

Cornell Local Roads Program

Town of Lewisboro

2016



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Executive Summary

The Cornell Local Roads Program (CLRP) was designed and begun by civil engineers at Cornell University to help towns and municipalities throughout New York maintain and improve the quality of their roads efficiently through the use of interns from Cornell and other colleges and universities in the area and a software called Cornell Asset Management Program – Roads and Streets (CAMP-RS). The major theme of the program is to continue to maintain good roads at an inexpensive rate while slowly bringing up the quality of the poor roads through more expensive and extensive repairs. Ultimately, this cost-effective process leads to longer lasting, better designed and maintained roads.

Before coming to Lewisboro, there was a three day orientation to the CLRP that prepared the interns for the summer by introducing the CAMP-RS software, explaining how to assess road damages, repair alternatives, cost calculations and other necessary topics for use during the summer. After coming to Lewisboro, the process began by inventorying all of the roads. It continued through many weeks of surveying road conditions and has finally concluded by making a capital plan with a timeline and road repair alternatives.

The end result of the program is the final capital plan that has been developed. As seen in Appendix VI, it lists all the roads with all the information about each, including a repair category and type, cost of the repairs, and the year in which the repair is to be completed. This can be used as reference during the coming years for road repairs and maintenance. Continuing to use the CAMP-RS software will allow the correct roads to continue to be repaired and will ultimately bring up the quality of all the roads in the Town of Lewisboro.

Cornell Training Session

The beginning of this process began at Cornell, where, during the three day orientation to the Cornell Local Roads Program (CLRP), interns and supervisors learned about a range of topics, covering “10 Commandments of a Good Road,” how a road is paved and pavement maintenance principles, typical road damages and repair alternatives, and of course the use of the Cornell Asset Management Program – Road Surface (CAMP-RS) software. The instructors, led by Geoffrey Scott and David Orr, focused on explaining how to assess road damages, likely causes, selecting the correct efficient repair, and computing costs and budgets of a typical repair project. The CLRP orientation was primarily geared toward implementing the program into a municipality and completing the following tasks once there:

1. Take/update the inventory of the paved roads of the town
2. Assess and survey each road’s conditions using guidelines provided by CLRP
3. Develop maintenance and rehabilitation alternatives with cost calculations that can be applied to the road network to restore and maintain the quality of the roads
4. Assign repairs to each of the roads in the network
5. Prioritize repair and maintenance needs of the network as a whole and of individual roads and develop a strategy to accomplish these goals
6. Create a five year plan with the maintenance and repairs, a budget and a timeline

Using these steps as a guideline, the process of creating a plan for Lewisboro began.

Project Parameters and Summer 2016 Process

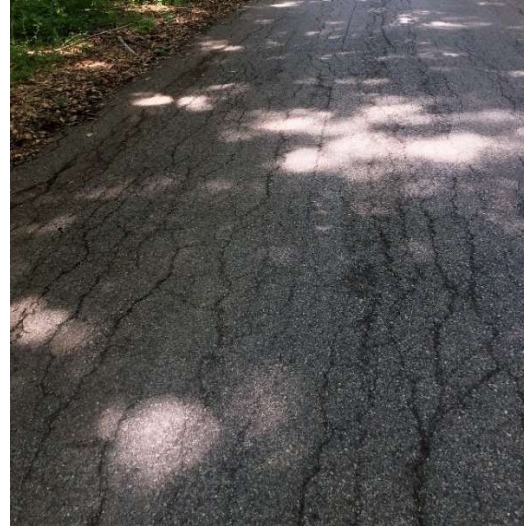
The first part of the process begins with the inventory step. Since Lewisboro participated in this program during the summer of 2013, former intern Meghan Collins had already taken a very good inventory of the roads. Additionally, the town has a file of all the roads in the town, separating them into private, town, and state roads and grouping them by region. Using these lists as references as well as Google Maps, a new inventory was put together with the categories required by the CAMP-RS software which include length, width, and intersections with other roads. After compiling the known information, an excel sheet was printed with blank faces to fill in the missing information while on the roads surveying the conditions.

Next, after taking a full inventory of the roads, I created a plan to tackle specific regions of the town. The map of the regions is located in Appendix I. I began with Cross River and worked my way counter-clockwise over the course of a few weeks until I finished with Vista. I only considered the paved roads, as requested by Highway Superintendent Peter Ripperger.

To evaluate each road, I used a Condition Surey Sheet, located in Appendix II. The survey sheet has eight different conditions to be assigned an extent and severity. The first of these conditions or damages is longitudinal/transverse cracking. Longitudinal cracks tend to be caused by joint failure or frost heaving with loading. Parralel cracks form from the intial crack in a process known as deterioration. Transverse cracks are caused by similar problems, but thermal changes tend to affect these cracks more. Two good examples from the town are on Waccabuc River Lane in Waccabuc and on Tommys Lane in Vista:



Waccabuc River Lane



Tommys Lane

The second damage to look at is alligator cracking, which is essentially when the road begins to look like the scales of an alligator. This can be caused by a failure of the base layers of the road or poor drainage coupled with heavy loading and these cracks ultimately, if left on their own, result in potholes. Deertrack Lane is a great example of a high extent of alligator cracking.



Deertrack Lane

A third type of cracking that can be seen on roads is edge cracking. Edge cracks come from the side of the road and usually result from poor drainage and moisture on the edges in combination with weak material. Two great example of this show a progretion from moderate to

severe: Wakeman Road in Vista is not as bad as Longview Road in South Salem, but could progress if left unrepaired.



Wakeman Road



Longview Road

Aside from cracks, there are other damages to roads. One such is bleeding, which is when there is excess asphalt seeping onto the road surface that is caused by excessive asphalt cement in the initial mix when the road was paved. It causes roads to become slippery in hot weather. The neighborhood in Vista that includes Deer Run Road (shown below) all have high bleeding.



Deer Run Road

Another damage similar to bleeding is ravelling, which is a loss of material from the pavement surface that results in a rough patch at the surface. It can be caused by bad bonding between asphalt and the aggregate, and can be made worse by freezing weather, poor drainage, and traffic. Boutonville Road East in South Salem is a good example of high ravelling.



Boutonville Road East

Potholes and patching are very self explanatory types of damages, often resulting from poor drainage, and can be the result of some of the other damages discussed previously like alligator cracking or ravelling. Potholes happen because there is not strength in a specific layer of pavement, especially in the presence of water, and, under loading, fragments of the top layer become dislodged. Patches are the spots often when pavement has been removed and replaced, or simply old damaged pavement has been paved over. Another damage, rutting, is a displacement of pavement caused by inadequate compaction; it usually occurs on the same lines on which cars wheels ride. The final damage category, roughness, is simply a measure of how easy the road is to drive on and takes into account many types of other damages.

For each type of damage, there are several repair alternatives to fix them. A detailed list of alternatives available to the town of Lewisboro, including costs and extended road life, are listed in Appendix III.

Once all the surveys were completed for each section of town, the information was entered into the CAMP-RS software. The program takes all the survey data, and assigns the road a Pavement Condition Index (PCI) value and a repair category. Then using these two values, some values from the inventory, and a specific equation (shown below), a priority value is given.

$$\text{Priority Value} = k1 * \text{Repair Category Priority Value} * (k2 * \text{Imp.} + k3 * \text{Traffic} + k4 * \text{PCI}/10 + k5 * \text{Drainage} + k6 * \text{Roughness})$$

Priority Value Equation

The priority indicates how important a selected road repair is, and the higher the number, the higher the priority. The PCI value, on a scale from 0 to 100, though the highest value a road can receive is a 94, because some survey categories cannot be assigned “No Defects,” deducts points from the total based on extent and severity of distresses, meaning the higher the PCI, the better condition the road is in. A repair category is assigned using decision trees. The decision tree links the type, severity, and extent of all of the distresses and assign a repair category accordingly and an example is available in Appendix V. The repair categories for asphalt surfaces are as follows: defer work, crack repairs, patching, surface treatment, overlays, rehabilitation, reconstruction, and drainage work.

The next step in the process is to assign each road a repair alternative that fits under the repair category assigned. The repair options available to the town are listed in Appendix III. The

Lewisboro Highway Department usually contracts for most major road improvements and repairs, so these cost estimates were generated from quotes and costs of recent road repairs in the past two years. These cost comparisons and breakdowns are located in Appendix IV. As part of some of the repairs, drainage work is required first, but this cost is not factored into the estimates, because different roads require a varying amount of drainage work. All of this information was input into the software as well as a typical annual budget of \$300,00 dollars.

The final step of the process was to finalize the five year plan for road improvement, which includes the list of roads that should be repaired each of the five years with estimated costs. This report is found in Appendix VI. It does not follow an exact \$300K budget, although it is very close, as the initial list from the CAMP-RS software was edited and groomed to make more sense in terms of repairing roads in nearby areas at the same time.

Cornell Asset Management Program – Roads and Streets Software Overview

The CAMP-RS program is an important piece of the entire internship process because it compiles all of the data, helps with budgeting and making a timeline, and places repair types into categories and makes recommendations. There are several important steps to use listed below:

1. Begin by adding roads and inputting the data asked for by the software like the beginning and end of the road, width, traffic, and importance
2. After adding a road, the condition survey from out in the field can be input by clicking the survey. Once all the roads have been surveyed, go to the surveys tab to “Apply Surveys to Section” and this will assign each road a repair category, priority value, and a PCI value.
3. After applying all the surveys, a repair type can be applied by using the “Apply Repair” button. This will prompt a short list of repair options, with a cost and an extended road life, that can be chosen.
4. Once all of the repair types have been chosen, a timeline for repairs can be made using the “Budgeting” tab. Choosing “Assign Budget Year” allows input of the money allotted for each year, and this then assigns a budget year to each road.

Other key features:

- Using the “Reports” tab, it is easy to view different types of reports. There is a survey report which gives more numbers about the specific damages for every road. There is a section report which gives the basic data about each road section of the town. Finally, there is a budget report that shows the road

information with the chosen repair, cost of each repair, and the year these repairs should be made.

- Administrative settings are under the “Admin Settings” tab and can be used to add and change costs and repair types, distress types, and even units, as well as change the priority value equation calculation.

Conclusion and Recommendations

The town roads of Lewisboro range from recently paved roads in very good condition to those that haven't been paved in 15 or more years that require major rework. Using the CAMP-RS program, and recommendations from Joe Posadas, the deputy highway superintendent, and Pete Ripperger, the highway superintendent, as well as knowledge of different neighborhoods and more pertinent needs of the Lewisboro roads, a budget report of the roads to be repaired and timeline was finalized, and can be seen in Appendix VI. The budget used was 300,000 dollars, although more breathing room was given for certain years, with all the roads set to be finished in 15 years. The limited budget accounts for 150,000 dollars from CHIPS and 150,000 dollars from the town. In recent years, however, more money has been used by getting bonds for projects; last year the town had a \$190,000 bond and the year before had a \$600,000 bond. For arguments sake, using a budget of \$400,000 would bring all the roads to good condition in 12 years, and a budget of \$500,000 would do the same in 10 years. During the coming years, using bonds could help speed up the repairing and maintenance process outlined, limiting the number of years required to return all the roads to good quality.

One important feature that makes Pavement Management programs like this so important is the idea of keeping good roads in excellent shape to limit their cost, while slowly bringing up the quality of the worse roads, that ultimately brings all the roads to a good condition. One problem with a typical road repairing system is that towns wait until roads are well below fair condition before spending any money to repair them or they are under heavy pressure from citizens and politicians to repair specific roads. The end result of these methods is that costs shoot up from around a dollar for minor repairs to between four and five for rehab and reconstruction of the road, which is an increase of 300% to 400% in repair cost. The graph in

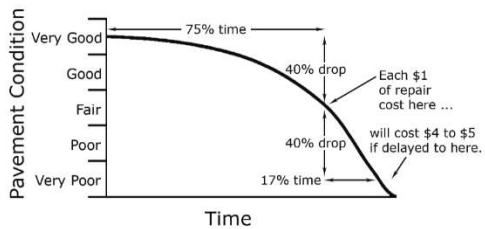


Figure 1. Pavement Deterioration/Rehabilitation Relationship

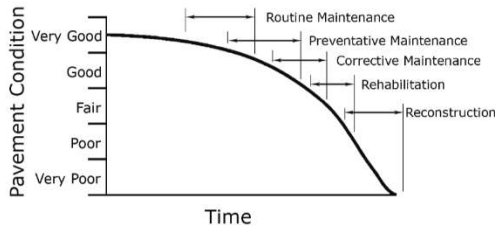


Figure 2. Maintenance and Rehabilitation Strategies

Figure 1 displays the necessity for consistent maintenance of roads: to keep quality high and to save money in the long term. The whole program focusses on prioritizing preventative maintenance as opposed to corrective maintenance. Preventative is planned, extends pavement life, and is performed before deterioration occurs, while corrective is performed after deterioration has occurred and usually comes at a much larger expense as shown in

Figure 2. Figure 1 and 2 go hand in hand, and keeping roads in the left side of the graphs is the goal of the program.

As stated previously, the ultimate goal of the program is to maintain the good roads, as this is cheaper, relatively, and then slowly rehabilitate and reconstruct the poor roads. The CAMP-RS strategy for repairs is to fix the roads with bad drainage first and foremost, because drainage is the cause of many of the problems discussed earlier. Next, the strategy calls for crack repairs and microsurfacing for roads in pretty good condition and then finally overlays, rehabilitation, and reconstruction. The table listed below in gives the number of miles, budget, and major roads and neighborhoods assigned for repairs in the following years.

Year	Miles	Budget	Major Roads/Neighborhoods
2017 (1)	2.68	306,794	Ridgefield Avenue, Puddin Hill Road
2018 (2)	3.69	303,455	Lake Kitchawan neighborhood
2019 (3)	3.11	303,129	Old Oscaleta Road, Lockwood Road
2020 (4)	8.23	301,987	Elmwood Road, Indian Hill and Flintlock Ridge Rd
2021 (5)	9.27	301,815	The Indians neighborhood, Todd Rd, Mount Holly Rd
2022 (6)	5.17	284,966	Redocat Lane neighborhood,
2023 (7)	7.62	292,420	Lake Katonah neighborhood, Mead Street
2024 (8)	3.31	342,949	Lake Waccabuc neighborhood, Benedict Road

2025 (9)	4.88	288,310	Boutonville Road E, Shady Lane
2026 (10)	2.83	319,182	Spring Hill Lane, West Lane, Oscaleta Road
2027 (11)	2.48	310,681	Peaceable Street, Bouton Road
2028 (12)	2.10	318,246	Post Office Road, Old Shop Road
2029 (13)	2.68	311,974	Adams Hill neighborhood
2030 (14)	3.94	301,290	Boway Road
2031 (15)	2.56	315,312	Pine Hill Drive

Table 1. Road Repair Plan Overview

All of these repairs cover 64.55 miles of road. Although the entirety of the town roads covers 85 miles, many roads that were recently repaved are not considered because they are in great condition. During the next five years, 41.8% of the roads including Ridgefield Avenue, the Lake Kitchawan neighborhood, the Indians neighborhood, Elmwood Road, and Old Oscaleta Road should all be repaired according to the report. Some bad spots from some of these roads are shown below.



Ridgefield Avenue



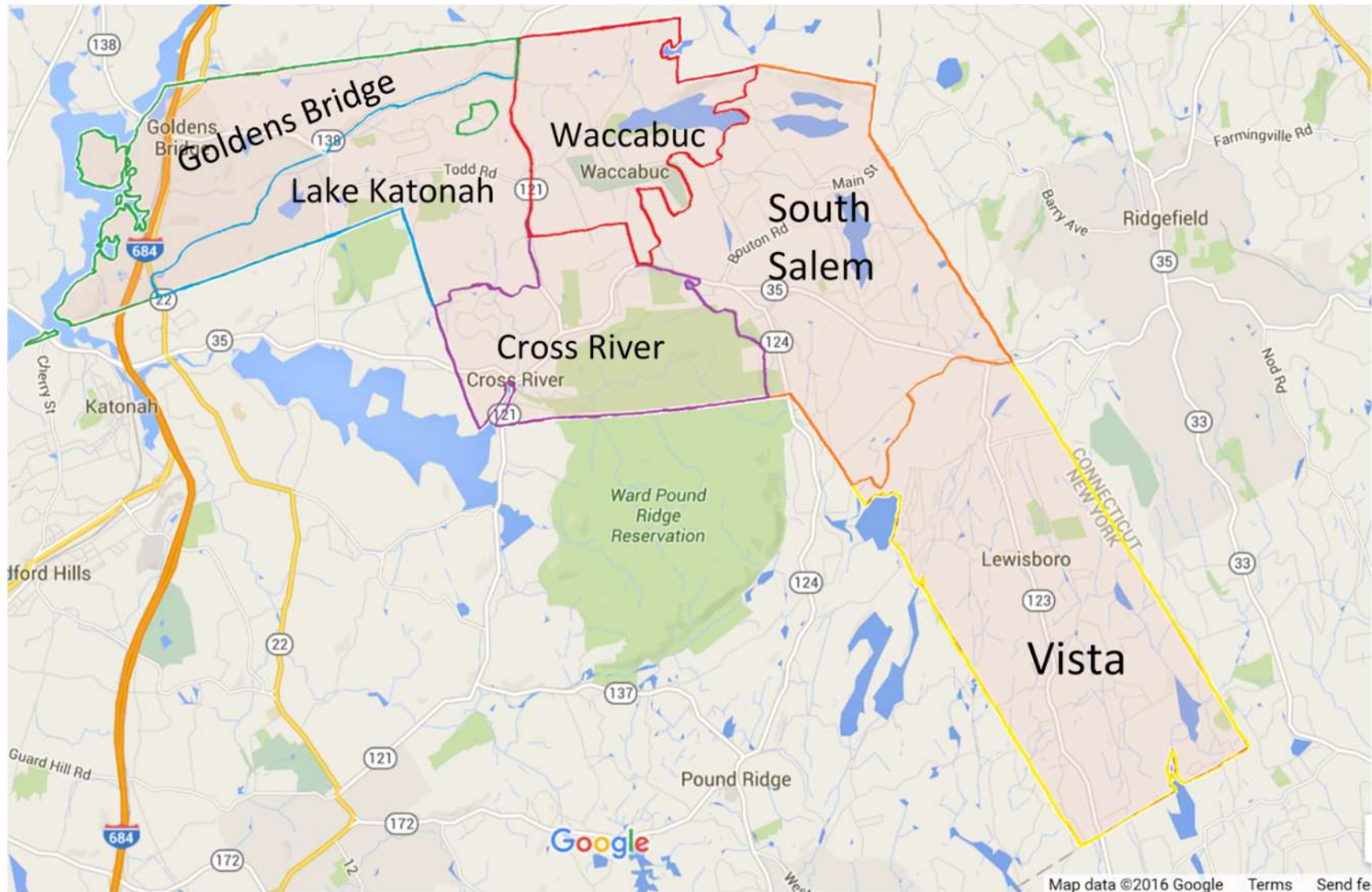
Brundige Road
(the Indians neighborhood)



Grandview Road
(Kitchawan Neighborhood)

Following this plan will allow the town to return roads with severe damage to good condition while also maintaining those good roads through routine and preventative maintenance methods. Using this exact plan, while good, will not be the best plan for all 15 years, and should thus be updated at least every 5 years to account for new and updated conditions of roads, which can be affected and changed dramatically with varying weather and traffic conditions from year to year. The town can vastly improve the quality of its roads by sticking to this program while continuing to reevaluate and update road conditions, and by developing and using efficient repair strategies.

Appendix I - Lewisboro Regions



Appendix II- Road Condition Survey Sheet

2 - The CAMP-RS Process

LONGITUDINAL/ TRANSVERSE CRACKING NO Defects EXTENT Low Med High SEVERITY <table border="1" style="border-collapse: collapse; text-align: center;"> <tr> <td>Low</td> <td>1</td> <td>2</td> <td>3</td> </tr> <tr> <td>Med</td> <td>4</td> <td>5</td> <td>6</td> </tr> <tr> <td>High</td> <td>7</td> <td>8</td> <td>9</td> </tr> </table>	Low	1	2	3	Med	4	5	6	High	7	8	9	ALLIGATOR CRACKING NO Defects EXTENT Low Med High SEVERITY <table border="1" style="border-collapse: collapse; text-align: center;"> <tr> <td>Low</td> <td>1</td> <td>2</td> <td>3</td> </tr> <tr> <td>Med</td> <td>4</td> <td>5</td> <td>6</td> </tr> <tr> <td>High</td> <td>7</td> <td>8</td> <td>9</td> </tr> </table>	Low	1	2	3	Med	4	5	6	High	7	8	9
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Figure 4. Typical Road Condition Survey Sheet - Flexible Pavement

Figure 4 is a sample asphalt road condition survey sheet with ratings for both severity and extent of a damage. These numbers are taken relative to all the roads of the town so that the best roads receive “no defects” and the worst roads receive “high” or “poor” for specific categories.

Appendix III- Lewisboro Road Repair Options

Crack Seal - \$0.102/SF

- Minor cracks filled with crack seal
- Extended Road Life: 24 months

Crack Repair and Microsurfacing - \$0.654/SF

- Fill cracks with crack seal and then apply 3/8 inch layer of microsurface to the road
- Extended Road Life: 60 months

Patch Mill and Fill - \$0.48/SF

- Roads with severe cracking damage are milled and removed, and then new asphalt mix replaces the milled part
- Extended Road Life: 36 months

Smear/Patching

- For roads with potholes and small damages, this adds a thin asphalt layer to different sections in a preparatory way for future blacktopping
- Extended Road Life: 12-24 months

Chip Seal - \$.068/SF

- A cheap solution to roads that need some treatment, a layer of oil and stone/chips is applied
- Extended Road Life: 36 months

FiberMat Surface Treatment - \$1.07/SF

- A surface treatment that combines polymer modified asphalt emulsion, fiberglass strands, and aggregate
- Effective crack inhibitor
- Extended Road Life: 108 months

True and Level with 1 Inch Overlay - \$0.519/SF

- True and level means to smooth out road imperfections like ruts and roughness
- 1 inch hot asphalt mix is placed on the top
- Cost varies based on how much "True and Level" is required
- Extended Road Life: 84 months

1.5 Inch Overlay - \$0.778/SF

- 1.5 inches of fresh/new asphalt applied to the surface of the road
- Extended Road Life: 60 months

Cold In-Place with Overlay - \$1.343/SF

- Recycles and rehabilitates existing pavement

- Recycling machines mill up failing surface and some of the base, mixes new asphalt emulsion and cement into it, and reapplies this in a thin layer back on the road
- Reduces amount of outside material required, and doesn't require much extra heat or energy, making it a viable environmental option
- Improves road surface and strength by addressing higher severity issues such as deep cracks and rutting that other options cannot fix well
- Extended Road Life: 180 months

Drainage Work

- Most all roads require drainage work before the selected repair option is used, and this is an additional varying cost
- Good and effective drainage is key to a long lasting road, because poor drainage causes rutting cracking, and premature road failure

SF- square foot

Appendix IV- Breakdown and Comparison of Repair Costs

Crack Repairs

Estimate for 1.77 miles of road at 24 feet wide from The Gorman Group

Item Description	Quantity	Units	Unit Price	Extended Price
Type II Liquid Crackfiller	953	Gallons	\$24.83	\$23,662.99
De-escalation adjustment	953	Gallons	(\$0.73)	(\$695.69)
Total				\$22,967.30
Total in terms of \$/ft^2				0.102 \$/ft

Crack Repair and Microsurfacing

Estimate for 1 mile at 20 feet wide (rough estimate)

Item Description	Quantity	Units	Unit Price	Extended Price
Crack Repair				
Type II Liquid Crackfiller	600	Gallons	\$24.83	\$14,898
De-escalation adjustment	600	Gallons	(\$0.73)	(\$438)
Microsurfacing (quote from SUIT KOTE Corporation)				
Microsurfacing Type II, F1	212	Tons	\$266.52	\$56,502
De-escalation adjustment	212	Tons	(\$8.832)	(\$1,872)
Total				\$69,090
Total in terms of \$/ft^2				0.654 \$/ft^2

Patch Mill and Fill

Estimate is \$0.48/ft^2 of patched area, from Cornell Database

FiberMat Microsurfacing

Based on estimates for all roads in Michelle Estates

Item Description	Quantity	Units	Unit Price	Extended Price
Microsurfacing with Microfibers	539	Tons	\$248.59	\$133,990.01
De-escalation adjustment	539	Tons	(\$12.00)	(\$6,468.00)
FiberMat Type B	31464.00	Sq. Yds	\$3.18	\$100,055.52
De-escalation adjustment	11954.00	Sq. Yds	(\$0.18)	(\$2,151.72)
Fiber Additive	1		\$8,600.00	\$8,600.00
Total				\$234,025.81
Fairview: 1.28 \$/ft^2				
Silkman: 1.24 \$/ft^2		Estimate using an average of costs = 1.07 \$/ft^2		

Lambert: 0.82 \$/ft²				
Gideon: 0.93 \$/ft²				

True and Level with 1" Overlay

Estimate for 1 mile of road at 20 ft wide from The Gorman Group

Thickness (ft)	Total ft ³	Density of Asphalt: lbs/ft ³	ton/lb	\$/ton	Total
0.0833	8800	145.0	0.0005	\$85.90	\$54,804.20

Total in terms of \$/ft² = 0.519 \$/ft²

1.5" Overlay

Estimate for 1 mile of road at 20 ft wide from The Gorman Group

Thickness (ft)	Total ft ³	Density of Asphalt: lbs/ft ³	ton/lb	\$/ton	Total
0.125	13200	145.0	0.0005	\$85.90	\$82,206.30

Total in terms of \$/ft² = 0.778 \$/ft²

Cold In-Place with Overlay

Estimate for 1 mile of road at 20 ft wide (older estimate)

Depth of Cut	Square Feet	\$/ft ²	Total
4"	105,600	\$1.343	\$141,820.800

Not all of these repairs take drainage issues into account that may come along with the actual cost of the repairs, so extra money should be budgeted accordingly.

Appendix V- Sample Decision Tree

Table 1. Decision Tree
Alligator Cracking - Asphalt Pavement - Repair Categories

Severity	Extent		
	Low	Moderate	High
Low	41	44	44
Moderate	43	43	45
High	43	46	48

Repair Categories by Surface Type

Asphalt Pavement: (Surface ID: 4)

41 Defer Work	45 Overlays
42 Crack Repairs	46 Rehabilitation
43 Patching	48 Reconstruction
44 Surface Treatment	49 Drainage: Fair/Poor

Table 1 shows a decision tree that uses a specific distress type and assigns numbers for different extent and severity combinations. The first number, in this case “4,” is used to identify the surface type, and the second number identifies the repair type necessary to repair the specific distress. The software then associates all the decision trees from a given road and recommends a repair category.

Appendix VI

CAMP-RS Budget Report

Report generated on 07/28/2016

Priority Weighting Factors:

Repair Category	Importance	Traffic	PCI
1	1	1	1

Annual Budget ~ \$300,000

Report shows all sections

RIN	Name	From	To	Length	Traffic	Importance	PCI	Repair Category	Repair Type	Repair Cost	Priority Value	Budget Year
V37	Puddin Hill Road	Route 123	town line	0.17	4	3	82	Drainage Work	Drainage with 1.5 inch Overlay	15364	120	1
S45	Ridgefield Avenue	Route 35	end	1.5	4	4	56	Drainage Work	Drainage with Cold In-Place	212732	114	1
G1 6	Green Street	Anderson Lane	end	0.07	1	1	57	Drainage Work	Drainage with 1.5 inch Overlay	4602	96	1
G0 2	Anderson Lane	Route 22	end	0.14	1	1	71	Overlay	1.5" Overlay	10353	42	1
V06	Brookside Trail	Shore Trail	end	0.05	1	1	63	Drainage Work	Drainage with 1.5 inch Overlay	3287	96	1

RIN	Name	From	To	Length	Traffic	Importance	PCI	Repair Category	Repair Type	Repair Cost	Priority Value	Budget Year
V46	Shore Trail	Lake Kitchawan Drive	end	0.07	1	1	70	Drainage Work	Drainage with 1.5 inch Overlay	4602	84	1
K04	Butternut Lane	Todd Road	end	0.33	2	2	88	Crack Repairs	Crack Repairs	4088	60	1
K17	Lois Lane	Todd Road	end	0.2	2	2	64	Rehab	Cold In-Place with Overlay	28365	30	1
K03	Brady Lane	Todd Road	end	0.15	1	1	55	Drainage Work	Drainage with Cold In-Place	23401	96	1
V20	Hemlock Road	Lake Kitchawan Drive	Grandview Road	0.51	2	2	55	Drainage Work	Drainage with 1.5 inch Overlay	33521	108	2
V39	Ridgeland Road	Lake Kitchawan Drive	Grandview Road	0.73	3	2	42	Drainage Work	Drainage with 1.5 inch Overlay	53977	102	2
V27	Lake Path	Grandview Road	Lake Kitchawan Drive	0.3	1	1	55	Drainage Work	Drainage with 1.5 inch Overlay	17253	96	2
V18	Grandview Road	Kitchawan Road	Lake Kitchawan Drive	0.53	3	3	74	Overlay	1.5" Overlay	45726	45	2
V03	Birch Spring Road	Lake Kitchawan Drive	end	0.07	1	1	66	Drainage Work	Drainage with 1.5 inch Overlay	4026	84	2

RIN	Name	From	To	Length	Traffic	Importance	PCI	Repair Category	Repair Type	Repair Cost	Priority Value	Budget Year
V01	Audubon Road	East Street	end	0.22	2	2	59	Drainage Work	Drainage with 1.5 inch Overlay	19882	108	2
V44	Serenity Place	Audubon Lane	end	0.1	1	1	61	Rehab	1.5 Inch Overlay	9038	26	2
K25	Skytop Drive	East Mountain Road	Sunset Drive	0.07	1	1	86	Crack Repairs	Crack Repairs	528	52	2
W07	Long Pond Road	Mead Street	end	0.2	2	2	55	Drainage Work	Drainage with Cold In-Place	28365	108	2
W06	Logging Road	Long Pond Road	end	0.22	1	1	59	Drainage Work	Drainage with Cold In-Place	34321	96	2
S34	Longview Road	Scotts Lane	end	0.2	1	1	54	Drainage Work	Drainage with 1.5 inch Overlay	18075	90	2
S50	Scotts Lane	Bouton Road	end	0.32	2	3	47	Drainage Work	Drainage with 1.5 inch Overlay	28920	108	2
S10-3	Boutonville Road South	Route 35	Spring Street	0.13	3	2	88	Crack Repairs	Crack Repairs	2428	64	2
S22	Dogwood Lane	Cross Pond Road	end	0.09	1	1	76	Drainage Work	Drainage with 1.5 inch Overlay	7395	90	2

RIN	Name	From	To	Length	Traffic	Importance	PCI	Repair Category	Repair Type	Repair Cost	Priority Value	Budget Year
V57	Wakeman Road	Elmwood Road	end	0.55	2	2	63	Drainage Work	Drainage with 1.5 inch Overlay	45187	108	3
V31	Lockwood Road	East Street	Elmwood Road	1.21	3	3	42	Drainage Work	Drainage with 1.5 inch Overlay	99410	108	3
V47	Silvermine Drive	Elmwood Road	end	0.64	2	2	64	Drainage Work	Drainage with 1.5 inch Overlay	57839	90	3
S38	Old Oscaleta Road	Oscaleta Road	end of obligation	0.71	2	2	47	Drainage Work	Drainage with Cold In-Place	100693	102	3
K32 -1	Todd Road North 1	Route 138	Todd Road North 2	0.31	2	2	64	Drainage Work	Drainage with 1.5 inch Overlay	20376	108	4
V52	Stonewall Court	West Lane	end	0.26	1	1	55	Drainage Work	Drainage with Cold In-Place	40562	96	4
V58 -1	West Lane 1	Route 123	Spring Hill Lane	0.63	4	4	88	Crack Repairs	Crack Repairs	8144	76	4
V15	Elmwood Road 1	Route 123	Wakeman Road	0.68	4	4	83	Patching	Crack Repairs	7691	72	4
V16	Elmwood Road 2	Wakeman Road	West Lane	1.71	4	4	85	Rehab	Crack Repairs	22103	36	4
S33	Laurie Lane	Boutonville Road	end	0.28	1	1	68	Drainage Work	Drainage with 1.5 inch Overlay	25305	84	4

RIN	Name	From	To	Length	Traffic	Importance	PCI	Repair Category	Repair Type	Repair Cost	Priority Value	Budget Year
V54	Tommys Lane	Route 123	end	0.33	1	1	77	Drainage Work	Drainage with 1.5 inch Overlay	29824	90	4
V59	West Road	Route 123	town line	0.63	3	2	79	Patching	Patch Mill & Fill: >25%	31934	60	4
V56	Upland Court	West Road	end	0.12	2	2	90	Crack Repairs	Crack Repairs	1896	60	4
V43	Scenic Drive	Puddin Hill Road	Upland Court	0.28	2	2	88	Crack Repairs	Crack Repairs	4424	60	4
V08	Carol Lane	Scenic Drive	end	0.07	1	1	90	Crack Repairs	Crack Repairs	1106	52	4
K09	Duffys Bridge Road	Route 22	end	0.3	1	1	44	Drainage Work	Drainage with Cold In-Place	38292	102	4
C04	Debbie Lane	Route 35	end	0.26	1	1	68	Drainage Work	Drainage with 1.5 inch Overlay	25633	84	4
S26	Harbor Place	Sabbathday Hill	end	0.15	1	1	85	Drainage Work	Drainage and Crack Repairs/Micro surfacing	11396	90	4
S47	Sabbathday Hill	Route 124	Pine Hill Drive	0.6	3	3	86	Surface Treatments	Crack Repairs	7109	51	4
G19	Indian Hill Road	Route 138	Flintlock Ridge Road	0.8	4	4	90	Crack Repairs	Crack Repairs	12639	76	4
K11	Flintlock Ridge Road	Todd Road	end	0.82	3	3	87	Overlay	Crack Repairs	9716	51	4

RIN	Name	From	To	Length	Traffic	Importance	PCI	Repair Category	Repair Type	Repair Cost	Priority Value	Budget Year
G29	Park Avenue	Old Bedford Road	end	0.1	2	2	89	Patching	Crack Repairs	1078	60	5
G24	Meadow Street	Park Avenue	end	0.11	1	1	88	Crack Repairs	Crack Repairs	1304	52	5
S24	Fay Lane	Ridgefield Avenue	end	0.15	1	1	86	Crack Repairs	Crack Repairs	1455	52	5
K21	Mount Holly Road East	Mount Holly Road	end	0.54	2	2	92	Crack Repairs	Crack Repairs	10082	60	5
K14	Holly Hill Lane	Mount Holly Road	end	0.61	2	2	92	Crack Repairs	Crack Repairs	10075	60	5
K20-2	Mount Holly Road 2	Holly Hill Lane	Todd Road	0.71	4	4	84	Surface Treatments	Crack Repairs	7648	54	5
K31-2	Todd Road 2	Mount Holly Road	Lower Lakeshore Drive	1.05	4	4	86	Surface Treatments	Crack Repairs	11310	57	5
V25	Kitchawan Road	Route 123	pound ridge line	1.33	4	3	92	Crack Repairs	Crack Repairs	17191	72	5
W15	Rockshelter Road	Chapel Road	end	0.3	1	1	92	Crack Repairs	Crack Repairs	4309	52	5
G14	Fairmount Road	Route 138	end	0.51	2	2	88	Crack Repairs	Crack Repairs	8790	60	5
G30	Park Road	Wild Oaks Road	end	0.19	2	1	88	Crack Repairs	Crack Repairs	3002	56	5
G38	Wild Oaks Road	Fairmount Road	Route 22	0.21	2	2	77	Overlay	Cold In-Place with Overlay	32762	42	5
G37	West Meadow Road	Wild Oaks Road	end	0.08	1	1	87	Patching	Patch Mill & Fill: >25%	4461	52	5

RIN	Name	From	To	Length	Traffic	Importance	PCI	Repair Category	Repair Type	Repair Cost	Priority Value	Budget Year
V30	Ledgewood Lane	Colonel Ferris Road	end	0.29	1	1	90	Crack Repairs	Crack Repairs	4582	52	5
V34	Millstone Lane	Route 123	end	0.15	1	1	86	Crack Repairs	Crack Repairs	2370	52	5
G09	Cheyenne Court	Indian Hill Road	end	0.08	1	1	80	Patching	Patch Mill & Fill: >25%	4461	48	5
G11	Cornel Drive	Brundige Road	Brundige Road	0.41	2	2	77	Surface Treatments	Crack Repairs and Microsurfacing	31148	42	5
G07	Brundige Drive	Shoshone Drive	Route 138	1.24	3	3	72	Rehab	T & L / 1" Overlay	78501	36	5
G25	Mowhawk Trail	Indian Hill Road	Indian Hill Road	0.41	2	2	67	Rehab	T & L / 1" Overlay	25957	32	5
G03	Apache Circle	Indian Hill Road	Shoshone Drive	0.09	2	2	67	Rehab	Cold In-Place with Overlay	14040	32	5
G33	Shoshone Drive	Brundige Road	Indian Hill Road	0.39	3	3	72	Rehab	T & L / 1" Overlay	24690	30	5
G08	Cherokee Court	Mowhawk Trail	end	0.08	1	1	69	Rehab	T & L / 1" Overlay	5065	22	5
G10	Comanche Court	Indian Hill Road	end	0.12	1	1	67	Rehab	T & L / 1" Overlay	7597	22	5
G39	Wright Drive	Brundige Road	Cornel Drive	0.12	2	2	90	Crack Repairs	Crack Repairs	1422	60	5
W12	Powder Hill	Redcoat Lane	end	0.09	1	1	84	Crack Repairs	Crack Repairs	970	48	6
W08	Makepeace Hill	Redcoat Lane	end	0.3	1	1	76	Drainage Work	Drainage with Cold In-Place	42547	90	6

RIN	Name	From	To	Length	Traffic	Importance	PCI	Repair Category	Repair Type	Repair Cost	Priority Value	Budget Year
W1 3	Rampart Pass	Mead Street	Redcoat Lane	0.2	3	2	76	Overlay	Cold In-Place with Overlay	28365	45	6
W1 4	Redcoat Lane	end	end	0.4	2	2	69	Rehab	Cold In-Place with Overlay	56729	32	6
V07	Canaan Circle	Silver Spring Road	end	0.63	2	2	72	Drainage Work	Drainage with 1.5 inch Overlay	56935	96	6
S20 -2	Cross Pond Road 2	Dogwood Lane	pound ridge line	0.75	3	3	73	Patching	Patch Mill & Fill: >25%	38016	60	6
W0 2	Chapel Road	Mead Street	Route 121	1.13	3	3	88	Crack Repairs	Crack Repairs	17852	68	6
S55	Twin Lakes Road	Oscaleta Road	end	0.9	2	2	86	Surface Treatments	Crack Repairs	9695	45	6
V60	Wilton Road	Silver Spring Road	town line	0.17	2	2	76	Rehab	Crack Repairs	1465	28	6
V22	Journeys End Road	Hastings Court	state line	0.18	2	1	80	Overlay	T & L / 1 inch Overlay	10852	39	6
V19	Hastings Court	Silver Spring Road	end	0.19	2	1	80	Overlay	T & L / 1 inch Overlay	11455	39	6
K07 -1	Deerfield Road 1	Sunnyridge Road	Outpost Road	0.23	2	2	72	Rehab	T & L / 1" Overlay	10085	26	6
W0 4	Hilltop Road	Route 121	end	0.36	2	2	83	Surface Treatment	Crack Repairs and Microsurfacing	27349	56	7

RIN	Name	From	To	Length	Traffic	Importance	PCI	Repair Category	Repair Type	Repair Cost	Priority Value	Budget Year
K29	Sunset Drive	East Mountain Road	Skytop Road	0.11	1	1	86	Crack Repairs	Crack Repairs	1067	52	7
K10	East Mountain Road	Deerfield Road	Skytop Drive	0.13	1	1	83	Patching	Patch Mill & Fill: >25%	5931	48	7
K18	Lower Lakeshore Drive	Upper Lakeshore Drive	Todd Road	0.34	2	2	76	Surface Treatments	T & L / 1" Overlay	14908	42	7
K02	Big Woods Trail	Upper Lakeshore Drive	Outpost Road	0.14	1	1	59	Rehab	T & L / 1" Overlay	6139	26	7
K30	The Glen Drive	Upper Lakeshore Drive	Lower Lakeshore Drive	0.17	1	1	70	Drainage Work	Drainage with 1.5 inch Overlay	11174	84	7
K33-2	Upper Lakeshore Drive 2	Big Woods Trail	The Glen Drive	0.17	1	1	75	Rehab	T & L / 1" Overlay	8386	24	7
K28	Sunnyridge Road	Todd Road	Deerfield Road	0.39	3	3	76	Rehab	T & L / 1" Overlay	19238	38	7
V49	Soundview Loop	East Street	end	0.4	2	2	75	Patching	Patch Mill & Fill: >25%	22303	56	7
V13	East Street 1	Route 123	Lockwood Road	1.52	4	4	76	Overlay	Crack Repairs	16373	54	7
W05	Kings Grant Way	Chapel Road	end	0.11	1	1	92	Crack Repairs	Crack Repairs	1896	52	7
W09-1	Mead Street 1	Route 35	Chapel Road	1.4	4	4	83	Patching	Crack Repairs	16588	72	7

RIN	Name	From	To	Length	Traffic	Importance	PCI	Repair Category	Repair Type	Repair Cost	Priority Value	Budget Year
W09-2	Mead Street 2	Chapel Road	town line	1.04	4	4	75	Surface Treatments	Crack Repairs and Microsurfacing	79008	54	7
S40	Orchard Drive	Twin Lakes Road	end	0.21	1	1	86	Surface Treatments	Crack Repairs and Microsurfacing	15954	39	7
S35	Lower Salem Road	Bouton Road	end	0.71	2	2	88	Surface Treatments	Crack Repairs	7648	45	7
V41	Robin Court	Robins Wood Lane	end	0.11	1	1	68	Overlay	1.5 Inch Overlay	9490	42	7
V42	Robins Wood Lane	East Street	end	0.31	2	2	62	Overlay	1.5 Inch Overlay	28968	45	7
S51	Shady Glen Court	Cove Road	end	0.04	1	1	76	Surface Treatments	Crack Repairs and Microsurfacing	2210	36	8
S57	Waterview Court	Cove Road	end	0.07	1	1	68	Rehab	T & L / 1" Overlay	2494	28	8
S19	Cove Road	Oscaleta Road	end	0.73	2	2	64	Rehab	T & L / 1" Overlay	32007	30	8
S32	Lakeview Road	Oscaleta Road	Cove Road	0.28	2	2	76	Rehab	T & L / 1" Overlay	15346	28	8
S05	Benedict Road	Post Office Road	Oscaleta Road	0.77	3	4	82	Surface Treatments	FiberMat	95705	51	8
S03	Autumn Ridge Road	Post Office Road	Benedict Road	0.56	2	2	86	Surface Treatments	FiberMat	69604	45	8

RIN	Name	From	To	Length	Traffic	Importance	PCI	Repair Category	Repair Type	Repair Cost	Priority Value	Budget Year
S54	Truesdale Lake Drive	Lakeshore Drive	Boway Street	0.77	2	3	64	Rehab	Cold In-Place with Overlay	125583	32	8
S11-1	Boway Road 1	Old Oscaleta Road	Main Street	0.09	2	2	73	Rehab	1.5 Inch Overlay	5916	32	8
S09	Bouton Street	Gilbert Street	Indian Lane	0.31	2	2	81	Overlay	T & L / 1 inch Overlay	14442	51	9
S27	Howe Street	Gilbert Street	end	0.25	1	1	65	Overlay	T & L / 1 inch Overlay	10962	39	9
S28	Hoyt Street and Lawrence Lane	Indian Lane	end	0.6	2	2	70	Rehab	T & L / 1" Overlay	29596	26	9
S18	Country Lane	Hoyt Street	Boway Street	0.07	2	2	70	Rehab	T & L / 1" Overlay	3453	26	9
S30	Indian Lane	Bouton Street	end	0.23	2	2	69	Rehab	T & L / 1" Overlay	12606	32	9
S25	Gilbert Street and Beach	Main Street	Indian Lane	0.51	3	3	72	Rehab	T & L / 1" Overlay	25156	36	9
S31	Lakeshore Drive	Spring Street	Gilbert Street	0.74	2	3	63	Rehab	T & L / 1" Overlay	40557	32	9
S49	Salem Lane	Truesdale Lake Drive	Truesdale Lake Drive	0.42	2	2	78	Patching	Patch Mill & Fill: >25%	21289	56	9
S10-1	Boutonville Road East	Route 35	Rainbow Hill	0.13	3	4	60	Rehab	T & L / 1" Overlay	6413	36	9

RIN	Name	From	To	Length	Traffic	Importance	PCI	Repair Category	Repair Type	Repair Cost	Priority Value	Budget Year
S17	Cider Mill Farm Road	Bouton Road	end	0.13	1	1	79	Surface Treatments	Crack Repairs and Microsurfacing	9877	36	9
V26 -1	Lake Kitchawan Drive 1	Mill River Road	Lake Avenue	0.5	2	2	80	Surface Treatments	Crack Repairs and Microsurfacing	34532	42	9
V26 -2	Lake Kitchawan Drive 2	Lake Avenue	Grandview Road	0.6	3	2	71	Overlay	1.5" Overlay	51766	42	9
V45	Shady Lane	Route 123	Elmwood Road	0.39	4	4	85	Rehab	Patch Mill and Fill	21745	36	9
V11	Deepwell Farms Road	Shady Lane	end	0.39	2	1	73	Surface Treatment	Crack Repairs and Microsurfacing	29628	48	10
V58 -2	West Lane 2 (and Spring Hill intersection)	Spring Hill Lane	town line	0.2	4	4	81	Rehab	Cold In-Place with Overlay	34037	36	10
V51	Spring Hill Lane	Route 123	West Lane	0.26	3	3	63	Rehab	Cold In-Place with Overlay	40562	34	10
V50	Split Rock Road	Conant Valley Road	end	0.4	2	2	82	Surface Treatments	Crack Repairs and Microsurfacing	30388	42	10

RIN	Name	From	To	Length	Traffic	Importance	PCI	Repair Category	Repair Type	Repair Cost	Priority Value	Budget Year
V29	Laurel Hollow Road	Split Rock Road	end	0.1	1	1	82	Surface Treatments	Crack Repairs and Microsurfacing	7597	36	10
G3 5	Todd Hill Circle	Brady Farm Road	Brady Farm Road	0.5	2	2	83	Surface Treatments	Crack Repairs and Microsurfacing	37985	42	10
S41 -2	Oscaleta Road 2	Benedict Road	end of obligation	0.98	4	4	75	Rehab	Cold In-Place with Overlay	138985	36	10
S08	Bouton Road	Main Street	Route 35	1.2	4	4	82	Rehab	Cold In-Place with Overlay	204222	36	11
S02	Ashwood Road	Pettit Lane	end	0.23	1	1	82	Surface Treatments	Crack Repairs and Microsurfacing	17473	36	11
G1 5-2	Green Hill Road	Route 22	end	0.3	2	2	56	Rehab	T & L / 1" Overlay	15540	36	11
S29	Ida Lane	Cross Pond Road	end	0.11	1	1	77	Surface Treatments	Crack Repairs and Microsurfacing	7217	36	11
V02	Beaver Pond Lane	Route 123	end	0.3	1	1	77	Surface Treatments	Crack Repairs and Microsurfacing	22791	36	11

RIN	Name	From	To	Length	Traffic	Importance	PCI	Repair Category	Repair Type	Repair Cost	Priority Value	Budget Year
V04	Blueberry Lane	Route 123	end	0.12	1	1	84	Surface Treatments	Crack Repairs and Microsurfacing	9117	36	11
S42	Peaceable Street	Route 35	town line	0.22	3	3	59	Rehab	Cold In-Place with Overlay	34321	34	11
W1 1	Post Office Road	Mead Street	Bouton Road	1.77	3	4	59	Rehab	Cold In-Place with Overlay	276125	36	12
C11	Old Shop Road	Route 35	Route 35	0.33	2	2	70	Rehab	Cold In-Place with Overlay	42121	32	12
C13	Southwind Drive	Old Shop Road	end	0.15	1	1	75	Rehab	Cold In-Place with Overlay	23401	30	13
G1 3	Deertrack Lane	Manor Drive	end	0.37	2	2	62	Reconstruct	Cold In-Place with Overlay	55098	30	13
G2 3	Manor Drive	Route 138	Deertrack Lane	0.32	2	2	71	Rehab	Cold In-Place with Overlay	40845	32	13
C08	Hunts Lane	Adams Hill Road	end	0.23	2	2	77	Patching	Patch Mill & Fill: >25%	12825	56	13
C01	Adams Hill Road	Route 35	Route 35	0.42	2	2	70	Rehab	T & L / 1" Overlay	25321	32	13
C07	Howland Drive	Adams Hill Road	end	0.24	2	2	75	Rehab	T & L / 1" Overlay	14469	28	13

RIN	Name	From	To	Length	Traffic	Importance	PCI	Repair Category	Repair Type	Repair Cost	Priority Value	Budget Year
V21	Hillcrest Court	Deer Run Road	end	0.13	2	1	78	Rehab	Cold In-Place with Overlay	18437	26	13
V40	Roads End Road	Hillcrest Court	end	0.19	1	1	80	Rehab	Cold In-Place with Overlay	28968	24	13
V36	Old Orchard Road	Elmwood Road	Deer Run Road	0.23	2	1	77	Rehab	Cold In-Place with Overlay	35881	26	13
V12	Deer Run Road	Elmwood Road	end	0.4	2	2	66	Rehab	Cold In-Place with Overlay	56729	32	13
G2 6	Nash Road	Route 22	town line	0.39	2	2	71	Rehab	Cold In-Place with Overlay	49780	32	14
V38	Reservoir Road	Laurel Road	end	0.19	1	1	66	Rehab	Cold In-Place with Overlay	30989	28	14
G0 4	Billingsley Trail	Route 138	end	0.35	2	1	66	Rehab	Patch Mill and Fill	17741	30	14
C03	Boutonville Road	Route 121	end	0.71	2	2	73	Rehab	T & L / 1" Overlay	38913	32	14
S11 -2	Boway Road 2	Main Street	Truesdale Lake Drive	0.59	3	3	68	Rehab	1.5 Inch Overlay	48473	30	14
S16	Church Tavern Road	Spring Street	Spring Street	1.51	2	2	79	Rehab	Patch Mill and Fill	84193	28	14
V24	Kingswood Way	Route 123	end	0.2	1	1	59	Rehab	Cold In-Place with Overlay	31201	26	14

RIN	Name	From	To	Length	Traffic	Importance	PCI	Repair Category	Repair Type	Repair Cost	Priority Value	Budget Year
S44	Pine Hill Drive (and Sabbathday Hill end)	Boutonville Road	end	0.68	2	2	67	Reconstruct	Cold In-Place with Overlay	106083	26	15
S56	Waccabuc River Lane	Route 35	end	0.26	1	1	60	Rehab	Cold In-Place with Overlay	40562	26	15
S48	Salem Hill Road	Main Street	end	0.28	1	1	59	Rehab	FiberMat	34802	26	15
S06	Bisbee Lane	Route 35	end	0.26	1	1	60	Rehab	Cold In-Place with Overlay	42404	26	15
V32	Lorraine Road	Glen Drive	end	0.15	1	1	64	Rehab	T & L / 1" Overlay	8221	26	15
S13	Brook Manor Drive	Post Office Road	end	0.08	1	1	76	Rehab	T & L / 1" Overlay	4604	24	15
V23	Kenfield Road	East Street	end	0.12	1	1	67	Rehab	T & L / 1" Overlay	7235	22	15
S01	Apple Hill Court	Bouton Road	end	0.16	1	1	65	Rehab	FiberMat	19888	20	15
W10	Perch Bay Road	Post Office Road	end	0.57	2	2	60	Overlay	1.5" Overlay	51513	45	15