Cornell Local Roads Program

Town of Farmington

2014

TOWN OF
FARMINGTON

Report by Joshua Ren, Summer Intern

Cornell University 2015

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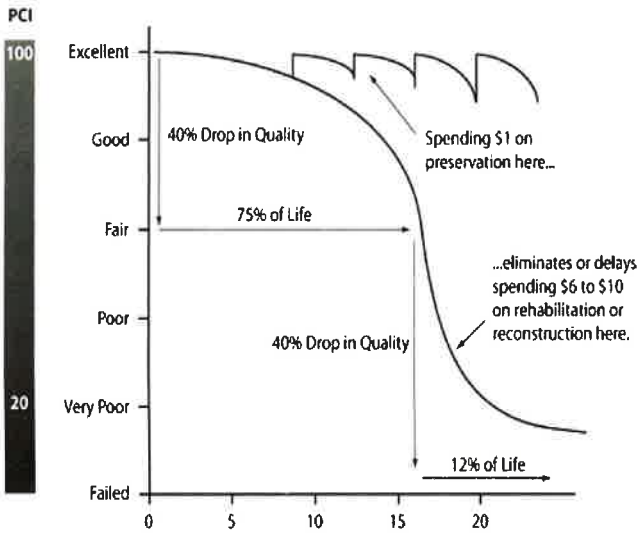
Executive Summary

The goals of the Cornell Local Roads program were to identify the condition of Farmington's roads and systematically decide the repairs that each road needs. A realistic 5 year budget can then be developed.

The main benefit to identifying distresses in roads is to save on repair costs over time. Although, a road may appear to be in good condition, if it is neglected for several years, it will deteriorate quickly and its repair cost will multiply. Spending more money on the maintenance of roads is an investment that will lower the costs of large capital projects in the future.



The strategy employed in creating this 5 year plan was prioritizing preventive measures and deferring repair of roads already in poor condition until there is enough money to spare for a large rehabilitation project.

For the first two years, priority is given to good roads that show some cracking. These roads need to be when their condition has not deteriorated to the point of needing more expensive repairs.

This 2014 survey evaluated Farmington's roads to have an average PCI of 85, meaning they are in good condition, but are starting to show signs of distress. These roads will need continued funding every year to keep them at their current standard.

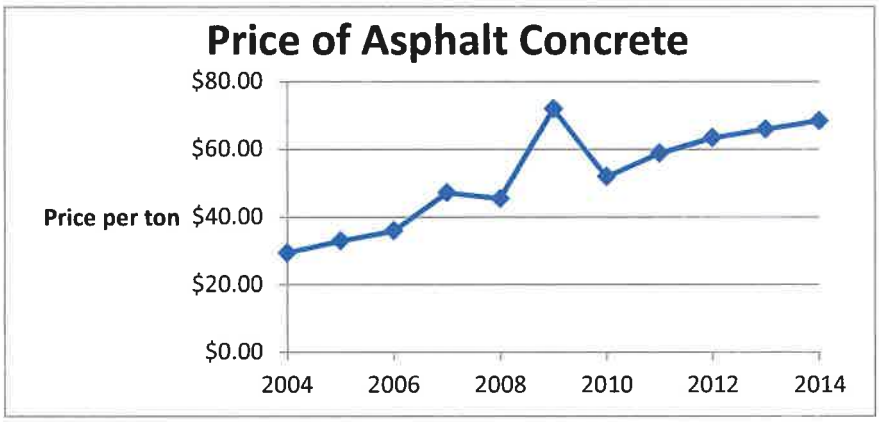
$331,000 will cover basic maintenance and repairs and prevent the rapid deterioration of roads. In other words, it will be enough to repair distresses at the rate they are formed on the "good" roads, but not enough to treat the roads in poorer condition.

Annual average maintenance...
14 miles of chip sealing at @ $18,200 per mile = $255,000
2000 gallons of crack sealing @ $13 per gallon = $26,000
120,000 square ft of slurry sealing @ $0.41 per square ft = $50,000

Continued maintenance of a good road will extend its lifespan, but not indefinitely. A portion of the budget must also be appropriated toward larger capital repair projects to rehabilitate failing roads. An additional $350,000 is needed to keep pace with the number of annual capital repairs, bringing the desired total road repair budget to $681,000. These capital repairs include mill and fills, overlays, recycling, and reconstructions.

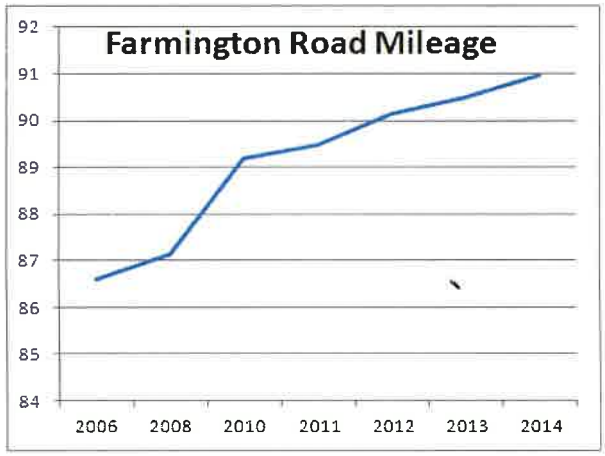
Rising Costs

A major concern that the Highway Department faces is the rising cost of repairs.

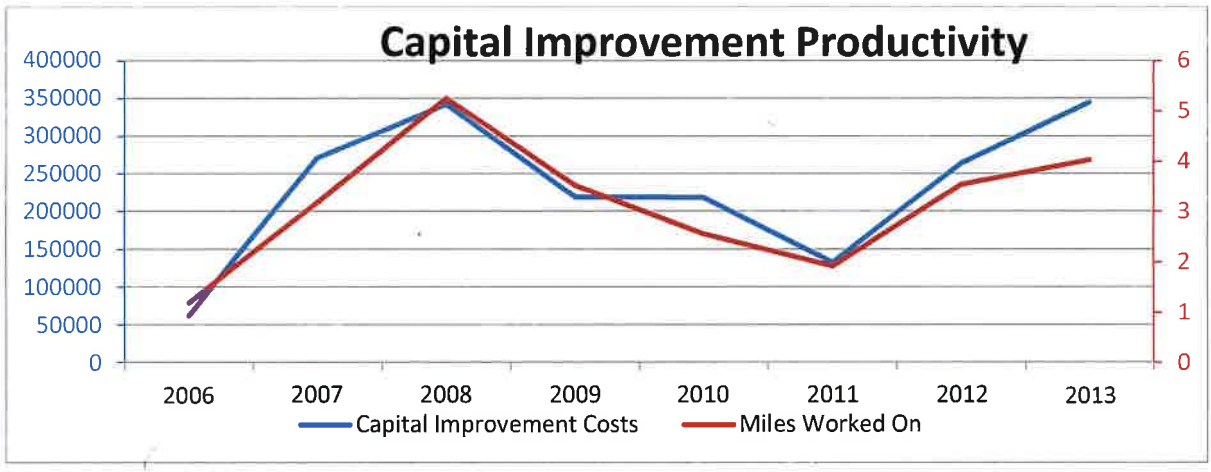


In the past 10 years, the price of hot mix asphalt has risen almost 300%, and it is likely to continue rising in price. Asphalt accounts for about 46% of the cost of a 2" overlay, a commonly done repair.

Another factor for rising costs is Farmington's increasing road mileage. Over the past 12 years, considerable construction has been done, adding over 5 miles of new subdivision roads. The new roads increase the total amount of area that needs to be maintained and drive up costs.



In 2014, the repair budget for the improvement of roads is about $600,000 (includes general repair budget, VLT and CHIPS money). This is an adequate amount of money to maintain roads at their current conditions, but it can be observed that costs are on the rise, and he budget needs to be increased to compensate. If the budget is increased further, forward progress can be made to increase the quality of Farmington's roads.

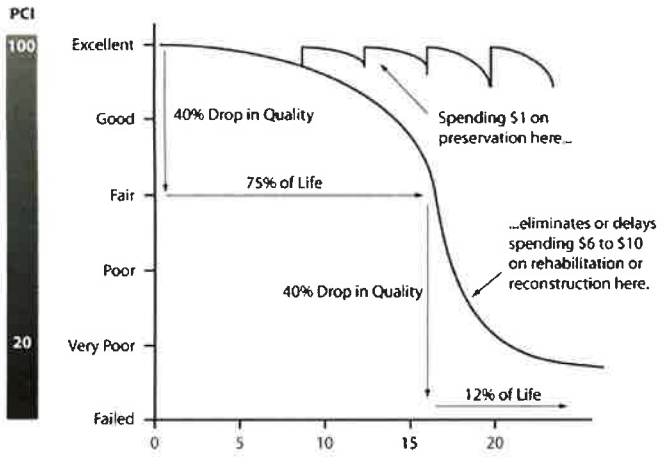


Detailed Description

Intern Joshua Ren was hired for the summer of 2014 to work with the Highway Department of Farmington to:

- Conduct an up-to-date a survey of road conditions
- Calculate average cost per square foot for each treatment Farmington uses on its roads
- Assign repairs to roads and estimate cost for repair
- Form a 5 year plan, targeting high priority roads first

Joshua Ren was hired through the Cornell Local Roads Program. Through this program, he and Highway Superintendent Ed McLaughlin, who would later act as Joshua Ren's supervisor, participated a three day training period. The Local Roads interns were instructed on the goals of the program, pavement repairs, pavement distresses, and using the CAMP-RS Software. The goal of the program is to reduce road repair costs for the municipalities over time by using the strategy, "Keep your good roads good." This strategy involves prioritizing surface treatments on roads that have started to show distresses, rather than targeting roads that have already fallen into serious disrepair. The logic behind this is that it is much cheaper to maintain a good road than to reconstruct a poor road. The dollar spent per year of lifespan extension ratio is more favorable when the road is still in fair condition. With this strategy, a 5 year plan is to be created to help the municipality appropriate its limited funds most efficiently.



First, a thorough survey of the road conditions in Farmington was conducted. This involved driving along all of Farmington's roads and inspecting for distresses. The distresses looked for are: drainage, roughness, longitudinal cracking, alligator cracking, edge cracking, potholes, rutting, and bleeding. (see **Sample Condition Survey** for full descriptions) The severity and extent of each were recorded and used to calculate the pavement condition index (PCI) of each road, which serves as a general indicator of how much repair the road needs. PCI ranges from 0 to 94, a road in perfect condition being a 94. Based on the severity, extent, and type of distresses a road has, a repair category for the road is selected. (see **Decision Trees** for more detail about how repair categories are picked) The repair categories are as listed in ascending order of expenses: Defer Maintenance, Crack Repairs, Patching, Surface Treatment, Overlay, Drainage Work, Rehab, and Reconstruction.

CAMP-RS Software

The CAMP-RS Software is a computer program that is to be used as a tool to help better address road repairs in a municipality. It was developed by the Cornell Local Roads Program for municipalities to integrate into their maintenance programs and was used to develop the 5 year budgeting plan found in this report.

After completing the road survey, the distress data was inputted into CAMP-RS and saved into its database. The software then calculates the PCI of each road which it will use later to determine each road's priority value.

The software abides by the stratagem of "keep your good roads good" and uses a formula to calculate a priority value for each road. This value is based on the volume of traffic, the suggested repair category, and PCI. Roads with drainage issues often will be prioritized first, as this often leads to a rapid deterioration of the road. Crack repairs are also highly prioritized because it is a very cheap repair that will extend the life of the road. Surface treatments and overlays have moderate priority so that several of them will be done a year. Rehabilitations and reconstructions have low priority because they are expensive and that money should be directed toward maintenance of good roads.

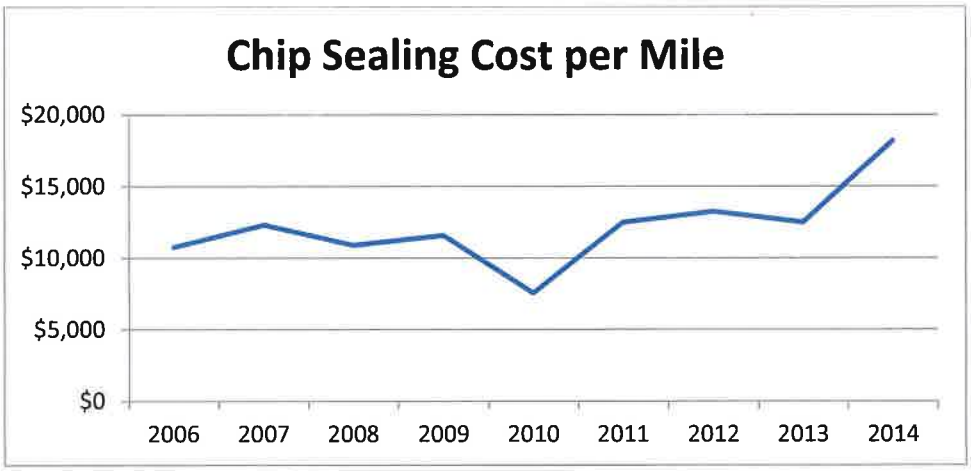
Next, the user must input values for the price per square foot of each repair. Since costs for labor and materials vary by municipality and by year, the price for each repair that Farmington uses needed to be calculated (for exact numbers for each repair see **Repair Alternatives)**. Farmington uses contractors for crack sealing, cape sealing, and central plant recycling. Estimated costs per square foot could be taken from past invoices for these repairs. Farmington does its own chip sealing, overlays, mill and fills, and edge repaving. In depth calculations had to be done to figure out cost per square footage for these (an example of this calculation is included in the **Appendix**).

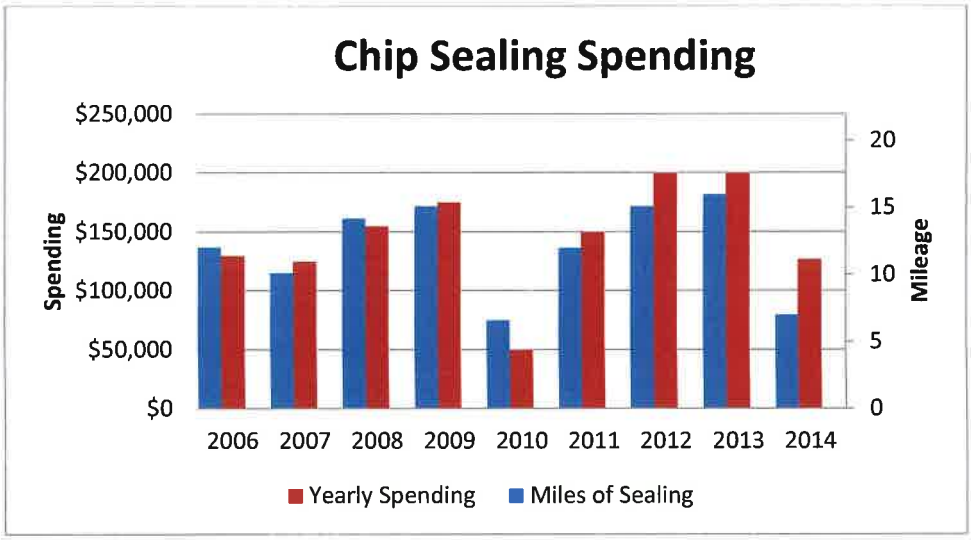
Given parameters for road width and length and cost per square footage of repair, the cost to repair each road section was calculated by CAMP-RS.

Overview of Repairs

Farmington uses a number of repairs for its roads. Two types of surface treatments are used primarily: chip seals for town roads and cape seals for subdivision roads, because it provides a smoother surface than a chip seal. For seriously damaged roads, 1.5" overlays, 2" overlays, and 2" mill and fills are used. For roads that have edges that are falling apart, an edge repaving is done, often followed by a surface treatment the next year. (see **Repair Alternatives** for detailed descriptions)

A certain amount of regular maintenance repairs, in the form of crack filling and surface treatments, must be done every year to keep roads from falling into disrepair. Using Section 284 documents from 2006-2014, the average yearly spending on crack filling and surface treatments is $200,000. However, this number has been increasing over time, and is estimated to be $326000 in 2014.





5 Year Budget

The CAMP-RS can create a rough draft budget when a yearly budget is inputted. $650,000 was inputted as the yearly budget. This number was based on the yearly spending on highway repairs from previous years. The software fit in as many high priority roads as the yearly budget will allow, creating the first draft of the budget.

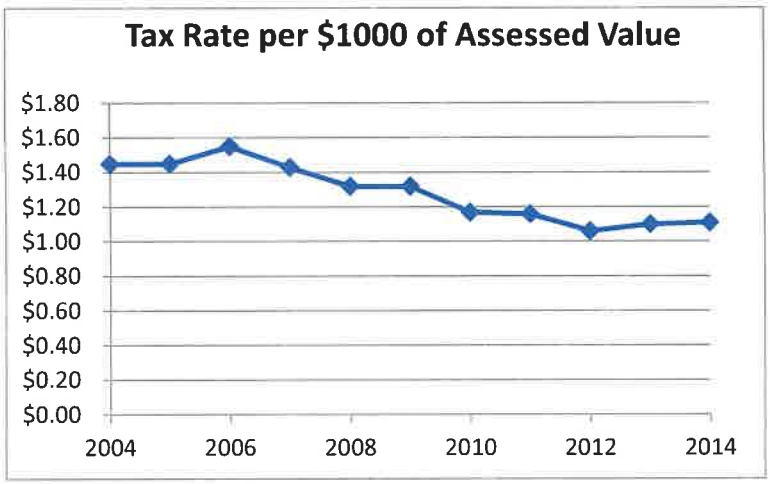
Highway Superintendent Ed McLaughlin was shown the draft, whereupon he made revisions. A significant amount of the 2014 repair budget was diverted toward the Mertensia Road Culvert Project which created setbacks for Superintendent McLaughlin's repair plan. Because of this, the yearly spending was reduced down to $450,000. This also provides ample leeway to account for a variety of factors: budget being reduced, losing VLT money, deterioration of roads that appear during the five year period, additional unexpected expenses. In order to meet this reduction in yearly spending, some planned overlays and mill and fills were substituted by less expensive repairs and maintenance was deferred for several expensive projects. The $650,000 figure was contingent upon the General Repair budget increasing from 2014 and onwards, and therefore, it would overestimate the amount of roads that could be repaired in a year if the budget does not increase.

Proposal

Ed McLaughlin worked with intern Joshua Ren to create a suggested plan for a rate of increase for the General Road Repair budget. The plan is to increase the General Road Repair budget by an amount equal to the maintenance bonds accrued that year. Maintenance bonds are a sum of money put aside by the contracting company that constructs a new road. The bond amount is equal to 10% of the cost to build. This bond is used to pay for the possible maintenance of the road if it shows distress and expires after two years. Since the responsibility of funding a newly built or rebuilt road shifts to the Highway Department after two years, the General Road repairs fund should be increased by the maintenance bond amount every year in preparation for when the bond expires.

On average over the past 12 years, $27,000 is accrued in maintenance bonds per year. From 2010 to 2014, the property tax levied through the Town of Farmington has increased by 4.3% per year, roughly equal to $24,000 per year. However, the tax rate per $1000 of assessed property value has gone down from $1.17 to $1.11 in the same time frame. This means that housing in Farmington has been being bought at a high enough rate to offset the decrease in taxation per capita.

In the long run, the roads are bound to suffer from an increase in traffic from the new housing if taxation rates continue at the current downwards rate.



The maximum allowable increase in property tax by the New York tax cap is 2% yearly, which roughly equates to a $12000 increase. Taking into account the rate of properties being sold, if the tax rate is increased by 2%, the maintenance bond amount can be matched every year, and there would be excess money to compensate for the rising cost of repairs.

Currently, the Highway Department spends about $600,000 yearly on road repairs and has $300,000 in General Road Repairs budget. This is made possible because the Highway Fund receives additional funds from VLT and CHIPS money.

If this plan is implemented and the General Roads Repair is increased by 36000 a year, in 10 years, the fund will increase to $660,000, enough to minimize the need for VLT and CHIPS money.

Conclusion

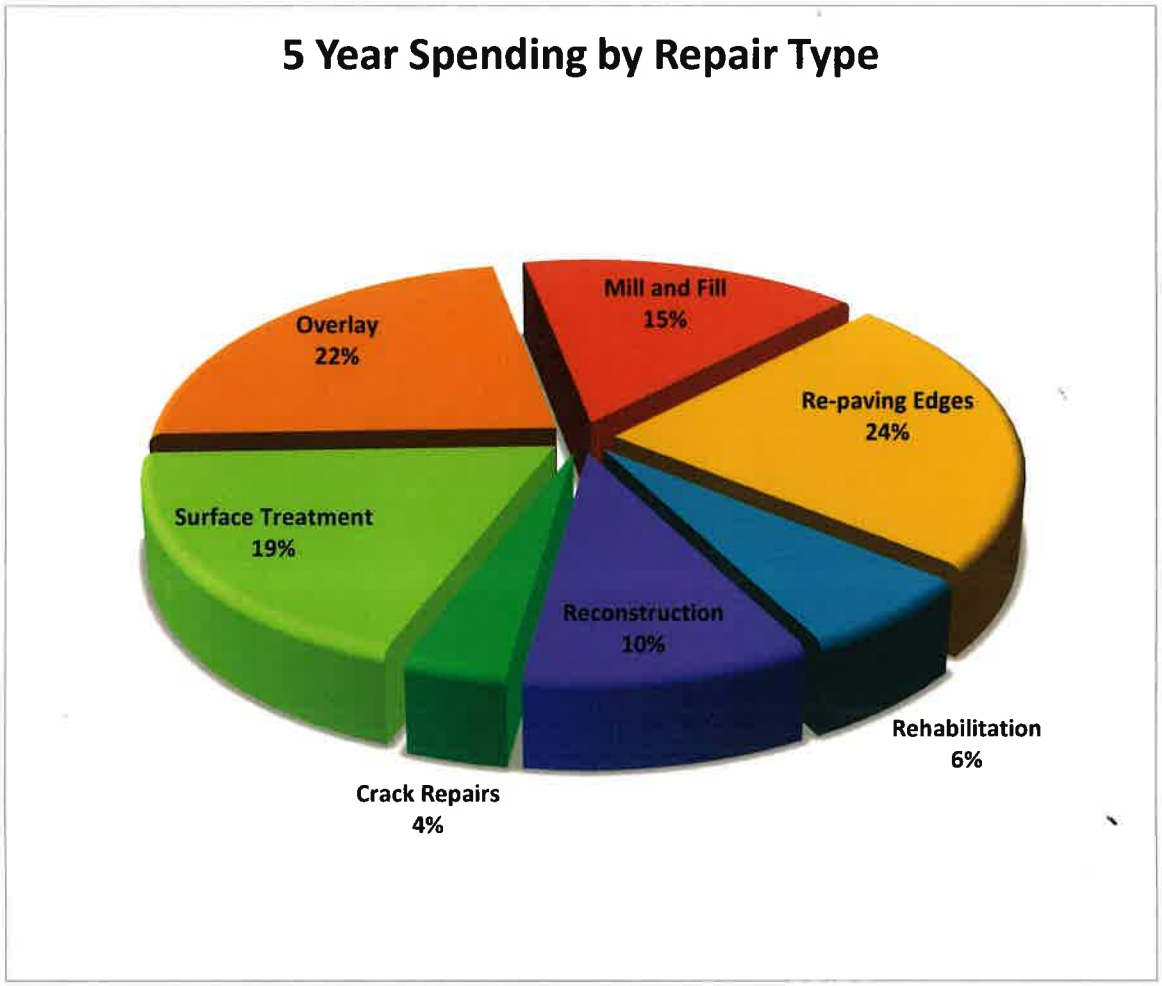
The summer of 2014 was the first time that the Highway Department took on an intern through the Cornell Local Road's Program. Superintendent Ed McLaughlin has considered the benefits of the CAMP-RS program and is willing to continue its usage in the future. A thorough survey of the road conditions has proven to be very useful in the development of an effective five year plan of road maintenance, and so it will likely continue to be done periodically. The five year plan will provide guidance on maintaining and preserving roads with a limited budget, but roads will not see significant overall improvement in quality unless funds are increased.

5 Year Capital Plan

Road Name	Repair Type		Year 1	Year 2	Year 3	Year 4	Year 5
15.3 Miles of Road	Crack Repairs		33600				
Green Rd	Crack fill and Chip Seal		25000				
Town Line Canadaigua - 4	2" Overlay		115000				
Martz Rd	2" Overlay		54000				
Collett Rd - 2	Chip Seal		27000				
Collett Rd West - 4	Chip Seal		17100				
Bittersweet Dr	Cape seal		17600				
Barkwood Ct	Cape Seal		5300				
Elder Dr	Cape Seal		16300				
Meadowbrook Lane - 2	Cape Seal		5700				
Meadowbrook Lane - 3	Cape Seal		9900				
Hathaway Drive	2" Mill and Fill		33700				
Coachlight Circle	2" Mill and Fill		31600				
Heritage Circle	2" Mill and Fill		23200				
13.7 Miles of Road	Crack Repairs			29200			
Corporate Drive	Chip Seal			6020			
Farmington Road	Chip Seal			4500			
State Street	Chip Seal			8200			
Bridal Path Lane	Cape Seal			3800			
Belmont Ln	Cape Seal			15300			
Commercial Dr North	Cape seal, fiber mat			11200			
Brownsville Rd	Re-pave Edges			36000			
Collett Rd West - 4	Re-pave Edges			46100			
Payne Rd - 1	Re-pave Edges			51300			
Shortsville Rd	Re-pave Edges			161000			
Amanda Pl	2" Mill and Reshape			6000			
Buckskin Dr	2" 50% Mill and Reshape			15000			
Red Fern Drive - 1	Cape Seal			8700			
1.2 Miles of Road	Crack Repair				2500		
Tomra Trail	Chip Seal				1800		
Yahn Road	Chip seal				13000		
Alfalfa Crescent	Cape Seal				1600		
Cornfield Circle	Cape Seal				8900		
Fairdale Glen	Cape Seal				13600		
Flaxen Drive	Cape Seal				14600		
Gannett Road	Cape Seal				28000		
Wheatstone Drive	Cape Seal				8900		
Willis Rd	Cape Seal				7800		
Mt. Payne Rd	Central Plant Recycle				56000		
Weigert Road - 2	1.5" Overlay				52900		
Weigert Road - 1	1.5" Overlay				56100		

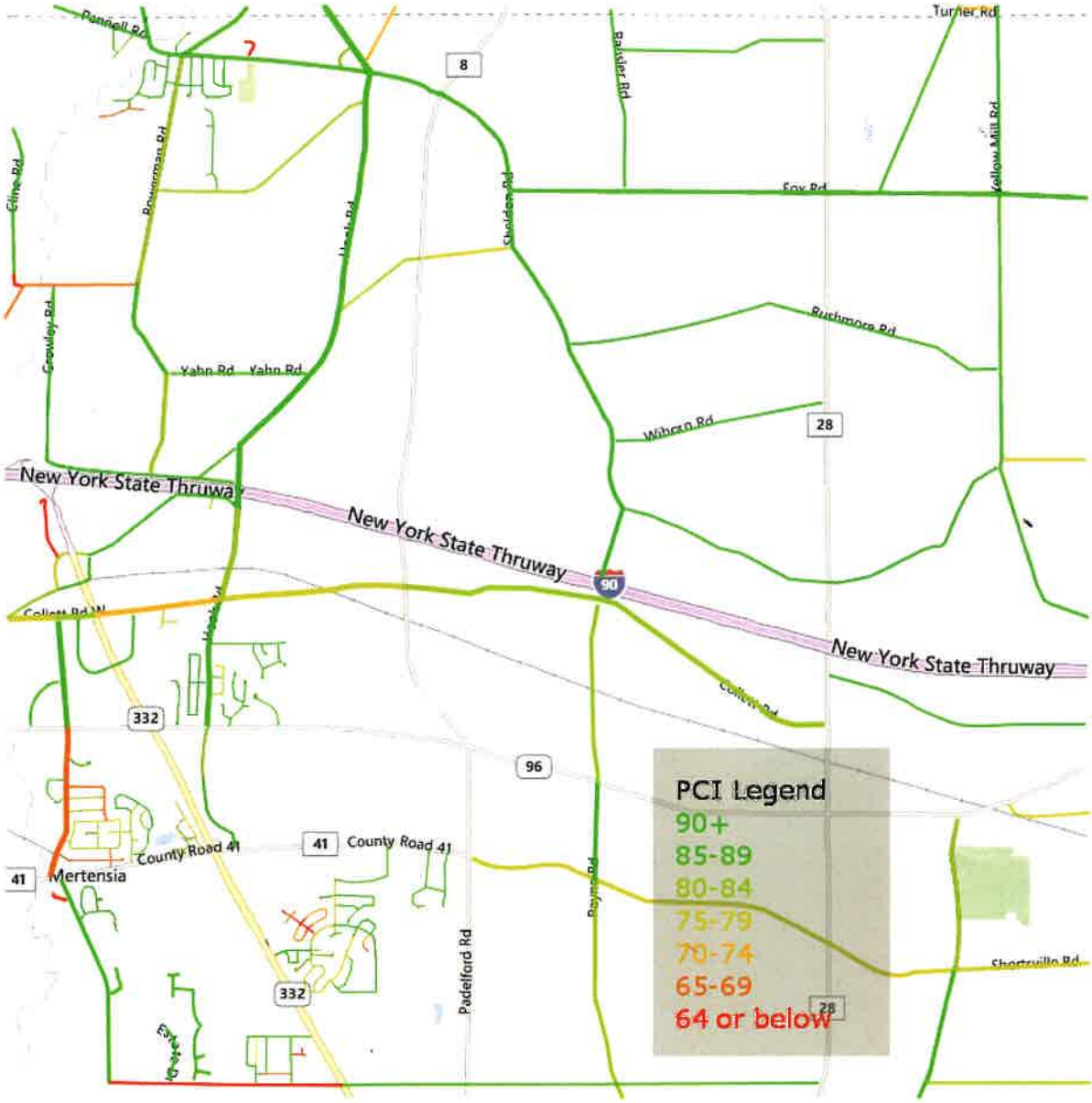
Road Name	Repair Type		Year 1	Year 2	Year 3	Year 4	Year 5
Weigert Road - 1	1.5" Overlay				56100		
Creek Pointe	Patch and Mill & Fill				23100		
Collett Road - 1	Re-pave Edges				63200		
Collett Road West - 2	Re-pave Edges				8800		
Estimated Crack repair and Surface treatments						150000	
Payne Road - 3	Chip Seal					16300	
Collett Road West - 2	Chip Seal					5900	
Farmington Road	Chip Seal					4500	
Doe Haven Drive	Cape Seal					20500	
Cline Road - 1	Reconstruct					47600	
Fallow Lane	Reconstruct					57000	
Walnut Drive - 1	Reconstruct					70000	
Walnut Drive - 2	2" Mill and Fill					5000	
Windingo Lane South	2" Mill and Fill					7000	
Windingo Lane North	2" Mill and Fill					8100	
Fawn Meadow	30% 2" Mill and Fill					25000	
Estimated Crack repair and Surface treatments							150000
Birchwood Drive	2" Mill and Fill						32500
Olde Park Square	2" Mill and Fill						18800
Collett Road West - 3	Re-pave Edges						46000
Sunset Drive	Central Plant Recycle						56000
Brownsville Rd	1.5" Overlay						60000
Marcus Way	2" Mill and Fill						39000
Total			**415000**	**402320**	**416900**	**416900**	**402300**

Deferred Roads							
Clover Meadow Lane	3/8 " Micro pave		32700				
Latting Road	Patch and Mill & Fill		56000				
Loomis Road - 2	1.5" Overlay		6500				
Sycamore Circle	All New Asphalt		37000				
Turner Road	1.5" Overlay		12800				
Beaver Creek Rd - 2	2" Mill and Fill		50600				
Church Ave	2" Overlay		16500				
Collett Road West - 1							
Cranberry Dr	Reconstruct		216000				
Curran Rd	1.5" Overlay		25000				
Holtz Rd	2" Overlay		61200				
Hook Rd - 2	2" Overlay		86600				
Hunts Park							
Marion way							
Mertensia Rd - 1							
Mulberry Dr							
Nettlecreek Lane							
Town Line Rd Canadaigua - 1	Rehab		755000				



Repair Type	Predicted Spending over 5 Years
Crack Repairs	$63,050
Surface Treatment	$327,020
Overlay	$394,100
Mill and Fill	$268,000
Re-paving Edges	$412,400
Rehabilitation	$112,000
Reconstruction	$174,600

Distress Map



CAMP-RS Asphalt Pavement Condition Survey

Street: _____	Distance: _____	Name: _____
Section #: _____	Start : _____	Date: _____
Start: _____	End : _____	Weather: _____
End: _____	Length: _____	Temp (F°/C°): _____

LONGITUDINAL/ TRANSVERSE CRACKING

SEVERITY	NO Defects	EXTENT Low	EXTENT Med	EXTENT High
Low		1	2	3
Med		4	5	6
High		7	8	9

ALLIGATOR CRACKING

SEVERITY	NO Defects	EXTENT Low	EXTENT Med	EXTENT High
Low		1	2	3
Med		4	5	6
High		7	8	9

EDGE CRACKING

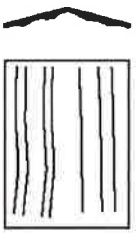
SEVERITY	NO Defects	EXTENT Low	EXTENT Med	EXTENT High
Low		1	2	3
Med		4	5	6
High		7	8	9

PATCHING / POTHOLES

NO Defects	EXTENT
	1 Low
	2 Medium
	3 High

Do not include good patches

RUTTING

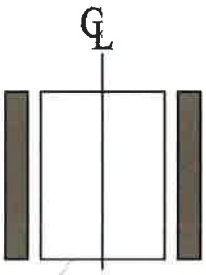


SEVERITY	NO Defects	EXTENT Low	EXTENT Med	EXTENT High
Low		1	2	3
Med		4	5	6
High		7	8	9

BLEEDING

SEVERITY	CONDITION
1	Good
4	Fair
7	Poor

DRAINAGE



SEVERITY	CONDITION
1	Good
4	Fair
7	Poor

ROUGHNESS

Check road for presence of the following:

- uneven surface
- sags
- humps
- frost heaves

SEVERITY	CONDITION
1	Good
4	Fair
7	Poor

Description of Distresses

Longitudinal/Transverse Cracking

Severity:

Low- Cracks are very thin, or they have been crack sealed already but starting to reform.
Medium- Cracks are 15 ft or longer and smaller cracks are forming off of main branches.
High- Cracks are wider than 1 cm and stretch across width of road or many cracks have formed off of a main crack, appearing almost like alligator cracking.

Extent:

Low- Cracks exist on less than 10% of road.
Medium- Cracks exist on roughly 10% to 40% of the road.
High- Cracks exist on more than 40% of the road.

Alligator Cracking

Severity:

Low- Cracks are thin; area of cracking is level with road.

Medium- Well defined cracking, with up to ⅛" in width. Pieces of pavement may be loose but have not broken away. Area of cracking may be depressed.

High- Cracks are wider than ⅛" and pieces have been broken away. Area of cracking is considerably warped and depressed.

Extent:

Low- One small patch every quarter mile.

Medium- A patches spanning a meter or more in diameter and take up 10% to 30% of road.

High- Cracks span more than 30% of the road.

Potholes/Patching

Extent:

Low- Fewer than or approximately equal to one pothole or patch per half mile.

Medium- Two to three potholes and patches per half mile.

High- Three or more potholes and patches per half mile.

Edge Cracking

Severity:

Low- Cracks are very thin, or they have been crack sealed already but starting to reform.

Medium- Well defined cracking, with up to ⅛" in width. Pieces of pavement may be loose but have not broken away.

High- Cracks are wider than ⅛" and pieces have been broken away.

Extent:

Low- Cracks exist on less than 10% of the section length.

Medium- Cracks exist on roughly 10% to 40% of the section length.

High- Cracks exist on more than 40% of the section length.

Drainage

Condition:

Good- No water accumulation on surface, road has good crown.

Fair- Road crown is in good condition, but pools of water form either in the shoulder or the road. There might be collected sediment on the road, evidence of suboptimal drainage.

Poor- There are large standing pools of water on pavement surface.

Roughness

Condition:

Good- Road surface is even and smooth.

Fair- Road has noticeable unevenness.

Poor- Road is bumpy to the point of being unsafe at the posted speed limit.

Rutting

Severity:

Low- Depth of rut is less than ½"

Medium- Depth of rut is between ½" and 1" deep

High- Ruts are greater than 1" deep and are holding water

Extent:

Low- Less than 10% of the road is covered by rutting.

Medium- Between 10% and 30% of the road is covered by rutting.

High- More than 30% of the road is covered by rutting.