.1	BOBBIN MILL RD	8.2	F	P	P	N			Partially Meets	Moderate	Needs to be stone lined	11/24/2020
4585.1	BOBBIN MILL RD	2.8	F	D	F	N	N	VH	Does Not Meet	Moderate		11/24/2020
4592.1	BOBBIN MILL RD	1.3	F	F	F	N	N	L	Partially Meets	Low		11/24/2020
4596.1	BOBBIN MILL RD	2.06	F	F	F	D	N	VH	Does Not Meet	Moderate	There is a 18? Drop of out of the large culvert	11/24/2020
4597.1	BOBBIN MILL RD	7.3	D	D	D	D	N		Does Not Meet	High	Water is erission from house 1323 down the hill in to the stream Need to cut trees and stone line ditch about 100ft	11/24/2020
22132	CHURCH	5.5	P	P	P	N			Does Not Meet	High		11/25/2020
22133	CHURCH	1.5	F	F	F	N			Fully Meets			11/25/2020
22134	CHURCH	1.5	F	F	D	D		H	Does Not Meet	Moderate		11/25/2020
24299	COLBY RD	5.8	P	P	P	N			Does Not Meet	High		11/24/2020
24570	COLE HILL RD	2.1	F	F	F	D		N	Does Not Meet	Moderate	4 30 to 36 inch pipes crossing the road so it don't flood.	11/24/2020
24571	COLE HILL RD	7	F	F	D	N	N	H	Does Not Meet	High	Hill needs stone ditch lines.	11/24/2020
12747.1	COMMERCIAL AV	2.4			F	D		VH	Does Not Meet	Moderate	Hydro study need to be done on this pipe and replaced. The pipe is a 30 inch metal that has hole in center of road.	11/16/2020

Segment ID	Road Name	Slope	Crown	Berm	Drainage	Conveyance	Driveway	Drainage	Segment Status	Segment Priority	Comments	Date
12748.1	COMMERCIAL AV	2.5			F	F			Fully Meets			11/16/2020
12749.1	COMMERCIAL AV	4.1			P	N			Partially Meets	Low	Shoulders need to be cut and re seeded	11/16/2020
12750.1	COMMERCIAL AV	0.8			F	N			Fully Meets			11/16/2020
12751.1	COMMERCIAL AV	1.49			F	N			Fully Meets			11/16/2020
28185	CREAMERY RD	3.5	P	P	P	D			Does Not Meet	Moderate	Does not look like class 3 rd	11/30/2020
28186	CREAMERY RD	2.5	P	P	P	N			Does Not Meet	Moderate		11/30/2020
33341	DODGE RD	5.5							Fully Meets			11/25/2020
91825	DUPONT RD	2.8	P	F	P	N			Partially Meets	Low		11/18/2020
91827	DUPONT RD	4.2	F	P	P	D		N	Does Not Meet	Moderate		11/18/2020
91828	DUPONT RD	2.8	F	F	P	N			Partially Meets	Low	Could use some ditching to keep water flowing	11/18/2020
17527.1	E CONCORD RD	1.3			F	N			Fully Meets			11/16/2020
17528.1	E CONCORD RD	1.4			F	N		N	Fully Meets			11/16/2020
17529.1	E CONCORD RD	1.34			F	N		N	Fully Meets			11/16/2020
17530.1	E CONCORD RD	0			F	N		N	Fully Meets			11/16/2020
17531.1	E CONCORD RD	1.07			F	N		N	Fully Meets			11/16/2020
17532.1	E CONCORD RD	1.5			F	N			Fully Meets			11/16/2020
17533.1	E CONCORD RD	0.56			F	N	N		Fully Meets			11/16/2020
17534.1	E CONCORD RD	1.22			F	D		N	Does Not Meet	Moderate		11/16/2020
17537.1	E CONCORD RD	1.5			F	N			Fully Meets			11/16/2020
17538.1	E CONCORD RD	0.56			F	N	N		Fully Meets			11/16/2020
17539.1	E CONCORD RD	0.56			F	N			Fully Meets			11/16/2020
17540.1	E CONCORD RD	0.8			P	N		N	Partially Meets	Low	One spot about 100ft long on the East bound side need to be ditched to let water get to cross culvert.	11/16/2020
17541.1	E CONCORD RD	1			F	N			Fully Meets			11/16/2020
17834.1	E MAIN ST	5.8			F	D			Does Not Meet	High	The ditch line is vegetated by could be stone lined.	11/17/2020
102572	GILMAN FARM RD	2.5	F	D	F	N	H	N	Does Not Meet	Moderate		11/18/2020

Segment ID	Road Name	Slope	Crown	Berm	Drainage	Conveyance	Driveway	Drainage	Segment Status	Segment Priority	Comments	Date
106683	GUILDHALL HILL RD	5.1	F	F	F	F			Fully Meets			11/25/2020
106696	GUILDHALL HILL RD	5.5	P	P	P	N	N		Does Not Meet	High		11/25/2020
106697	GUILDHALL HILL RD	5	F	P	F	N			Partially Meets	Moderate		11/25/2020
107679	HALL RD	12.2							Fully Meets			11/19/2020
107680	HALL RD	8.7							Fully Meets			11/19/2020
107681	HALL RD	12.1							Fully Meets			11/19/2020
120414	KIMBALL RD	3.8	P	D	P	N	H	H	Does Not Meet	Moderate		11/18/2020
120424	KIMBALL RD	3.5							Fully Meets			11/18/2020
120425	KIMBALL RD	2.8	P	P	P	N	H	H	Fully Meets			11/18/2020
120426	KIMBALL RD	2.8							Fully Meets			11/18/2020
120441	KIMBALL RD	2.8	P	P	P	N	H	H	Fully Meets			11/18/2020
120442	KIMBALL RD	2.8							Fully Meets			11/18/2020
122283	LAKE RD	2.3	P	F	F	F			Partially Meets	Low	Crown could be improved in areas. Grader berm near beginning needs removal. Upstream culvert header needs stabilization. Ohter ditch side steep in places.	10/13/2022
122285	LAKE RD								Not Connected		Not maintained by town according to road crew	10/13/2022
122286	LAKE RD	1.1	F	P	F	N			Partially Meets	Low	Correction of errors from previous 10/13 assessment	10/13/2022
122287	LAKE RD	2.1	P	P	F	F			Partially Meets	Low	Remove grader berm, improve crown, stabilize culvert up to road surface to reduce loss of road material.	10/13/2022
122288	LAKE RD	3.2	F	P	P	N			Partially Meets	Low	Ditch needs widening and more gradual slope from upstream edge. Especially at bottom corner of driveway at top of hill. Grader berms need removal.	10/13/2022
122289	LAKE RD	2.6	P	P	F	N			Partially Meets	Low	Remove grader berm. Improve crown.	10/13/2022
129216	MAILLETT RD	7							Fully Meets		Water running down wheel track in to river at bridge	11/24/2020
129217	MAILLETT RD	2.5	P	F	P	N			Partially Meets	Low		11/24/2020

Segment ID	Road Name	Slope	Crown	Berm	Drainage	Conveyance	Driveway	Drainage	Segment Status	Segment Priority	Comments	Date
129218	MAILLETT RD	2	P	F	F	N	N	N	Partially Meets	Low		11/24/2020
129222	MAILLETT RD	3.5	F	F	P	F			Partially Meets	Low		11/24/2020
129223	MAILLETT RD	4.8	P	F	P	N			Partially Meets	Low		11/24/2020
131987	MCLAUGHLIN RD	3.3	P	D	P	N	H	N	Fully Meets			11/19/2020
134466	MOHANAN RD	6.2	F	F	D	N			Does Not Meet	High		11/19/2020
134467	MOHANAN RD	8.4	P	P	D	D		VH	Does Not Meet	High	Grass ditch lines and light erission	11/19/2020
134468	MOHANAN RD	7.8	D	D	P	F			Does Not Meet	High	Grass ditch lines with slight erission	11/19/2020
135706	MORIN RD	2.8	F	D	D	N			Does Not Meet	Moderate	Shoulders need to be cut to allow water to sheet of road	11/18/2020
135707	MORIN RD	1.2	F	P	D	N			Does Not Meet	Moderate	Needs gravel to lift road for proper drainage	11/18/2020
149773	PERRY RD	5.5							Fully Meets			11/25/2020
149777	PERRY RD	3.5							Fully Meets		Beavers are putting water over rd	11/25/2020
149778	PERRY RD	1.1							Fully Meets		Beavers are putting water over rd	11/25/2020
149779	PERRY RD	3.5							Fully Meets			11/25/2020
149780	PERRY RD	7.3							Fully Meets			11/25/2020
149781	PERRY RD	8.6							Fully Meets			11/25/2020
149782	PERRY RD	7.1							Fully Meets			11/25/2020
149783	PERRY RD	7.3							Fully Meets			11/25/2020
152048	POND HILL RD	2.5			F	N			Fully Meets		Good grass in ditch line but slight erosion. Need to stone line ditch.	11/19/2020
152069	POND HILL RD	6.4	P	D	P	N	H	N	Fully Meets			11/19/2020
152091	POND HILL RD	14	P	F	P	N			Partially Meets	Moderate		11/19/2020
152092	POND HILL RD	12.1	P	F	D	N			Does Not Meet	Very High		11/19/2020
152093	POND HILL RD	11	F	F	P	F	H	N	Partially Meets	Moderate		11/19/2020
152094	POND HILL RD	11.2	F	F	P	N			Partially Meets	Moderate	Some stone in ditches but water is moving it.	11/19/2020
152095	POND HILL RD	4.8	P	P	P	D	H	VH	Does Not Meet	Moderate		11/19/2020
152096	POND HILL RD	1.7	F	F	F	N			Fully Meets			11/19/2020

Segment ID	Road Name	Slope	Crown	Berm	Drainage	Conveyance	Driveway	Drainage	Segment Status	Segment Priority	Comments	Date
152097	POND HILL RD	1.06	P	P	P	D	H	H	Does Not Meet	Moderate		11/19/2020
152098	POND HILL RD	4.1	P	D	P	N	H		Does Not Meet	Moderate		11/19/2020
152099	POND HILL RD	0.8	F	P	F	N			Partially Meets	Low		11/19/2020
152100	POND HILL RD	1.3	F	D	F	N			Does Not Meet	Moderate		11/19/2020
152106	POND HILL RD	2.8	F	P	P	N		N	Partially Meets	Low		11/19/2020
152109	POND HILL RD	4.1	P	D	P	N	H	N	Does Not Meet	Moderate		11/19/2020
152110	POND HILL RD	5	P	D	P	N			Does Not Meet	High	G	11/19/2020
152111	POND HILL RD	8.6	P	P	P	N			Does Not Meet	High	Good grass in ditch line but slight erosion. Need to stone line ditch.	11/19/2020
152112	POND HILL RD	9	P	P	D	D	H	H	Does Not Meet	High		11/19/2020
152113	POND HILL RD	6	P	F	F	N			Partially Meets	Moderate		11/19/2020
152118	POND HILL RD	2.4	P	P	F	N			Partially Meets	Low		11/19/2020
152119	POND HILL RD	2	F	P	P	N			Partially Meets	Low	Good grass in ditch line but slight erosion. Need to stone line ditch.	11/19/2020
50700.1	POND HILL RD	1.8			F	F			Fully Meets			11/19/2020
50708.1	POND HILL RD	7.8			D	N	H	N	Does Not Meet	High	Good grass in ditch line but slight erosion. Need to stone line ditch.	11/19/2020
50709.1	POND HILL RD	8.8			D	N	H	VH	Does Not Meet	High	Good grass in ditch line but slight erosion. 15 inch plastic and is plunge pooling at out let. Need to stone line ditch.	11/19/2020
50710.1	POND HILL RD	7.8			D	N			Does Not Meet	High	Good grass in ditch line but slight erosion. Need to stone line ditch.	11/19/2020
50711.1	POND HILL RD	6.5			D	N	VH	VH	Does Not Meet	High	Gully Washington right hand side and only 15 inch plastic cross pipe Need to stone line ditch.	11/19/2020
50712.1	POND HILL RD	6.6			D	N	H	N	Does Not Meet	High	Good grass in ditch line butt erosion. Need to stone line ditch.	11/19/2020
153192	POWELL RD	9.5							Fully Meets			11/24/2020
153194	POWELL RD	3.4	P	F	P	N	N		Partially Meets	Low	Stone in ditch line but still eroding	11/24/2020

Segment ID	Road Name	Slope	Crown	Berm	Drainage	Conveyance	Driveway	Drainage	Segment Status	Segment Priority	Comments	Date
153200	POWELL RD	2							Fully Meets			11/24/2020
153201	POWELL RD	4							Fully Meets			11/24/2020
153207	POWELL RD	6							Fully Meets			11/24/2020
54168.1	RIVER RD	0.56			F	N			Fully Meets			11/17/2020
54169.1	RIVER RD	0.94			F	D		VH	Does Not Meet	Moderate	30? Metal pipe is completely rotten along the bottom	11/17/2020
54172.1	RIVER RD	2.2			F	N			Fully Meets			11/16/2020
54173.1	RIVER RD	2.1			F	F			Fully Meets			11/16/2020
54174.1	RIVER RD	1.18			F	N			Fully Meets			11/16/2020
54176.1	RIVER RD	0.56			F	N			Fully Meets			11/16/2020
54177.1	RIVER RD	0.56			F	N		N	Fully Meets			11/16/2020
54178.1	RIVER RD	0.56			F	N			Fully Meets			11/16/2020
54179.1	RIVER RD	2.14			F	N		N	Fully Meets			11/16/2020
54180.1	RIVER RD	2			F	N			Fully Meets			11/16/2020
54181.1	RIVER RD	2.2			F	F			Fully Meets		Some sand on bridge and should under rail could be leveled and seeded.	11/16/2020
54182.1	RIVER RD	2.1			F	N			Fully Meets			11/16/2020
54190.1	RIVER RD	2.2			F	D		L	Does Not Meet	Moderate		11/16/2020
54196.1	RIVER RD	3.2			F	F		N	Fully Meets		Concrete box with stone lined ditches leading in to it.	11/16/2020
54200.1	RIVER RD	3.24			F	D		VH	Does Not Meet	Moderate		11/16/2020
54201.1	RIVER RD	1.9			F	N			Fully Meets			11/16/2020
54202.1	RIVER RD	3.6			P	D	H	VH	Does Not Meet	Moderate		11/16/2020
54203.1	RIVER RD	5			P	N			Partially Meets	Moderate	Slight erission in grass ditch line.	11/16/2020
54204.1	RIVER RD	1.39			F	N		L	Partially Meets	Low	Concrete pipe half plugged	11/16/2020
54205.1	RIVER RD	2			F	D		VH	Does Not Meet	Moderate	Pipe is failing, gravel shoulders are sliding tord the stream.	11/16/2020
54206.1	RIVER RD	0.56			F	N		H	Partially Meets	Low		11/16/2020

Segment ID	Road Name	Slope	Crown	Berm	Drainage	Conveyance	Driveway	Drainage	Segment Status	Segment Priority	Comments	Date
54207.1	RIVER RD	5.7			F	N		N	Fully Meets			11/16/2020
54210.1	RIVER RD	6.4			F	N			Fully Meets		Ditches are all grass with no erission	11/16/2020
54214.1	RIVER RD	4.3			F	N			Fully Meets			11/16/2020
54215.1	RIVER RD	3.4			F	N			Fully Meets			11/16/2020
54216.1	RIVER RD	1.13			F	N			Fully Meets			11/16/2020
54217.1	RIVER RD	1.6			F	N			Fully Meets			11/16/2020
54218.1	RIVER RD	1.8			F	N		N	Fully Meets			11/16/2020
54219.1	RIVER RD	1.4			F	N		N	Fully Meets			11/16/2020
54220.1	RIVER RD	1.2			F	N			Fully Meets			11/16/2020
54221.1	RIVER RD	0.56			F	N			Fully Meets			11/17/2020
54222.1	RIVER RD	1.6			F	D		H	Does Not Meet	Moderate	Large drop at outlet of pipe should have some large rock to slow down energy of water	11/17/2020
54235.1	RIVER RD	0.56			F	D		H	Does Not Meet	Moderate	Inlet should be stones to stop erosion	11/17/2020
54236.1	RIVER RD	0.56			F	F			Fully Meets			11/17/2020
54243.1	RIVER RD	0.56			F	N			Fully Meets			11/17/2020
54244.1	RIVER RD	0.56			F	N			Fully Meets			11/17/2020
54245.1	RIVER RD	1.2			F	N			Fully Meets			11/17/2020
54246.1	RIVER RD	0.56			F	N			Fully Meets			11/17/2020
54247.1	RIVER RD	0.56			F	N			Fully Meets			11/17/2020
54248.1	RIVER RD	0.4			F	N			Fully Meets			11/17/2020
54250.1	RIVER RD	0.4			F	N			Fully Meets			11/17/2020
54251.1	RIVER RD	0.56			F	N			Fully Meets			11/17/2020
54842.1	RIVERSIDE AV	3.4			F	N		N	Fully Meets			11/16/2020
54843.1	RIVERSIDE AV	2.02			F	N			Fully Meets			11/16/2020
54844.1	RIVERSIDE AV	1			F	N		N	Fully Meets			11/16/2020
54845.1	RIVERSIDE AV	2.5			F	N		VH	Does Not Meet	Moderate	Plung pool at outlet of pipe washing tord the river.	11/16/2020
54846.1	RIVERSIDE AV	1.02			F	N			Fully Meets			11/16/2020
54847.1	RIVERSIDE AV	0.56			F	N	N					11/16/2020

Segment ID	Road Name	Slope	Crown	Berm	Drainage	Conveyance	Driveway	Drainage	Segment Status	Segment Priority	Comments	Date
54848.1	RIVERSIDE AV	3.5										11/30/2020
57249.1	S LUNENBURG RD	1.2			F	N			Fully Meets			11/16/2020
57250.1	S LUNENBURG RD	1.18			F	N			Fully Meets			11/17/2020
57256.1	S LUNENBURG RD	6.5			D	N	H	H	Does Not Meet	High	Need to ditched and stone lined	11/17/2020
57257.1	S LUNENBURG RD	0.56			F	N		VH	Does Not Meet	Moderate	Some stone ditch line need to finish	11/17/2020
57278.1	S LUNENBURG RD	1.4			F	N			Fully Meets			11/17/2020
57279.1	S LUNENBURG RD	0.56			F	N			Fully Meets			11/17/2020
167350	SIMONDS RD	6.5	P	P	P	N			Does Not Meet	High	Shoulders need to be cut	11/25/2020
167355	SIMONDS RD	3.8	F	P	P	N		H	Does Not Meet	Moderate		11/25/2020
167356	SIMONDS RD	6.6	F	P	F	N			Partially Meets	Moderate		11/25/2020
167359	SIMONDS RD	3.3	F	P	P	N		L	Does Not Meet	Moderate		11/25/2020
167360	SIMONDS RD	3.4	F	P	F	N		H	Partially Meets	Low		11/25/2020
167361	SIMONDS RD	3.43	F	F	F	D		VH	Does Not Meet	Moderate	Small stream coming off access road is making a channel	11/25/2020
167362	SIMONDS RD	3.4	F	P	F	N		N	Partially Meets	Low		11/25/2020
167363	SIMONDS RD	2.8	P	P	F	N			Partially Meets	Low		11/25/2020
167364	SIMONDS RD	1.5	P	P	F	N	N	VH	Does Not Meet	Moderate		11/25/2020
167365	SIMONDS RD	3.2	F	F	F	N	N		Fully Meets			11/25/2020
185992	TOBYNE RD	7.7	P	F	P	N			Partially Meets	Moderate	No stone in ditch lines with some erosion	11/18/2020
66656.1	TOWN HIGHWAY 4	0.56			F	F			Fully Meets			11/17/2020
187692	TRANSFER STATION RD	5	F	F	F	N			Fully Meets			11/18/2020
193229	W THOMAS RD	2.8	D	D	P	N	H	H	Does Not Meet	Moderate	Needs gravel to build road up and install a ditch line	11/18/2020
193230	W THOMAS RD	2.6	P	D	P	N			Does Not Meet	Moderate		11/18/2020
193231	W THOMAS RD	1.65	F	P	D	N			Does Not Meet	Moderate	Bank needs to be removed and gravel added.	11/18/2020
193242	W THOMAS RD	2.8	F	P	D	N			Does Not Meet	Moderate	Ditch line leading to stream is eroding Needs a ditch line established	11/18/2020
193243	W THOMAS RD	4.8	P	D	D	D			Does Not Meet	Moderate	Needs gravel and ditch line established	11/18/2020
193244	W THOMAS RD	1.5	P	P	D	N	H	H	Does Not Meet	Moderate	Need to add gravel and open ditch line	11/18/2020

Segment ID	Road Name	Slope	Crown	Berm	Drainage	Conveyance	Driveway	Drainage	Segment Status	Segment Priority	Comments	Date
193660	WALKER PIT RD	3.5	P	F	P	N			Partially Meets	Low		11/16/2020
70487.1	WASHINGTON AV	0.56			F	N			Fully Meets			11/16/2020
70488.1	WASHINGTON AV	2.7			F	N			Fully Meets			11/16/2020

Implementation schedule as laid out in the MRGP

The timeline for implementation of the MRGP is laid out in the MRGP document on the MRGP website: https://dec.vermont.gov/watershed/stormwater/permit-information-applications-fees/municipal-roads-program. A portion of the implementation requirements from that document are outlined below.

4.2 Implementation Table Portal (ITP)

Municipalities shall record the REI scoring information in the ITP. The ITP is available on the MRGP website at: https://dec.vermont.gov/watershed/stormwater/permit-information-applications-fees/municipal-roads-program.

The ITP displays a Progress Report on MRPG compliance for each municipality. The Progress Report displays the number of non-compliant road segments the municipality will bring up to standards in order to achieve compliance by December 31, 2036. The municipality shall upgrade at least 7.5% of non-compliant road segments identified in the REI submitted to DEC in the ITP each year. Municipalities' ITP's Progress Report will identify the number of road segments that must be upgraded by the end of the calendar year to reach, at a minimum, 7.5% compliance annually. The municipality shall report annually on the status of implementation (see Part 5.2) and any changes to individual connected road segment compliance status. Any segment upgrades from non-compliant to compliant (Fully Meets) status reported after May 1, 2023 will not require a new REI reassessment of that segment(s) during this permit term.

4.3 Very High Priority Road Segments

Under the current (completed 2023) Road Erosion Inventory:

Hydrologically-connected paved and gravel road segments with drainage ditches scoring "Does Not Meet" on the REI, on slopes greater than 10 %, are considered Very High Priority Road Segments. Very High Priority segments shall be upgraded to meet the MRGP standards listed in Part 6 of this General Permit by December 31, 2025.

Under the next (must be completed by October 31, 2027) Road Erosion Inventory:

DEC will calculate Very High Priority segment scores using methodology described in the scoring methodology document. Twenty percent of all Very High Priority segments shall be upgraded to meet the MRGP standards annually, as part of the required 7.5% listed in Section 4.2

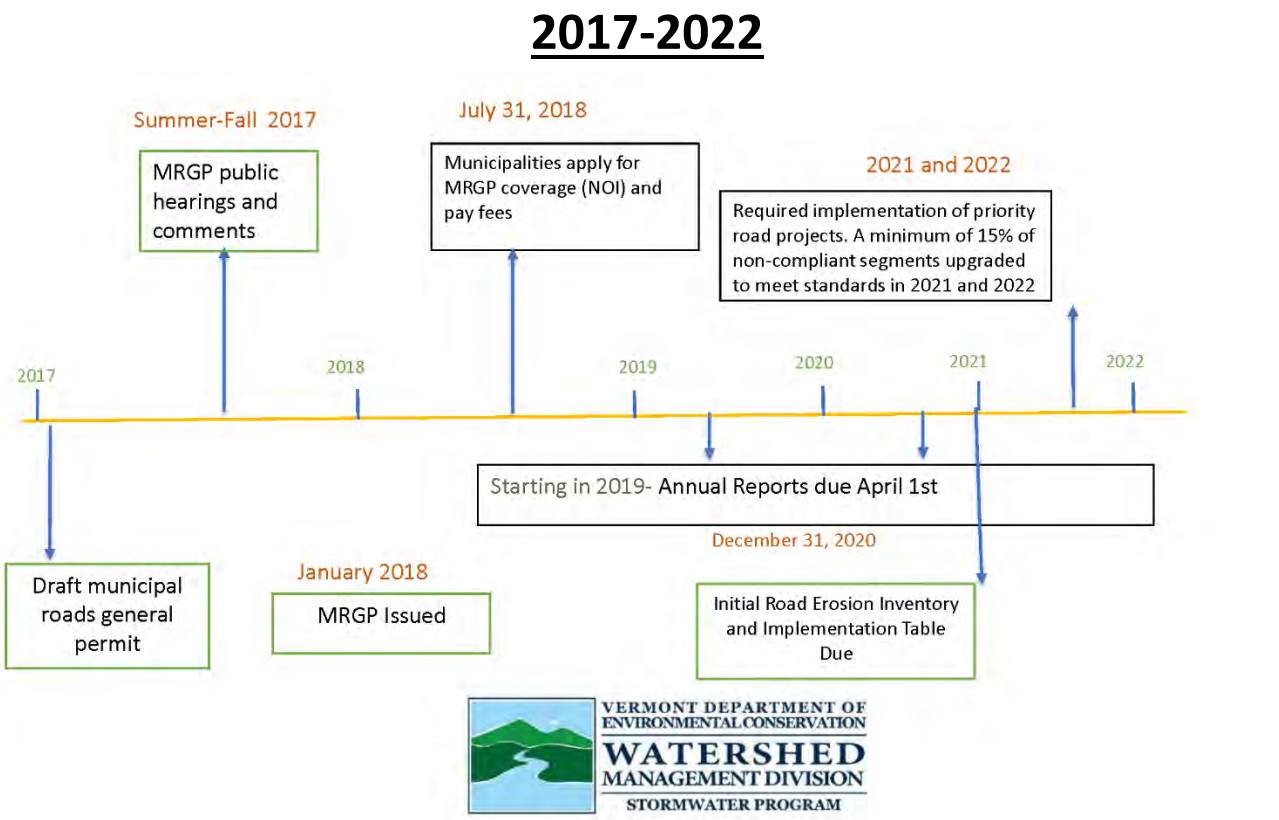
4.4 Implementation and Compliance Schedule

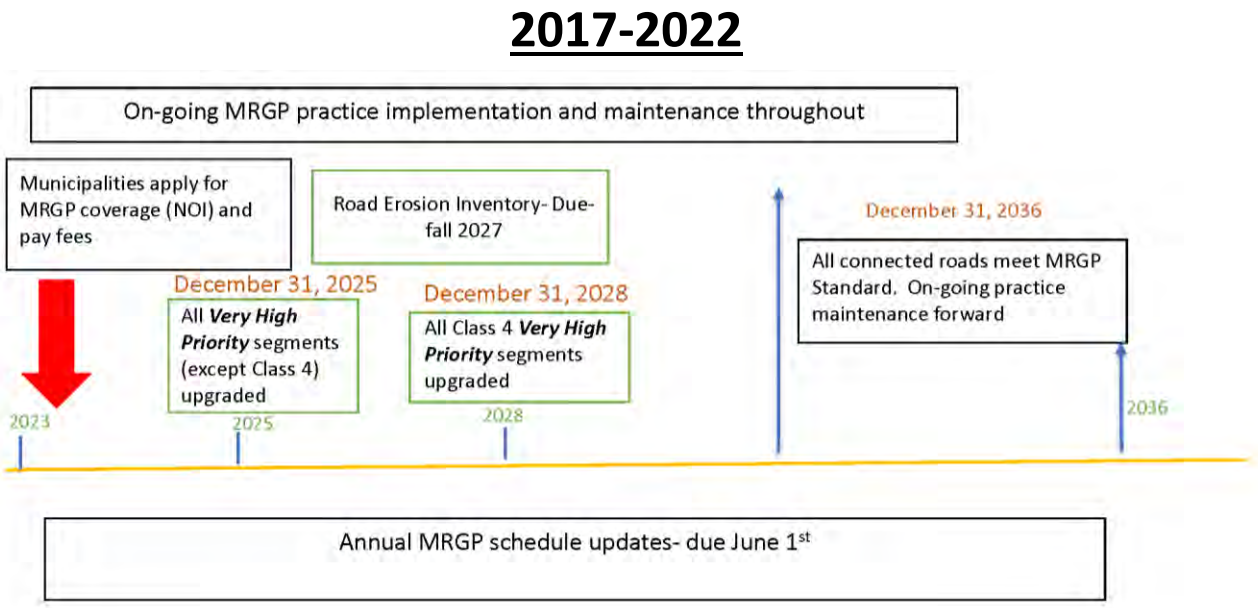
The municipality shall bring all hydrologically-connected road segments up to the MRGP standards as soon as possible but no later than December 31, 2036.

The following implementation schedule shall apply.

January 26, 2023	NOI must be filed with the Agency
April 1, 2023 and every year thereafter	Annual Report forms due (see Part 5.2.A)
October 31, 2027	REI reassessment via the ITP
November 1, 2027[2]	Apply for authorization upon reissuance of the MRGP
No later December 31, 2036	Complete implementation; all hydrologically-connected municipal roads meet the standards listed in the MRGP General Permit

MRGP Timeline

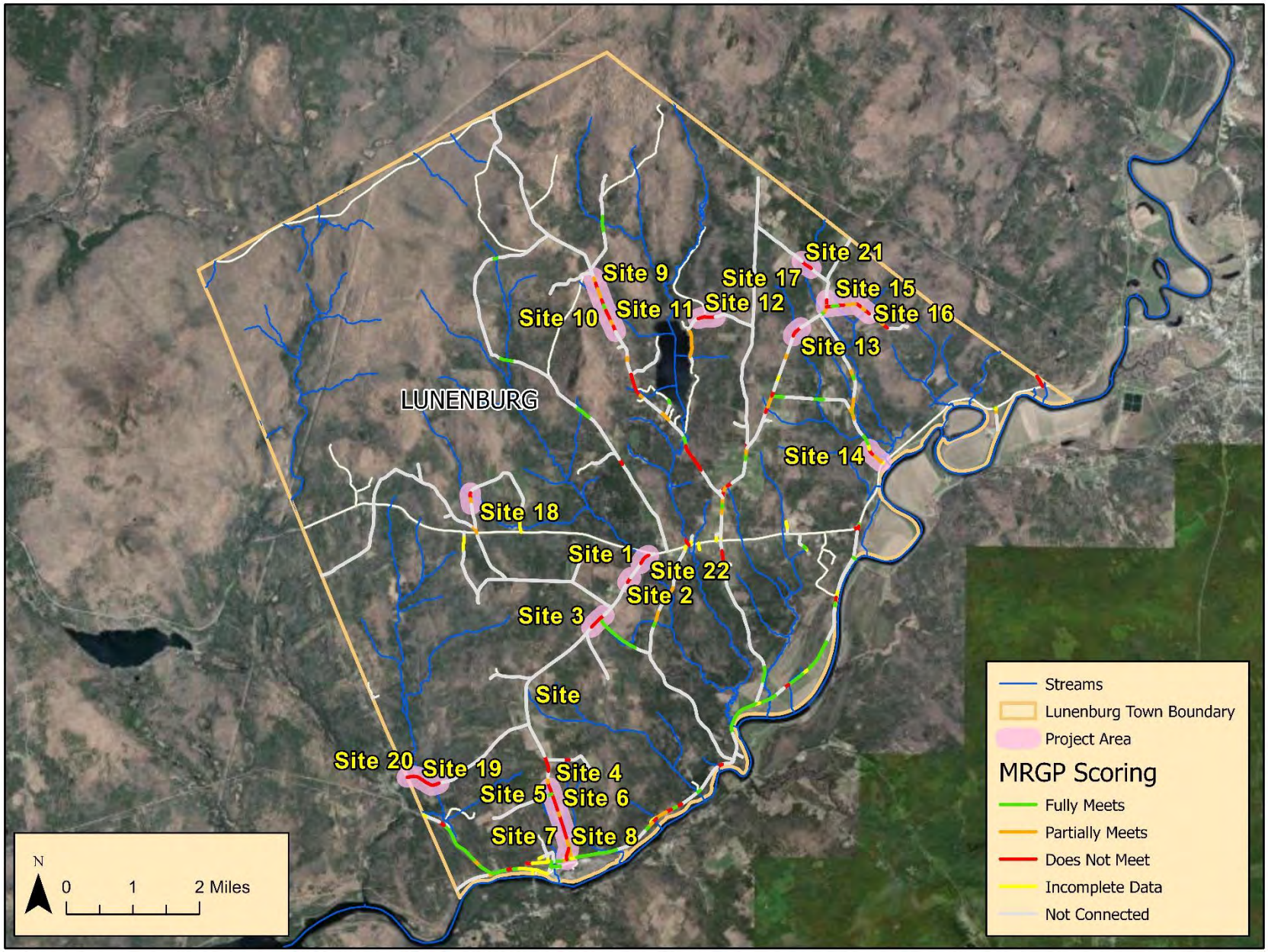




Identified Priority Road Project Sites						
Site #	Location	Segments	TH#	Priority*	Cost Estimate	Town match
1	Baptist Hill Rd - Mink Brook	4170, 4171	5	VH	$28,988.10	$8,988.10
2	Baptist Hill Rd - Mink Brook Hill	4166	5	H	$16,550.85	$3,310.17
3	Baptist Hill Rd - Perry Rd	4156, 4157, 4158	5	VH	$24,095.70	$4,819.14
4	Baptist Hill Rd - Dodge Rd North	1938.1, 1937.1	5	VH	$31,604.18	$11,604.18
5	Baptist Hill Rd - Dodge Rd South	1936.1, 1935.1, 1934.1	5	VH	$26,007.35	$5,201.47
6	Baptist Hill Rd - Bottom North	1933.1, 1932.1, 1931.1	5	H	$29,720.05	$9,720.05
7	Baptist Hill Rd - Bottom South	1930.1, 1929.1, 1928.1	5	H	$23,012.40	$4,602.48
8	Church St	22134, 22132	49	H	$20,346.75	$4,069.35
9	Pond Hill Rd - Hill	152091, 152092, 152093	15	VH	$26,564.50	$6,564.50
10	Pond Hill Rd - Middle	152094, 152095	15	M	$21,422.35	$4,284.47
11	Pond Hill Rd - Flat	152097, 152098, 152099, 152100	15	M	$17,731.00	$3,546.20
12	Monahan Rd	134466, 134467, 134468	41	H	$46,898.70	$9,379.74
13	Bobbin Mill Rd - Bend	4596.1, 4597.1	34	H	$19,236.70	$3,847.34
14	Bobbin Mill Rd - Rt 2	10509, 10508, 10507	34	M	$22,588.25	$4,517.65
15	Simonds Rd - Guildhall Rd	106696, 167350	9, 8	H	$18,357.50	$3,671.50
16	Simonds Rd - Culverts	167364, 167363, 167362, 167361, 167360, 167359	9	M	$20,304.95	$4,060.99
17	Cole Hill Rd	24571	7	H	$6,356.85	$1,271.37
18	Dupont Rd	91827, 91828	20	H	$9,327.25	$1,865.45
19	Thomas Rd - East	193243, 193242	31	M	$23,452.80	$4,690.56
20	Thomas Rd - West	193229, 193231, 193230	31	M	$27,428.55	$7,428.55
				Total Estimated Budget	$459,994.78	
				Town Match (minimum 20% on each project)	$107,443.26	
Large structures Projects						
21	Cole Hill Rd - Box Culvert	24570	7	M	$490,000.00	
22	Baptist Hill Rd - Mink Brook Culvert	4171	5	M	$982,250.00	

*VH= Very High, H = High, M = Moderate. All Very High segments must be completed by 2025 for MRGP compliance.

Town of Lunenburg Project Site Map



Site #1: Baptist Hill Rd – Mink Brook

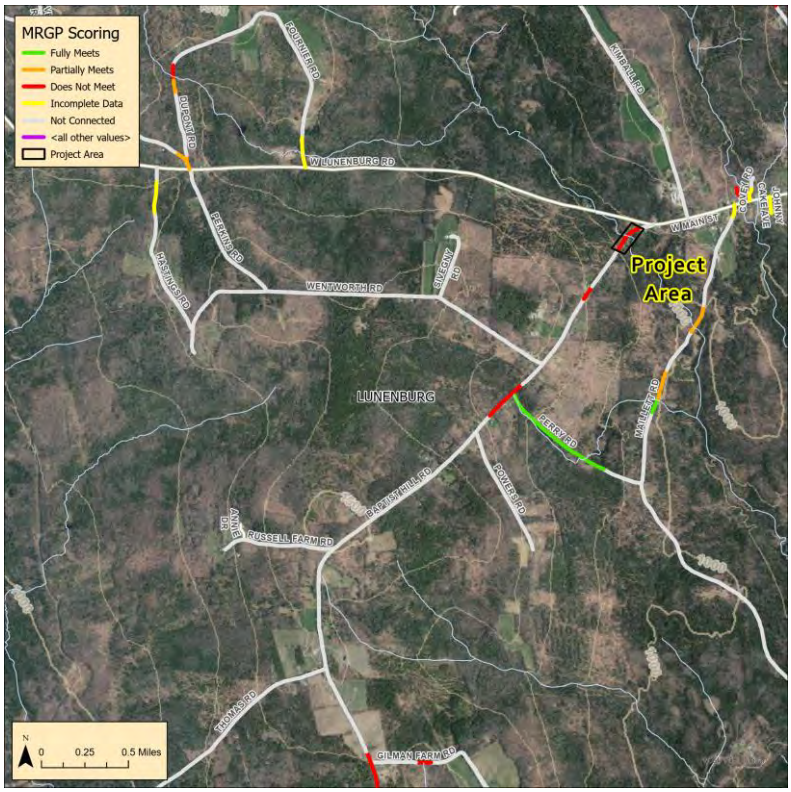


Figure 1: Location of Site #1

Figure 2: Water runs along the road surface in segment 4171 due to poor crowning and absent ditches

Project Length in ft.:	**656 ft.**
Number of Structures/culverts replaced or repaired:	**3**
Average Slope of Roadway:	**6.8%**
Road Segment ID(s):	**4170, 4171**
Structure ID(s):	**unknown**
Priority:	**Very High**

Description of erosion/water quality issue:

The crown in segment 4170 and 4171 does not adequately shed water off the road surface as sheet flow, causing water to run along the road surface picking up sediment. The ditches are also too narrow, filled with sediment, and not stone lined in steep sections, causing erosion on the road surface and in the ditches. Cross drain culverts in segment 4171 and 4170 (uknown ID) are obstructed and too small, with overflow running onto the road surface causing erosion, and a driveway does not have a culvert, causing erosion. Sediment picked up by water flowing along these segments enters Mink Brook in segment 4171 at the bottom of the hill. Sink holes are beginning around the culvert conveyance at Mink Brook (ID 3) causing sediment addition to Mink Brook.

Description of Project/Corrective Measures

In segment 4170 and 4171 ditches will be reestablished and stoned to shed water evenly without erosion. Shoulders will be reshaped in areas where distributed flow away from the roadway is possible. 5 inches of ¾" minus gravel will also be added to allow for adequate crowning to shed water off the road surface as sheet flow. The two cross drain culverts will be replaced with 2' steel culverts, and an 18" steel culvert will be installed across the driveway in the segment to allow adequate road drainage. Turnouts will be added to ensure water entering Mink Brook does so as distributed flow through vegetation. These measures will reduce erosion of the road surface and sediment transport to surface waters. The sink hole near Culvert 3 on Mink Brook will be stabilized by filling it with stone and gravel. The town is seeking funding to replace Culvert 3 in partnership with ECNRCD.

Cost Estimate Site

Project Budget			
Item	Cost	Qty	Total
Materials			
3/4" crushed gravel	$9.75/T	532	$5,187.00
12" minus - 3 turnouts, sink hole repairs	$17.35/T	32	$555.20
12" minus - ditch stone (606')	$17.35/T	94	$1,630.90
2'x55', 1.5'x20' steel culverts	$8,950.00 total	1	$8,950.00
Stone hauling	$115/hr/20T load	33	$3,795.00
Equipment			
Excavator & operator	$135/hr	50	$6,750.00
Grader & operator	$90/hr	7	$630.00
Trucking removing road & ditch material	$85/hr	14	$1,190.00
Hydroseeder	$300/day	1	$300.00
Total			$28,988.10
Recommended Grant Program	**Better Roads Grant Category D**		
Grant Amount ($20,000 maximum)	69%		$20,000.00
Cost To Town (20% minimum)	31%		$8,988.10

***Additional Notes**: The large culvert at Mink Brook is exempt from the MRGP because Mink Brook is a perennial stream, but it should also be replaced due to erosion and issues with fish passage. A design is being made for this structure in 2023, and ECNRCD & USFWS are looking into additional funding options for installation, including: National Fish Passage Program, Eastern Brook Trout Joint Venture, VTrans Structures Grant, VT DEC Clean Water Enhancement Grants, DEC Design & Implementation Block Grants, and Inflation Reduction Act Funds

Photos of Site

Figure 3: Rill erosion occurring at a driveway in segment 4171 that lacks a culvert

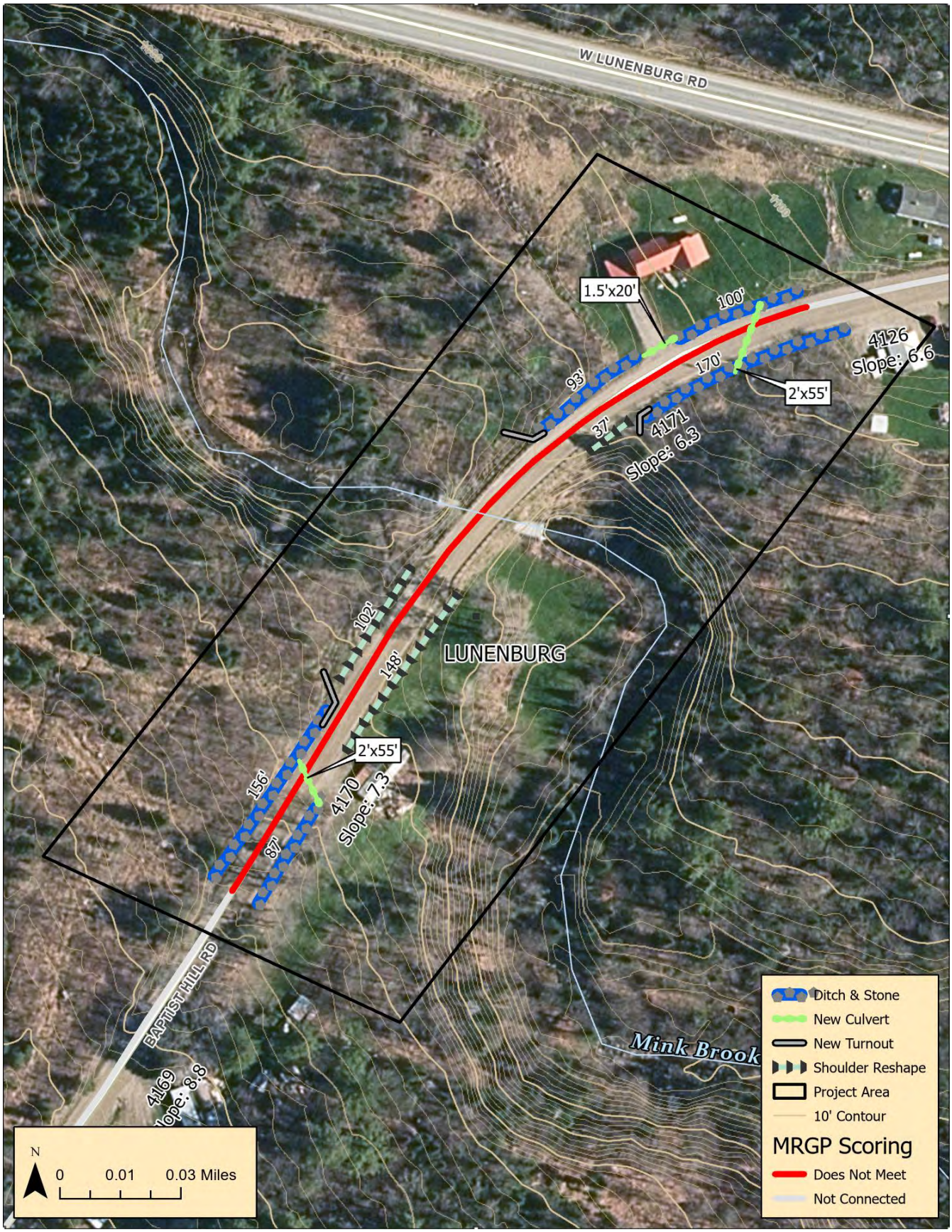
Figure 4: The cross culvert in segment 4171 has shifted and should be replaced with a metal culvert to ensure stability.

Figure 5: A cross drain in segment 4170 is filled with sediment and will be replaced with a 2' cross drain that leads to a turnout.

Figure 6: Erosion occurring at the Mink Brook culvert in segment 4171 will be repaired.

Figure 7: Ditches in both segments have filled with sediment and need additional stone added to slow water velocity and reduce sediment transport.

Project Map


W LUNENBURG RD
1.5'x20'
100'
93'
170'
2'x55'
4126
Slope: 6.6
37'
4171
Slope: 6.3
LUNENBURG
102'
148'
2'x55'
156'
87'
4170
Slope: 7.3
BAPTIST HILL RD
4169
Slope: 8.8
Mink Brook
N
0
0.01
0.03 Miles
Ditch & Stone
New Culvert
New Turnout
Shoulder Reshape
Project Area
10' Contour
MRGP Scoring
Does Not Meet
Not Connected

Site #2: Baptist Hill Rd – Mink Brook Hill

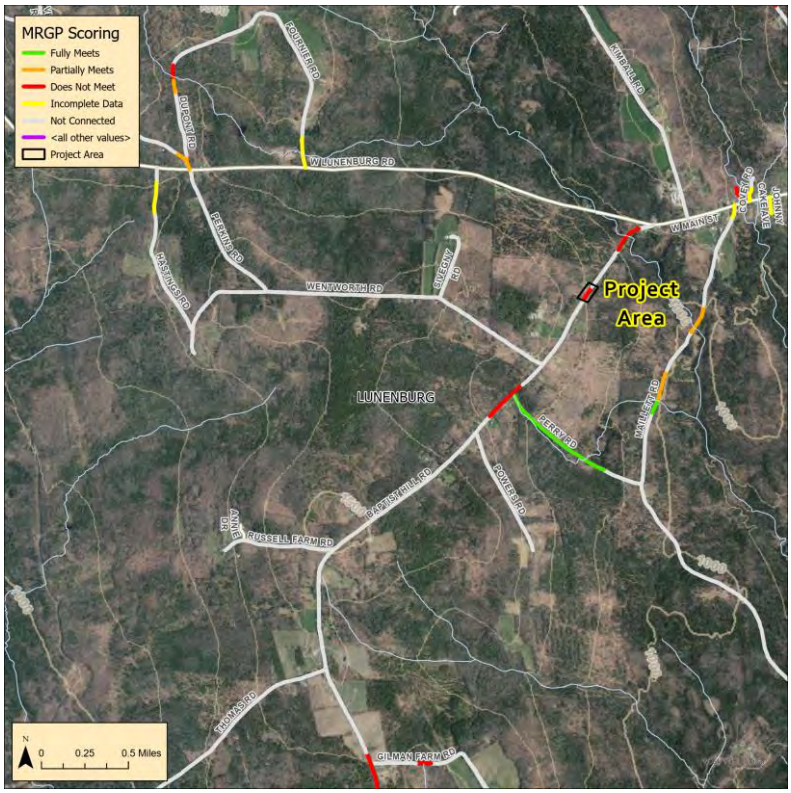


Figure 1: Location of Site #2

Figure 2: The ditches in segment 4166 are filling with sediment from the roadway and eroding within the ditch.

Project Length in ft.:	**328 ft.**
Number of Structures/culverts replaced or repaired:	**0**
Average Slope of Roadway:	**7.6%**
Road Segment ID(s):	**4166**
Structure ID(s):	
Priority:	**High**

Description of erosion/water quality issue:

The crown in segment 4171 does not adequately shed water off the road surface as sheet flow, causing water to run along the road surface picking up sediment. The ditches are also too narrow and not stone lined in steep sections, causing erosion on the road surface and in the ditches. Sediment picked up by water flowing along these segments enters Mink Brook in segment 4171 at the bottom of the hill.

Description of Project/Corrective Measures

In segment 4166 ditches will be reestablished and stoned to shed water evenly without erosion. 5 inches of ¾" minus gravel will also be added to allow for adequate crowning to shed water off the road surface as sheet flow. These measures will reduce erosion of the road surface and sediment transportation to surface waters.

Cost Estimate Site #1: Baptist Hill Rd – Mink Brook

Project Budget			
Item	Cost	Qty	Total
Materials			
3/4" crushed gravel	$9.75/T	532	$5,187.00
12" minus - ditch stone (586')	$17.35/T	91	$1,578.85
Stone hauling	$115/hr/20T load	31	$3,565.00
Equipment			
Excavator & operator	$135/hr	31	$4,185.00
Grader & operator	$90/hr	7	$630.00
Trucking removing road & ditch material	$85/hr	13	$1,105.00
Hydroseeder	$300/day	1	$300.00
Total			$16,550.85
Recommended Grant Program	**Better Roads Grant Category D**		
Grant Amount ($20,000 maximum)	80%		$13,240.68
Cost To Town (20% minimum)	20%		$3,310.17

***Additional Notes**: Additional stone lining of ditches downhill of this segment would also be beneficial for water quality. These segments may be considered hydrologically connected by another assessor and would then be subject to the MRGP standards.

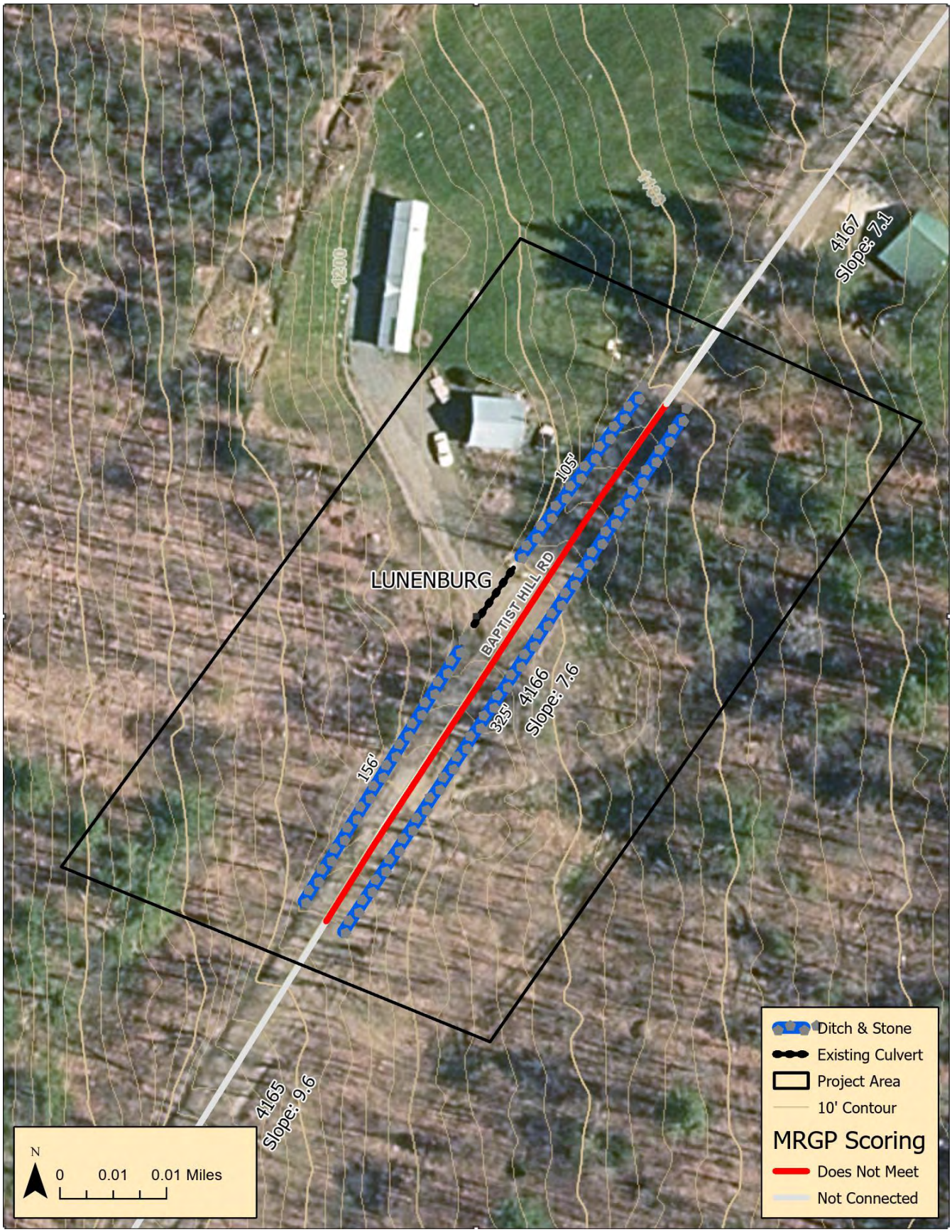
Photos of Site #1-Baptist Hill Rd – Mink Broo

Figure 3: Some parts of segment 4166 lack ditches altogether. Water from these segments flow toward Mink Brook at the bottom of the hill.

Figure 4: Water runs along the road in segment 4166 due to poor crown and shallow ditches, picking up sediment.

Figure 5: Not enough stone is present in ditches in segment 4166, causing erosion within the ditch.

Project Map Site #1: Baptist Hill Rd – Mink Brook



Site #3: Baptist Hill Rd – Perry Rd

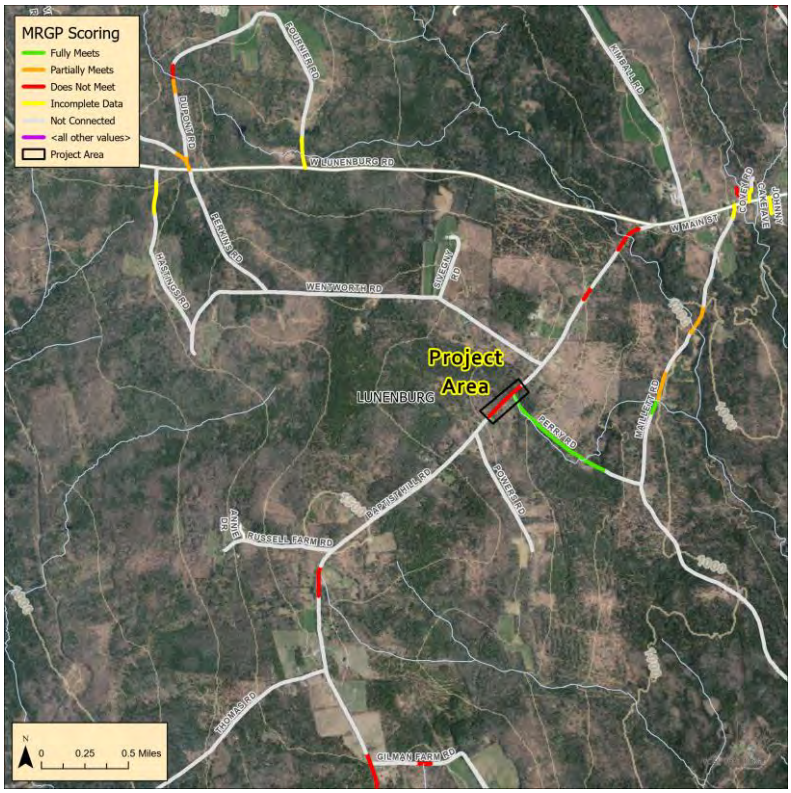


Figure 1: Location of Site #3

Figure 2: Water runs along the road surface through segment 4156 toward segment 4157

Project Length in ft.:	**984 ft.**
Number of Structures/culverts replaced or repaired:	**1**
Average Slope of Roadway:	**5.7%**
Road Segment ID(s):	**4156, 4157, 4158**
Structure ID(s):	**14**
Priority:	**Very High**

Description of erosion/water quality issue:

The crown in segments 4156, 4157, and 4158 does not adequately shed water off the road surface as sheet flow, and poorly shaped shoulders and grader berms cause water to run along the road surface picking up sediment. The ditches are also too narrow and not stone lined in steep sections, causing erosion on the road surface and in the ditches. Several intermittent streams enter the ditches in these segments, concentrating to a perennial stream after passing through the culvert in segment 4157 (ID 14). Erosion is occurring around the inlet of this culvert, contributing sediment to the stream. Sediment from the road surface entering the ditches is also transported to this stream.

Description of Project/Corrective Measures

In segments 4156, 4157, and 4158, ditches and shoulders will be reshaped to shed water evenly without erosion, and stone will be added to the steep sections in segment 4156 and 4157. 7 inches of ¾" minus gravel will be added to allow for adequate crowning to shed water off the road surface as sheet flow. Turnouts will be added to ensure water from ditches entering the unnamed stream in segment 4157 does so as distributed flow through vegetation. These measures will reduce erosion of the road surface and sediment transportation to surface waters. The headers on culvert 14 will be stabilized with stone to reduce erosion.

Cost Estimate Site #1: Baptist Hill Rd – Perry Rd

Project Budget			
Item	Cost/Unit	Qty	Total
Materials			
3/4" crushed gravel	$9.75/T	745	$7,263.75
12" minus - turnout, culvert headers	$17.35/T	24	$416.40
12" minus - ditch stone (724')	$17.35/T	113	$1,960.55
Stone hauling	$115/hr/20T load	44	$5,060.00
Equipment			
Excavator & operator	$135/hr	52	$7,020.00
Grader & operator	$90/hr	7	$630.00
Trucking removing road & ditch material	$85/hr	17	$1,445.00
Hydroseeder	$300/day	1	$300.00
Total			$24,095.70
Recommended Grant Program	**Better Roads Grant Category D**		
Grant Amount ($40,000 maximum)	80%		$19,276.56
Cost To Town (20% minimum)	20%		$4,819.14

***Additional Notes**: The stream culvert in segment 4157 is likely undersized for the amount of water it passes, but because it is the beginning of a perennial stream the MRGP does not apply to its sizing. If the town is interested in replacing it, a Better Roads Grant Category D would secure additional funding up to $60,000. A hydraulic study is suggested to determine proper culvert sizing, though a 6' culvert is likely adequate. If the culvert is replaced, the DEC River Management Engineer should be consulted about the need for a stream alteration permit.

Photos of Site

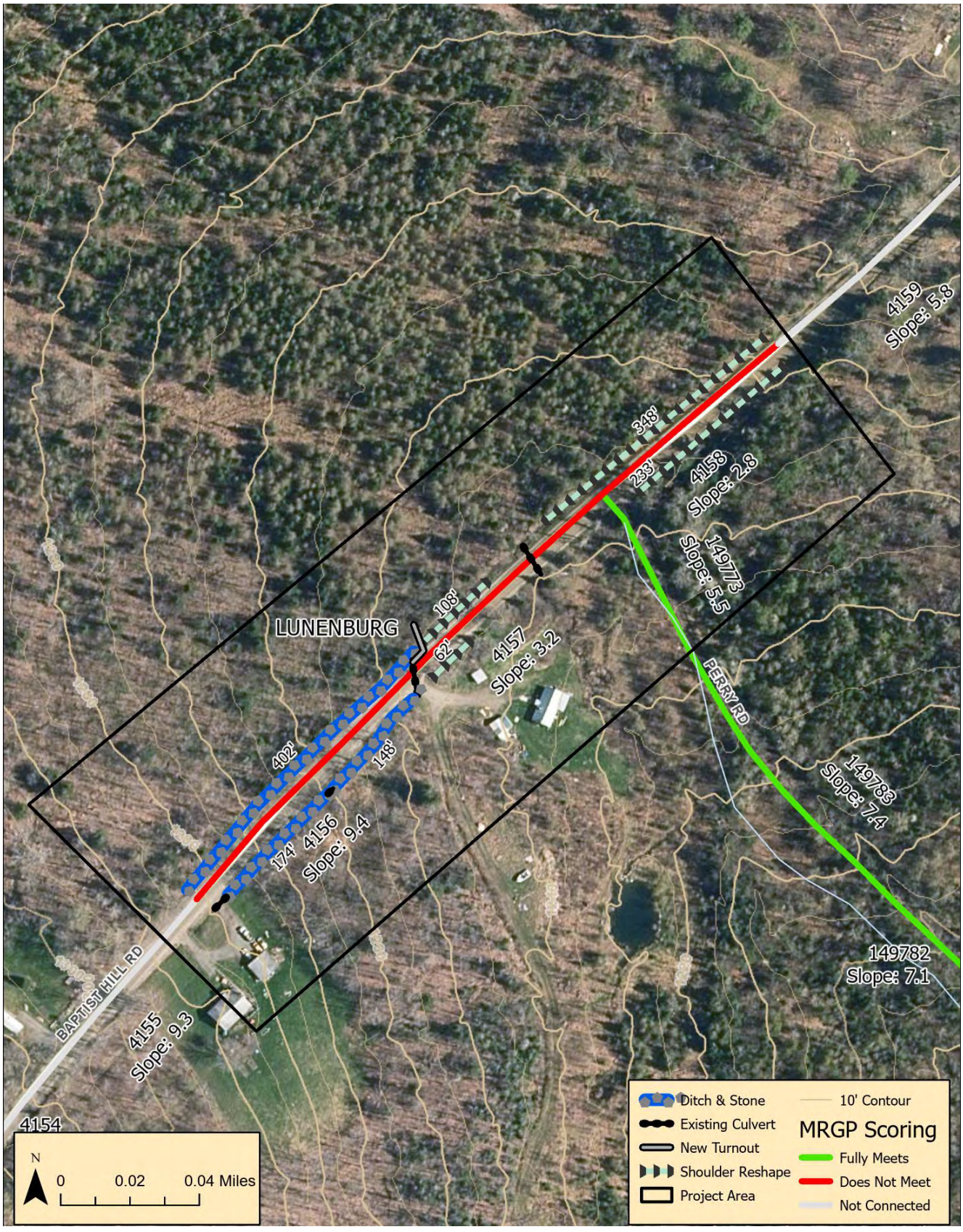
Figure 3: Rill erosion along road surface in segments 4156 & 5157

Figure 4: Ditches have filled with sediment and lack stone lining in steep sections

Figure 5: Erosion is occurring around culvert 14's inlet because there is no stone stabilization

Figure 6: Water runs along the road surface picking up sediment in segment 4156 due to a grader berm and shoulder shaping

Project Map Site



Site #4: Baptist Hill Rd – Dodge Rd North

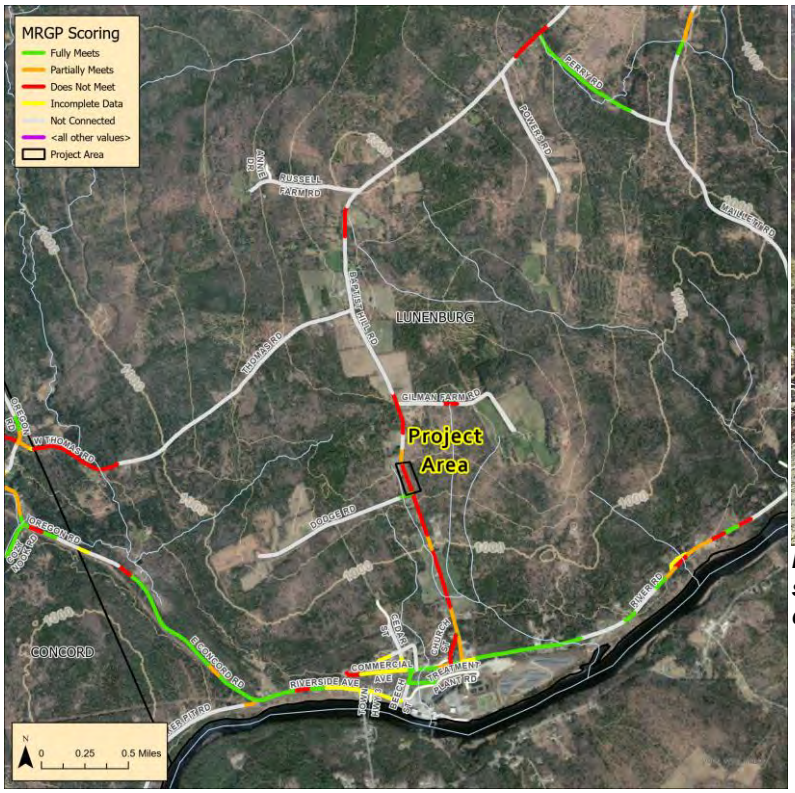


Figure 1: Location of Site #4

Figure 2: Water runs along the road surface in segment 1938.1 due to a poorly shaped crown and ditches

Project Length in ft.:	**656 ft.**
Number of Structures/culverts replaced or repaired:	**0**
Average Slope of Roadway:	**11.5%**
Road Segment ID(s):	**1938.1, 1937.1**
Structure ID(s):	
Priority:	**Very High**

Description of erosion/water quality issue:

The crown in both segments 1938.1 and 1937.1 does not adequately shed water off the road surface as sheet flow, causing water to run along the road surface picking up sediment. The road also becomes very unstable in the spring, causing serious erosion and causing deterioration of the crown. The ditches are also too narrow and not stone lined, causing erosion on the road surface and in the ditches. Sediment picked up by water flowing along these segments enters an unnamed stream further down the road.

Description of Project/Corrective Measures

In both segments 1938.1 and 1937.1, ditches will be reestablished and stoned to shed water evenly without erosion. The road surface in both segments will also be removed and replaced with better material. The road will be underlined with road fabric to stop migration of road material, and 8 inches of 5" minus will be added, followed by 4 inches of ¾" minus, which will be properly crowned.

Cost Estimate

Project Budget			
Item	Cost	Qty	Total
Materials			
5" minus	$6.5/T	567	$3,685.50
3/4" crushed gravel	$9.75/T	256	$2,496.00
12" minus - ditch stone (1252')	$17.35/T	195	$3,383.25
Road stabilization fabric (12.5'x432')	$1,329.81/roll	3	$3,989.43
Stone hauling	$115/hr/20T load	51	$5,865.00
Equipment			
Excavator & operator	$135/hr	57	$7,695.00
Grader & operator	$90/hr	5	$450.00
Trucking removing road & ditch material	$85/hr	44	$3,740.00
Hydroseeder	$300/day	1	$300.00
Total			$31,604.18
Recommended Grant Program	**Better Roads Grant Category B**		
Grant Amount ($20,000 maximum)	63%		$20,000.00
Cost To Town (20% minimum)	37%		$11,604.18

***Additional Notes**: None

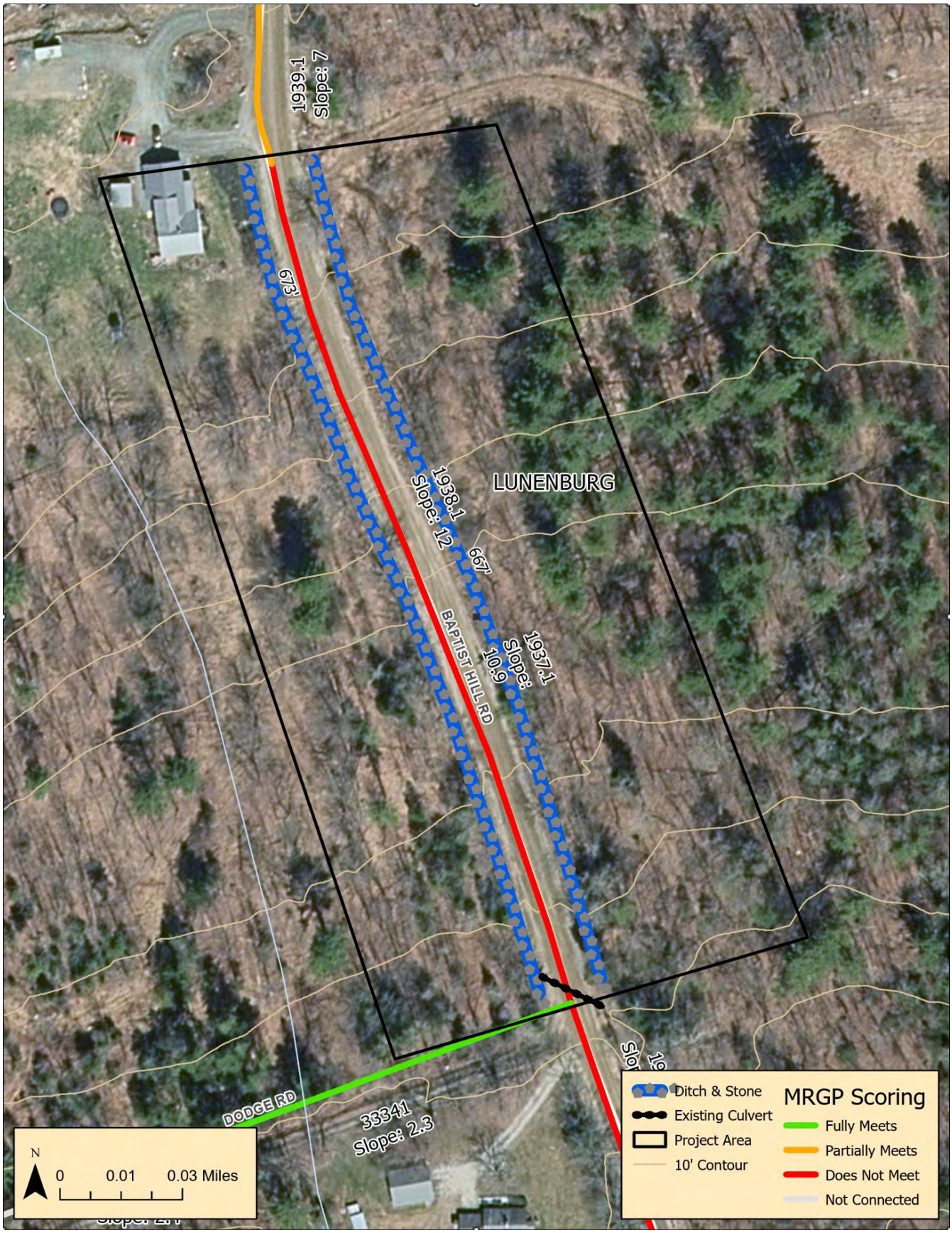
Photos

Figure 3: The ditches in segment 1938.1 and 1937.1 have filled with sediment and lack stone, causing sediment transport to waterbodies.

Figure 4: The ditches in segment 1938.1 and 1937.1 have filled with sediment and lack stone, causing sediment transport to waterbodies.

Figure 5: The ditches in segment 1938.1 and 1937.1 have filled with sediment and lack stone, causing sediment transport to waterbodies.

Project Map


1939.1
Slope: 7
673'
1938.1
Slope: 12
LUNENBURG
657'
BAPTIST HILL RD
1937.1
Slope:
10.9
DODGE RD
33341
Slope: 2.3
N
0
0.01
0.03 Miles
Ditch & Stone
Existing Culvert
Project Area
10' Contour
MRGP Scoring
Fully Meets
Partially Meets
Does Not Meet
Not Connected

Site #5: Baptist Hill Rd – Dodge Rd South

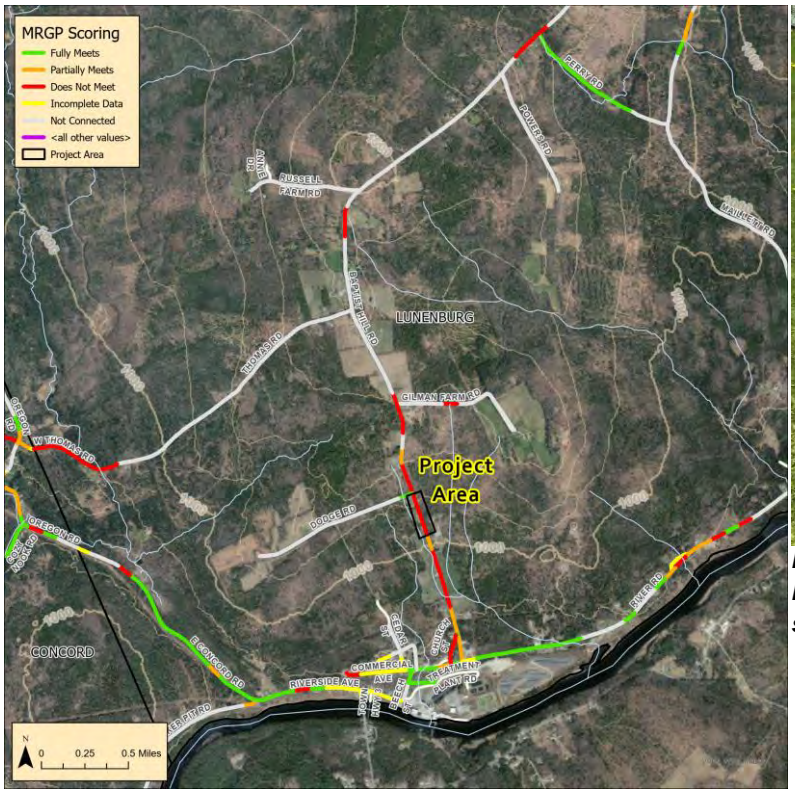


Figure 1: Location of Site #5

Figure 2: Figure 4: The ditches in segment 1934.1 lack stone, causing erosion in the ditch and sediment transport to streams.

Project Length in ft.:	**984 ft.**
Number of Structures/culverts replaced or repaired:	**1**
Average Slope of Roadway:	**10.7%**
Road Segment ID(s):	**1936.1, 1935.1, 1934.1**
Structure ID(s):	**42**
Priority:	**Very High**

Description of erosion/water quality issue:

The crown in segments 1936.1, 1935.1, 1934.1 does not adequately shed water off the road surface as sheet flow, causing water to run along the road surface picking up sediment. The ditches are also too narrow and not stone lined, causing erosion on the road surface and in the ditches. Sediment picked up by water flowing along these segments enters an unnamed stream in segment 1934.1 at culvert 42. Water entering this stream does not flow through a vegetated or stone-lined area. Culvert 42's headers are eroding, adding sediment to the stream.

Description of Project/Corrective Measures

In segments 1936.1, 1935.1, and 1934.1, ditches will be reestablished and stoned to shed water evenly without erosion. 4 inches of ¾" minus gravel will also be added to allow for adequate crowning. In segment 1934.1, stone-lined turnouts will be added above the crossing to ensure water entering the stream passes through a vegetated and stone-stabilized area. Culvert 42's headers will be stabilized with stone to reduce erosion. These measures will reduce erosion of the road surface and sediment transportation to surface waters. Precautions will be taken to ensure the invasive Japanese knotweed in segment 1934.1 will not be spread.

Cost Estimate

Project Budget			
Item	Cost	Qty	Total
Materials			
3/4" crushed gravel	$9.75/T	383	$3,734.25
12" minus - culvert headers & 2 turnouts	$17.35/T	20	$347.00
12" minus - ditch stone (1455')	$17.35/T	226	$3,921.10
Stone hauling	$115/hr/20T load	32	$3,680.00
Equipment			
Excavator & operator	$135/hr	69	$9,315.00
Grader & operator	$90/hr	7	$630.00
Trucking removing road & ditch material	$85/hr	48	$4,080.00
Hydroseeder	$300/day	1	$300.00
Total			$26,007.35
Recommended Grant Program	Better Roads Grant Category D		
Grant Amount ($20,000 maximum)	80%		$20,805.88
Cost To Town (20% minimum)	20%		$5,201.47

***Additional Notes**: The cross culvert in this segment appears to be passing a perennial stream, meaning that the culvert size is not covered by the MRGP. If the town would like to replace the structure, a Better Roads Grant Category D could be used for up to $60,000 of assistance. A 6' culvert is expected to be sufficient, but sizing should be based on the stream width and the River Management Engineer should be consulter for a Stream Alteration permit.

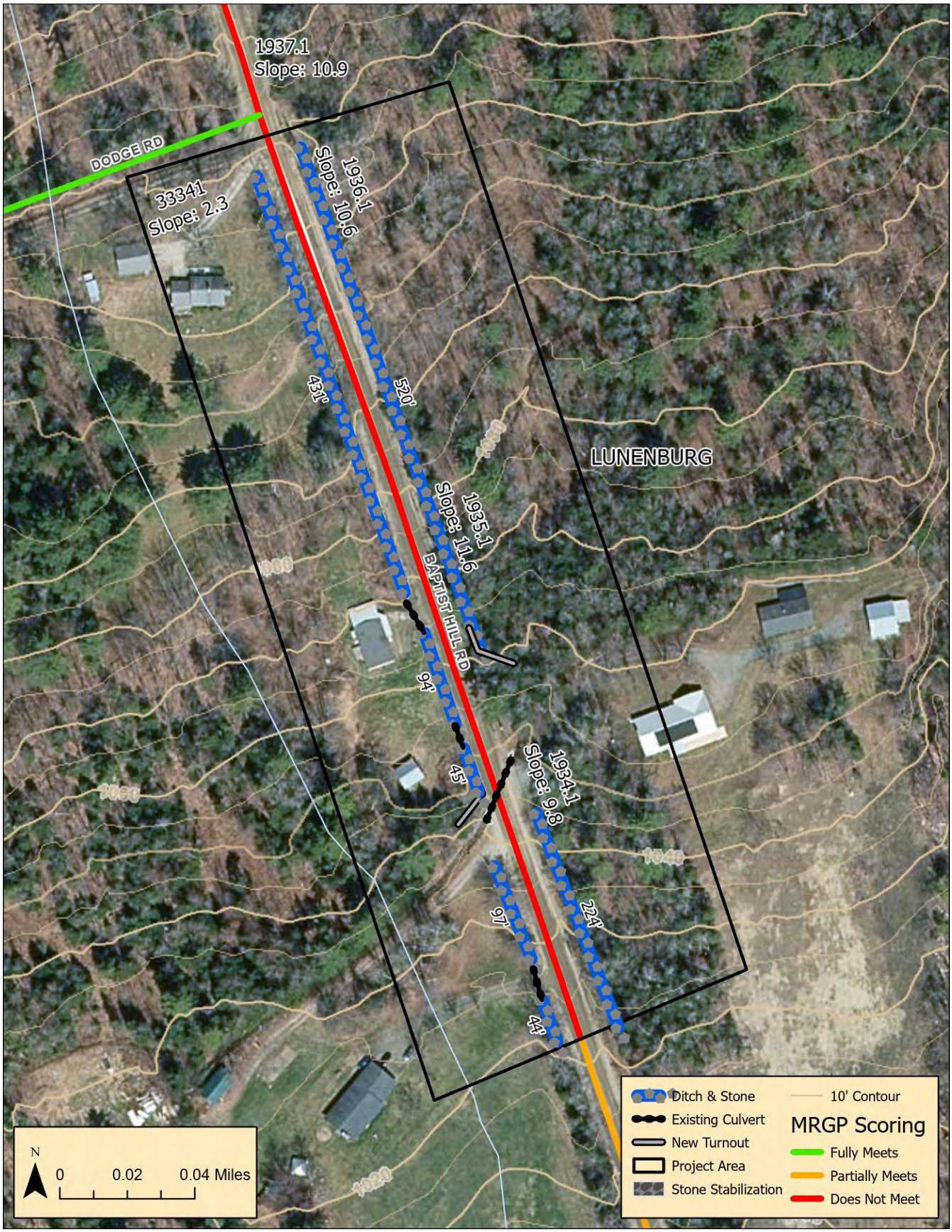
Photos

Figure 3: The inlet and outlet of culvert 42 are eroding and need stone stabilization.

Figure 4: The ditches in segment 1936.1 and 1937.1 have filled with sediment and lack stone, causing sediment transport to waterbodies.

Figure 5: The ditches in segment 1936.1 and 1937.1 have filled with sediment and lack stone, causing sediment transport to waterbodies.

Project Map


1937.1
Slope: 10.9
DODGE RD
33341
Slope: 2.3
1936.1
Slope: 10.6
431'
520'
LUNENBURG
1935.1
Slope: 11.6
BAPTIST HILL RD
94'
45'
1934.1
Slope: 9.8
97'
224'
44'
N
0
0.02
0.04 Miles
Ditch & Stone
Existing Culvert
New Turnout
Project Area
Stone Stabilization
10' Contour
MRGP Scoring
Fully Meets
Partially Meets
Does Not Meet

Site #6: Baptist Hill Rd – Bottom North

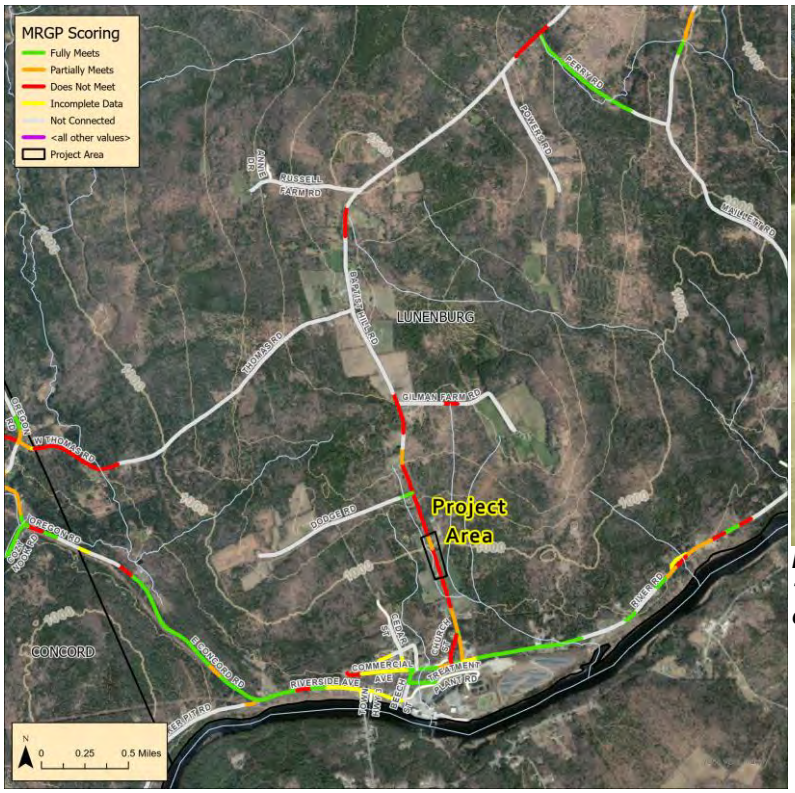


Figure 1: Location of Site #6

Figure 2: The ditches in segment 1931.1, 1932.1, and 1933.1 have filled with sediment and lack stone, causing sediment transport to waterbodies.

Project Length in ft.:	**984 ft.**
Number of Structures/culverts replaced or repaired:	**0**
Average Slope of Roadway:	**7.1%**
Road Segment ID(s):	**1933.1, 1932.1, 1931.1**
Structure ID(s):	
Priority:	**High**

Description of erosion/water quality issue:

The crown in segments 1933.1, 1932.1, and 1931.1 does not adequately shed water off the road surface as sheet flow, causing water to run along the road surface picking up sediment. The ditches are also too narrow and not stone lined, causing erosion on the road surface and in the ditches. Sediment picked up by water flowing along these segments enters an unnamed stream further down the hill in segment 1929.1.

Description of Project/Corrective Measures

In segments 1933.1, 1932.1, and 1931.1, ditches will be reestablished to shed water evenly without erosion, and stone will be added to stop in-ditch erosion. 4 inches of ¾" minus gravel will also be added to allow for adequate crowning to shed water off the road surface as sheet flow. These measures will reduce erosion of the road surface and sediment transportation to surface waters.

Cost Estimate

Project Budget			
Item	Cost	Qty	Total
Materials			
3/4" crushed gravel	$9.75/T	447	$4,358.25
12" minus - ditch stone (1853')	$17.35/T	288	$4,996.80
Stone hauling	$115/hr/20T load	37	$4,255.00
Equipment			
Excavator & operator	$135/hr	86	$11,610.00
Grader & operator	$90/hr	7	$630.00
Trucking removing road & ditch material	$85/hr	42	$3,570.00
Hydroseeder	$300/day	1	$300.00
Total			$29,720.05
Recommended Grant Program	**Better Roads Grant Category B**		
Grant Amount ($20,000 maximum)	67%		$20,000.00
Cost To Town (20% minimum)	33%		$9,720.05

***Additional Notes**: None

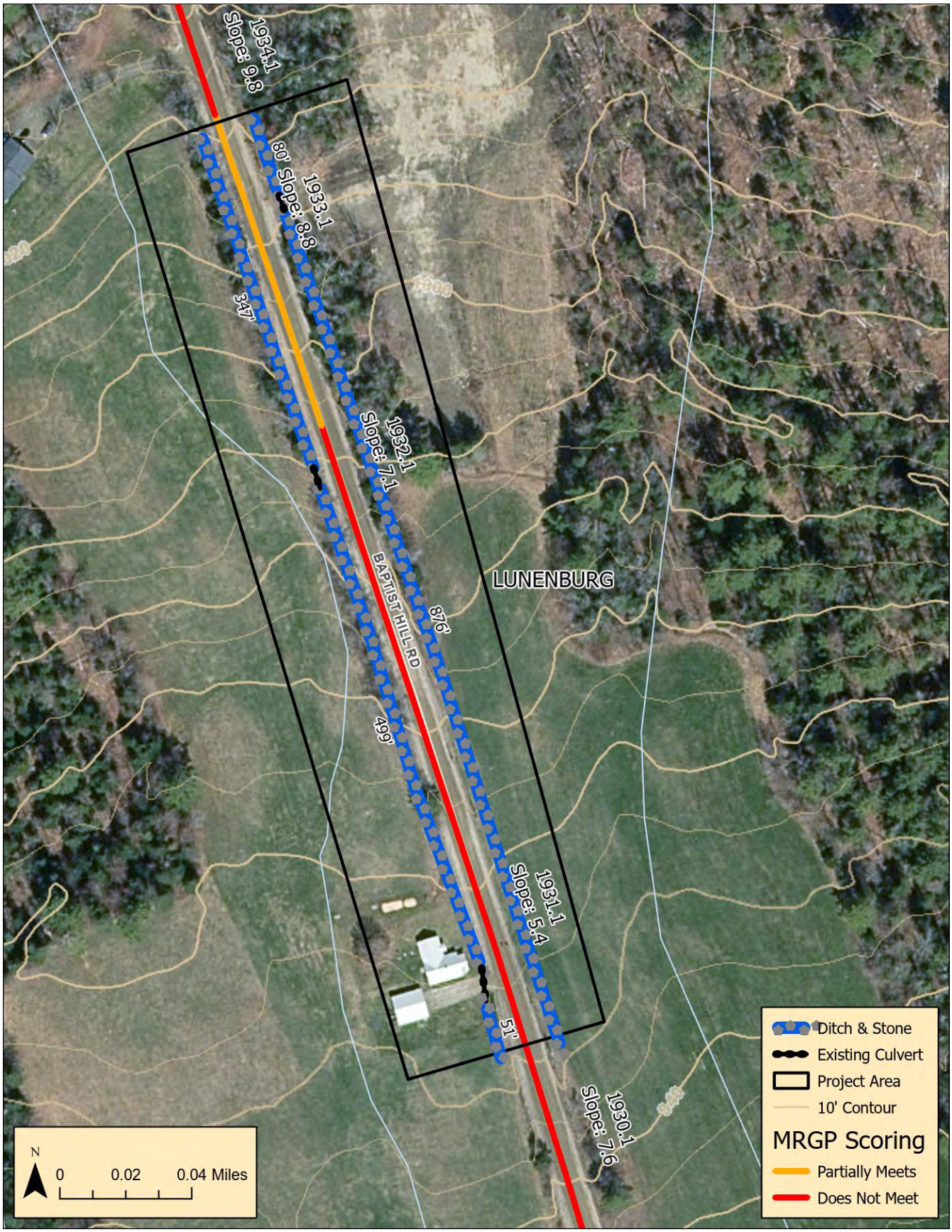
Photos

Figure 3: The ditches in segment 1931.1, 1932.1, and 1933.1 have filled with sediment and lack stone, causing sediment transport to waterbodies.
Grader berms and poorly formed shoulders cause erosion on the road.

Figure 4: The ditches in segment 1931.1, 1932.1, and 1933.1 have filled with sediment and lack stone, causing sediment transport to waterbodies.

Figure 5: The ditches in segment 1931.1, 1932.1, and 1933.1 have filled with sediment and lack stone, causing sediment transport to waterbodies.

Project Map


1934.1
Slope: 9.8
80'
1933.1
Slope: 8.8
347'
1932.1
Slope: 7.1
BAPTIST HILL RD
LUNENBURG
876'
499'
1931.1
Slope: 5.4
51'
1930.1
Slope: 7.6
N
0
0.02
0.04 Miles
Ditch & Stone
Existing Culvert
Project Area
10' Contour
MRGP Scoring
Partially Meets
Does Not Meet

Site #7: Baptist Hill Rd – Bottom South

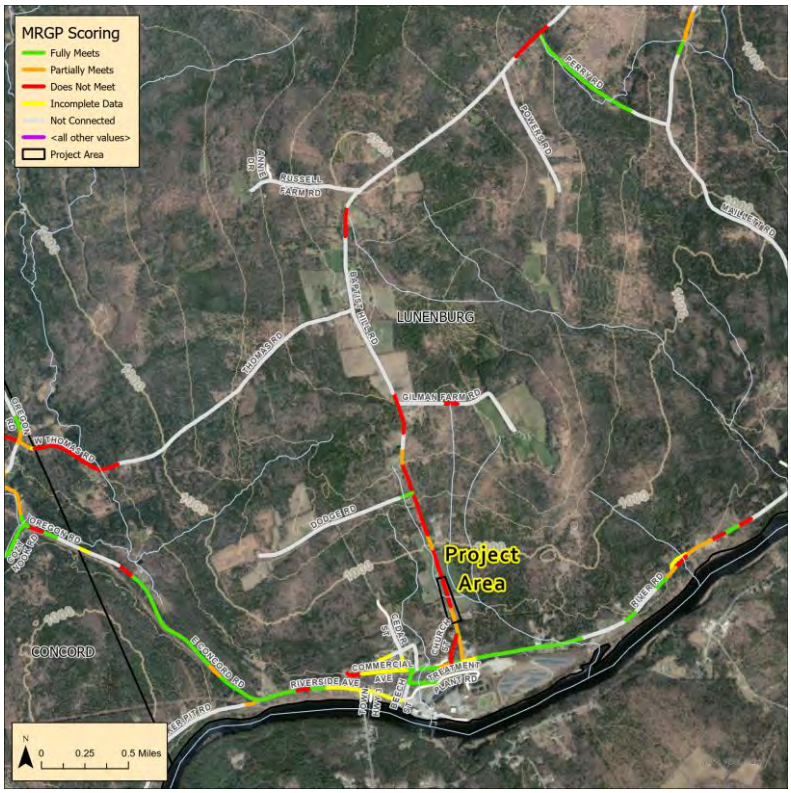


Figure 1: Location of Site #7

Figure 2: Driveway culvert 49 is too small and partially blocked by sediment, causing erosion at the header and on the driveway.

Project Length in ft.:	**984 ft.**
Number of Structures/culverts replaced or repaired:	**1**
Average Slope of Roadway:	**5.8%**
Road Segment ID(s):	**1930.1, 1929.1, 1928.1**
Structure ID(s):	**49**
Priority:	**High**

Description of erosion/water quality issue:

The crown in segments 1930.1, 1929.1, and 1928.1 does not adequately shed water off the road surface as sheet flow, causing water to run along the road surface picking up sediment. The ditches are also too narrow and not stone lined in steep section and shoulders are poorly shaped in places, causing erosion on the road surface and in the ditches. There is also a driveway culvert in segment 1928.1 that is undersized and partially filled with sediment, resulting in erosion across the driveway and at the headers. Sediment picked up by water flowing along these segments enters an unnamed stream at the bottom of the hill. The stream crossing the road shown in the project map is incorrectly mapped. No stream crossing exists in this location.

Description of Project/Corrective Measures

In segments 1930.1, 1929.1 and 1928.1, shoulders and ditches will be reestablished to shed water evenly without erosion, and stone will be added to the steep sections in segments 1930.1 and 1929.1. 4 inches of ¾" minus gravel will also be added to allow for adequate crowning to shed water off the road surface as sheet flow.

Culvert 49 in segment 1928.1 will be upsized to allow adequate water passage. These measures will reduce erosion of the road surface and sediment transportation to surface waters.

Cost Estimate

Project Budget			
Item	Cost	Qty	Total
Materials			
3/4" crushed gravel	$9.75/T	421	$4,104.75
12" minus - ditch stone (635')	$17.35/T	99	$1,717.65
1.5'x25' steel culvert	$1,600.00 total	1	$1,600.00
Stone hauling	$115/hr/20T load	26	$2,990.00
Equipment			
Excavator & operator	$135/hr	77	$10,395.00
Grader & operator	$90/hr	7	$630.00
Trucking removing road & ditch material	$85/hr	15	$1,275.00
Hydroseeder	$300/day	1	$300.00
Total			$23,012.40
Recommended Grant Program	**Better Roads Grant Category B**		
Grant Amount ($20,000 maximum)	80%		$18,409.92
Cost To Town (20% minimum)	20%		$4,602.48

***Additional Notes**: None

Photos

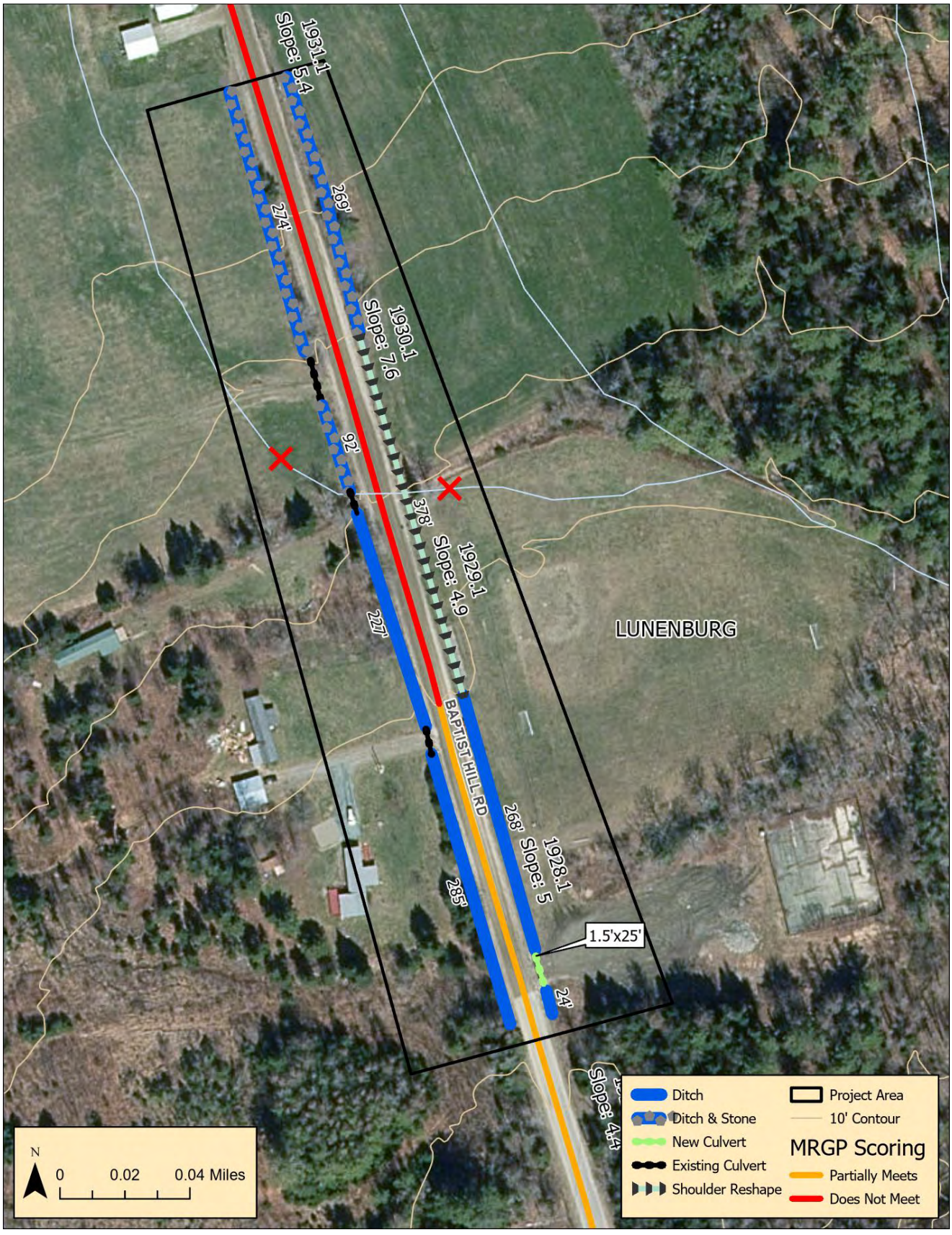
Figure 3: In segment 1930.1 the ditches lack stone and a berm prevents water from entering as sheet flow.

Figure 5: Not enough stone is present in steep sections of segment 1930.1.

Figure 4: The shoulder in segments 1930.1 and 129.1 do not shed water evenly as sheet flow.

Figure 6: In segment 1928.1 the ditches have filled with sediment, preventing even runoff from the road.

Project Map


1931.1
Slope: 5.4
269'
274'
1930.1
Slope: 7.6
92'
378'
1929.1
Slope: 4.9
227'
LUNENBURG
BAPTIST HILL RD
268'
1928.1
Slope: 5
285'
1.5'x25'
24'
Slope: 4.1
N
0
0.02
0.04 Miles
Ditch
Ditch & Stone
New Culvert
Existing Culvert
Shoulder Reshape
Project Area
10' Contour
MRGP Scoring
Partially Meets
Does Not Meet

Site #8: Church St

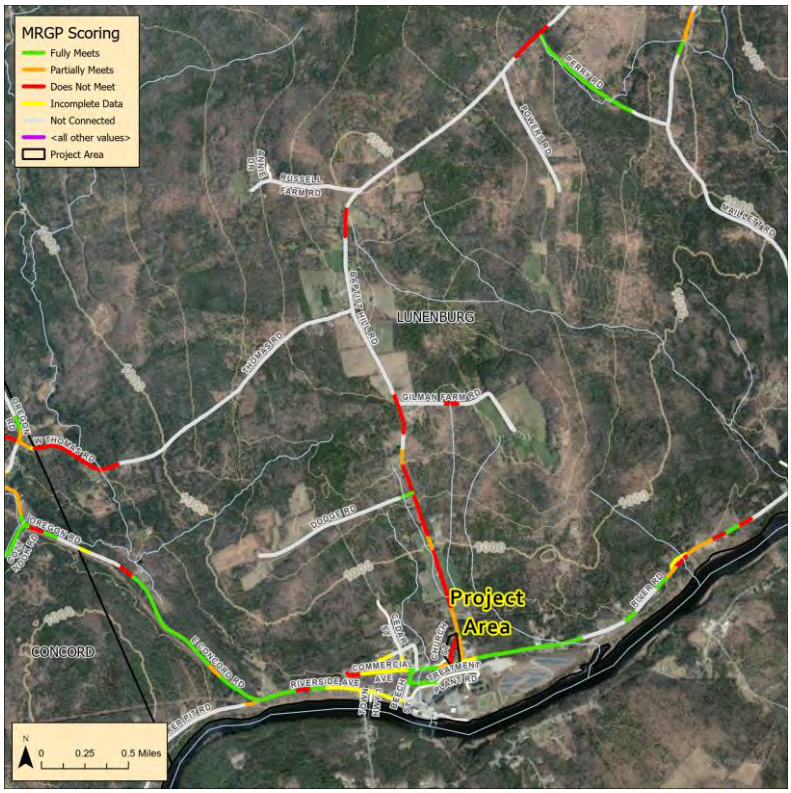


Figure 1: Location of Site #8

Figure 2: Segment 22134 has very little crown and no ditches, causing water to run along the road surface picking up sediment.

Project Length in ft.:	**656 ft.**
Number of Structures/culverts replaced or repaired:	**3**
Average Slope of Roadway:	**3.6%**
Road Segment ID(s):	**22134, 22132**
Structure ID(s):	**102, 101, 133**
Priority:	**High**

Description of erosion/water quality issue:

The crown in both segments 22134 and 22132 does not adequately shed water off the road surface as sheet flow, causing water to run along the road surface picking up sediment.

Segment 22134 lacks ditching on the uphill side and the shoulder on the downhill side does not shed water evenly. Water runs along the road, picking up sediment, and into a stream in the segment. Culvert 102, which passes this stream, is not adequately armored at its headers, causing erosion into the stream.

Segment 22132 does not have adequate ditching on the uphill side causing erosion on the road surface, and lacks stone in the steep section causing erosion in the ditch. A driveway ditch culvert (101) is mostly obstructed, causing erosion on the road during overflows. A drainage culvert (133) which passes Church St's drainage across Commercial Ave is undersized, increasing the chance of erosion at high flow events.

Description of Project/Corrective Measures

Ditches and shoulders will be established and reshaped in both segments, to shed water as sheet flow away from the road surface, and 12" stone will be added in sections with greater than 5% slope. ¾" gravel will be added to the road surface in both sections to allow for adequate crowning.

Additional stone armoring will be added to the headers of culvert 102 in segment 22134 to stop erosion, and an additional stone-lined turnout will be added to ensure water enters the conveyance through a vegetated area.

Culvert 101 will be cleaned out and replaced with a steel 1.5' culvert and culvert 133 will be upsized to a 2' width to allow adequate flow.

Cost Estimate

Project Budget			
Item	Cost	Qty	Total
Materials			
3/4" crushed gravel	$9.75/T	341	$3,324.75
12" minus - ditch stone (126')	$17.35/T	20	$347.00
1.5'x30', 2'x90' steel culverts	$9,300.00 total	1	$9,300.00
Stone hauling	$115/hr/20T load	19	$2,185.00
Equipment			
Excavator & operator	$135/hr	31	$4,185.00
Grader & operator	$90/hr	5	$450.00
Trucking removing road & ditch material	$85/hr	3	$255.00
Hydroseeder	$300/day	1	$300.00
Total			$20,346.75
Recommended Grant Program	**Better Roads Grant Category B**		
Grant Amount ($20,000 maximum)	80%		$16,277.40
Cost To Town (20% minimum)	20%		$4,069.35

***Additional Notes**: Neither culvert likely needs to be replaced for MRGP compliance, though both could be replaced and would have a positive water quality impact.

Photos

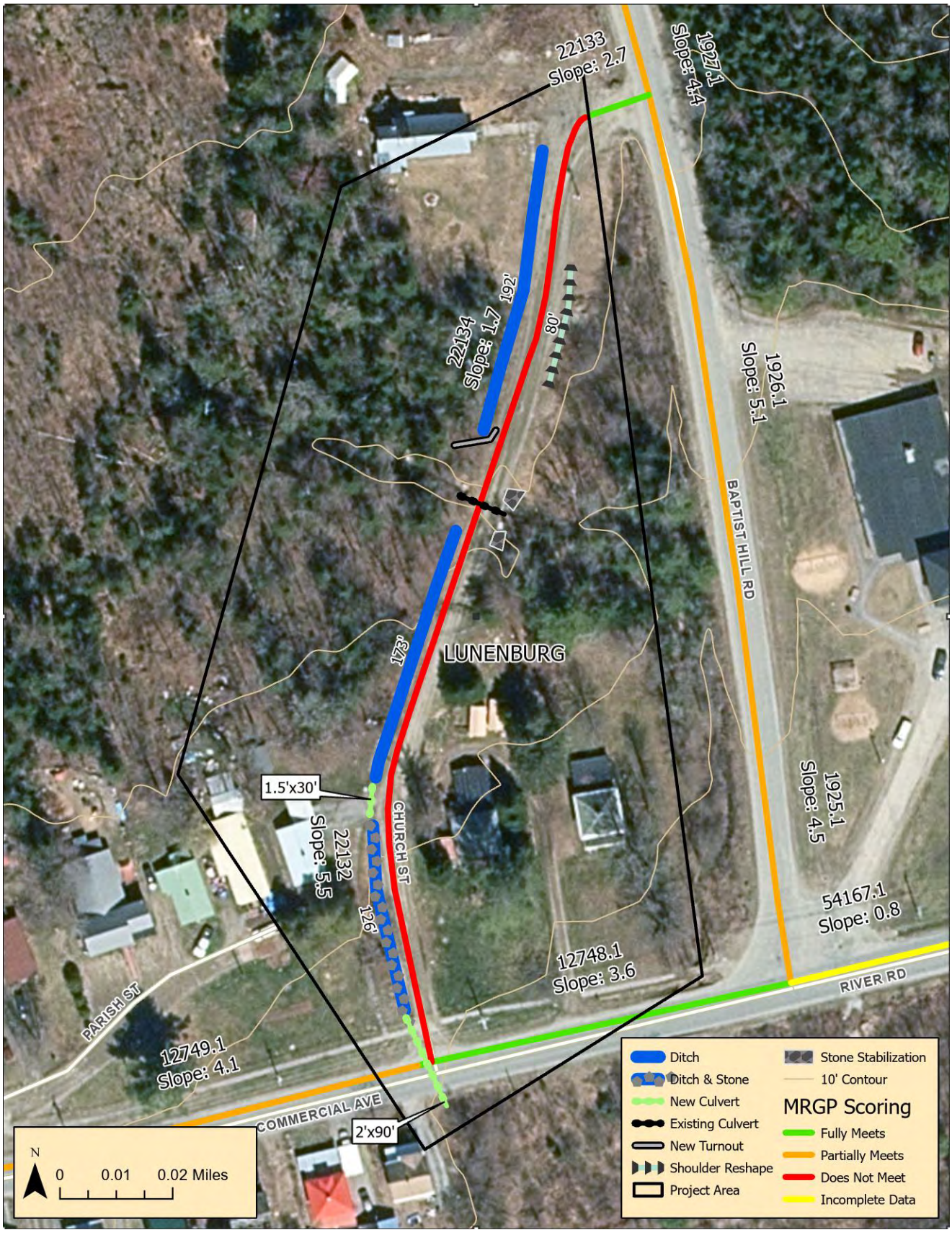
Figure 3: Culvert 102 in segment 22134 lacks adequate header stabilization, and should be reinforced to reduce erosion.

Figure 4: Water runs along the road picking up sediment in segment 22132 and 22134 due to poor crown and no ditches.

Figure 5: Segment 22134 lacks proper ditching and culvert 101 is plugged, causing water to run along the road surface.

Figure 3: Stone is needed in segment 22132 to stop erosion in the ditch.

Project Map


22133
Slope: 2.7
1927.1
Slope: 4.4
22134
Slope: 1.7
197'
80'
1926.1
Slope: 5.1
BAPTIST HILL RD
LUNENBURG
173'
1.5'x30'
CHURCH ST
22132
Slope: 5.5
126'
1925.1
Slope: 4.5
54167.1
Slope: 0.8
12748.1
Slope: 3.6
RIVER RD
PARISH ST
12749.1
Slope: 4.1
COMMERCIAL AVE
2'x90'
N
0
0.01
0.02 Miles
Ditch
Ditch & Stone
New Culvert
Existing Culvert
New Turnout
Shoulder Reshape
Project Area
Stone Stabilization
10' Contour
MRGP Scoring
Fully Meets
Partially Meets
Does Not Meet
Incomplete Data

Site #9: Pond Hill Rd – Hill

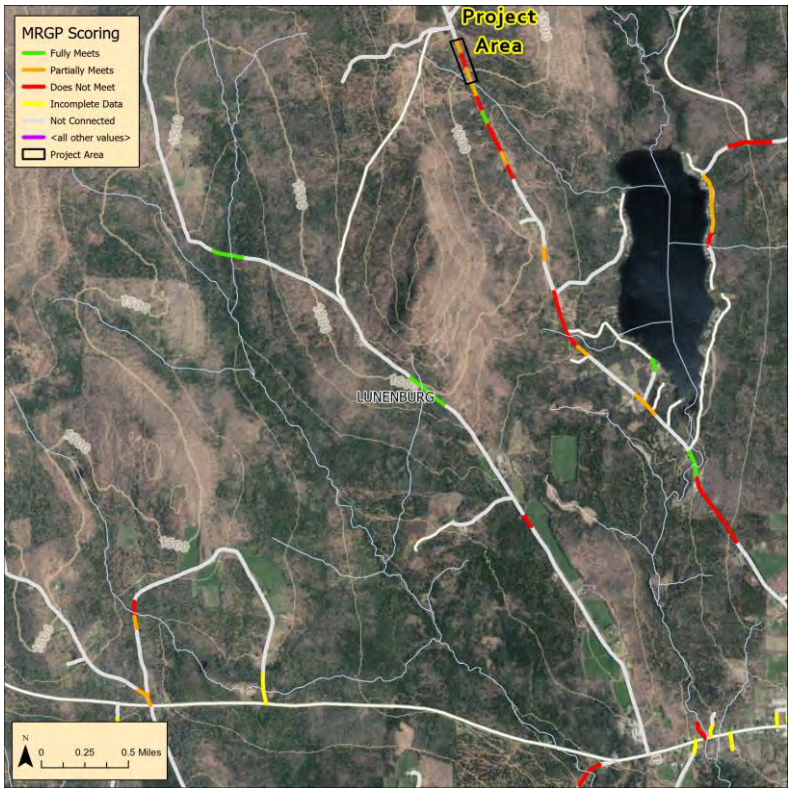


Figure 1: Location of Site #9

Figure 2: All segments are very steep and have ditches that are too narrow and shallow without enough stone. Crowning is also not shedding water off the road surface.

Project Length in ft.:	**984 ft.**
Number of Structures/culverts replaced or repaired:	**0**
Average Slope of Roadway:	**11.3%**
Road Segment ID(s):	**152091, 152092, 152093**
Structure ID(s):	
Priority:	**Very High**

Description of erosion/water quality issue:

The crown in segments 152091, 152092, and 152093 does not adequately shed water off the road surface as sheet flow, causing water to run along the road surface picking up sediment. The ditches are also too narrow and shallow and not stone lined, causing erosion on the road surface and in the ditches. Sediment picked up by water flowing along these segments enters an unnamed stream in segment 152095.

Description of Project/Corrective Measures

In segments 152091, 152092, and 152093, ditches will be reestablished to shed water evenly without erosion, and stone will be added. 4 inches of ¾" minus gravel will also be added to allow for adequate crowning to shed water off the road surface as sheet flow. These measures will reduce erosion of the road surface and sediment transportation to surface waters.

Cost Estimate

Project Budget			
Item	Cost	Qty	Total
Materials			
3/4" crushed gravel	$9.75/T	281	$2,739.75
12" minus - ditch stone (1834')	$17.35/T	285	$4,944.75
Stone hauling	$115/hr/20T load	28	$3,220.00
Equipment			
Excavator & operator	$135/hr	84	$11,340.00
Grader & operator	$90/hr	5	$450.00
Trucking removing road & ditch material	$85/hr	42	$3,570.00
Hydroseeder	$300/day	1	$300.00
Total			$26,564.50
Recommended Grant Program	**Better Roads Grant Category B**		
Grant Amount ($20,000 maximum)	75%		$20,000.00
Cost To Town (20% minimum)	25%		$6,564.50

***Additional Notes**: None

Photos

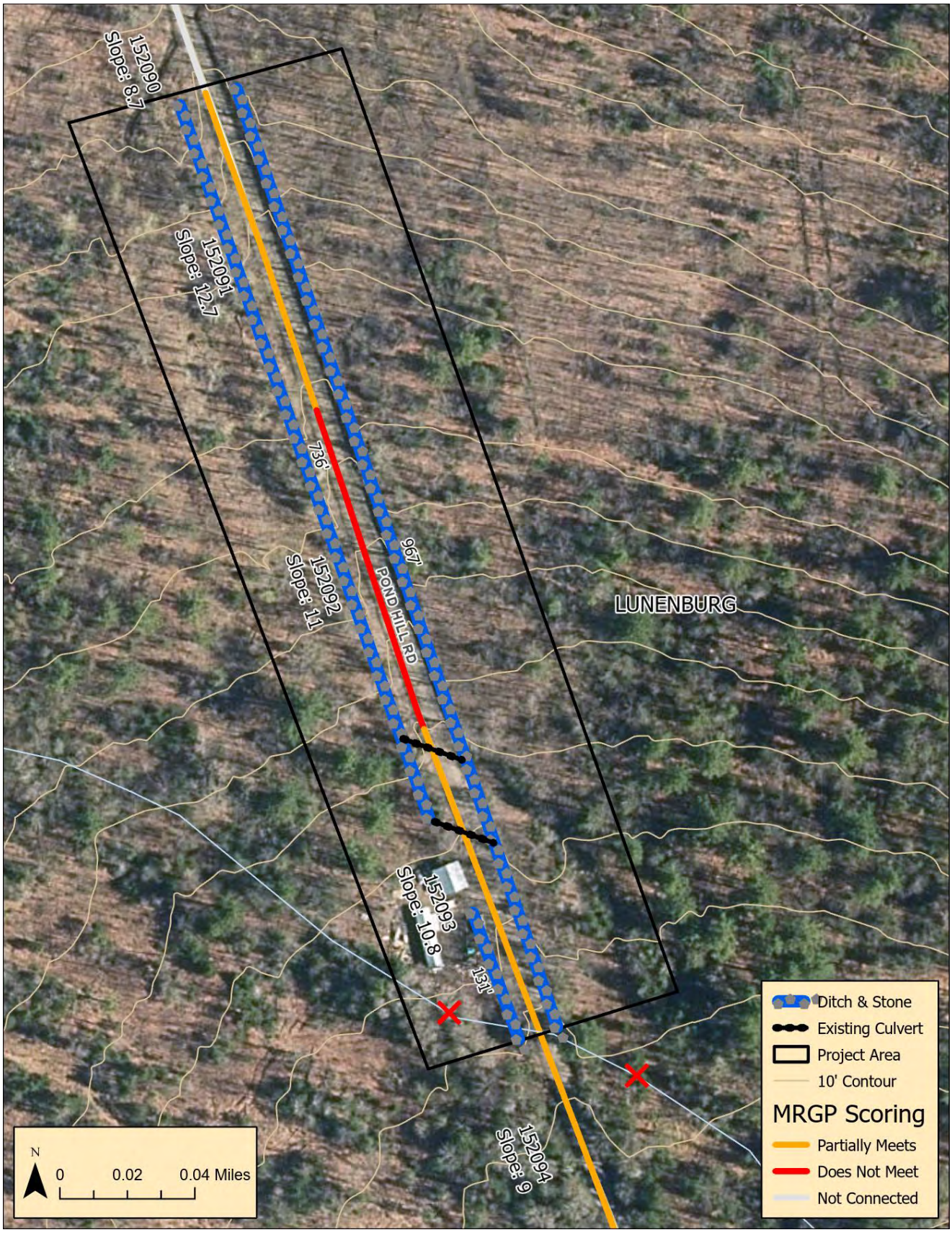
Figure 3: The ditches is segment 152091 have filled with sediment and lack stone, causing erosion.

Figure 4: In segment 152093 water from the road and a driveway causes erosion because crowing does not shed it into the ditch and the ditch is full of sediment.

Figure 5: In all segments, steep ditches without adequate stone lining are eroding. Water enters an unnamed stream further down the hill.

Figure 6: In segment 152093 water from the road and a driveway causes erosion because crowning does not shed water into the ditch and the ditch is full of sediment.

Project Map


152090
Slope: 8.7
152091
Slope: 12.7
736'
967'
POND HILL RD
152092
Slope: 11
LUNENBURG
152093
Slope: 10.8
131'
152094
Slope: 9
N
0
0.02
0.04 Miles
Ditch & Stone
Existing Culvert
Project Area
10' Contour
MRGP Scoring
Partially Meets
Does Not Meet
Not Connected

Site #10: Pond Hill Rd – Middle

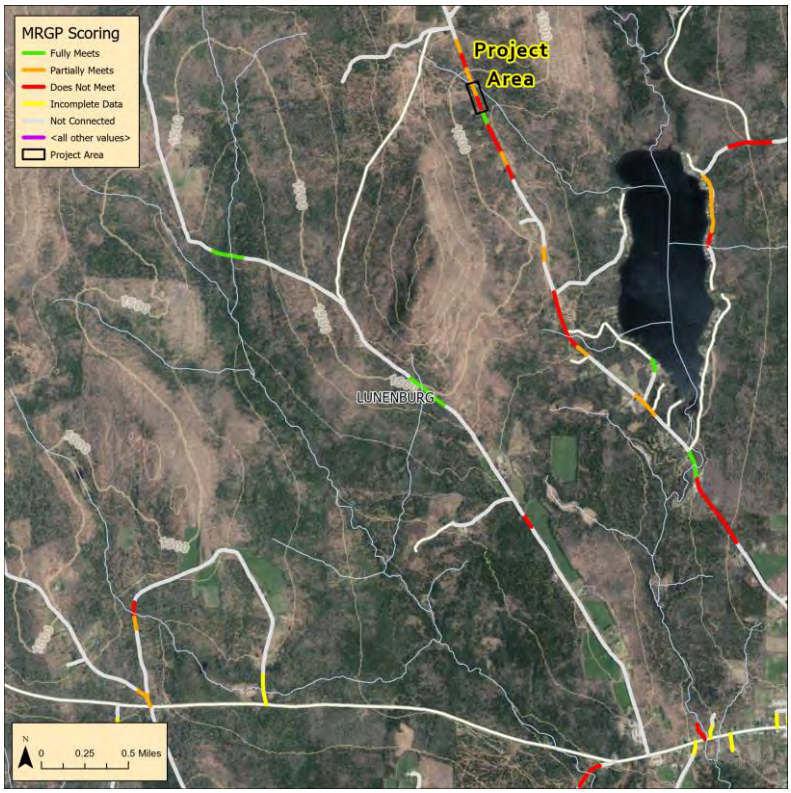


Figure 1: Location of Site #10

Figure 2: Culvert 263 in segment 152095 passes a perennial stream. Road runoff is eroding the ditch and the culvert outlet and runs directly into the stream.

Project Length in ft.:	**656 ft.**
Number of Structures/culverts replaced or repaired:	**2**
Average Slope of Roadway:	**7.2%**
Road Segment ID(s):	**152094, 152095**
Structure ID(s):	**264 & 263**
Priority:	**Moderate**

Description of erosion/water quality issue:

The ditched in segment 152094 are too narrow and lack stone, causing erosion on the road surface and in the ditch.

The crown in segment 152095 does not adequately shed water off the road surface as sheet flow, causing water to run along the road surface picking up sediment. The ditches are also too narrow, not allowing water to escape the road surface as sheet flow. A driveway culvert (ID 264) in segment 152095 is undersized causing erosion in the ditch. Erosion is also occurring at a perennial stream conveyance culvert (ID 263). Water from the ditch is eroding the outlet header and entering the stream through an eroding, unvegetated area.

Sediment picked up by water flowing along these segments flows into an unnamed stream in segment 152095 and further downhill in segment 152097.

Description of Project/Corrective Measures

In segment 152095, ditches will be reestablished and stone will be added to reduce erosion and sediment transport. 2 inches of ¾" minus gravel will be added to maintain adequate crowning for sheet flow off the road surface. The field slope was determined to be 4.8%, so stone is not needed within the ditches, but stone will be added in ditches above culvert 263. Culvert 263's headers will also be stabilized with stone, and turnouts will be established to ensure water enters the stream in a distributed way through vegetation.

In segment 152094, ditches will be reestablished to allow adequate drainage of water to reduce erosion and sediment transport. 6 inches of ¾" minus gravel will be added to improve the road crowning for sheet flow off the road surface. Culvert 264 will be upsized to a 2.5' diameter steel corrugated culvert to allow adequate water transport at high flows, reducing erosion.

Cost Estimate

Project Budget			
Item	Cost	Qty	Total
Materials			
3/4" crushed gravel	$9.75/T	281	$2,739.75
12" minus - ditch stone (747')	$17.35/T	116	$2,012.60
2.5'x30' steel culvert*	$4,500.00 total	1	$4,500.00
Stone hauling	$115/hr/20T load	21	$2,415.00
Equipment			
Excavator & operator	$135/hr	56	$7,560.00
Grader & operator	$90/hr	5	$450.00
Trucking removing road & ditch material	$85/hr	17	$1,445.00
Hydroseeder	$300/day	1	$300.00
Total			$21,422.35
Recommended Grant Program	**Better Roads Grant Category B**		
Grant Amount ($20,000 maximum)	80%		$17,137.88
Cost To Town (20% minimum)	20%		$4,284.47

***Additional Notes**: Culvert 263 is undersized, but is exempt from the MRGP because it is passing a perennial stream. It could be upsized as part of a Better Roads grant, still at a 20% local match. An approximately 4' culvert should be sufficient, and a Stream Alteration Permit would be needed. A Better Roads Category D could be used total project costs exceed $25,000 with culvert 263 included.

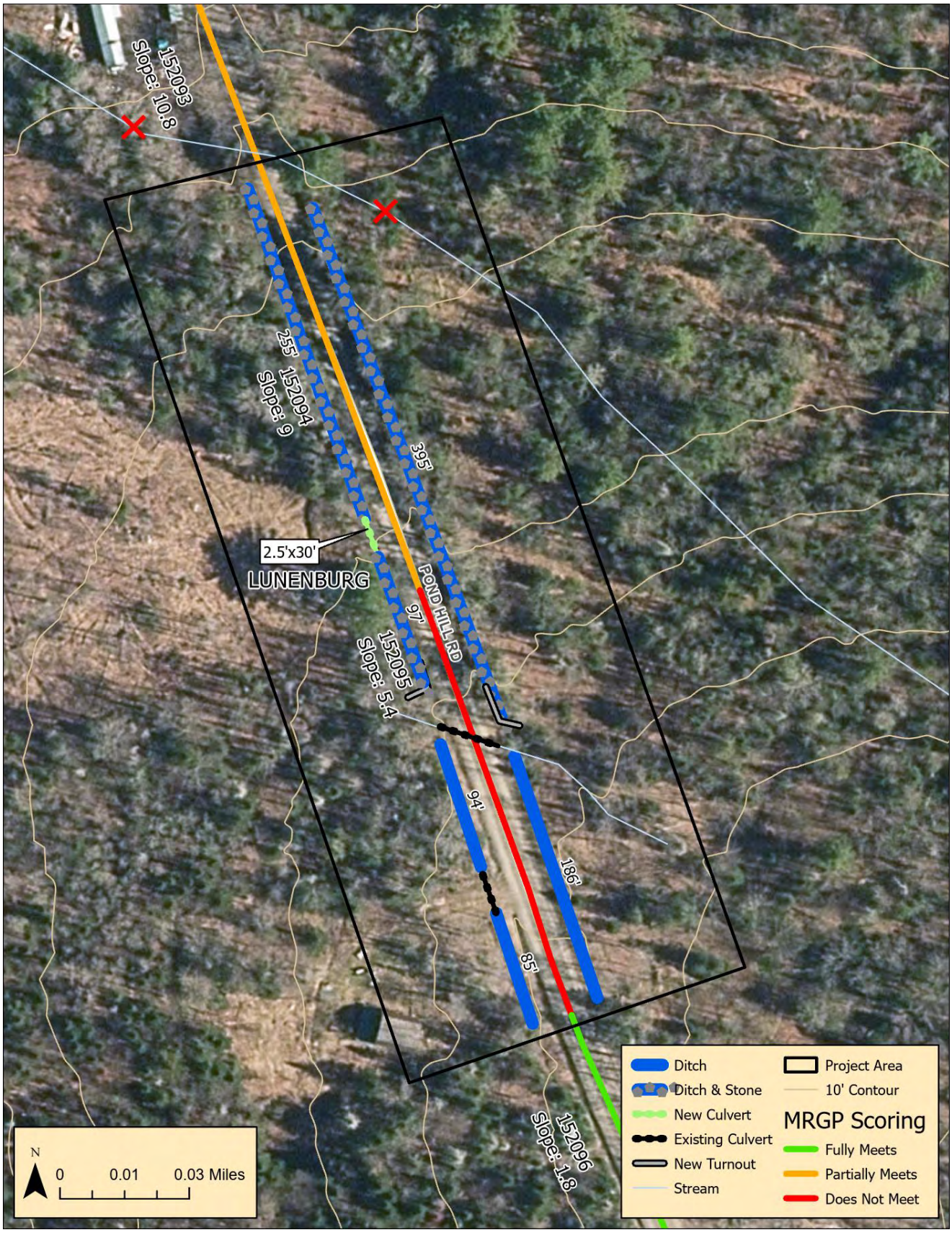
Photos

Figure 3: Culvert 264 in segment 152094 is undersized, causing erosion in the ditch. The crown is also not shedding water as sheet flow, causing erosion of the road into the ditch.

Figure 4: A grader berm and inadequate ditching prevents water from escaping the road surface.

Figure 5: Water flows along the road surface in both segments, picking up sediment which is deposited in the stream in segment 152095.

Project Map


152093
Slope: 10.8
255'
152094
Slope: 9
395'
2.5'x30'
LUNENBURG
POND HILL RD
97'
152095
Slope: 5.4
94'
186'
85'
152096
Slope: 1.8
N
0
0.01
0.03 Miles
Ditch
Ditch & Stone
New Culvert
Existing Culvert
New Turnout
Stream
Project Area
10' Contour
MRGP Scoring
Fully Meets
Partially Meets
Does Not Meet

Site #11: Pond Hill Rd – Flat

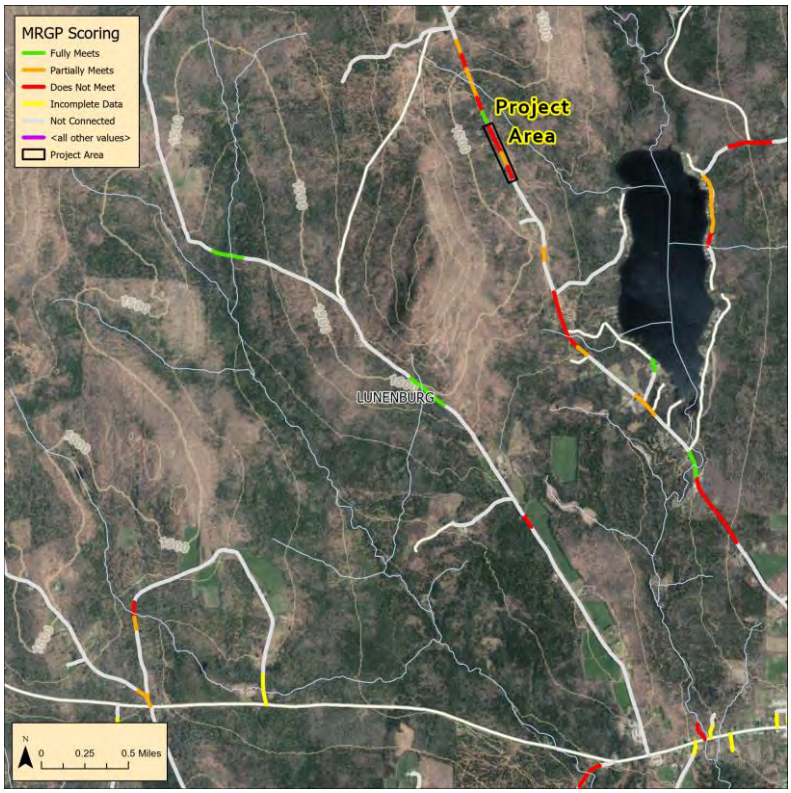


Figure 1: Location of Site #11

Figure 2: In segment 152097 and 152098 insufficient ditching and crowning causes water to run along the road surface, picking up sediment.

Project Length in ft.:	**1312 ft.**
Number of Structures/culverts replaced or repaired:	**1**
Average Slope of Roadway:	**7.1%**
Road Segment ID(s):	**152097, 152098, 152099, 152100**
Structure ID(s):	**262**
Priority:	**Moderate**

Description of erosion/water quality issue:

The crown in segments 152097 and 152098 does not adequately shed water off the road surface as sheet flow, causing water to run along the road surface picking up sediment. The ditches are also too narrow and filled with sediment in places and the road shoulder is poorly shaped, not allowing water to escape the road surface as sheet flow. A culvert conveyance (ID 262) in segment 152097 is eroding at the headers.

Grader berms in segments 152099 and 152100 stop water from shedding off of the roadway. This water runs along the road, picking up sediment.

Sediment picked up by water flowing along these segments flows from drainage culverts throughout, and an intermittent stream in segment 152097, to an unnamed stream.

Description of Project/Corrective Measures

In segments 152097 and 152098, ditches and shoulders will be reshaped to shed water evenly without erosion. 5 inches of ¾" minus gravel will also be added to allow for adequate crowning to shed water off the road surface as sheet flow. The headers of culvert 262 stabilized with stone. In segments 152099 and 152100, 3 inches of ¾" minus gravel will be added to maintain adequate crowning and grader berms will be removed to shed water off the road surface as sheet flow. These measures will reduce erosion of the road surface and sediment transportation to surface waters.

Cost Estimate

Project Budget			
Item	Cost	Qty	Total
Materials			
3/4" crushed gravel	$9.75/T	596	$5,811.00
Stone hauling	$115/hr/20T load	30	$3,450.00
Equipment			
Excavator & operator	$135/hr	41	$5,535.00
Grader & operator	$90/hr	17	$1,530.00
Trucking removing road & ditch material	$85/hr	13	$1,105.00
Hydroseeder	$300/day	1	$300.00
Total			$17,731.00
Recommended Grant Program	**Better Roads Grant Category B**		
Grant Amount ($20,000 maximum)	80%		$14,184.80
Cost To Town (20% minimum)	20%		$3,546.20

***Additional Notes**: None

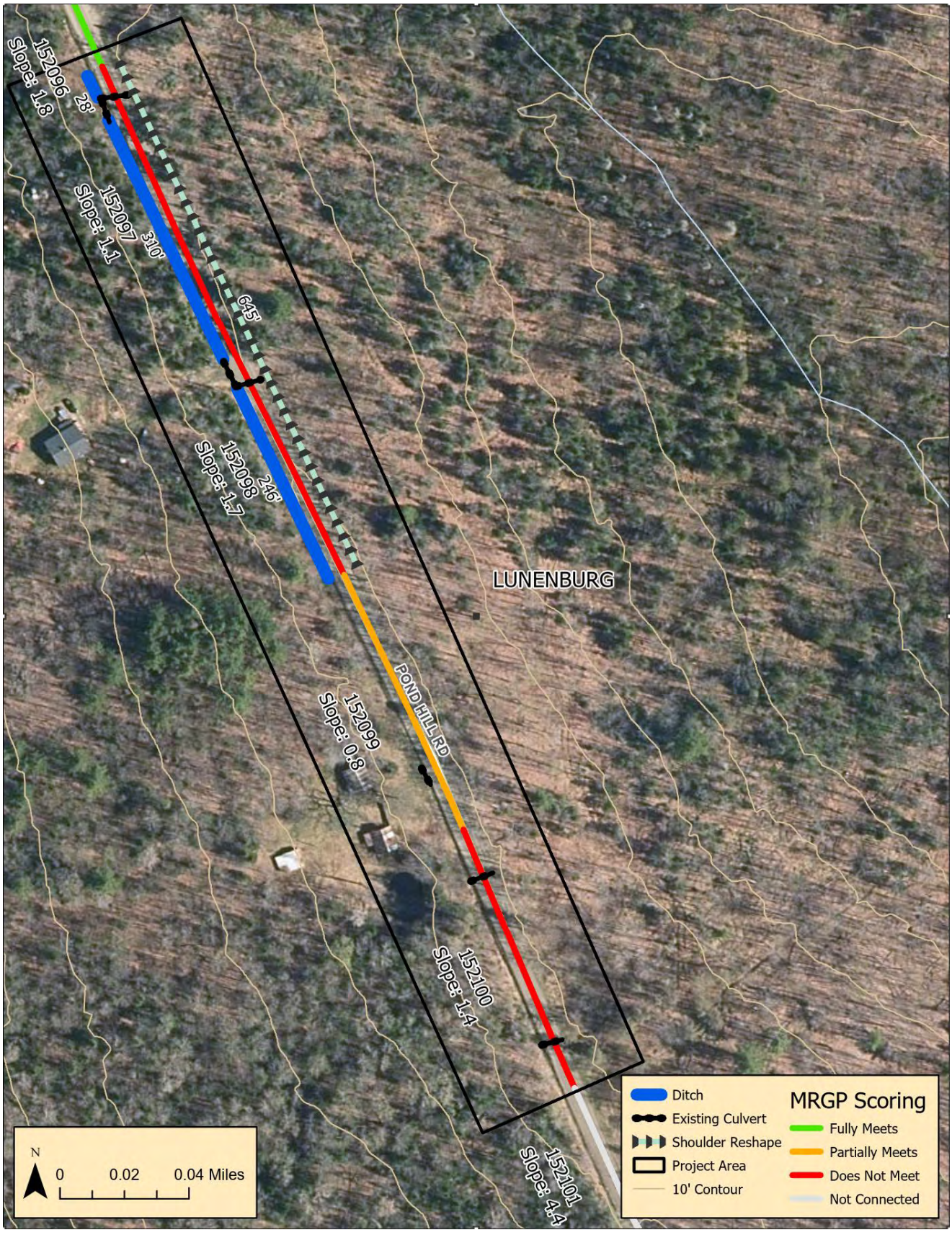
Photos

Figure 3: In segments 152099 and 152100 grader berms stop water from escaping the roadway, causing erosion on the road surface.

Figure 4: Water runs along the road in all segments due to poor crown and grader berms, picking up sediment.

Figure 5: Sediment in ditches s clogging culverts, stopping proper water transport.

Project Map


152096
Slope: 1.8
28'
152097
Slope: 1.1
310'
645'
152098
Slope: 1.7
246'
LUNENBURG
POND HILL RD
152099
Slope: 0.8
152100
Slope: 1.4
152101
Slope: 4.4
N
0
0.02
0.04 Miles
Ditch
Existing Culvert
Shoulder Reshape
Project Area
10' Contour
MRGP Scoring
Fully Meets
Partially Meets
Does Not Meet
Not Connected

Site #12: Monahan Rd

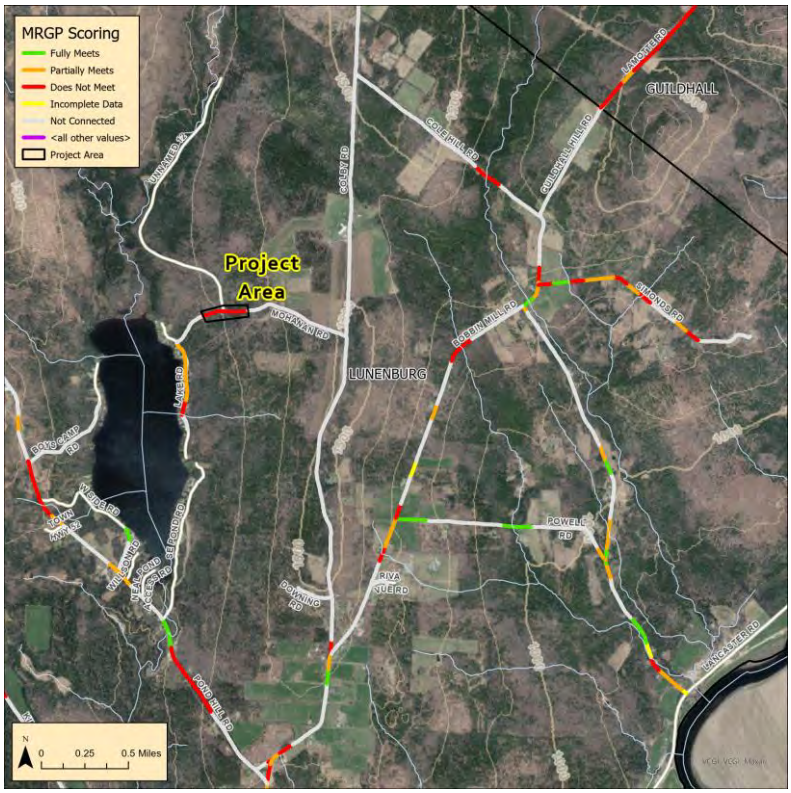


Figure 1: Location of Site #12

Figure 2: Shallow ditches and minimal crown in segments 134468 and 134467 causes water to run along the road surface picking up sediment. Ditches also lack stone, allowing erosion to occur.

Project Length in ft.:	**984 ft.**
Number of Structures/culverts replaced or repaired:	**1**
Average Slope of Roadway:	**7.7%**
Road Segment ID(s):	**134466, 134467, 134468**
Structure ID(s):	**229**
Priority:	**High**

Description of erosion/water quality issue:

The crown in segments 152091, 152092, and 152093 does not adequately shed water off the road surface as sheet flow, causing water to run along the road surface picking up sediment. The ditches are also too narrow and not stone lined, causing erosion on the road surface and in the ditches. Sediment picked up by water flowing along these segments enter unnamed streams in segment 134467 and 134466. The conveyance culvert (ID 229) is undersized, being undermined, and eroding at the outlet, adding sediment to the stream it passes.

Description of Project/Corrective Measures

In segments 134466, 134467, and 134468, ditches will be reestablished to shed water evenly without erosion in places where not prevented by excessive ledge, and 12" minus stone will be added. 6 inches of ¾" minus gravel will also be added to allow for adequate crowning to shed water off the road surface as sheet flow. Culvert 229 will be replaced by a 4.5' diameter steel corrugated pipe with stone stabilization at both ends. Turnouts will be added above the conveyance to ensure water entering the unnamed brook passes through a vegetated area in a distributed manner. The River Management Engineer for Lunenburg will be consulted about the need for a Stream Alteration Permit for replacing culvert 229 on a potential perennial stream. These measures will reduce erosion of the road surface and sediment transportation to surface waters.

Cost Estimate

Project Budget			
Item	Cost	Qty	Total
Materials			
3/4" crushed gravel	$9.75/T	638	$6,220.50
12" minus - nonditch	$17.35/T	47	$815.45
12" minus - ditch stone (1705')	$17.35/T	265	$4,597.75
4.5'x50' steel culvert	$12,300.00 total	1	$12,300.00
Stone hauling	$115/hr/20T load	48	$5,520.00
Equipment			
Excavator & operator	$135/hr	94	$12,690.00
Grader & operator	$90/hr	7	$630.00
Trucking removing road & ditch material	$85/hr	45	$3,825.00
Hydroseeder	$300/day	1	$300.00
Total			$46,898.70
Recommended Grant Program	**Better Roads Grant Category D**		
Grant Amount ($60,000 maximum)	80%		$37,518.96
Cost To Town (20% minimum)	20%		$9,379.74

***Additional Notes**: If the stream here is determined to be perennial, it is exempt from MRGP compliance, and all other work can be done without replacing the stream culvert if desired. In that situation, a Better Roads Category B grant would be recommended, with a maximum State contribution of $20,000. A hydraulic study is advisable to ensure the culvert is sized appropriately.

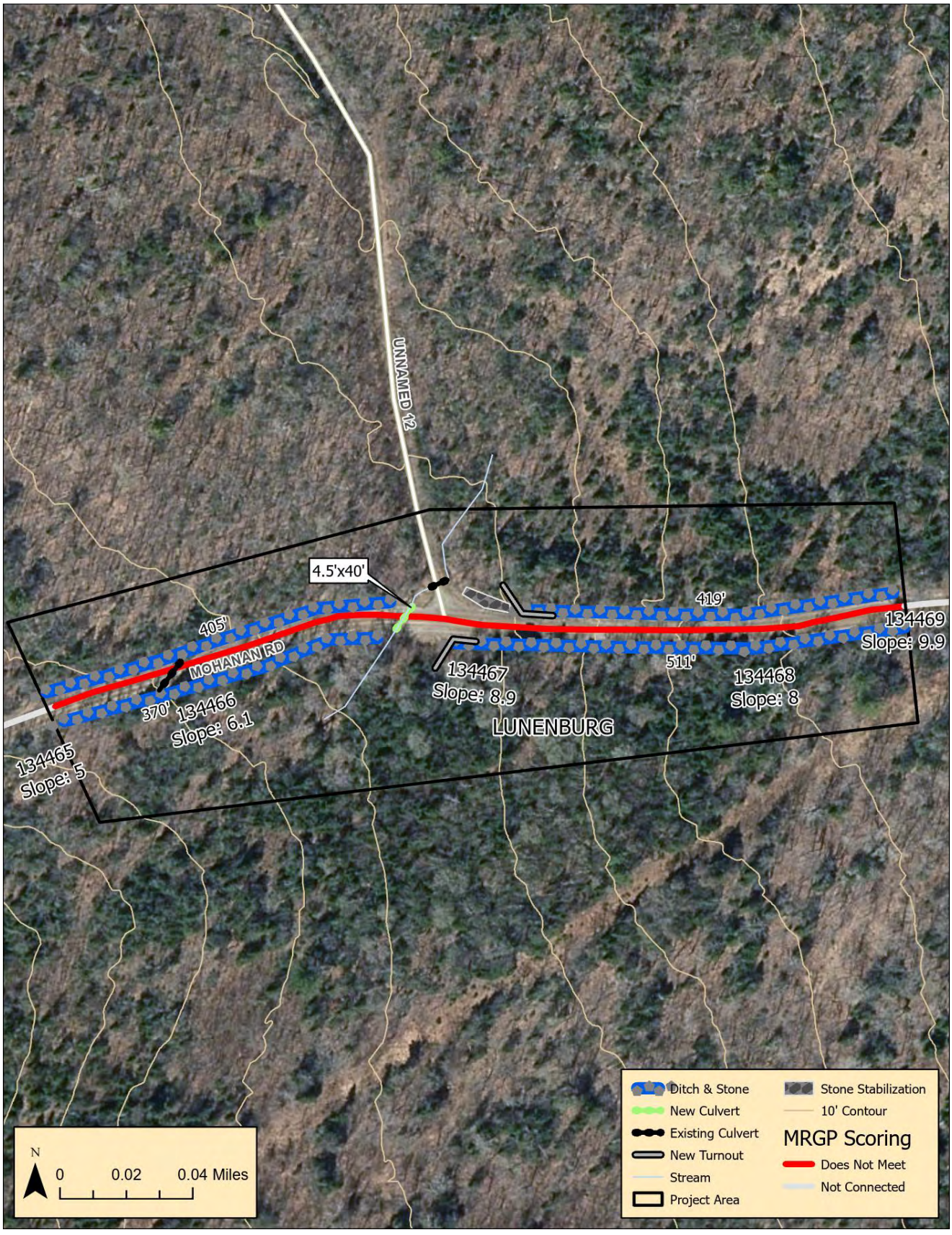
Photos

Figure 3: In segment 134467, The cross culvert (228) on Unnamed Rd 12 passes water effectively before it enters culvert 229.

Figure 4: Shallow ledge in all segments may make ditching difficult and requires additional gravel for building a crown.

Figure 5: Gully erosion is occurring at culvert 229 in segment 134467 due to water flowing around the culvert. The culvert should be increased in size.

Project Map


UNNAMED 12
4.5'x40'
405'
MOHANAN RD
370'
134466
Slope: 6.1
134465
Slope: 5
134467
Slope: 8.9
LUNENBURG
419'
511'
134468
Slope: 8
134469
Slope: 9.9
N
0
0.02
0.04 Miles
Ditch & Stone
New Culvert
Existing Culvert
New Turnout
Stream
Project Area
Stone Stabilization
10' Contour
MRGP Scoring
Does Not Meet
Not Connected

Site #13: Bobbin Mill Rd – Bend

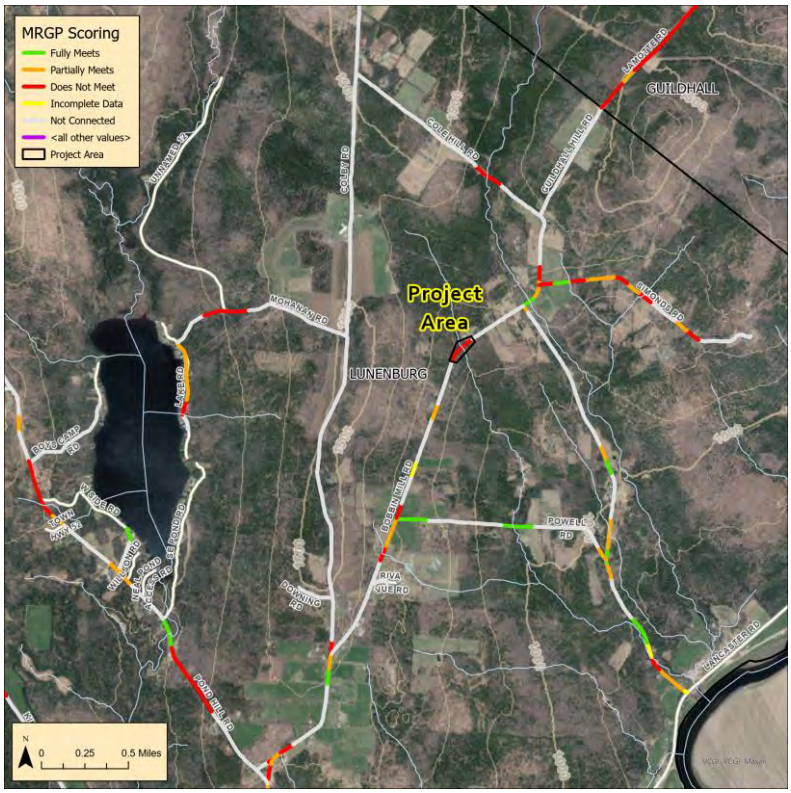


Figure 1: Location of Site #13

Figure 2: Water runs along the road surface in segment 4597.1 because ditches are too far away from the road for water to reach them. Ditches need to be reshaped and more crowning added to move water off the road as sheet flow.

Project Length in ft.:	**656 ft.**
Number of Structures/culverts replaced or repaired:	**3**
Average Slope of Roadway:	**4.7%**
Road Segment ID(s):	**4596.1, 4597.1**
Structure ID(s):	**66, 67, 68**
Priority:	**High**

Description of erosion/water quality issue:

The crown in segments 4596.1 and 4597.1 does not adequately shed water off the road surface as sheet flow, causing water to run along the road surface picking up sediment. Sediment picked up by water flowing along these segments enters an unnamed stream in segment 4597.1. The water entering the conveyance culvert (ID 68).

The driveway culverts (ID 66, 67) and the ditch in segment 4597.1 are too far away from the road for water to flow to it effectively, and the ditches lack stone, causing erosion. The downhill shoulder also does not adequately shed water away from the road surface, causing erosion.

The ditch and shoulder in segment 4596.1 are poorly shaped and do not move water off the road surface, causing erosion of the road surface.

Description of Project/Corrective Measures

In segment 4597.1, the ditch will be moved closer to the road to effectively capture runoff from the road, reducing erosion, and stone will be added to stop erosion in the culvert and sediment transportation. The culverts will be upsized to 18". The downhill shoulder will be reshaped to allow sheet flow off the road.

In segment 4596.1 ditches and shoulders will be reestablished to shed water evenly without erosion. No culvert is needed at the driveway culvert, as the driveway is located at the top of slope, with a gentle downward grade in both directions.

8 inches of ¾" minus gravel will be added in both segments to allow for adequate crowning to shed water off the road surface as sheet flow. Turnouts will be added in both segments above the conveyance (culvert 68) in segment 4597.1 to ensure water entering the unnamed brook passes through a vegetated area in a distributed manner. These measures will reduce erosion of the road surface and sediment transportation to surface waters.

Cost Estimate

Project Budget			
Item	Cost	Qty	Total
Materials			
3/4" crushed gravel	$9.75/T	567	$5,528.25
12" minus - ditch stone (171')	$17.35/T	27	$468.45
1.5'x20' x 2 steel culverts	$3,050.00 total	1	$3,050.00
Stone hauling	$115/hr/20T load	31	$3,565.00
Equipment			
Excavator & operator	$135/hr	41	$5,535.00
Grader & operator	$90/hr	5	$450.00
Trucking removing road & ditch material	$85/hr	4	$340.00
Hydroseeder	$300/day	1	$300.00
Total			$19,236.70
Recommended Grant Program	**Better Roads Grant Category B**		
Grant Amount ($20,000 maximum)	80%		$15,389.36
Cost To Town (20% minimum)	20%		$3,847.34

***Additional Notes**: None

Photos

Figure 3: In segment 4597.1 the ditches lack stone and water and does not reach the ditch as sheet flow due to insufficient crown and the ditch being too far from the road.

Figure 4: A grader berm and poorly shaped road shoulder prevents water from flowing away from the road to the south in both segments.

Figure 5: In segment 4596.1 a poorly shaped shoulder and lack of crown prevents water from escaping the roadway as sheet flow.

Project Map


1.5'x20'
1.5'x20'
67'
4598.1
Slope: 2.7
104'
256'
4597.1
Slope: 7.3
BOBBIN MILL RD
LUNENBURG
266'
337'
4596.1
Slope: 2.1
N
0
0.01
0.02 Miles
Ditch
Ditch & Stone
New Culvert
Existing Culvert
New Turnout
Shoulder Reshape
Project Area
Stone Stabilization
10' Contour
MRGP Scoring
Does Not Meet
Not Connected

Site #14: Bobbin Mill Rd – Rt 2

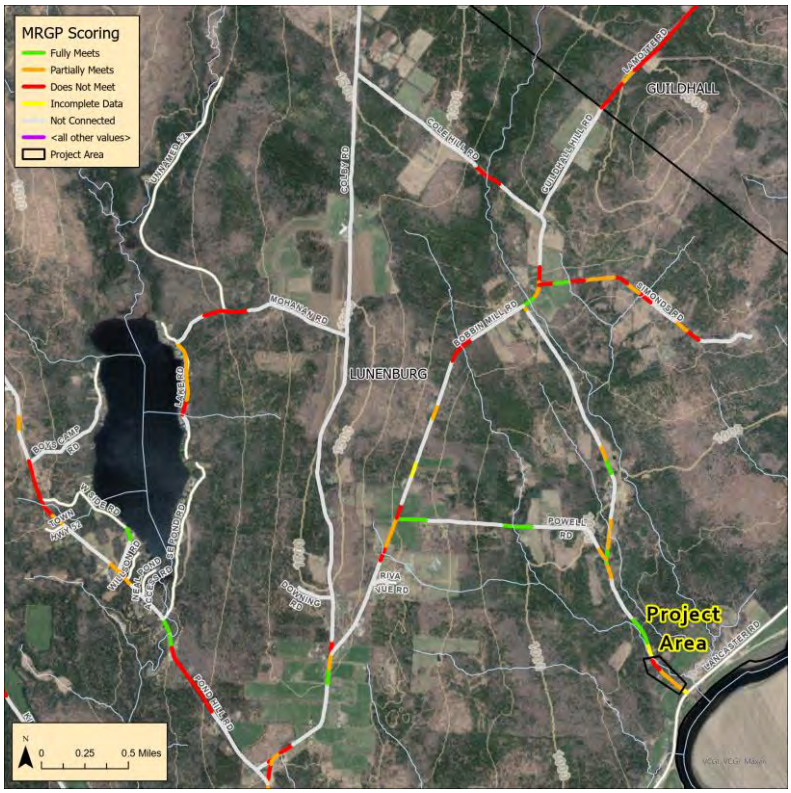


Figure 1: Location of Site #14

Figure 2: Two driveways in segment 10509 lack culverts. Water running across these driveways picks up sediment that is eventually transported to an unnamed stream in segment 10507.

Project Length in ft.:	**984 ft.**
Number of Structures/culverts replaced or repaired:	**2**
Average Slope of Roadway:	**2.6%**
Road Segment ID(s):	**10509, 10508, 10507**
Structure ID(s):	**None existing**
Priority:	**Moderate**

Description of erosion/water quality issue:

Inadequate crowning, unditched and poorly shaped shoulders, and missing driveway culverts are leading to water flow along the road surface and sediment addition to an unnamed tributary of Catbow Brook. Water enters the tributary through places in segment 10509 and 10508 where a steep shoulder leads to the stream and a drainage culvert in segment 10507 that empties toward the stream.

In segment 10509, two driveways do not have culverts, leading water to flow into the roadway picking up sediment. Ditches are not deep enough to adequately transport water off the road surface. Inadequate crowing is also causing water to flow along the road surface, picking up sediment. Sediment from the culvert and road surface is entering a nearby unnamed stream.

In segment 10508 and 10507, the road surface is not crowned adequately to move water off the road, causing water to run along the road and pick up sediment before entering the ditch, and eventually an unnamed stream.

Description of Project/Corrective Measures

In segment 10509, 18" steel culverts will be installed at two driveways currently lacking culverts. Grass lined ditches will be established where the shoulder can not be shaped to shed water as sheet flow out of the right-of-way. 4 inches of road material will also be added to allow for adequate crowning to shed water off the road surface.

In segment 10508 and 10507, 4 inches of road material will also be added to allow for adequate crowning to shed water off the road surface.

Cost Estimate

Project Budget			
Item	Cost	Qty	Total
Materials			
3/4" crushed gravel	$9.75/T	567	$5,528.25
2'x20' x 2 steel culverts	$3,200.00 total	1	$3,200.00
Stone hauling	$115/hr/20T load	28	$3,220.00
Equipment			
Excavator & operator	$135/hr	58	$7,830.00
Grader & operator	$90/hr	9	$810.00
Trucking removing road & ditch material	$85/hr	20	$1,700.00
Hydroseeder	$300/day	1	$300.00
Total			$22,588.25
Recommended Grant Program	**Better Roads Grant Category B**		
Grant Amount ($20,000 maximum)	80%		$18,070.60
Cost To Town (20% minimum)	20%		$4,517.65

***Additional Notes**: None

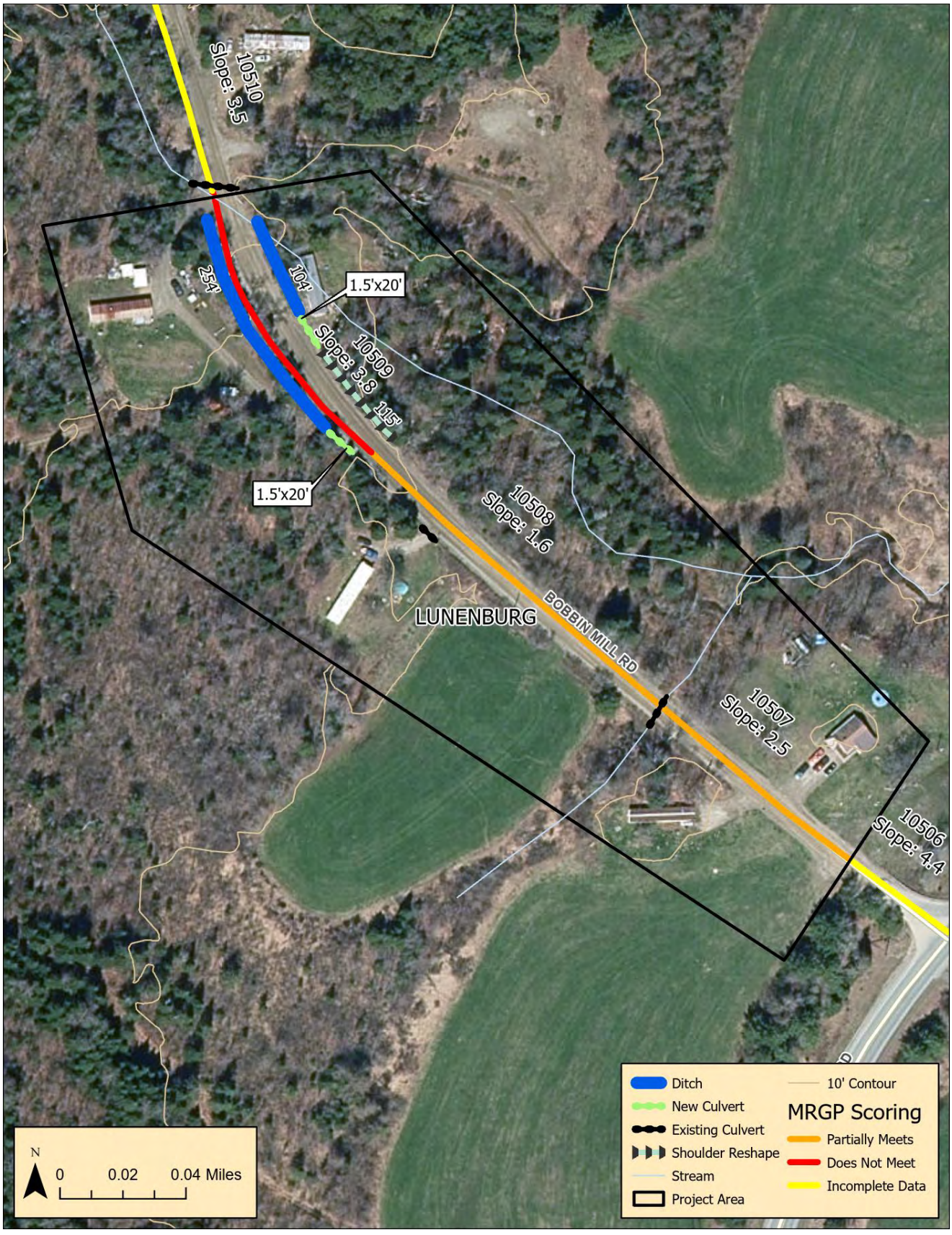
Photos

Figure 3: Water is running down the road surface due to insufficient crowning, no ditching, and no driveway culvert in segment 10509.

Figure 4: Water runs along the road edge in segment 1050 due to insufficient crowning and a grader berm.

Figure 5: A driveway lacks a culvert and the shoulder lacks ditches in segment 10509.

Project Map


10510
Slope: 3.5
254'
104'
1.5'x20'
10509
Slope: 3.8
115'
1.5'x20'
10508
Slope: 1.6
LUNENBURG
BOBBIN MILL RD
10507
Slope: 2.5
10506
Slope: 4.4
N
0
0.02
0.04 Miles
Ditch
New Culvert
Existing Culvert
Shoulder Reshape
Stream
Project Area
10' Contour
MRGP Scoring
Partially Meets
Does Not Meet
Incomplete Data

Site #15: Simonds Rd – Guildhall Hill Rd

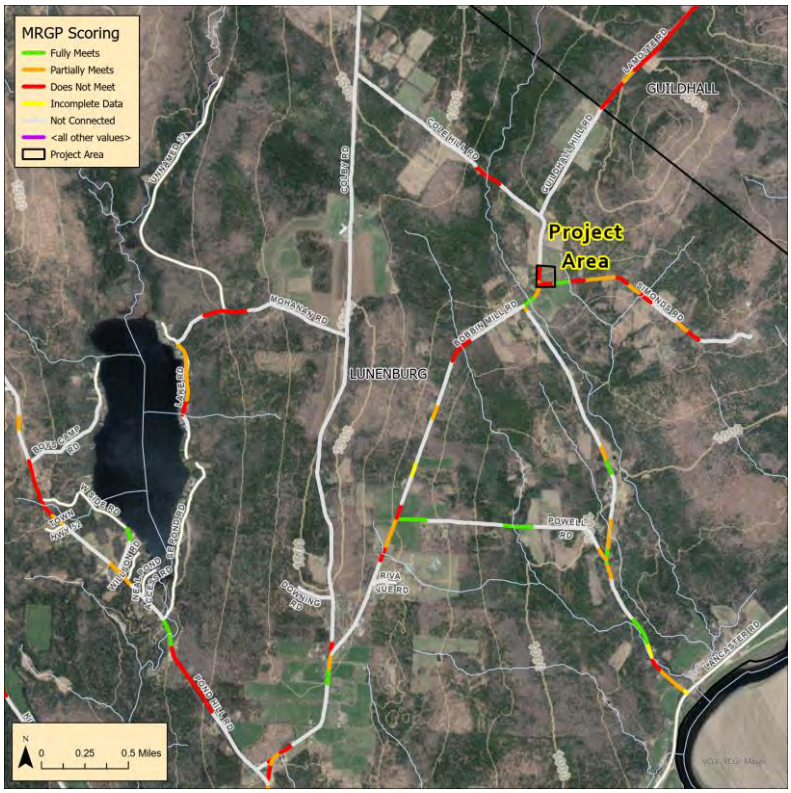


Figure 1: Location of Site #15

Figure 2: Water runs along the road surface in segment 1936.1 due to a poorly shaped crown and ditches

Project Length in ft.:	**656 ft.**
Number of Structures/culverts replaced or repaired:	**0**
Average Slope of Roadway:	**4.7%**
Road Segment ID(s):	**106696, 167350**
Structure ID(s):	
Priority:	**High**

Description of erosion/water quality issue:

The crown in segments 106696 and 167350 does not adequately shed water off the road surface as sheet flow, causing water to run along the road surface picking up sediment. Sediment picked up by water flowing along these segments enters Catbow Brook after flowing down Guildhall Hill Rd.

The shoulders and grader berms in segment 106696 prevent water from shedding away from the road as sheet flow, causing erosion along the road edge.

In segment 167350, the shoulder and a grader berm prevents water from leaving the roadway, causing erosion on the road surface. Inadequate ditching exists on the uphill side of the segment to transport water, causing flow along the roadway. No drainage structure is present to move water across the road at the low point in the segment, causing water to move across the road instead, eroding the road and picking up sediment.

Description of Project/Corrective Measures

In segment 106696, the shoulders and grader berms will be reshaped to allow water to escape the roadway, preventing erosion and the movement of sediment toward Catbow Brook.

In segment 167350 a ditch will be established to move water along the uphill road edge without causing erosion. The downhill shoulder and grader berm will be reshaped to allow water to escape the roadway as sheet flow. A 24" culvert will be added to move water across the roadway at the low point.

8 inches of ¾" minus gravel will be added in both segments to allow for adequate crowning to shed water off the road surface as sheet flow. All of these measures will reduce erosion of the road surface and sediment transportation to surface waters.

Cost Estimate

Project Budget			
Item	Cost	Qty	Total
Materials			
3/4" crushed gravel	$9.75/T	570	$5,557.50
12" minus - culvert stabilization	$17.35/T	3	$345.00
2'x30' steel culvert	$2,550.00 total	1	$2,550.00
Stone hauling	$115/hr/20T load	29	$3,335.00
Equipment			
Excavator & operator	$135/hr	36	$4,860.00
Grader & operator	$90/hr	10	$900.00
Trucking removing road & ditch material	$85/hr	6	$510.00
Hydroseeder	$300/day	1	$300.00
Total			$18,357.50
Recommended Grant Program	**Better Roads Grant Category B**		
Grant Amount ($20,000 maximum)	80%		$14,686.00
Cost To Town (20% minimum)	20%		$3,671.50

***Additional Notes**: None

Photos

Figure 3: A grader berm, insufficient crown, and slightly malformed shoulder prevent water from escaping the road, causing erosion in segment 106696.

Figure 4: The shoulder in segment 167350 prevents water from escaping the road surface, causing erosion.

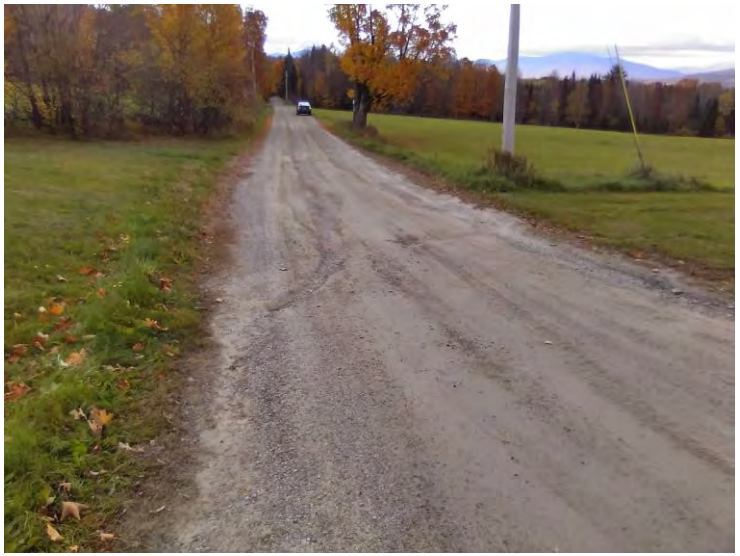


Figure 5: In segment 167350, water runs along the road surface due to insufficient crowning and shoulders and ditches that do not shed water. Water eventually flows across the road surface, causing erosion.

Project Map


106695
Slope: 9.7
75'
106696
Slope: 5.7
160'
325'
GUILDHALL HILL RD
LUNENBURG
35'
167365
Slope: 3.3
167350
Slope: 3.7
183'
95'
SIMONDS RD
94'
2'x30'
192'
106697
Slope: 5.1
N
0
0.01
0.01 Miles
Ditch
New Culvert
Existing Culvert
Shoulder Reshape
Project Area
10' Contour
MRGP Scoring
Fully Meets
Partially Meets
Does Not Meet
Not Connected

Site #16: Simonds Rd – Culverts

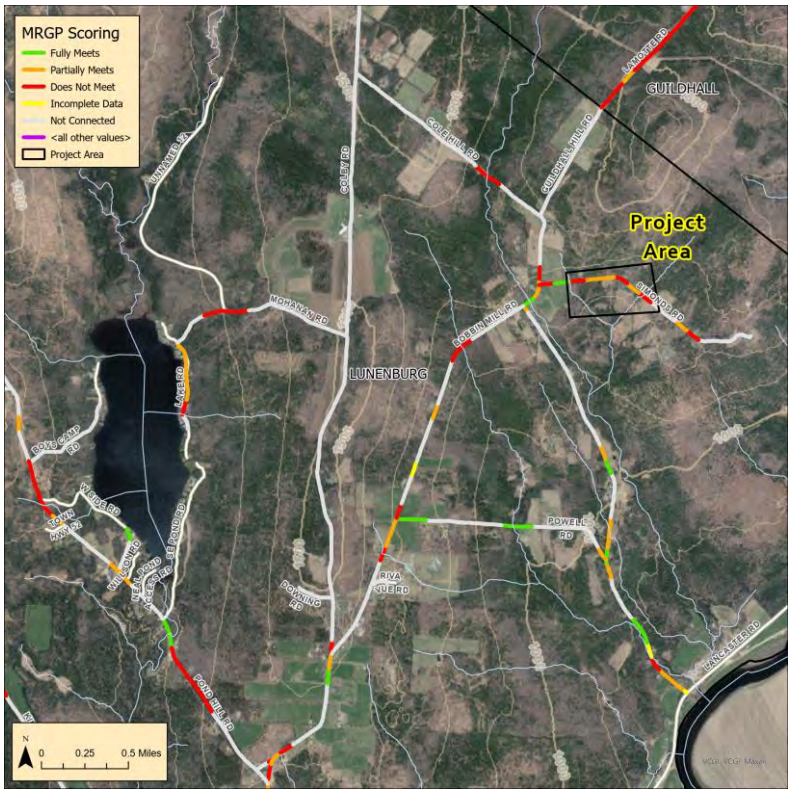


Figure 1: Location of Site #16

Figure 2: Culvert 359 in segment 167361 is and several other culverts in this area are undersized, causing in-channel erosion and erosion around headers.

Project Length in ft.:	**1968 ft.**
Number of Structures/culverts replaced or repaired:	**3**
Average Slope of Roadway:	**2.7%**
Road Segment ID(s):	**167364, 167363, 167362, 167361, 167360, 167359**
Structure ID(s):	**356, 357, 359, 360, 361**
Priority:	**Moderate**

Description of erosion/water quality issue:

Undersized culverts, inadequate crowning, an unditched shoulder, and grader berms are leading to erosion and sediment added into waterways.

In segment 167364, a drainage culvert (ID 356) is eroding around the headers. Inadequate crowing is also causing water to flow along the road surface, picking up sediment. Sediment from the culvert and road surface is entering a nearby unnamed stream.

In segment 167361, an undersized drainage culvert (ID 359) is eroding around the headers. This culvert is receiving a large amount of water from an adjacent driveway, forming an intermittent stream which flows into an unnamed perennial stream.

In segment 167360, an undersized drainage culvert (ID 360) is eroding around the headers, adding sediment to an unnamed perennial stream.

In segment 167359, an undersized culvert (ID 361) on a small perennial stream is eroding around the headers. There is also no ditch on the downhill side of the road immediately southeast of this stream, resulting in water running along the roadway and picking up sediment before entering the stream.

Description of Project/Corrective Measures

In segment 167364, the headers on culvert 356 will be stabilized with stone to reduce erosion. 4 inches of road material will also be added to allow for adequate crowning to shed water off the road surface.

In segment 167361, culvert 359 will be upsized to 2.5’ and the headers will be stabilized with stone to reduce erosion. 2 inches of road material will also be added to maintain adequate crowning to shed water off the road surface.

In segment 167360, culvert 360 will be upsized to 2.5’ and the headers will be stabilized with stone to reduce erosion. 2 inches of road material will also be added to maintain adequate crowning to shed water off the road surface.

In segment 167359, the headers of culvert 361 will be stabilized with stone to reduce erosion. 2 inches of road material will also be added to maintain adequate crowning to shed water off the road surface. A ditch will be established and stone lined to the southeast of the unnamed stream to reduce sediment transport and a turnout will be added to allow water to pass through a vegetated area into the unnamed stream.

Grader berms will be removed in all segments (167364, 167363, 167362, 167361, 167360, and 167359).

Cost Estimate

Project Budget			
Item	Cost	Qty	Total
Materials			
3/4" crushed gravel	$9.75/T	355	$3,461.25
12" minus - ditch stone (137')	$17.35/T	21	$364.35
12" minus - culvert stabilization	$17.35/T	21	$364.35
2.5'x30' x 2 steel culverts*	$9,300.00 total	1	$9,300.00
Stone hauling	$115/hr/20T load	20	$2,300.00
Equipment			
Excavator & operator	$135/hr	16	$2,160.00
Grader & operator	$90/hr	20	$1,800.00
Trucking removing road & ditch material	$85/hr	3	$255.00
Hydroseeder	$300/day	1	$300.00
Total			$20,304.95
Recommended Grant Program	**Better Roads Grant Category D**		
Grant Amount ($60,000 maximum)	80%		$16,243.96
Cost To Town (20% minimum)	20%		$4,060.99

***Additional Notes**: Culvert 361 in segment 167359 could also be replaced with a 4' pipe. Because this is a perennial stream, the sizing is not subject to the MRGP and all other work can happen without changing this culvert. If it is replaced, a Better Roads Category D grant could be secured, still with a 20% town match. A Stream Alteration Permit would also be needed for replacing this culvert.

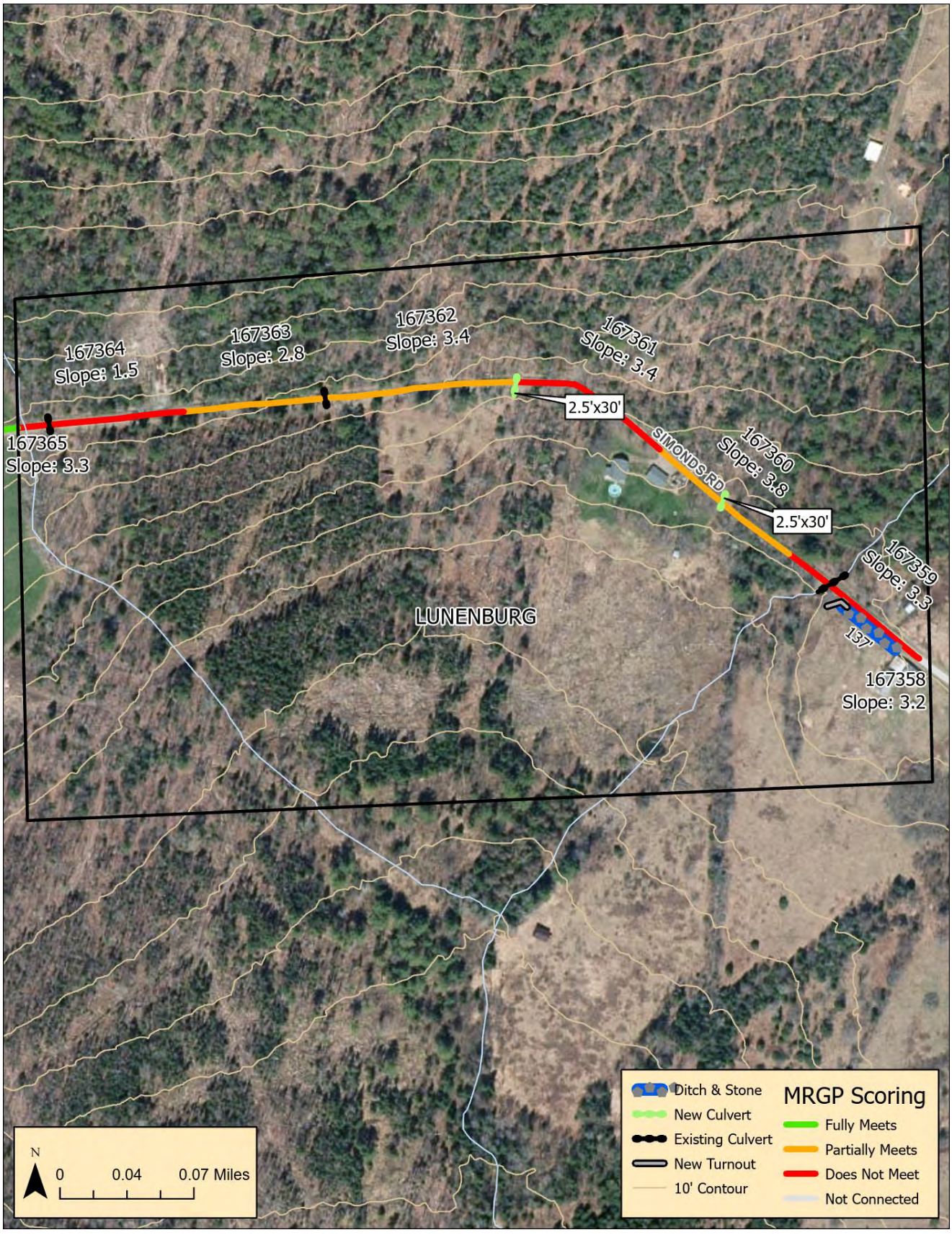
Photos

Figure 3: No ditch is present on the south side of segment 167358, causing erosion and sediment addition to a stream at culvert 361.

Figure 4: Erosion is occurring around culvert 361, which is undersized, not armored, and passes a perennial stream.

Figure 5: Erosion is occurring around the outlet of culvert 360 in segment 167360.

Project Map


167364
Slope: 1.5
167363
Slope: 2.8
167362
Slope: 3.4
167361
Slope: 3.4
2.5'x30'
167365
Slope: 3.3
SIMONDS RD
167360
Slope: 3.8
2.5'x30'
167359
Slope: 3.3
LUNENBURG
137'
167358
Slope: 3.2
N
0
0.04
0.07 Miles
Ditch & Stone
New Culvert
Existing Culvert
New Turnout
10' Contour
MRGP Scoring
Fully Meets
Partially Meets
Does Not Meet
Not Connected

Site #17: Cole Hill Rd – Hill

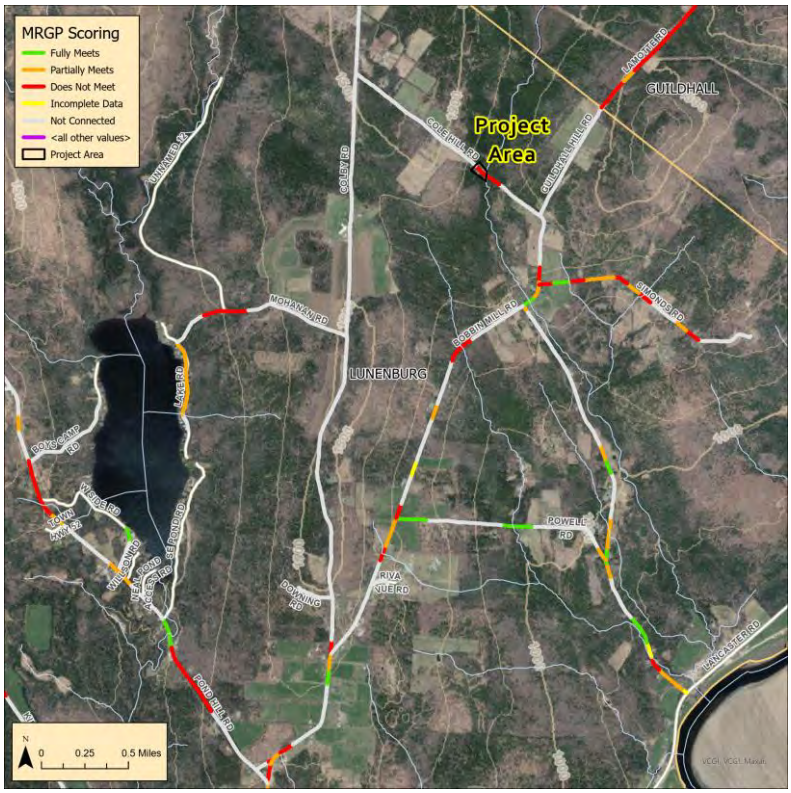


Figure 1: Location of Site #17

Figure 2: In segment 24571, lack of stone in ditches in steep sections results in erosion transporting sediment to streams and lower sections where it clogs ditches and culverts.

Project Length in ft.:	**328 ft.**
Number of Structures/culverts replaced or repaired:	**1**
Average Slope of Roadway:	**5.3%**
Road Segment ID(s):	**24571**
Structure ID(s):	**124**
Priority:	**High**

Description of erosion/water quality issue:

In segment 24571, ditches and a driveway culvert (ID 124) have filled with sediment causing water to run along the road surface, picking up sediment that is then transported into Catbow Brook. The ditches are also not stoned in steep sections, causing erosion in the ditch and resulting in the filled ditches downhill.

Description of Project/Corrective Measures

In segment 24571, ditches will be reestablished and stoned in steep sections. Turnouts will be added to ensure water flowing along the shoulder is distributed through vegetation before entering Catbow Brook. Culvert 124 will be replaced with an 18" steel culvert at the driveway to keep water in the ditch. Not enough space exists between the parking area and Catbow Brook for treatment of water coming out of a culvert, so water from the ditch will be turned out above the parking area.

Cost Estimate

Project Budget			
Item	Cost	Qty	Total
Materials			
3/4" crushed gravel	$9.75/T	71	$692.25
12" minus - ditch stone (232')	$17.35/T	36	$624.60
Stone hauling	$115/hr/20T load	7	$805.00
Equipment			
Excavator & operator	$135/hr	24	$3,240.00
Grader & operator	$90/hr	3	$270.00
Trucking removing road & ditch material	$85/hr	5	$425.00
Hydroseeder	$300/day	1	$300.00
Total			$6,356.85
Recommended Grant Program	**Better Roads Grant Category B**		
Grant Amount ($20,000 maximum)	80%		$5,085.48
Cost To Town (20% minimum)	20%		$1,271.37

***Additional Notes**: None

Photos

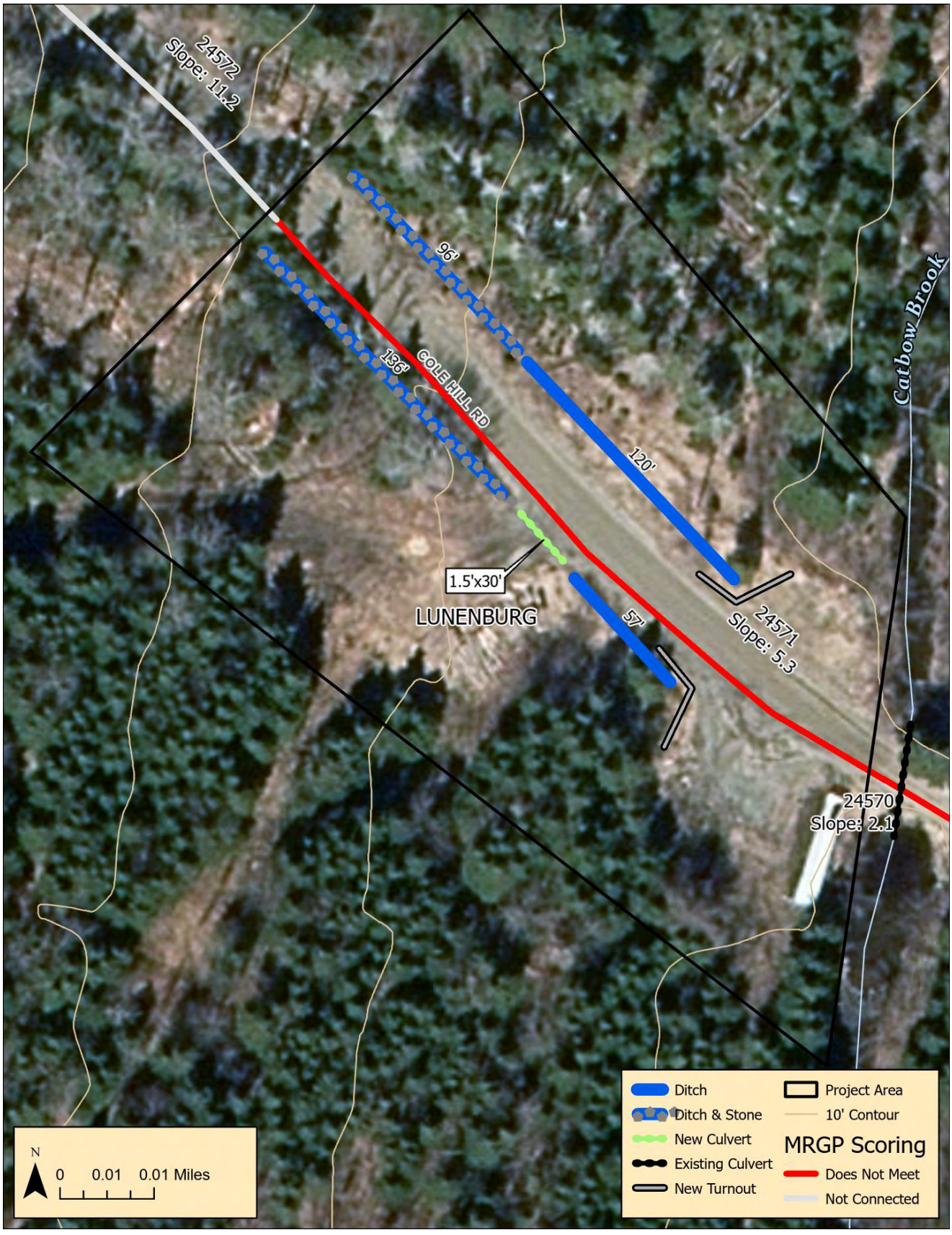
Figure 3: Water should be turned out before the parking area next to Catbow Brook.

Figure 4: Ditches in the dodwnhill parts of segment 24571 have filled with sediment, causing water to flow along the road surface.

Figure 5: Steep section sof segment 24571 lack stone, resulting in in-ditch erosion and sediment transport to Catbow Brook.

Figure 6: Culvert 124 has filled with sediment. Ditches will be cleaned out and the culvert will be replaced with an 18" pipe.

Project Map


24572
Slope: 11.2
96'
136'
COLE HILL RD
120'
Catbow Brook
1.5'x30'
LUNENBURG
57'
24571
Slope: 5.3
24570
Slope: 2.1
N
0 0.01 0.01 Miles
Ditch
Ditch & Stone
New Culvert
Existing Culvert
New Turnout
Project Area
10' Contour
MRGP Scoring
Does Not Meet
Not Connected

Site #18: Dupont Rd

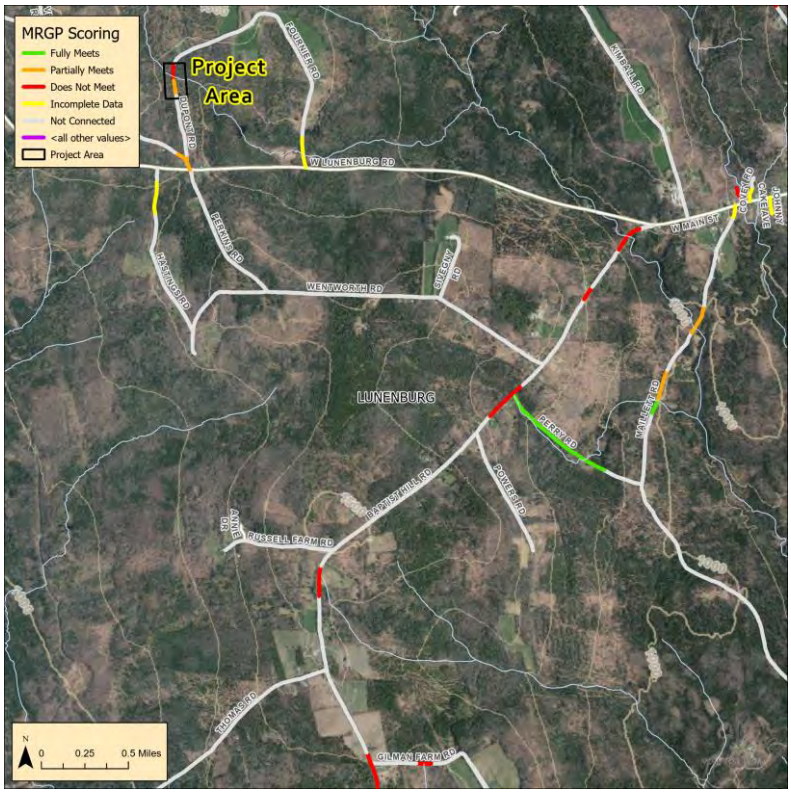


Figure 1: Location of Site #18

Figure 2: Sediment from the ditch and erosion around an undersized culvert are entering an unnamed stream.

Project Length in ft.:	**656 ft.**
Number of Structures/culverts replaced or repaired:	**2**
Average Slope of Roadway:	**3.1%**
Road Segment ID(s):	**91827, 91828**
Structure ID(s):	**159, 158**
Priority:	**High**

Description of erosion/water quality issue:

In both segments 91827 and 91828, ditches and shoulders do not adequately transport water off the road surface, causing water to flow along the surface picking up sediment. Sediment enters an unnamed stream where it crosses the road in segment 91827. The culvert at this crossing (ID 159) is also undersized and not stone-stabilized, causing instream erosion and erosion around the headers. Erosion is occurring around the headers of a drainage culvert (ID 158) in segment 91828.

Description of Project/Corrective Measures

In segment 91827, grass lined ditches will be reestablished to adequately transport sediment along the road shoulder. Culvert 159 will also be stabilized with stone to reduce header erosion. Turnouts will be installed on the north side of the culvert to ensure water from the ditch passes through a vegetated area before entering the stream. Water in the ditch south of the culvert already passes through vegetation into the stream.

In segment 91828 the uphill ditch will be reestablished to ensure adequate water transport and the downhill shoulder will be shaped to allow water to flow away from the road surface as sheet flow. Culvert 158's headers will be stabilized with stone.

Cost Estimate

Project Budget			
Item	Cost	Qty	Total
Materials			
12" minus - 3 turnouts	$17.35/T	35	$607.25
Stone hauling	$115/hr/20T load	2	$230.00
Equipment			
Excavator & operator	$135/hr	46	$6,210.00
Grader & operator	$90/hr	5	$450.00
Trucking removing road & ditch material	$85/hr	18	$1,530.00
Hydroseeder	$300/day	1	$300.00
Total			$9,327.25
Recommended Grant Program	**Better Roads Grant Category D**		
Grant Amount ($60,000 maximum)	80%		$7,461.80
Cost To Town (20% minimum)	20%		$1,865.45

***Additional Notes**: Because culvert 159 is on a perennial stream, it is exempt from the MRGP and all other work can be done without replacing the culvert. If the town would like to replace the culvert a Better Roads Grant Category D is recommended. An 8' culvert should be adequate, but a hydrologic study should be done to determine the best culvert size for the stream.

Photos

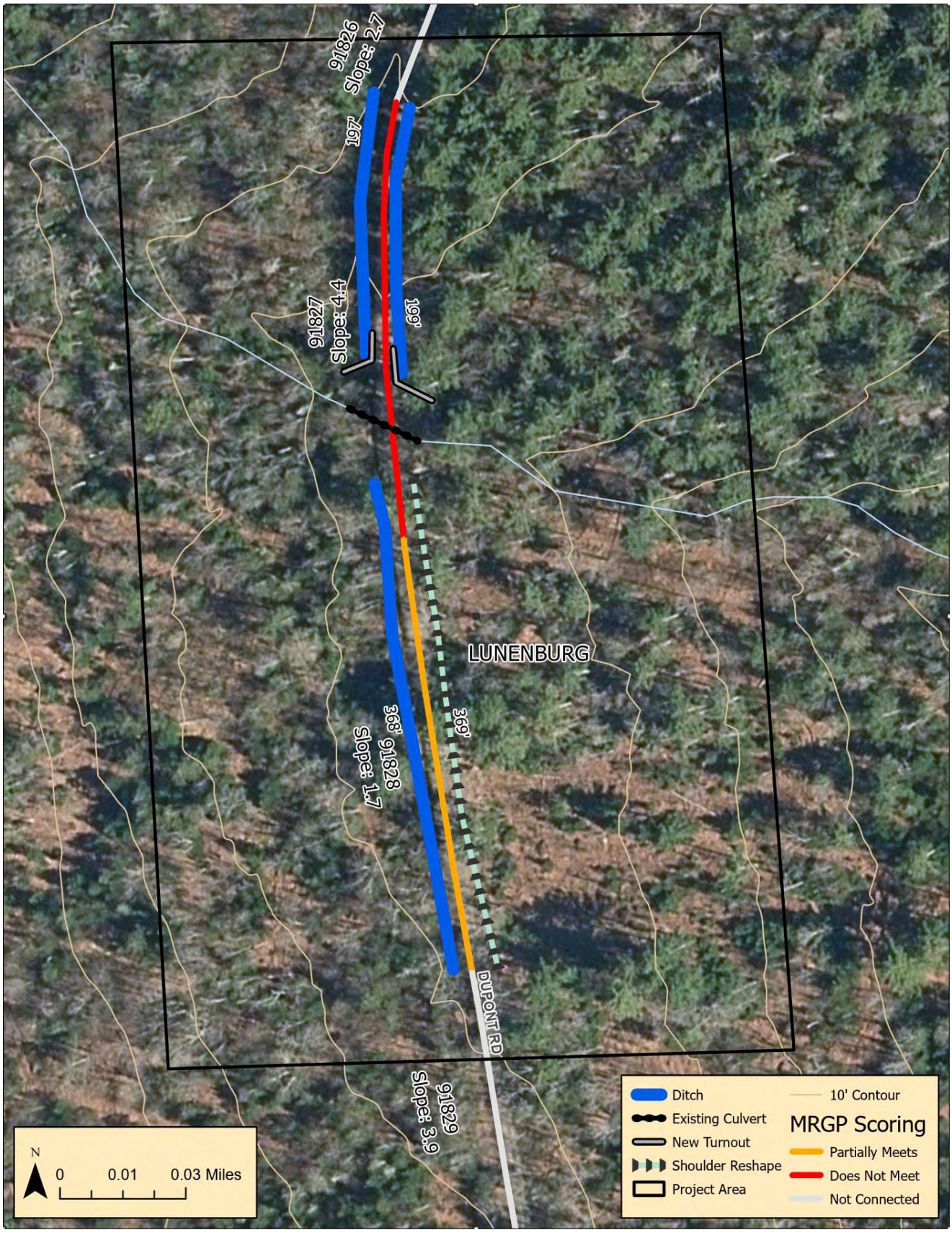
Figure 3: The headers of culvert 159 are not fully stabilized with stone, causing some erosion.

Figure 4: Culvert 158 in segment 91828 is not stabilized with stone headers and some erosion is occurring around it.

Figure 5: The uphill ditches in both segments are too shallow to effectively move water.

Figure 4: The downhill shoulder in both segments does not shed water as sheet flow away from the road.

Project Map


91826
Slope: 2.7
197'
91827
Slope: 4.4
199'
LUNENBURG
368'
91828
Slope: 1.7
369'
DUPONT RD
91829
Slope: 3.9
N
0
0.01
0.03 Miles
Ditch
Existing Culvert
New Turnout
Shoulder Reshape
Project Area
10' Contour
MRGP Scoring
Partially Meets
Does Not Meet
Not Connected

Site #19: Thomas Rd – East

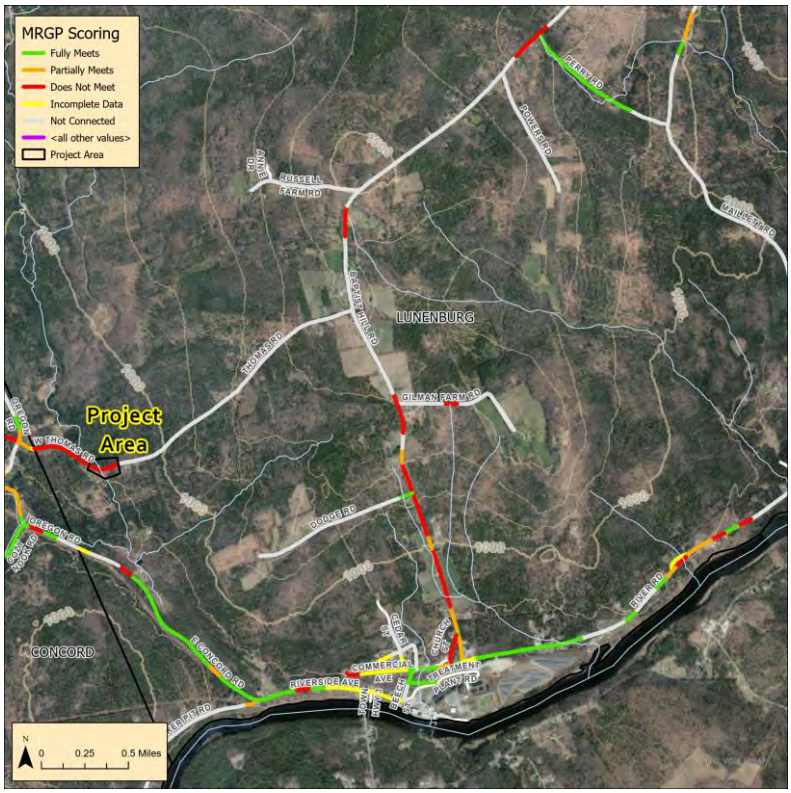


Figure 1: Location of Site #19

Figure 2: The south side of segment 193242 lacks ditching and driveway culverts, and enters Scales Brook through an area that is not stabilized.

Project Length in ft.:	**656 ft.**
Number of Structures/culverts replaced or repaired:	**1**
Average Slope of Roadway:	**5.8%**
Road Segment ID(s):	**193243, 193242**
Structure ID(s):	**None present**
Priority:	**Moderate**

Description of erosion/water quality issue:

Inadequate crowning, unditched shoulders, and a missing driveway culvert are leading to water flow along the road surface and sediment addition to Scales Brook.

In segment 193242, a driveways does not have a culvert, leading water to flow into the roadway picking up sediment. On the south side ditches are absent or not deep enough to adequately transport water off the road surface, leading to erosion on the road surface. On the north side a stream comes from the north and flows along the road shoulder into Scales Brook. The ditch runs into the stream without flowing through vegetation. Inadequate crowning is also causing water to flow along the road surface, picking up sediment. Sediment from the culvert and road surface is entering the unnamed stream and Scales Brook.

In segment 193243 ditches are absent or not deep enough to adequately transport water off the road surface, leading to erosion on the road surface. Ditches lack stone, which may result in erosion in the ditch. Water also runs along the road surface, picking up sediment, due to inadequate crowning.

Description of Project/Corrective Measures

In segment 193242, an 18" steel culvert will be installed at the driveway currently lacking a culvert. Stone lined ditches will be established in steep sections of the segment to ensure erosion does not occur in ditches, and the ditch will be turned out before entering the unnamed stream. Grass lined ditches will be established in less steep sections to allow adequate water transport along the roadside. 7 inches of road material will be added to allow for adequate crowning to shed water off the road surface.

In segment 193243, stone lined ditches will be established to reduce sediment transport to Scales Brook. Turnouts will be installed next to Scales Brook to ensure water enters the brook in a distributed manner through a vegetated area. 7 inches of road material will be added to allow for adequate crowning to shed water off the road surface.

Cost Estimate

Project Budget			
Item	Cost	Qty	Total
Materials			
3/4" crushed gravel	$9.75/T	489	$4,767.75
12" minus - 2 turnouts, splash pool	$17.35/T	61	$1,058.35
12" minus - ditch stone (785')	$17.35/T	122	$2,116.70
2'x80', 2'x40', 2'x55' steel culverts	$1,775.00 total	1	$1,775.00
Stone hauling	$115/hr/20T load	34	$3,910.00
Equipment			
Excavator & operator	$135/hr	54	$7,290.00
Grader & operator	$90/hr	5	$450.00
Trucking removing road & ditch material	$85/hr	21	$1,785.00
Hydroseeder	$300/day	1	$300.00
Total			$23,452.80
Recommended Grant Program	**Better Roads Grant Category B**		
Grant Amount ($20,000 maximum)	80%		$18,762.24
Cost To Town (20% minimum)	20%		$4,690.56

***Additional Notes**: None

Photos

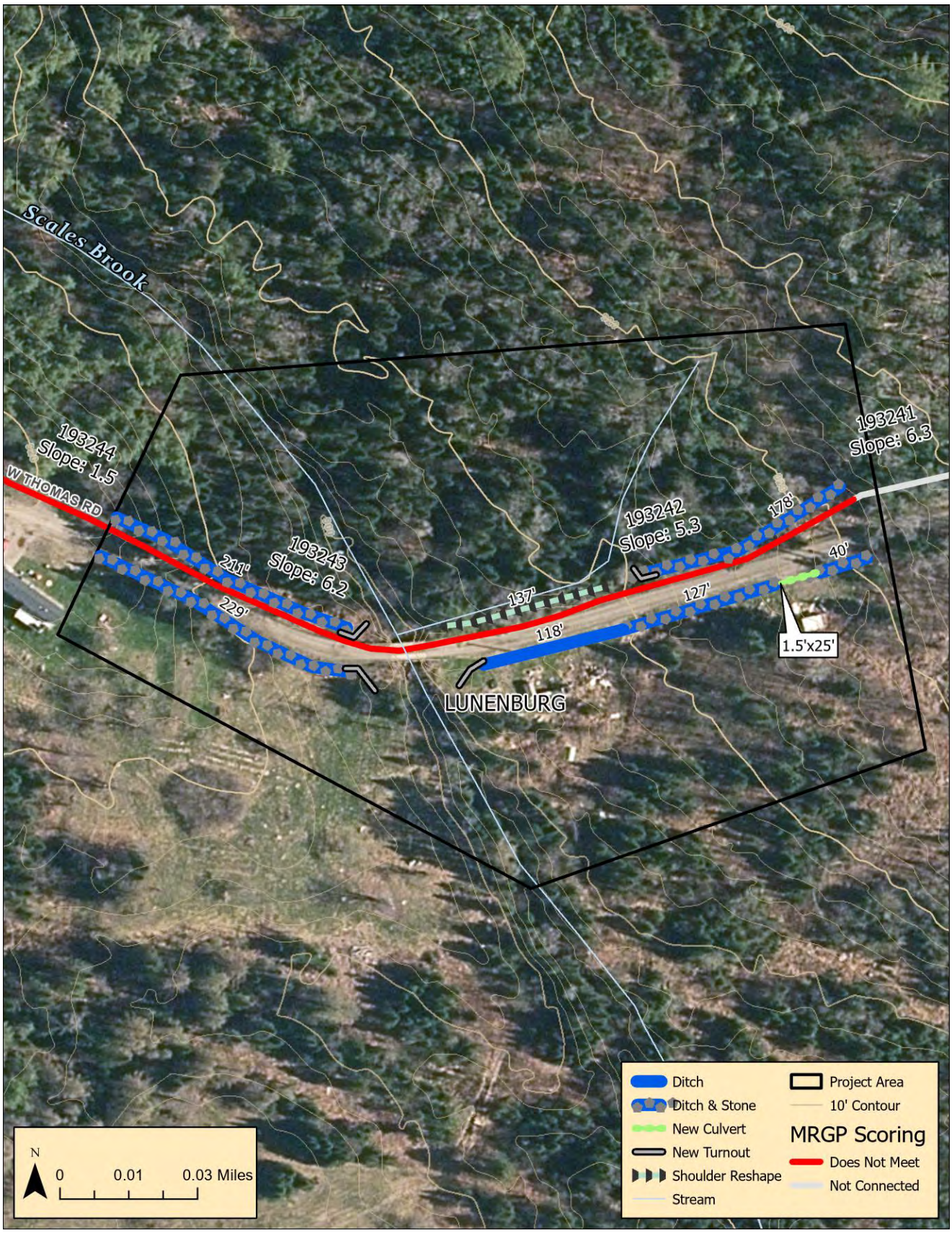
Figure 3: The ditches in segment 193243 are narrow and shallow and lack stone. Crowning on the segment does not shed water as sheet flow, causing erosion. Stone walls may prevent adequate ditching in areas.

Figure 4: Lack of crown, ditching, and driveway culverts causes erosion in segment 193242.

Figure 5: In segment 193243, flow along the road surface due to lacking ditches is transporting sediment to Scales brook.

Figure 6: In segment 193242, an unnamed stream approaches the road and runs along it until entering Scales Brook. The ditch will be turned out above the stream, and the road shoulder will be stabilized adjacent to the stream.

Project Map


Scales Brook
193244
Slope: 1.5
W THOMAS RD
193243
Slope: 6.2
193242
Slope: 5.3
193241
Slope: 6.3
211'
229'
137'
118'
127'
178'
40'
1.5'x25'
LUNENBURG
N
0
0.01
0.03 Miles
Ditch
Ditch & Stone
New Culvert
New Turnout
Shoulder Reshape
Stream
Project Area
10' Contour
MRGP Scoring
Does Not Meet
Not Connected

Site #20: Thomas Rd – West

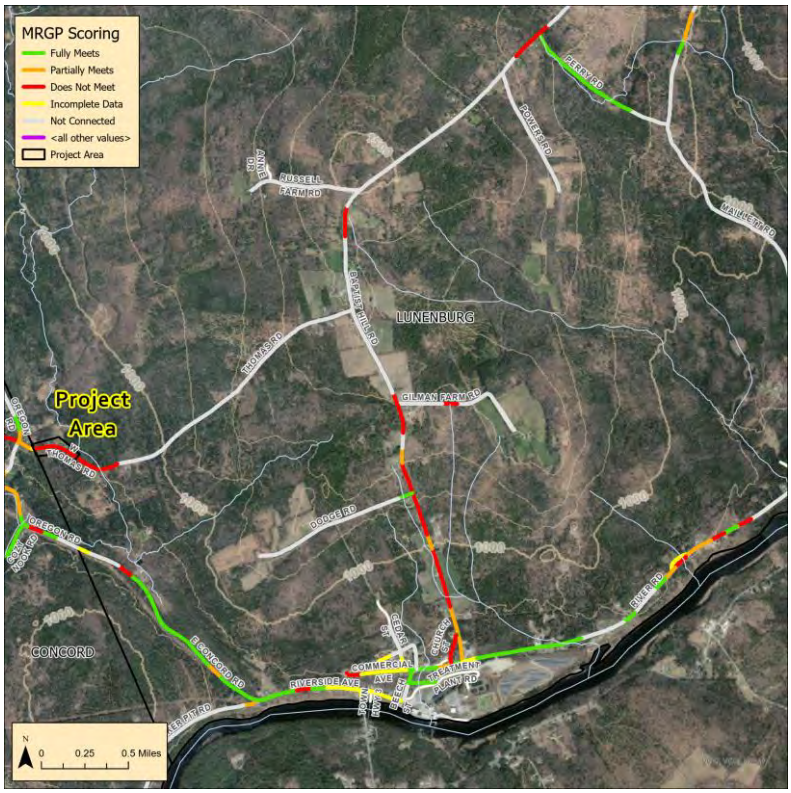


Figure 1: Location of Site #20

Figure 2: Water runs along the road surface causing erosion in segment 193229 due to inadequate crowning and no ditching.

Project Length in ft.:	**984 ft.**
Number of Structures/culverts replaced or repaired:	**1**
Average Slope of Roadway:	**2.9%**
Road Segment ID(s):	**193229, 193231, 193230**
Structure ID(s):	**None present**
Priority:	**Moderate**

Description of erosion/water quality issue:

Inadequate crowning, unditched and poorly shaped shoulders, and missing driveway culverts are leading to water flow along the road surface and sediment addition to Scales Brook and an unnamed stream.

In segment 193229, ditches are absent or not deep enough to adequately transport water off the road surface, leading to erosion on the road surface. Inadequate crowning and poorly formed shoulders area also causing water to flow along the road surface, picking up sediment. Sediment from the road surface is entering an unnamed stream in the segment.

In segment 193231 road shoulders and ditches do not adequately shed water away from the road surface, causing flow and erosion along the road. Water also runs along the road surface, picking up sediment, due to inadequate crowning. Water flowing along the road surface in this segment moves toward an unnamed stream to the west and Scales Brook to the east.

In segment 193230, one driveway does not have a culvert, leading water to flow into the roadway picking up sediment. Ditches and road shoulders are not adequately transporting water off the road surface, leading to erosion on the road and sediment transport toward Scales Brook. Inadequate crowning is also causing water to flow along the road surface, picking up sediment.

Description of Project/Corrective Measures

In segment 193229, ditches and sloped shoulders will be reestablished to ensure water can escape the roadway and reduce sediment transport to the unnamed stream. Turnouts will be installed on both sides of the stream to ensure water enters the brook in a distributed manner through a vegetated area. 6 inches of road material will be added to allow for adequate crowning to shed water off the road surface.

In segment 193231, grass lined ditches will be established to ensure water transport off of the road surface. Ditching to the south will require tree removal. 6 inches of road material will be added to maintain adequate crowning to shed water off the road surface.

In segment 193230, an 18" steel culvert will be installed at the driveway currently lacking a culvert. A grass lined ditch will be established to the east of the culvert and shoulders will be reshaped in other areas to ensure water flowing off the road surface moves away from the road as sheet flow. Some tree removal will be necessary for ditch and shoulder work. 6 inches of road material will be added to allow for adequate crowning to shed water off the road surface.

Cost Estimate

Project Budget			
Item	Cost	Qty	Total
Materials			
3/4" crushed gravel	$9.75/T	638	$6,220.50
12" minus - 4 turnouts	$17.35/T	30	$520.50
12" minus - ditch stone (215')	$17.35/T	33	$572.55
1.5'x20', 1.5'x30' steel culverts	$3,550.00 total	1	$3,550.00
Stone hauling	$115/hr/20T load	35	$4,025.00
Equipment			
Excavator & operator	$135/hr	69	$9,315.00
Grader & operator	$90/hr	7	$630.00
Trucking removing road & ditch material	$85/hr	27	$2,295.00
Hydroseeder	$300/day	1	$300.00
Total			$27,428.55
Recommended Grant Program	**Better Roads Grant Category B**		
Grant Amount ($20,000 maximum)	73%		$20,000.00
Cost To Town (20% minimum)	27%		$7,428.55

***Additional Notes**: None

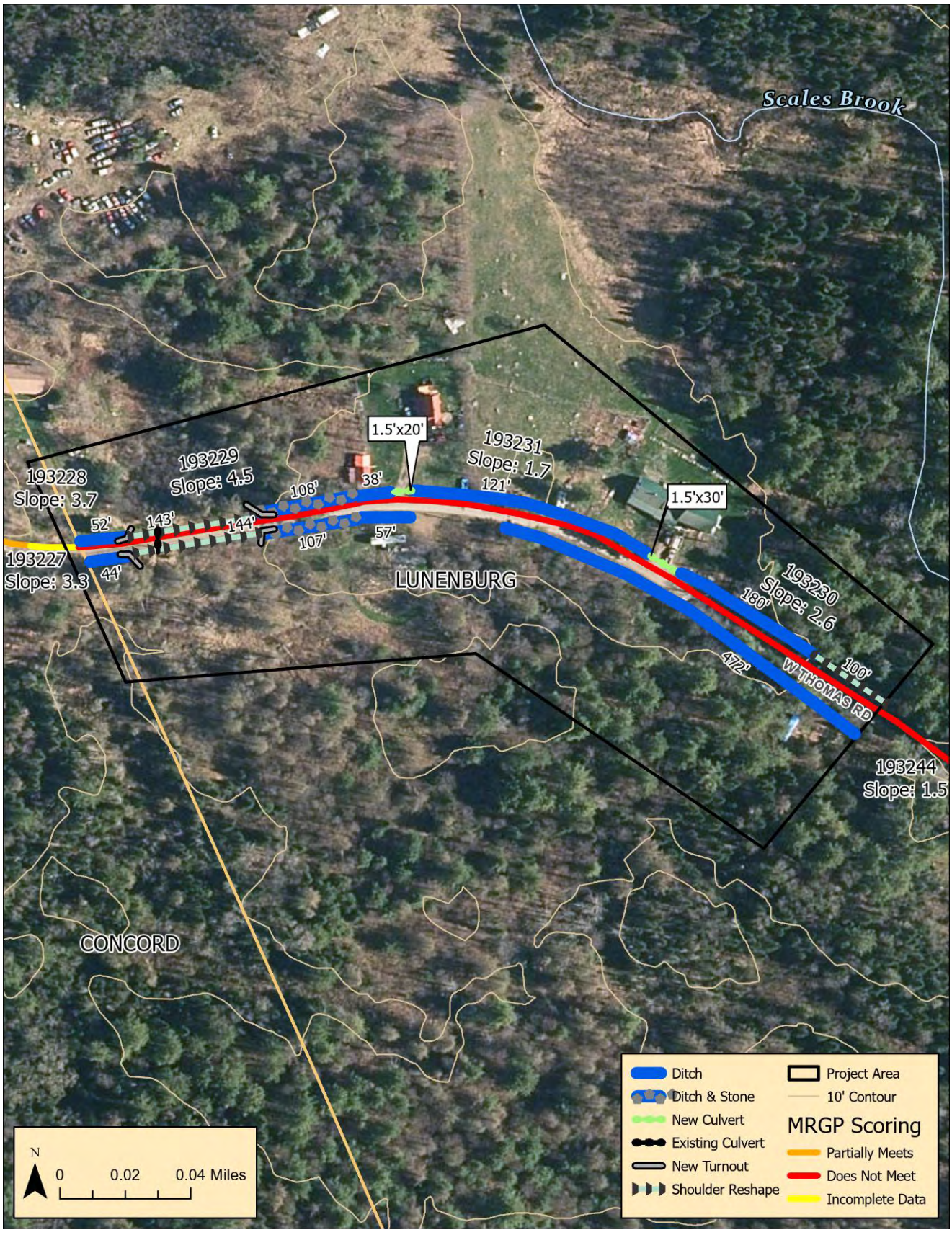
Photos

Figure 3: Ditches and more crown need to be established in segment 193229 to prevent erosion on the road surface.

Figure 4: A ditch needs to be established in segment 193230 to allow water to escape the road surface.

Figure 5: A ditch needs to be established in segment 193231 to allow water to escape the road surface.

Project Map


Scales Brook
193228
Slope: 3.7
193229
Slope: 4.5
193231
Slope: 1.7
193227
Slope: 3.3
193230
Slope: 2.6
193244
Slope: 1.5
1.5'x20'
1.5'x30'
52'
143'
144'
108'
107'
38'
57'
121'
44'
180'
472'
100'
W THOMAS RD
LUNENBURG
CONCORD
N
0
0.02
0.04 Miles
Ditch
Ditch & Stone
New Culvert
Existing Culvert
New Turnout
Shoulder Reshape
Project Area
10' Contour
MRGP Scoring
Partially Meets
Does Not Meet
Incomplete Data

Large Structures Projects

Two large structures were identified as priorities for replacement by the town or outside organizations. A preliminary cost estimation is provided, along with potential sources of grant funding. The town can work with ECNRCD or other partner organizations to pursue these funding options. Any large structures identified as priorities for replacement not listed in this section are likely eligible for a VTrans Structures Grant of up to $175,000 with 20% town match. Other grant opportunities may exist, and must be identified on a case-by-case basis.

Site #21: Cole Hill Rd – Box Culvert

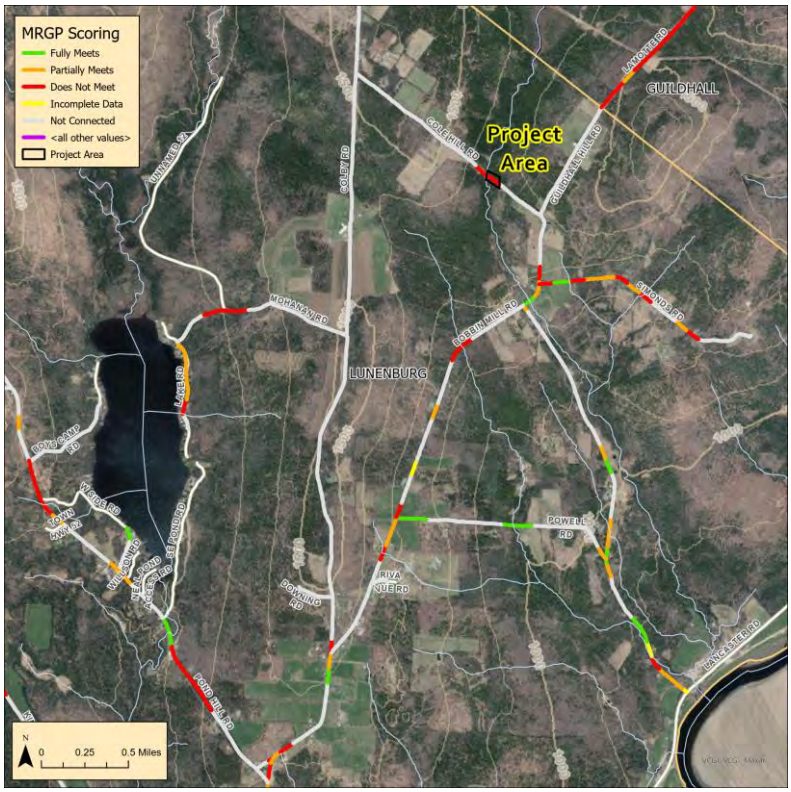


Figure 1: Location of Site #21

Figure 2: The existing culverts are in poor condition and undersized for the flow they receive, posing a failure risk. The multi-culvert design also poses a clogging risk.

Project Length in ft.:	**328 ft.**
Number of Structures/culverts replaced or repaired:	**3**
Average Slope of Roadway:	**2.1%**
Road Segment ID(s):	**24570**
Structure ID(s):	**123, 122, 121**
Priority:	**Moderate**

Description of erosion/water quality issue:

In segment 24570, the structure crossing Catbow Brook is degraded and undersized, causing in-stream erosion, erosion at the culvert headers, and risking failure. The existing structure is two heavily degraded and partially collapsed culverts (ID 122, 123), each roughly 5 feet in diameter, with several steel overflow culverts, one 30" (ID 121), and another 18" (unknown ID).

Description of Project/Corrective Measures

In segment 24570, a concrete box culvert will be installed to replace the degraded and undersized culverts, reducing erosion and risk of failure. According to a hydraulic study performed on the site, a box culvert with a span of 16' and height of 8' installed at a 2% grade will be sufficient. All additional overflow culverts will be removed. A Stream Alteration Permit will be secured before construction begins, and DEC will be consulted about any additional permitting needs.

Cost Estimate*

Project Budget			
Item	Cost	Qty	Total
Engineering			
100% Engineered Design, Permitting, Bid Administration	$40,000	1	$40,000.00
Materials			
All materials	$300,000	1	$300,000.00
Equipment & Labor			
All Equipment & Labor	$150,000	1	$150,000.00
Total			$490,000.00
Potential Grant Funding			
Clean Water DIBG/Enhancement Grant			$300,000.00
VTrans Structures Grant*			$175,000.00

***Additional Notes**: This cost estimation is very rough. VTrans has done a hydrologic study on this culvert and proposed a box culvert of this size. If the town does not have this study on file, contact VTrans. VTrans structures grants require a 20% town match ($35,000 for $175,000 grant), but would be reduced to 10% if Lunenburg meets certain criteria, including enrollment in the National Flood Insurance Program.

Photos

Figure 3: The undersized culverts have created a large scour pool downstream of the conveyance, indicating in-stream erosion.

Figure 4: The culverts are perched, causing in-stream erosion and blocking fish passage.

Figure 5: Two 30"x30" overflow culverts are present, with erosion occurring around the headers and in-stream erosion occurring in the large downstream scour pool.

Project Map


24571
Slope: 5.3
24570
Slope: 2.1
COLE HILL RD
LUNENBURG
24569
Slope: 2.8
Catbow Brook
N
0 0.01 0.01 Miles
Remove Culvert
New Culvert
Project Area
MRGP Scoring
Does Not Meet
Not Connected

Site #22: Baptist Hill Rd – Mink Brook Culvert

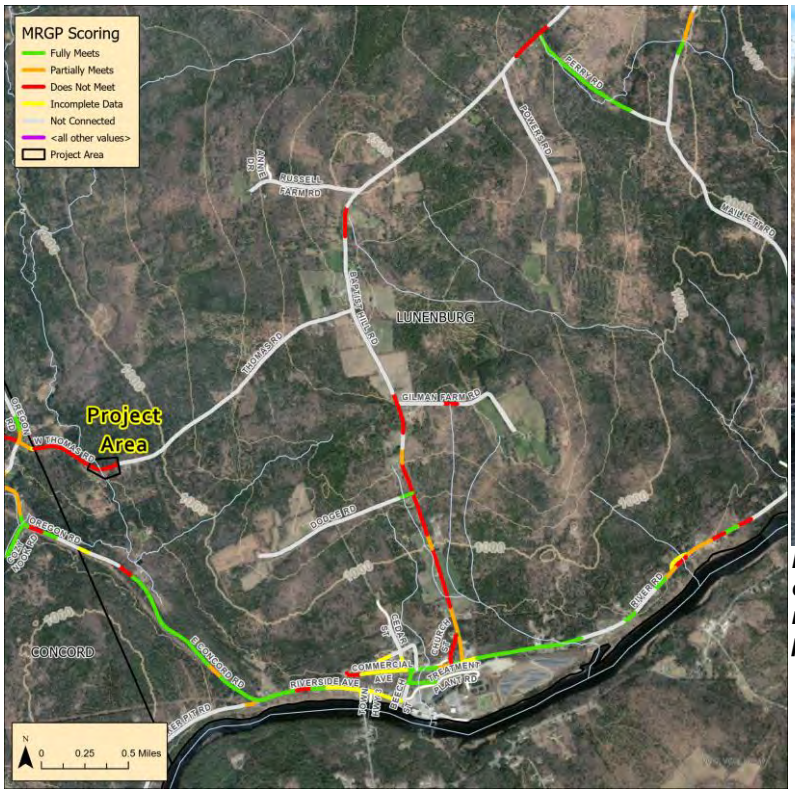


Figure 1: Location of Site #22

Figure 2: A large scour pool is present downstream of the culvert due to high water velocity from restricted flow. High water velocity also prevents fish passage upstream through the culvert.

Project Length in ft.:	**328 ft.**
Number of Structures/culverts replaced or repaired:	**1**
Average Slope of Roadway:	**6.3%**
Road Segment ID(s):	**4171**
Structure ID(s):	**3**
Priority:	**Moderate**

Description of erosion/water quality issue:

The culvert that passes Mink Brook under Baptist Hill Rd is eroding around the headers. It is also causing in-stream erosion because it is not set at grade with the stream and it constricts water flow at normal water levels. The resulting high velocity flows cause significant scour downstream of the outlet and has created a large scour pool. High velocities also prevent fish passage through the culvert, and the culvert has been identified as a priority for replacement. Restoring fish passage would result in an additional 8.5 miles of connected upstream habitat for eastern brook trout.

Description of Project/Corrective Measures

The Mink Brook culvert should be replaced with a new structure that allows fish passage and natural stream hydrology. In 2023, the USFWS and Essex County NRCD are hiring an engineer to design a structure for this purpose. Implementation will likely require multiple grants, and both Essex County NRCD and USFWS are happy to partner with the Town of Lunenburg to assist in this process. Grants being considered for this project include:

National Fish Passage Program, Eastern Brook Trout Joint Venture, VTrans Structures Grant, VT DEC Clean Water Enhancement Grants, DEC Design & Implementation Block Grants, and Inflation Reduction Act Funds

Cost Estimate*

Project Budget			
Item	Cost	Qty	Total
Engineering			
Permitting, easements, bid administration	$50,000	1	$50,000.00
Materials			
Mob/demob/general conditions	$80,000.00	1	$80,000.00
Stream bypass	$25,000.00	1	$25,000.00
Site excavation	$30.00	3000	$90,000.00
Concrete footers/stems	$1,250	120	$150,000.00
BridgeCor71 Purchase/Transport	$117,000	1	$117,000.00
BridgeCor71 Assemply	$70,000	1	$70,000.00
Concrete head/wingwalls	$1,250	160	$200,000.00
Rock armor/infill	$50	400	$20,000.00
Site backfill	$30	2000	$60,000.00
Guardrails	$30	350	$10,500.00
Site restoration	$25,000	1	$25,000.00
Contingency (10%)			$84,750.00
Total			$982,250.00
Potential Grant Funding			
IRA USFWS Fish Passage Structures Grant			$1,000,000.00
National Fish Passage Program			$200,000.00
Eastern Brook Trout Join Venture			$50,000.00
Clean Water DIBG/Enhancement Grant			$300,000.00
VTrans Structures Grant*			$175,000.00

***Additional Notes**: This cost estimation is based on preliminary estimates from an engineer. VTrans structures grants require a 20% town match ($35,000 for $175,000 grant), but would be reduced to 10% if Lunenburg meets certain criteria, including enrollment in the National Flood Insurance Program.

Photos

Figure 3: At normal flow, the culvert restricts Mink Brook to much less than it's natural bank full width.

Figure 5: Erosion is occurring around the upstream header of the culvert.

Project Map


Mink Brook
4171
Slope: 6.3
LUNENBURG
BAPTIST HILL RD
4170
Slope: 7.3
N
0
0.01
0.01 Miles
New Culvert
Project Area
10' Contour
MRGP Scoring
Does Not Meet