Road Needs Study Report – 2021

D.M. Wills Project No. 4782

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Partners in Engineering, Planning and Environmental Services
Peterborough

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Prepared for:
The Township of South Stormont

Executive Summary

The Township of South Stormont (Township) retained the services of D.M. Wills Associates (Wills) to undertake a review of the Township's existing road network, and assess its physical condition as well as confirm various road attributes. Data collected during the field review was used to develop a prioritized listing of the road network needs, the results of which are documented in this report.

The Township's road infrastructure system spans a total of 310 km primarily within a rural setting, with small areas of urban and semi-urban development. The road network includes surfaces ranging from gravel to hot mix paved (asphalt). The Township has approximately 10 km of earth roads,103 km of gravel roads, 84 km of surface treated roads (low class bituminous (LCB)), and 113 km of hot mix asphalt paved roads (high class bituminous (HCB)).

Township of South Stormont		
Road System in Centerline Kilometres		
(As of November 2021)		
	Road Class	
(i)	Arterial	0
(ii)	Collector	
	Hot Mix Asphalt (HCB)	6
		6 km
(iii)	Local	
	Earth (may have superficial surface gravel)	10
	Gravel (loose Top Gravel)	103
	Surface Treatment (LCB)	84
	Hot Mix Asphalt (HCB)	107
	Total Local	304 km
	Total	310 km
**Estimated to the nearest centreline kilometre.*		

Class	HCB	LCB	Loose-Top (Gravel and Earth)	All
Arterial	-	-	-	-
Collector Roads	$ 3.8 M	-	-	$ 3.8 M
Local Roads	$ 67.5 M	$ 41.9 M	$ 34.3 M	$ 146.9 M
All	$ 71.3 M	$ 41.9 M	$ 34.3 M	$ 150.7 M

Two (2) primary indicators of the relative health of a road are the structural adequacy and surface condition ratings. The current average structural adequacy rating for the

Township's road network is 13.9/20. The current average surface condition rating for the Township's road network is 7.2/10.

The average PCI for hard top surfaces, weighted by traffic, in the Township is 73.7. As detailed in the following table, the approximately 70% of the Township's network is in good or better condition, with 30% in fair or worse condition.

Class or Surface Type	Very Good	Good	Fair	Poor	Very Poor
Arterial	-	-	-	-	-
Collector Roads	9.2%	63.9%	10.9%	16.0%	0.0%
Local Roads	19.2%	50.1%	14.1%	15.6%	2.0%
HCB	31.6%	10.2%	14.1%	38.7%	5.4%
LCB	27.7%	51.3%	21.0%	0.0%	0.0%
G or E	0.0%	89.9%	8.7%	1.4%	0.0%
All	19.0%	50.4%	14.0%	14.6%	2.0%

Rehabilitation and Preservation Management

In addition to addressing currently deficient roads (i.e. capital reconstruction), a dedicated preservation management approach is required, and perhaps even more important, to "keep the good roads good"; the fundamental principle being that it costs much less to maintain a good road than it does to let it fail and then reconstruct it, from a life cycle cost perspective. Ultimately, the goal of preservation management is to extend the useful life of a road and road network, maximizing the Township's investment over the road life-cycle.

Road resurfacing is an effective way of extending the overall life of the pavement structure and therefore a road resurfacing program is highly recommended. Preliminary recommendations and prioritization for road resurfacing are based on PCI and traffic demands on each road section, as per the Inventory Manual. Specific resurfacing treatment recommendations must be assessed through further field investigation and detail design effort, prior to selecting and implementing the resurfacing strategy.

The recommended budget to maintain a road network through regular rehabilitation is estimated below.

Hot Mix Paved Roads:

- 112.8 km of paved roads (HCB).
- 20-year resurfacing period.
- Annual resurfacing 5.6 km / year.
- Annual budget $862,400: (5.6 km / year x $154,000 / km RMP1).

Surface Treated Roads:

- 83.8 km of surface treated roads (LCB).
- 7 year resurfacing period.
- Annual resurfacing 12.0 km / year.
- Annual budget $420,000 (12.0 km / year x $35,000 / km ST1).

The hard top resurfacing program, (hot mix, and surface treatment) is estimated at $1,282,400 per year.

Gravel roads require regular maintenance. Maintenance includes regular grading and reapplication of new gravel. Typically, gravel roads should be resurfaced on a 3 - 5 year cycle. Gravel road refreshment is currently considered an operation cost at the Township of South Stormont.

Gravel Roads:

- 113.0 km of earth / gravel roads.
- 50 mm gravel every 3 years.
- Annual gravelling of 37.7 km.
- Granular M ($12,000 / km).
- Annual budget $452,400 (37.7 km / year x $12,000 G) **.

*** Township Staff currently conduct shaping and grading of new material as an operational expense. Provided costing based on application by outside forces.*

Slurry Seal / Microsurfacing

- 112.8 km of paved roads (HCB).
- 83.8 km of surface treated roads (LCB).
- Assume that slurry seal / microsurfacing will be applied, on average, once per resurfacing cycle.
- 17.6 km of road to preserve per year (5.6 km HCB and 12.0 km of LCB).
- Annual budget $387,200 (17.6 km x $22,000/ km Slurry Sealing / Microsurfacing).

Capital Plan

Gravel road resurfacing is currently considered an operational cost at the Township of South Stormont and is not included in the capital budget.

Two capital plans were developed as part of this report. A fully funded plan and a plan constrained by the Township's existing budget was developed as per the following table.

Item	Fully Funded Plan	Existing Budget
Annual Capital Funding	$ 2.3 M	$ 1.5 M
Annual Reconstruction Budget	$ 0.6	$ 0.4
Annual Rehabilitation Budget	$ 1.7	$ 1.1
Length of roads rehabilitated or reconstructed	152 km	100 km
Annual Preservation Budget *(Considered an Operational Cost)*	$ 0.3 M	$ 0.3 M

If the budget was increased to implement the fully funded Plan with the Preservation Program, the PCI would rise 19 points by 2031. The fully funded program would address all construction needs as well as apply rehabilitation and preservation treatments at the ideal timing (according to PCI). Although this may not be fiscally feasible in the near term, the budget needs at the end of 2031 would be expected to drop significantly and approach the rehabilitation and preservation program base rates.

If the capital budget does not increase in real terms in the next 10 years, the PCI is expected to fall by three (3) points without a preservation program. With a rigorously implemented preservation program, the PCI may rise by three (3) points. A significant number of rehabilitation candidates will not be addressed and may require more costly interventions in the future. It is therefore highly recommended that the Township endeavor to consistently increase the annual capital budget over the next 10 years.

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1.0 Purpose, Background and Study Method

1.1 Purpose

The purpose of the 2021 Road Needs Study Report is to update the current road inventory and road condition assessments within the Township of South Stormont (Township). Using this information, a prioritized listing of the road network needs is developed. The information derived from the study and documented in this report will provide assistance to the Township for developing and executing a planned road maintenance and improvement program.

The Township retained the services of D.M. Wills Associates (Wills) to undertake a review of the existing road network, and assess its physical condition as well as confirm various attributes. Data collected as a result of the field review is used to develop a prioritized listing of the road network needs, the results of which are documented in this report.

1.2 Background

The Township of South Stormont is located in eastern Ontario within the United Counties of Stormont, Dundas and Glengarry. The Township is largely rural with some scattered urban and semi-urban developments. The communities of Ingleside and Long Sault, serve as the Township's main population centres.

The Township is undertaking a strategic update to the 2021 Asset Management Plan. This Road Needs Study will serve as the basis for all Road Assets and its' findings will be included in the updated Asset Management Plan. The study utilizes and builds from the road asset information provided by the Township.

1.3 Study Objectives

Based on discussion with Township staff, the following study objectives were identified:

- Provide a current inventory and value of the Township's roads, assess road conditions and needs, and develop a priority listing for construction needs and improvements.
- Provide a prioritized list of capital projects for the Township to invest in.

To ensure compliance with the latest Ministry of Transportation (MTO) guidelines, the inventories were completed in accordance with the most current edition of the Inventory Manual for Municipal Roads.

1.4 Study Methodology

The procedure utilized to complete the study was in accordance with the Ministry of Transportation's Inventory Manual for Municipal Roads (February 1991).

Additionally, field reviews for the purpose of Pavement Condition Index (PCI) were undertaken in accordance with:

- MTO Manual for Condition Rating of Flexible Pavements, SP-024.
- MTO Manual for Condition Rating of Surface-Treated Roads, SP-021.

There are two (2) key observations when using PCI methods: the Ride Condition Rating (RCR), and the Distress Manifestation Index (DMI). RCR is a subjective measurement of how smooth a travelled surface is, rated from 0 to 10, with 10 representing excellent, new surfaces, and 0 representing an extremely rough, impassible road. DMI aggregates various forms of visible pavement distress into a rating from 0 to 10, with 10 representing a new surface and 0 representing a destroyed surface.

RCR and DMI are rated strictly independently. A rough road may have relatively few visible distresses while a fairly smooth road may display many distresses. In general, rough roads display associated visible distresses.

The combined approach facilitates comparing all the Township's roads, as the Inventory Manual prescribes the same rating system regardless of surface type, while also providing detailed descriptions of the types of distress encountered on surfaces as per the PCI ratings. This approach is compliant with O. Reg. 588/17. Wills undertook the field study in November 2021.

During the field study, a visual assessment of the following road characteristics was documented to assess the current adequacy of the road:

- Platform Width (overall width of road).
- Surface Width (width of pavement surface).
- Shoulder Width.
- Surface Type (gravel, low class bituminous, or high class bituminous).
- Drainage Type (open ditches vs. storm sewers etc.).
- Surface Condition (assigned based on Ride Condition Rating for this Study).
- Maintenance Demand.
- Roadside Environment.
- Capacity.
- Alignment.

1.4.1 Critical Deficiencies

Critical deficiencies represent road characteristics that result in increased maintenance costs or lead to an inadequate level of service. Road sections may be assessed as

critically deficient if any one (1) of the following characteristics fall below the minimum tolerable standards defined in the MTO Inventory Manual:

- Surface type - Insufficient surface type for traffic volumes.
- Surface width - Insufficient width of the road surface excluding the shoulders.
- Capacity - Inability of the road to accommodate traffic volumes at peak periods.
- Structural Adequacy - Inability of the road base to support vehicular traffic.
- Drainage - Increased frequency of flooding or excessive maintenance effort required to prevent flooding.

Critically deficient roads have generally reached the end of their service life and /or require major work to improve e.g. widening or new surface type. As such, reconstruction is generally required.

Surface Type

The following parameters were used to assess the adequacy of the road surface type. Road sections with traffic volumes (AADT) in excess of the Minimum Tolerable values for Earth and Gravel in Table 1, were noted as critically deficient triggering a "NOW" surface type need as per the Inventory Manual Method.

Table 1 – Surface Type by Annual Average Daily Traffic (AADT)

Surface Type	AADT		
	Inventory Manual		MTO Pavement Design and Rehabilitation Manual[1]
	Tolerable Range	Design Standard	
Earth (E)	<50	-	-
Gravel (G)	<400	0-199	0 - 199
Low Class Bituminous (LCB) / Surface Treatment	-	200-399	200 - 1500
High Class Bituminous (HCB) / Hot Mix	-	400+	>1500

Table 1 provides further guidance with respect to surface type from both the Inventory Manual as well as the MTO Pavement Design and Rehabilitation Manual.

As detailed in Table 1, Gravel surfaces are generally considered acceptable for AADT of less than 200 vehicles but may be tolerable up to 400 AADT. Transition to Surface Treatment should be considered above 200 AADT. Gravel road maintenance costs

[1] Ministry of Transportation. Pavement Design and Rehabilitation Manual, Second Edition, 2013, Table 3.3.3 Structural Design Guidelines for Flexible Pavement – Secondary Highways

(resurfacing, grading, dust suppression, etc.) versus surface treatment costs are key considerations.

Low Class Bituminous (LCB) i.e. Surface Treatment may be acceptable for traffic volumes between 200 and 1500 AADT. A transition to a Hot Mix or High Class Bituminous surface from Surface Treatment must be considered on a case by case basis. The following factors require consideration:

- Surface Treatment Maintenance Costs.
- Commercial Vehicle Loading.
- Roadside Environment (Urban, Semi-urban, vs. Rural).
- On-street Parking.
- Adjacent Drainage Infrastructure i.e. curb and gutter, catch basins etc.
- Asphalt Availability / Cost.
- Surface / Platform Width.
- Traffic Volume Growth.
- Sub-base Quality.
- Roadbed Frost Susceptibility.
- Future Resurfacing / Rehabilitation Costs.

Vehicle loading is one of the key considerations for pavement design and ultimately the decision between Hot Mix and Surface Treatment. Roads with high levels of commercial traffic require a more substantial pavement structure. The values noted in Table 1, for the "MTO Method" are generally reflective of a highway with 10% commercial vehicles. Roads with AADT in excess of 400 vehicles with a good sub-base and commercial vehicles up to 10% may still perform very well with a Surface Treatment. Existing/past performance of a Surface Treatment can be an excellent indicator when considering the upgrade to Hot Mix.

Surface Width

Surface widths that fall below minimum tolerable standards, as detailed in the MTO Inventory Manual are noted as critically deficient triggering a "NOW" need.

The Minimum Tolerable Surface Widths for Rural roads are included in Table 2:

Table 2 – Rural Road Surface Width by Annual Average Daily Traffic (AADT)

	AADT							
	1-49	40-199	200-399	400-999	1000-1999	2000-2999	3000-3999	4000+
Road Width (m)	5.0	5.5	5.5	6.0	6.0	6.0	6.5	6.5

Capacity

An in-depth traffic capacity analysis was not completed as part of the scope of this Road Needs Study. Decisions with respect to expansion of roads should be made within the context of a Transportation Master Plan or Official Plan for the Township.

However, from a general perspective, a two-lane road can typically provide adequate service up to an AADT of approximately 12,000 vehicles. The functionality of a road from a capacity standpoint is of course dependent upon other factors in combination with volume. Adjacent land uses, number of access points i.e. entrances and side roads etc. also have a significant impact on how the road functions.

A rural road with limited entrances and side roads will have a much greater capacity to flow traffic versus an urban street with many entrances and side road intersections. The AADT of 12,000 can be used as a 'rule of thumb' to trigger further analysis on the road capacity and operation. For the purposes of this study, a detailed capacity analysis was not undertaken as part of the scope of work. All roads were assigned to be adequate from a capacity perspective noting that no road section had an AADT greater than 5000 vehicles.

Structural Adequacy

In cases where road base or structure is showing distress over more than 20% of the length of the road section, a score between 1 and 7 (out of 20) is assessed and the road section is assigned a "NOW" need and considered Critically Deficient per the Inventory Manual. The structural adequacy rating is often the best indicator of the overall road section's health.

It should be noted that a structural "NOW" need does not explicitly mean that work must be undertaken on the road immediately (although this may be so in some cases). A structural "NOW" need means that a significant portion of the road is showing distress of the road bed and requires significant intervention i.e. reconstruction or major rehabilitation to renew it service life. A structural "1-5" year need is expected to become a "NOW" need in the next five (5) years, and a "6-10" year need is expected to become a "NOW" need in the next 10 years.

Drainage

A road section is assessed as a "NOW" need for drainage generally when a road becomes impassible due to water one or more times a year. This information is not readily accessible from inspection. Characteristics such as ditching, water ponding on or around the road, and evidence of past washouts were used to assess road drainage. As such, a road was given a "NOW" need for drainage if there were evident drainage problems that would likely lead to an impassable road during a heavy rain or a rapid snow melt.

Three sections of road are noted by Township Staff as experiencing regular flooding during the spring thaw. Determining the best course of action to address a drainage

issue that regularly causes flooding on a road is complex and beyond the scope of this report. Cost estimates to fix the roads are estimated based on the reconstruction cost and the length of the length of the section that is prone to flooding.

Mary's Road: up to a quarter of the road width may be inundated, causing the road to be temporarily closed. It is recommended that the Township conduct a drainage study to determine the appropriate sizing of culverts and a target elevation for the road surface to prevent overtopping during spring flooding. Alternatively, Mary's Road may be closed permanently at either end of the stretch prone to flooding.

Chisolm Road: water encroaches the shoulder for approximately 100m. It is recommended that the Township conduct a drainage study to determine the appropriate sizing of culverts and minimum elevation for the road surface to prevent overtopping during spring flooding. Alternatively, the road may be closed at either end of the problem area.

Bingley Road: Water has been more than 0.3 m above the road surface at the double culvert. It is recommended that the Township conduct a drainage study to determine the appropriate sizing of culverts and a minimum elevation for the road surface to prevent overtopping during spring flooding. As a dead end road, closing the section is not feasible.

These roads have been included in the fully funded capital plan with estimates based on the cost of a reconstructed road for the length of road that experiences flooding.

2.0 The Road System

2.1 Inventory and Classification

All roads in the municipal road system were inventoried according to the methods outlined in the Inventory Manual for Municipal Roads.

The inventory procedure requires that each road in the system be studied as a separate unit. Initially, the road system was divided into sections so that each conformed, as close as possible, to the following requirements:

- Uniform traffic volume.
- Uniform terrain.
- Uniform physical conditions.
- Uniform adjacent land.

Depending on location with respect to the built up areas, roads were classified in a manner generally descriptive of the type of construction as follows:

- Urban - Roads with curb and gutter and storm sewer drainage.

- Semi-Urban - Hard-topped Roads in built up areas (development exceeds 50% of the frontage) without curb and gutter or curb and gutter on one (1) side only.
- Rural - Roads with development on less than 50% of the frontage.

Rural roads were further evaluated based on estimated traffic volumes; such as 0 to 50 vehicles per day, 51 to 200, and 201 to 400 etc. For the purpose of this study, a combination of counted and estimated traffic volumes were provided by the Township. Where gaps existed in the data, traffic volumes were estimated. Counts and estimated completed in the past were brought forward to 2021 traffic volumes using a growth rate of 1.5%.

Table 3 summarizes the total road length in kilometres by surface type and road class as of November 2021.

The existing road system consists of 310 km of roadway, 10 km of earth roads,103 km of gravel roads, 84 km of surface treated roads (LCB) and 113 km of HCB (asphalt paved) roads; with all calculations being approximate and rounded to the nearest kilometre.

Table 3 – Road System Inventory

Township of South Stormont		
Road System in Kilometres		
(As of November 2021)		
A.	Surface Type	Totals*
	Earth	10
	Gravel (Loose Top Gravel)	103
	Surface Treatment (LCB & ICB)	84
	Hot Mix Asphalt (HCB)	113
	Total A	310 km
B.	Road Class	
(i)	Arterial	0
(ii)	Collector	
	Hot Mix Asphalt (HCB)	6
		6 km
(iii)	Local	
	Earth (may have superficial surface gravel)	10
	Gravel (loose Top Gravel)	103
	Surface Treatment (LCB)	84
	Hot Mix Asphalt (HCB)	107
	Total Local	304 km
	Total B	310 km
Estimated to the nearest centreline kilometre.		

3.0 Road Needs

The primary purpose of the study is to develop a list of all roads within the Township ranked according to priority with respect to road needs.

The method of evaluating road needs in terms of type, cost and timing of improvements is identified in the Inventory Manual for Municipal Roads.

It is important to note that budgetary restrictions will often influence the level of upgrades to the road system and therefore it is imperative to maximize the improvements based on availability of funds and needs priority.

3.1 Critical Deficiencies

The inventory of the road system revealed that certain road sections are now deficient or will become deficient during the study period.

As noted previously, critical deficiencies include road characteristics which result in increased maintenance costs and which inevitably lead to an inadequate level of service. A road section is critically deficient if any one of the following characteristics fall below the minimum tolerable standards defined in the Inventory Manual.

- Surface type - Incorrect surface type to suit traffic volumes on the roadway.
- Surface width - Insufficient width of the road surface excluding the shoulders.
- Capacity - Inability of the road to accommodate traffic volumes at peak periods.
- Structural Adequacy - Inability of the road base to support vehicular traffic.
- Drainage - Increased frequency of flooding or excessive maintenance effort required to prevent flooding.

Of the 310 km of roads inventoried, a total of 31 km were found to be critically deficient in one (1) or more areas. Of the 31 km, approximately 8 km represents roads with AADT of less than 50 vehicles. Regardless of condition, roads with AADT of fifty (50) or less are typically assigned as "Adequate" (as per the Ministry protocol) for the purpose of the system adequacy calculation.

The overall system adequacy for the Township's road network, which is based upon the total road kilometres less the identified critically deficient ("NOW" needs) roads, is as follows:

$$\textbf{2021 System Adequacy} = \frac{\textbf{310 - (31 - 23)}}{\textbf{310}} \textbf{ x 100\% = 92\%}$$

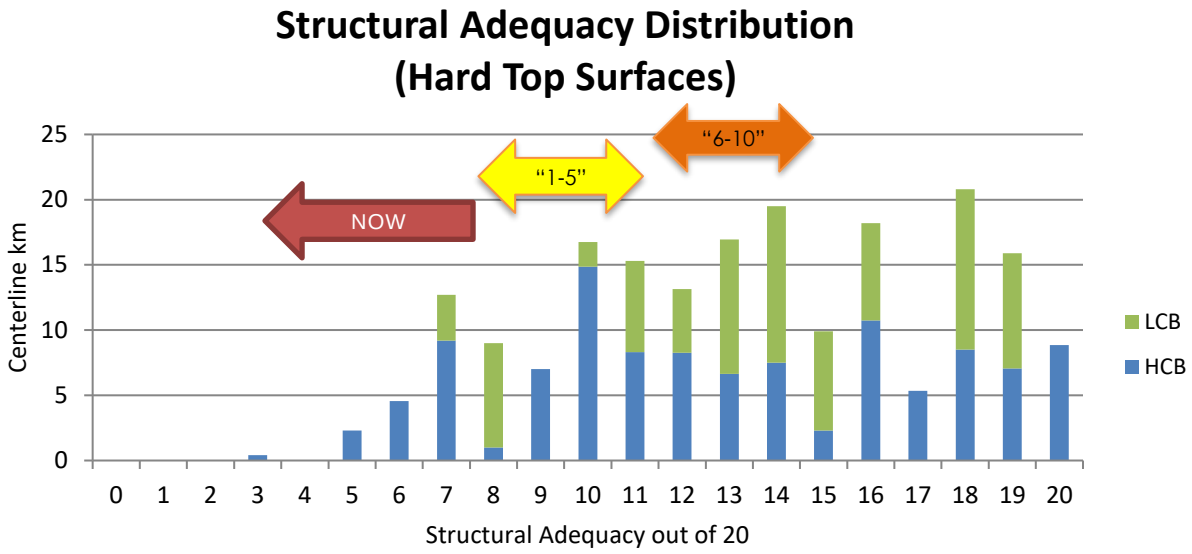
Table 4 – Selected Inventory Manual Ratings by Class

Class	Surface Condition (10)	Structural Adequacy (20)	Drainage (15)	Maintenance (10)	Condition Rating (100)
Arterial	-	-	-	-	-
Collector Roads	7.2	14.3	13.8	7.2	64.2
Local Roads	7.2	13.9	12.7	7.3	72.8
HCB	6.9	13.0	13.2	6.9	70.6
LCB	7.3	13.9	13.0	1.3	77.4
G & E	7.4	14.8	12.2	7.6	74.6
All	7.2	13.9	12.8	7.3	72.7

A review of the structural adequacy distribution of the Township's hard top roads identifies a group of roads, 79 km, that are in very good condition (structural adequacy of 15 and over), and with regular resurfacing and preservative maintenance, should not

require reconstruction in the next 10 years. Another cohort of roads, approximately 50 km, are in average condition (Structural Adequacy from 12 to 14). Some of these roads may continue to perform well, but without timely resurfacing and preventative maintenance, many of them are expected to become NOW or 1 – 5 year needs. The remaining 68 km of hard top road network is well distributed over the very poor to poor range (structural adequacy from 3 to 11). Most of these roads will require reconstruction over the next 5 years to fully repair them.

It is therefore recommended that, while the Township endeavors to repair these poor roads as part of its 10-year capital plan, every reasonable effort is made, through preservation management, to prevent the current cohort of fair to very good roads (78 km) from becoming capital reconstruction needs themselves.



3.2 Pavement Condition Index (PCI)

Pavement Condition Index (PCI) was calculated based on the MTO PCI methodologies, using the following empirical formula:[2]

$$\mathbf{PCI} = \mathbf{10} \times \sqrt{\frac{\mathbf{RCR}}{\mathbf{10}}} \times \mathbf{DMI} \times \mathbf{w_c}$$

Where DMI is the Distress Manifestation Index (0 to 10), calculated based on distress severity and density, RCR is the assigned Ride Condition Rating out of 10, $\boldsymbol{w_c}$ is the weighting constant to adjust for pavement bias (1.088 for HCB and 0.962 for LCB and gravel surfaces).

[2] Alternative empirical formulas are available.

The weighted PCI provides an indication of the average level of service that drivers within South Stormont experience. The overall weighted PCI for the Township's road network, which is based upon the section condition as weighted by AADT, is as follows:

$$\textbf{Overall Weighted Condition} = \frac{\sum \textbf{length} \times \textbf{AADT} \times \textbf{PCI}}{\sum \textbf{length} \times \textbf{AADT}}$$

Class / Surface Type	PCI
Collector	75.5
Local	73.5
HCB	75.3
LCB	70.2
All Hard Top Roads	73.7

The unweighted average PCI (i.e. traffic levels are ignored) is 72.0.

3.3 Priority Ratings of Road Treatments

A mathematical empirical formula was used to calculate the priority rating for each road section. The priority rating is a weighted calculation which takes into account the existing traffic volume, and the extension of service life of the proposed treatments.

This priority analysis is an impartial procedure to place the deficiencies in order of relative utility. A higher Priority Rating number indicates a relatively greater utility of applying a treatment / improvement, dollar for dollar.

The formula takes into account the current traffic volume (AADT), whether it is from actual road counts or estimated road counts, the extension of service life of a preliminary treatment recommendation, and the cost of the selected treatment. The formula is as follows:

$$Priority\ Score = \frac{Extension\ of\ Service\ Life \times AADT}{Cost\ of\ Preliminary\ Treatment}$$

In utilizing the above equation Wills identified a priority listing for review with Township staff.

When developing the recommended capital expenditure plan consideration may be given to the remaining useful service life of a road / roadbed with a view to coordinating major reconstruction efforts at / near the end of the road's life. Furthermore, while a priority rating will give a general idea of which roads should be improved before others, it does not prescribe an exact order for road improvements nor does it determine the timing of preservation and rehabilitation work. For example, it may be wise to defer the full reconstruction of a high priority road ("let the bad roads fail") in favor of resurfacing work on a medium priority road ("keep the good roads good").

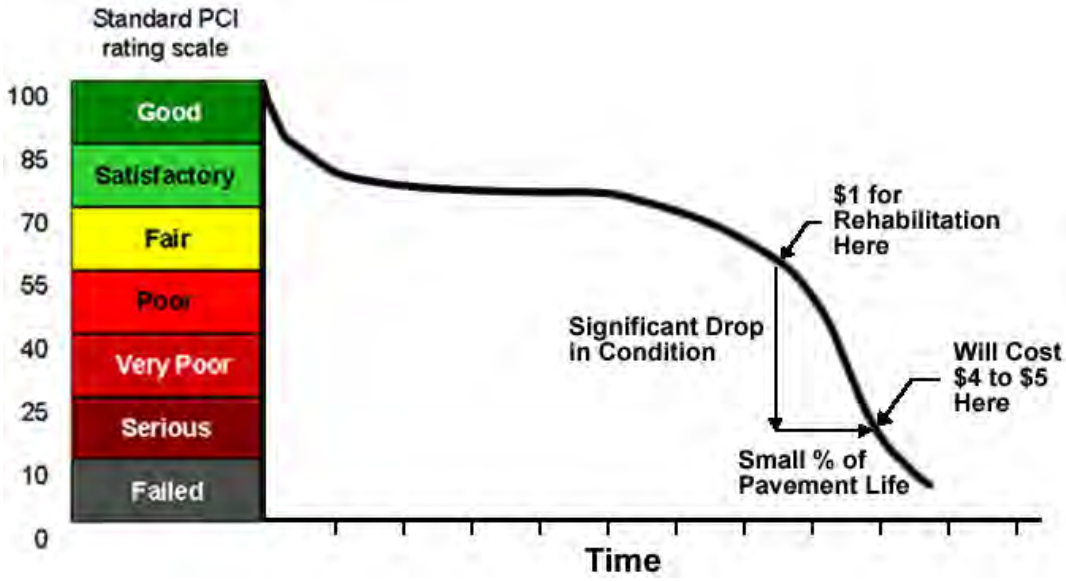
4.0 Roads Best Management Practices

The key to managing a pavement / road network is the timing of maintenance and rehabilitation activities. This idea evolves from the fact that a pavement's structural integrity does not fall constantly with time. A pavement generally provides a constant, acceptable condition for the first part of its service life and then begins to deteriorate very rapidly. In many cases, maintenance and rehabilitation measures are not taken until structural failure or noticeable changes in ride quality become apparent. This is the "fix it once it is already broken" approach.

The unfortunate consequence of this decision is that maintenance and rehabilitation becomes exponentially more expensive over the life of the pavement and is often overlooked until the pavement condition reaches a severe state of distress. There is opportunity for substantial cost savings when intervention is made *before* the pavement becomes severely compromised; i.e. "fix it before it breaks". Figure 1 illustrates the underlying principle in support of a preservation management approach to pavement infrastructure. The principle also has application to each of the classes of roads maintained by the Township. Significant cost savings will result from proactive intervention rather than simply waiting as long as possible before performing maintenance.

Examples of approach to roads management with their associated cost implications over the lifecycle of a road are set out below in Section 4.1 and are provided as an illustration of the benefit of a "preservation management approach".

Figure 1 – Typical Service Life of an Asphalt Pavement



A summary of general lifecycle management activities for roads are included in the following table.

Table 5 – Lifecycle Management Activities and Associated Risks

Asset Management Activities	Specific Activities or Planned Actions	Specific Risks of Neglecting Activities or Planned Actions
Non-Infrastructure Solutions	• Regular patrolling as per O. Reg. 239/02	• Failure to regularly patrol Township Roads may mean that unacceptable road conditions are not corrected in a timely manner, increasing public exposure to dangerous road conditions and potentially introducing financial liabilities to the Township
	• Regular Road Need Study Updates	• Neglecting to conduct regular updates to the Road Needs Study will force decision makers to rely on outdated information to plan pavement interventions and budget accordingly. PCI deterioration curves cannot be fitted to local conditions without multiple ratings over time.
	• Regular inspection and maintenance of underground infrastructure	• If underground infrastructure fails prematurely, the road assets above also fail.
	• Align road and underground infrastructure work	• If road work is not aligned with related assets, it is likely that that the Township will end up duplicating road work.
	• Maintain accurate records of road work	• Failure to maintain accurate road histories increases the amount of uncertainty for planners.
Asset Acquisition / Procurement / Construction	• Ensure roads are properly designed and constructed prior to assumption	• Assumption of poorly constructed and designed roads may leave the Township with unexpected costs in the medium term future. Poor road design may require substantial, complex work to correct, or leave the Township with a substandard asset in perpetuity.
Asset Maintenance Activities	• Ditch Cleanout	• Neglecting ditching may result in premature road distress from saturated base granulars. If

Asset Management Activities	Specific Activities or Planned Actions	Specific Risks of Neglecting Activities or Planned Actions
		ditching fills in entirely, storm events may result in rapid erosion of road embankments.
	• ROW brushing	• Allowing woody vegetation to grow unimpeded within the ROW shades the road in the winter, decreasing the effectiveness of de-icing activities. Trees near the travelled way can be safety hazard in themselves.
	• Spot repairs on guide rail and posts	• Can result in a health and safety hazard.
	• Removal of winter sand berms	• Can result in pseudo-ditches that either impede drainage or cause erosion of the road embankment
	• Clear obstructions from culverts and bridges	• Could result in flooding, undermining of structures and culverts, washouts, and environmental impacts
Asset Preservation	• See Tables 7, 8, 9 for specific approaches to each surface type	• Failure to apply preservation techniques in a timely manner means that less cost effective treatments will be required to bring a road into full repair.
Asset Rehabilitation	• See Tables 7, 8, 9 for specific approaches to each surface type	• Failure to rehabilitate a road in a timely manner will result in a poorly performing surface and generally much more resource intensive interventions up to and including full reconstruction.
Asset Reconstruction	• See Tables 7, 8, 9 for specific approaches to each surface type	• The road will become dangerous to drivers or unpassable.
Asset Decommissioning and Disposal	• Road closure following realignment, removing thru access to traffic by closing a section of a road, or removing a lane from a road.	• Maintaining an unused road / extraneous lane means that Township resources that could be used elsewhere are diverted. Note that permanent roadway / lane closure are appropriate in rare circumstances.

4.1 Ideal PCI Deterioration Curves

For the purposes of this report, three ideal PCI Deterioration Curves were created to estimate the future PCI ratings and remaining useful life of South Stormont's Roads.[3]

Sigmoidal curves were used to characterize the S-shaped PCI curve typical of hard-topped surfaces as detailed below:

$$PCI(t) = a + \frac{b}{1 + e^{c \times t + d}}$$

Where a, b, c, and d are constants used to fit the curve to the data, e is Euler's Number, and t represents the effective age. The constants used in this report are indicated in the table below:

Table 6 – Ideal PCI Deterioration Curve Constants

Constant	HCB	LCB	Description
a	25	15	Although PCI can technically reach zero (representing an impassible road), from a practical standpoint, ad hoc maintenance (potholes, patches) will keep a pavement's terminal PCI above zero.
b	79.56	89.15	The difference between the higher and lower asymptotes of the sigmoidal curve.
c	0.1645	0.2469	Represents the steepness of the curve. The higher the value, the steeper the curve
d	-2.800	-3.020	Shifts the deterioration curve to the left or right. A value of 0 places the inflection point of the sigmoidal curve on the y-axis.

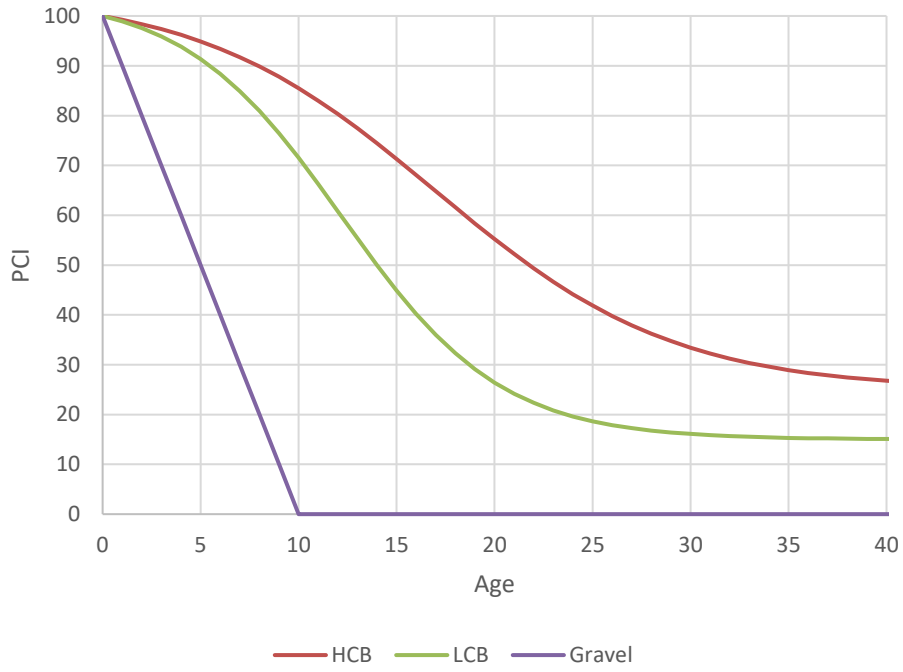
In this report, treatments do not improve the PCI by a constant amount, but reduce the effective age of the pavement by the specified service life extension. This can lead to scenarios where a pavement's effective age is less than zero. In these cases, the PCI is set to 100.

Gravel roads can be maintained indefinitely as long as surface gravel is regularly refreshed and the crown is maintained properly by grading. Therefore, a straight line deterioration is used in lieu of a curve to account for lost material. Note that gravel roads were not inspected based on a PCI approach in the report.

Tables associated with the ideal PCI deterioration curves are found in Appendix B.

[3] Generally, it is best practice to fit PCI deterioration curves with real field data. As this requires at least three data points over time, this was not possible for this report. As all predictions of PCI in this report is based on these unfitted curves, it is expected that there will be discrepancies between predicted and actual future PCI values.

Figure 2 – Ideal PCI Deterioration Curves



4.2 Life Cycle Cost Analysis

For the purposes of this report, a discount rate of 2.5% is used in determining the equivalent annual cost of each treatment strategy. Lifecycle costs are calculated until (and including) the next full reconstruction of each road type. Detailed tables showing deterioration, prescribed treatments, and associated costs by year are provided in Appendices C and D. Externalities and operational costs are not included in this analysis.

4.2.1 Asphalt Roads

Asphalt surfaces are the smoothest and most durable hard top surface used by the Township, however; they are also the most expensive. The Township currently maintains 113 km of asphalt surface roads. Asphalt provides a constant, acceptable condition for the initial portion of its service life but then begins to deteriorate rapidly as it ages. Surface defects such as cracking and raveling are the first signs of the deterioration. If left untreated, the pavement will rapidly deteriorate to the point where reconstruction is the only option. A preservation management strategy can mitigate this by applying renewal treatments earlier in the pavements life before the conditions begin to deteriorate too far. Table 7 below summarizes preservation management activities to be considered for asphalt roads:

Table 7 – Preservation Management Approach – Asphalt Roads

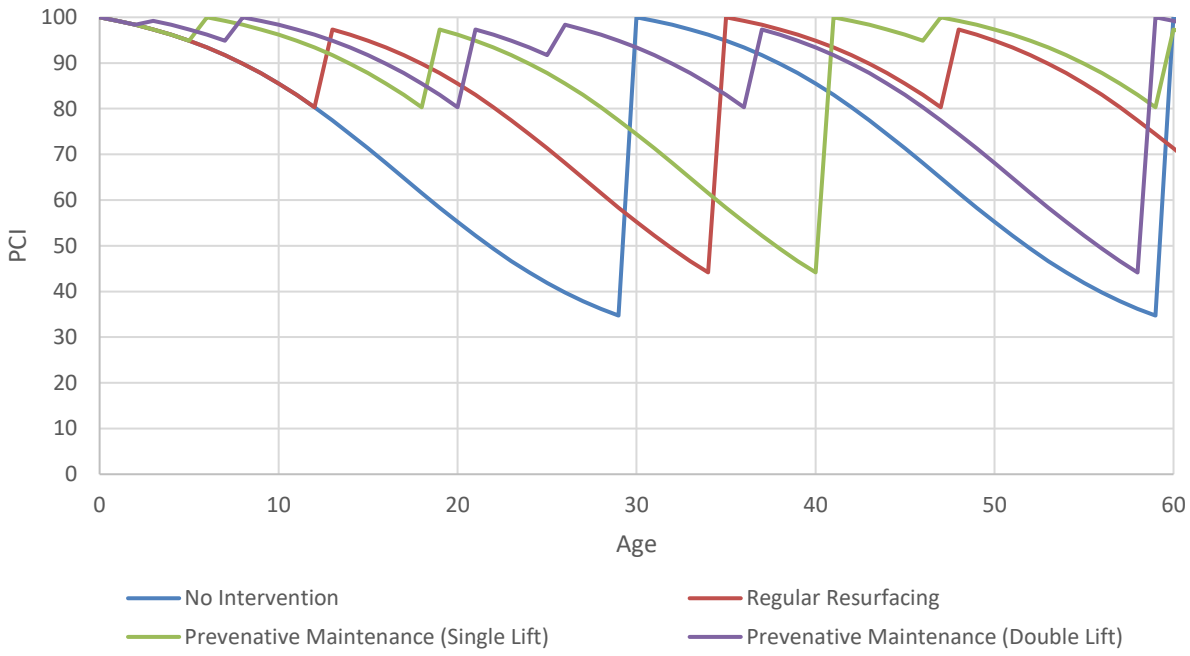
Activity		Age (Years)	PCI Range (Trigger)	Estimated Service Life Extension (Years)	Risk if Application Window is Missed	Cost
Preservation	RS: Route and Seal (Double Lift Only)	2-6	90-100 (97)	2	Unsealed cracks will allow moisture in the base granular and accelerate aging.	$4,000 / km
	SS: Slurry Seal	4-8	88 - 96 (93)	4-6	Preventative maintenance may fail prematurely if applied. No further action until the road becomes a candidate for overlays or mill and paving, which is less cost effective.	$22,000 / km
	MS: Microsurface					$42,000 / km
Rehabilitation	RO1: Overlay 1 lift	12-15	70-80 (77)	10	Overlays / Mill and Pave may fail prematurely if applied. No further action until the road becomes a candidate for major rehabilitation which is less cost effective.	$156,000 / km
	RMP1: Mill and Pave 1 lift					$154,000 / km
	PP1: Pulverize and Pave 1 lift	20-25	<55 (42)	20-25	Restoring HCB may require more intensive rehabilitation up to complete reconstruction, which is less cost effective.	$150,000 / km
	PP2: Pulverize and Pave 2 lifts					$259,000 / km
Replacement	RECON 1R: Reconstruct Rural section and pave 1 lift	30	40 (33)	30	Road may revert to a loose top surface.	$549,000 / km
	RECON 2R: Reconstruct rural section and pave 2 lifts					$668,000 / km

Activity		Age (Years)	PCI Range (Trigger)	Estimated Service Life Extension (Years)	Risk if Application Window is Missed	Cost
	Recon 2S: Reconstruct semi-urban section and pave 2 lifts					$981,000 / km
	RECON 2U: Reconstruct urban section and pave 2 lifts					$986,000 / km

Notes: 1. Slurry seal can be used on lower volume paved roads (less than 1000 vehicles per day). For roads with volumes in excess of 1000 AADT, microsurfacing should be considered. 2. Recon 2S and Recon 2U are used when there is curb and gutter. This represents a minority of the roads in South Stormont and Recon 1R and Recon 2R are used for life cycle analysis.

Figure 3 shows the expected deterioration of an HCB road with No Interventions, Regular Resurfacing, Preventative Maintenance – Single Lift and Preventative Maintenance – Double Lift with equivalent annual costs of $8,510, $4,040, $3,110 and $2,560 / year / km of HCB road for each respective approach.

Figure 3 – HCB Road Asset Management Approach



4.2.2 Surface Treated Roads

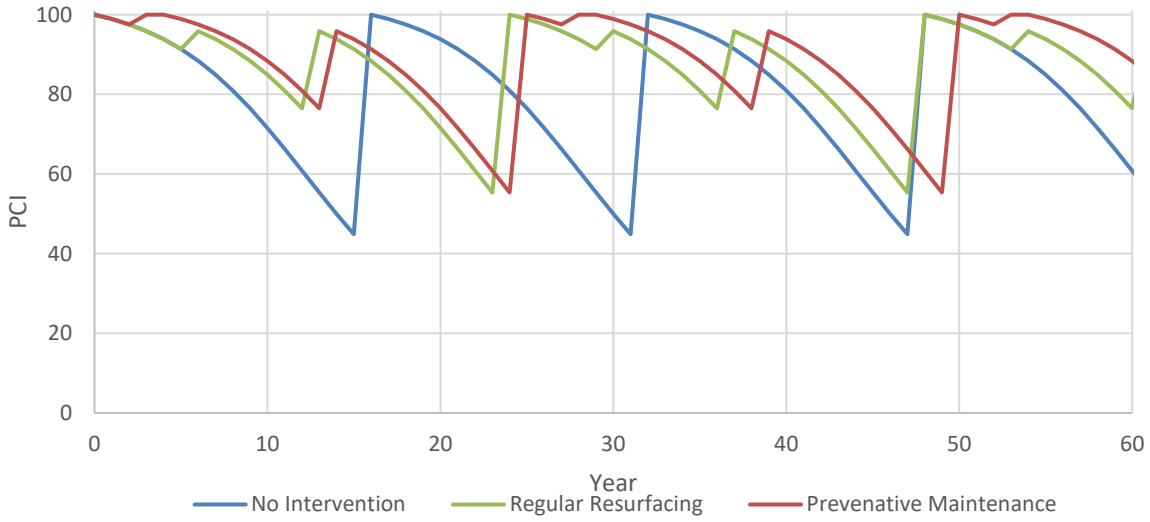
Surface treated roads have a hard wearing surface that must be preserved in order to be effective. The Township currently maintains 84 km of surface treated roads. Unlike gravel roads, a significant investment has been made in the surface and consequently these roads must be managed properly to obtain the longest possible service life from the surface.

Table 8 – Preservation Management Approach – Surface Treated Roads

Activity		Age (Years)	PCI Range (Trigger)	Estimated Service Life Extension (Years)	Risk if Application Window is Missed	Cost
Preservation	SS: Slurry Seal	3	92-100 (95)	4	ST1 may be applied instead, which is less cost-effective.	$22,000 / km
Rehabilitation	ST1: Single Surface Treatment (overlay)	6	80-92 (85)	3	ST2 may be applied instead, which is less cost effective.	$35,000 / km
	ST2: Double Surface Treatment (overlay)	10	65-80 (72)	7	Overlays may fail prematurely. Rehabilitation should be applied as the current surface reaches the end of its useful life, which is less cost effective.	$56,000 / km
	ST2PA: Pulverize and DST with Minor Grade Raise	14	<50 (50)	14	Road may revert to a loose top surface. Restoring LCB may require more intensive rehabilitation up to complete reconstruction.	$108,000 / km
Replacement	RECON LCB: Full Reconstruction	14+	<50 (40)	14	Road will revert to a loose top surface if not extensively patched.	$499,000 / km

Figure 4 shows the expected deterioration of an LCB road with No Interventions, Regular Resurfacing, and Preventative Maintenance with equivalent annual costs of $20,510, $2,980, and $2,550 / year / km of LCB road for each respective approach.

Figure 4 – LCB Road Asset Management Plan



4.2.3 Gravel Roads

The Township currently maintains approximately 10 km of earth roads and103 km of gravel roads. The proposed preservation management approach for this class of road is outlined in the following Table 9.

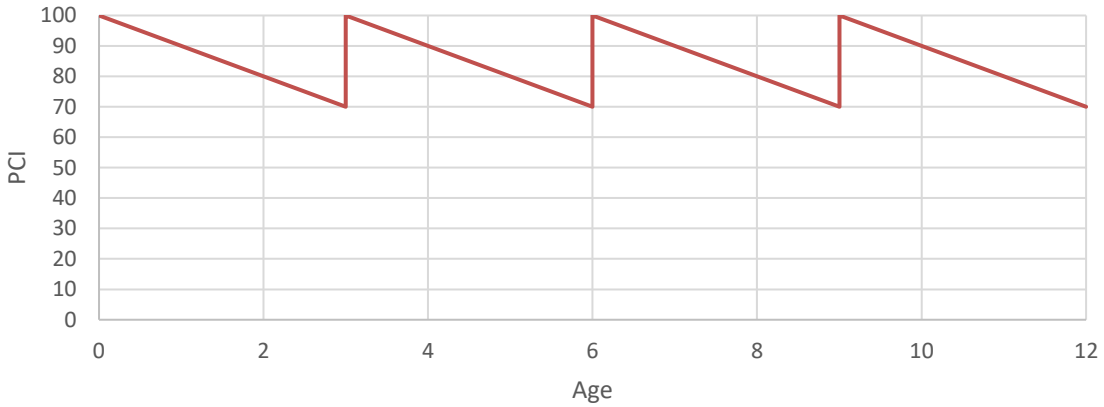
Table 9 – Preservation Management Approach- Gravel Surface

	Action	Frequency	Risk if not Undertaken	Cost
Preservation	Regrade surfaces to maintain smooth / safe driving surface and proper crossfall.	As needed, generally 2-3 times per year for higher volume gravel, or more frequently as necessary; 1-2 for lower volume.	Surface will become dangerously rough. Surface runoff may form gullies and secondary ditches and quickly erode the road base.	This is considered an operational cost and is performed by Township Staff.
	Add calcium to tighten surface, retain aggregate and reduce dust.	Each spring on all roads of higher volume and as needed during summer months.	Aggregate will be lost at a greater rate. Excessive dust may reduce the safety of the travelling public.	This is considered an operational cost and is performed by Township Staff.
	Ditching and brushing of right-of-ways to improve roadbed drainage and safety.	Complete road network every 10 years.	Poor ditching weakens the road base and may be responsible for surface distresses. Brushing increases visibility and reduces winter shading.	This is considered an operational cost and is performed by Township Staff.

	G (50mm): Add layer (50 mm) of granular material to road surface.	Every 3 years for gravel roads.§	Loose-Top surfaces loose aggregate over time. If the gravel supply on the surface is gone, the road will effectively become an earth road and require reconstruction.	$12,000 / km if done by outside contractors (This is done by Township Staff as part of their operations budget)
Replacement	Base and sub-base improvements.	As needed or as dictated by traffic volumes.	Spot Reconstruction is appropriate to repair localized areas of distress.	See below
	Recon G: Reconstructed road using existing embankment	As required due to extensive distress areas.	Road requires excessive maintenance or must be closed.	$332,000 / km
	Convert to Hard Top	As dictated by traffic volumes.	For high traffic roads, loose top surfaces require frequent maintenance and will likely lose aggregate at an accelerated rate.	Highly Variable depending on existing structure and new surface type.

Figure 5 shows the expected deterioration of a gravel road with regular refreshment of the surface gravel. The cost of gravel is estimated at $4,000 / year / km of gravel road. Note that this cost only includes the capital costs – grading, calcium application, and ditching and brushing are considered operational costs within this report.

Figure 5 – Gravel Road Asset Management Approach



§ Actual rate may vary. Generally, 50-75mm of a loose topped surface is lost every 3-5 years.

4.3 Application of Asset Management Approaches

Table 10 summarizes the theoretical outcomes of each strategy. The preventative maintenance approach is both less expensive and provides a higher average PCI over time.

Table 10 – Treatment Strategies

	HCB (Double Lift)	HCB (Single Lift)	LCB	Gravel
Length (km)	6	106	84	113
No Intervention				
Equivalent Annual Cost / km ($K) **	8.51	8.51	20.51	4.00
Expected Annual Cost ($K)	51.07	902.23	1,723.24	452.00
Average PCI (Hardtop Only)	70.39	70.39	78.57	-
Average Overall PCI (Hard Top Only)				73.9
Total Expected Annual Cost ($K)				3,128.54
Regular Resurfacing				
Equivalent Annual Cost / km ($K)**	4.04	4.04	2.98	4.00
Expected Annual Cost ($K)	24.22	427.86	250.23	452.00
Average PCI (Hardtop Only)	77.77	77.77	84.85	-
Average Overall PCI (Hard Top Only)				80.8
Total Expected Annual Cost ($K)				1,154.31
Preventative Maintenance				
Equivalent Annual Cost / km ($K) **	2.56	3.11	2.55	4.00
Expected Annual Cost ($K)	15.35	329.98	214.19	452.00
Average PCI (Hardtop Only)	84.10	80.52	86.05	-
Average Overall PCI (Hard Top Only)				83.0
Total Expected Annual Cost ($K)				1,011.51

The preservation management activities detailed in each of the tables above are not necessarily intended or required to be completed on each and every road. Road deterioration rates and the type of deterioration will dictate when action should be taken and what kind of treatment is most appropriate. The intention of the above is to outline the series of techniques to be considered in an effort to realize and extend the useful service life of the road asset for the lowest overall lifecycle cost while maintaining the highest overall condition. As detailed in the life cycle costs analysis presented

** Note that the equivalent annual cost is calculated based on starting with a new pavement structure (i.e. the reconstruction costs are incurred at the tail end of the cycle.

above, the preservation management approach to roads is proven to yield the lowest overall life-cycle costs.

Each of the preservation management activities for gravel, surface treatment and asphalt roads identified above (including route and seal, slurry seal, resurfacing etc.), shall be considered as part of the regular Road Needs Study Report every five (5) years.

5.0 Road Needs Study Summary Table

5.1 Types of Improvements

All roads were examined to appraise the extent and type of improvement necessary.

"Order of Magnitude" construction costs were developed for each of the below options on a per kilometre basis. An estimated cost for isolated frost heave repairs was also considered.

The below alternative rehabilitation / reconstruction strategies are considered preliminary in nature and are intended to assist in providing an order of magnitude cost estimate to rehabilitate the road. Further field investigations and engineering design is required to confirm and develop the rehabilitation strategies for each road.

5.1.1 Asphalt

High Class Bituminous roads (HCB) or hot mix asphalt roads have rehabilitation alternatives ranging from a simple overlay to complete reconstruction. The following is a listing of standard road rehabilitation techniques that were considered for HCB or hot mix asphalt roads.

RO1	Resurfacing, Single-Lift Overlay. This results in a very minor grade raise.
RMP1	Resurfacing, Mill and Pave 1-Lift.
PP1	Pulverize and Pave 1-Lift. This results in a slight grade raise.
PP2	Pulverize and Pave 2-Lifts. This results in a modest grade raise.
Recon 1R	Excavate and Reconstruct Road and Pave 1-Lift. Used when ditching is controlled by ditching on both sides of the roadway.
Recon 2S	Excavate and Reconstruct Semi-Urban Road and Pave 2-Lifts. Used when drainage is controlled by curb and gutter on one side of the roadway (a minority of roads in South Stormont).
Recon 2U	Excavate and Reconstruct Urban Road and Pave 2-Lifts – Urban. Used when drainage is controlled by curbs on both sides of the roadway (a minority of roads in South Stormont).
SS	Slurry Seal (Preventative Maintenance).
MS	Microsurfacing (Preventative Maintenance).

RS	Route and Seal (Preventative Maintenance).

5.1.2 Surface Treatment

Surface treated roads are generally able to be rehabilitated with either a single or double Low Class Bituminous (LCB) overlay treatment. They may also be upgraded to HCB pavement or downgraded to gravel. In some cases, previous resurfacing of LCB roads has occurred or the LCB surface or road structure has deteriorated to a state where a simple overlay surface treatment is not feasible. In these cases consideration can be given to removal or pulverizing of the existing surface treatment and placement of a new application. In some cases, where it is necessary to improve the overall roadbed structure, the addition of Granular A to build up the road and the reapplication of a surface treatment is recommended. The following is a listing of standard road rehabilitation techniques that were considered for LCB (surface treated) roads:

ST1	Single Surface Treatment.
ST2	Double Surface Treatment.
ST2PA	Double Surface Treatment, over Pulverized Existing and New Granular A. This results in a moderate grade raise.
Recon LCB	Excavate and Reconstruct Rural Road with double surface treatment.
SS	Slurry Seal (Preventative Maintenance).

5.1.3 Gravel

G (50mm)	Surface granular refreshment.
Recon G	Excavate and Reconstruct Gravel / Earth Road.

Gravel roads can likewise be upgraded with the reapplication of Gravel (G) or surface treatments (ST1 / ST2).

5.2 Benchmark Construction Costs

The Unit Price Form found in Appendix A is based on average prices for the local area. The unit prices were used to prepare an array of benchmark construction costs.

6.0 Improvement Plan

In the following tables you will find four (4) columns being used to describe the condition of the road; PCI, Surface Condition, Structural Adequacy, and Condition Rating.

PCI: Represents the condition of a road's pavement – the higher, the better the pavement is performing. *Rated on a scale of 0 to 100*.

Surface Condition: Surface conditions relate to driving ease, comfort and safety. Inadequacies for paved surface include excessive or uneven crowns, washboarding, raveling and bumpiness because of cracking, sealing, and rough patching. Inadequacies on loose top surfaces do not include situations that can be readily corrected by maintenance blading. They do include unconsolidated surfaces due to poorly graded or clean aggregate and permanent roughness due to insufficient depth of aggregate or weak subgrade. The effects of surface inadequacies in ascending order of seriousness are noise, vibration, sway, excessive steering effort and reduced speed. *Rated on a scale of 1 to 10*.

Structural Adequacy: The Structural Adequacy point rating relates to the capability of the surface and base courses to support a load and to resist deformation or rupture. Soft spots and frost boils are structural adequacy distress signs for loose top roads. For paved surfaces, distress signs may be cracking, rutting, heaving, pot-holing, roughness, alligatoring, dishing, breakup, distortion, frost boils, etc. *Rated on a scale of 1 to 20*.

Condition Rating: A holistic rating that sums point ratings from alignment, surface condition, surface width, level of service, structural adequacy, drainage and maintenance demands. The condition rating is one of the major factors used to calculate the Priority Rating. *Rated on a scale of 1 to 100*.

6.1 Capital Plan – Fully Funded vs Existing Budget

A fully funded capital program is included in Table 12. The fully funded capital plan applies treatments when they reach trigger PCI values as the tables in Section 4 (i.e. budget levels are unrestricted and allowed to fluctuate freely from year to year). Within a specific year, treatments are listed in descending priority.

Over the next 10 years, this program would spend $23.6 M and reconstruct or rehabilitate 152 km of road. If implemented along with a fully funded preservation plan as per Table 13, the average PCI for hard top roads is expected to improve dramatically from 72 to 91 points. The Condition Rating as per the Inventory Manual is expected to increase from 77.0 to 80.2. If implemented, the Township's network would be left in excellent condition

A capital program based on existing funding level of $1.5 M / year is included in Table 14. This program is based on the highest priority sections from in Table 12. Treatment years have been shifted so that the annual expected cost remains stable from year to year. Within a specific year, treatments are listed in descending priority.

Theoretically, the Township's average hardtop PCI would drop from 72 to 69 if the existing budget is maintained and the Township did not carry out a preservation management approach. If conducted alongside a fully funded preservation program,

the average hardtop PCI may increase to 75. The Condition Rating, as per the Inventory Manual, is expected to drop from 77.0 to 74.2. This suggests that current funding is adequate to maintain the existing level of service over the next 10 years, but is unsustainable in the long term – it defers a significant amount of identified rehabilitation candidates which may require even more expensive interventions following 2031 and requires a practically perfectly implemented preservation program to maintain the average PCI.

Table 11 – Fully Funded and Existing Budget Scenarios

Item	Fully Funded Plan	Existing Budget
Annual Capital Funding	$ 2.3 M	$ 1.5 M
Annual Reconstruction Budget	$ 0.6	$ 0.4
Annual Rehabilitation Budget	$ 1.7	$ 1.1
Length of roads rehabilitated or reconstructed	152 km	100 km
Annual Preservation Budget *(Considered an Operational Cost)*	$ 0.3 M	$ 0.3 M
2021 PCI*	72	72
Estimated 2031 PCI with Capital Work Alone*	83 (+11)	69 (-3)
Estimated 2031 PCI with Capital and Preservation Programs*	91 (+19)	75 (+3)
2021 Condition Rating	77.0	77.0
Estimated 2031 Condition Rating with Capital Work and Preservation (Hard Top)*	80.2 (+3.2)	74.2 (-2.8)

**Average PCI not weighted by AADT*

Figure 6 – Fully Funded vs Existing Budget, Total

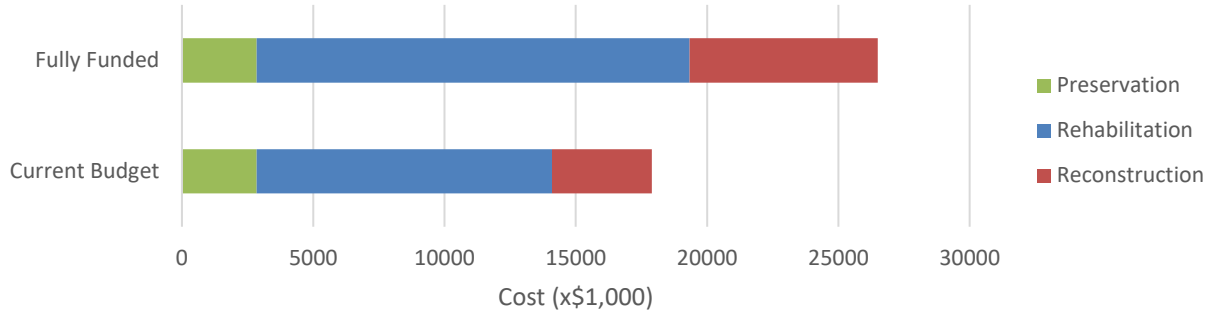


Figure 7 – Fully Funded vs Existing Budget, Yearly Breakdown

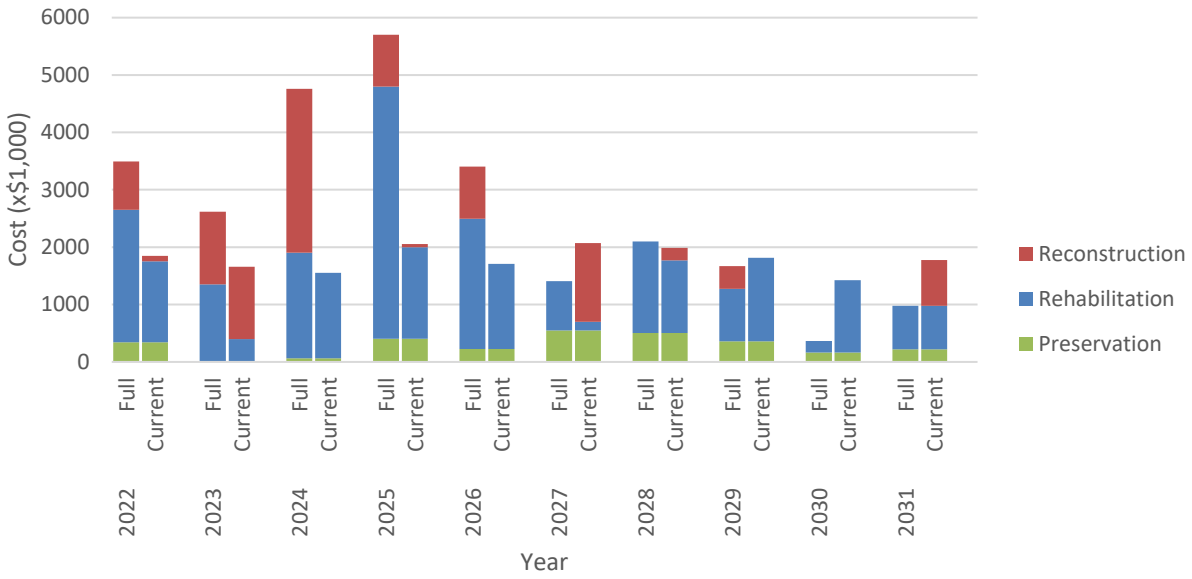


Table 12 – Township of South Stormont Capital Improvement Plan – Fully Funded

Sect. No.	Road Name	From	To	Length (km)	AADT	Preliminary Improvement Type Recommendation	Cost (x1000)	PCI (2021)	Surface Condition	Structural Adequacy	Condition Rating
2022											
197	Mille Roches Road	Cherry Avenue	County Road 36	0.7	2350	*RO1*	*$109*	77.3	8	15	73
002	Lefebvre Road	Island Road	County Road 18	0.1	214	*RO1*	*$16*	79.7	7	14	77
178	Farran Drive	County Road 2	Spruce Street	0.6	1278	*RO1*	*$94*	77.4	7	14	78
209	Plaza Street	Long Sault Drive	Simcoe Street	0.1	800	*RECON 2S*	*$98*	31.4	3	6	65
206	Saunders Avenue	Strachan Avenue	Frost Avenue	0.75	600	*RMP1*	*$115*	76.3	7	14	82
076	Dixon Road	Northfield Road	MacRae Road	0.65	240	*ST2*	*$36*	79.0	8	16	82
011	North Branch Road	South Glengarry Boundary	Delaney Road	1.8	330	*ST2PA*	*$195*	54.7	6	11	74
021	Haughton Street	Willis Street	Dead End	0.2	49	*PP1*	*$30*	44.3	5	7	67
192	Moak Street	Dale Street	David Street	0.15	49	*RO1*	*$23*	79.7	8	16	84
223	Algonquin Drive	County Road 2	Dead End	0.4	100	*RO1*	*$62*	80.8	7	14	77
016C	Cameron Road	Highway 138	Dead End	2.4	295	*ST2PA*	*$260*	54.7	6	11	75
238	Joseph Street	MacLennan Street	Philip Street	0.3	49	*PP1*	*$45*	44.9	5	9	72
231	Alguire Avenue	Mack Street	Melba Street	0.5	49	*PP1*	*$75*	44.2	4	7	67
088	Eaman Road	1.7km west of County Road 12	County Road 14	3.5	202	*ST2PA*	*$379*	50.7	5	7	62
115	Hunters Road	County Road 12	County Road 11	8	213	*ST2PA*	*$866*	48.4	5	8	68

Sect. No.	Road Name	From	To	Length (km)	AADT	Preliminary Improvement Type Recommendation	Cost (x1000)	PCI (2021)	Surface Condition	Structural Adequacy	Condition Rating
121	Mary's Road	County Road 11	County Road 18	3.4	102	*Conduct Drainage Study, Ensure culverts are sized properly and raise road grade above spring flood levels*	*$632*	0.0	7	14	64
010	Bingley Road	Willy Bill Road	Dead End	1.5	44	*Conduct Drainage Study, Ensure culverts are sized properly and raise road grade above spring flood levels*	*$86*	0.0	8	16	65
066	Chisholm Road	County Road 18	County Road 36	0.95	508	*Conduct Drainage Study, Ensure culverts are sized properly and raise road grade above spring flood levels*	*$29*	0.0	8	16	75
2023											
208A	Long Sault Drive	County Road 35	Plaza Street	0.1	1718	*RO1*	*$16*	81.1	8	16	86
188	Santa Cruz Drive	Woodlands Road	Wales Drive	0.1	602	*PP1*	*$15*	46.7	4	7	68
068B	Windfall Road	2.5km north of County Road 35	County Road 18	0.9	469	*ST2PA*	*$97*	60.1	6	12	61
237	Marydale Avenue	Dead End	Joseph Street	1.3	725	*PP1*	*$195*	48.7	4	7	69
183	Elm Street	County Road 14	Wales Drive	0.5	275	*RO1*	*$78*	84.1	7	14	81
239	Philip Street	Dead End	Marydale Avenue	0.15	49	*PP1*	*$23*	48.5	5	10	72
068A	Windfall Road	County Road 35	2.5km northerly	2.6	469	*ST2PA*	*$282*	60.6	6	12	59
013	McPhail Road	Delaney Road	2.8km west of Delaney Road	2.8	407	*ST2PA*	*$303*	61.8	6	11	62
004	Island Road	Delaney Road	Edge of South Glengarry Boundary	2.2	301	*ST1*	*$77*	89.4	9	18	86
260	Primrose Lane	Columbia Avenue	Dead End	0.3	49	*RO1*	*$47*	82.0	8	16	81

Sect. No.	Road Name	From	To	Length (km)	AADT	Preliminary Improvement Type Recommendation	Cost (x1000)	PCI (2021)	Surface Condition	Structural Adequacy	Condition Rating
017	Amell & Ranald George Road	Highway 138	Dead End	1.9	146	*ST2PA*	*$206*	56.8	6	10	73
085	Saving Street	County Road 14	2.3km east of County Road 14	2.3	157	*RECON 1R*	*$1,262*	35.3	3	5	57
2024											
232	Melba Street	Alguire Avenue	Marydale Avenue	0.25	801	*PP1*	*$38*	49.6	5	10	72
233	Sunnyview Avenue	Melba Street	Mack Street	0.5	801	*PP1*	*$75*	51.7	5	10	73
180	College Street	Farran Drive	County Road 14	0.4	600	*RO1*	*$62*	83.5	8	16	88
145	Stuart Road	Manning Road	Dead End	0.1	49	*ST2PA*	*$11*	64.3	7	14	78
207	Frost Avenue	Strachan Avenue	Mille Roches Road	0.5	400	*RO1*	*$78*	85.4	8	15	85
213	Robin Road	County Road 2	Dead End	0.2	143	*RO1*	*$31*	83.4	7	14	79
245	Bruce Street	Dead End	Cornwall Center Road	1	318	*PP1*	*$150*	49.2	5	9	71
073	Eamer Road	1.6km east of North Field Road	County Road 15	1.4	320	*ST2PA*	*$152*	65.6	6	12	73
156	Willbruck Drive	Ault Island Road	Dead End	1.8	387	*PP1*	*$270*	50.2	5	7	71
124C	North Lunenburg Road West	County Road 14	0.8km east of County Road 14	0.8	171	*PP1*	*$120*	51.7	5	6	64
040C	Atchison Road	1.35km east of Richmond Drive	County Road 33	1.1	151	*ST2PA*	*$119*	65.7	7	13	79
100A	Eligh-Beckstead Road	0.9km east of County Road 11	2.0km east of County Road 11	2.1	284	*ST2*	*$118*	83.1	8	16	82

Sect. No.	Road Name	From	To	Length (km)	AADT	Preliminary Improvement Type Recommendation	Cost (x1000)	PCI (2021)	Surface Condition	Structural Adequacy	Condition Rating
032	Headline Road	County Road 33	2.5km east of County Road 33	2.5	1344	*RECON 1R*	*$1,372*	84.7	8	16	75
241	Daisy Street	Marydale Avenue	Rosedale Avenue	0.3	23	*PP1*	*$45*	49.2	5	9	73
243	Jean Street	Rosedale Avenue	Marydale Avenue	0.3	74	*RECON 1R*	*$165*	37.1	4	7	72
040B	Atchison Road	Richmond Drive	1.35km East of Richmond Drive	2	151	*ST2PA*	*$217*	65.7	7	13	79
098	Neville Road	Rombough Road	County Road 14	2	140	*ST2PA*	*$217*	66.0	7	13	80
169	Shaver Road	Colonial Drive	0.7 km North	0.7	49	*ST2PA*	*$76*	64.3	7	13	76
177	Spruce Street	Farran Drive	Hickory Street	0.4	49	*RO1*	*$62*	84.9	8	15	85
242	Rosedale Avenue	Daisy Street	Jean Street	0.4	49	*RECON 1R*	*$220*	38.1	4	7	67
127	Cooper Road	County Road 12	2.0km west of County Road 12	2	132	*RECON 1R*	*$1,098*	38.5	4	6	64
2025											
158	Killarney Avenue	County Road 2	St. Lawrence Street	0.1	400	*RECON 1R*	*$55*	39.3	4	7	68
062A	Myers Road	O'Keefe Road	1.0km east of O'Keefe Road	1	758	*PP1*	*$150*	52.6	5	9	54
172	Ault Drive	St. Lawrence Street	Hickory Street	0.4	600	*RO1*	*$62*	87.5	8	15	85
202	Strachan Avenue	County Road 35	St. Laurent Avenue	0.3	400	*RMP1*	*$46*	88.7	8	16	86
226	Thompson Drive	Penny Lane	County Road 15	0.2	100	*PP1*	*$30*	52.6	5	9	68
186	Woodlands Road	Santa Cruz Drive	0.2km North	0.4	600	*RECON 1R*	*$220*	39.1	4	3	64
037	Poplar Avenue	Headline Road	Beaver Dam Road	0.5	245	*PP1*	*$75*	54.9	5	9	72

Sect. No.	Road Name	From	To	Length (km)	AADT	Preliminary Improvement Type Recommendation	Cost (x1000)	PCI (2021)	Surface Condition	Structural Adequacy	Condition Rating
105A	Morgan Road	County Road 18	Duffy's Road	0.3	220	*ST2*	*$17*	86.3	9	18	86
203	St. Laurent Avenue	Saunders Avenue	County Road 35	0.4	400	*RMP1*	*$62*	88.5	8	16	86
246	Virgina Street	Highway 138	Bruce Street	0.15	49	*PP1*	*$23*	54.3	5	9	71
096A	Rombough Road	County Road 18	Pleasant Valley Road	1.1	336	*PP1*	*$165*	54.9	5	7	68
101	Eligh-Beckstead Road	3.5 km West of County Road 14	County Road 11	0.9	284	*ST2PA*	*$97*	71.2	7	14	78
235	St. James Street	Sunnyview Avenue	Dead End	0.2	49	*PP1*	*$30*	51.9	5	10	73
039	Equestrian Drive	Beaver Dam Road	Beaver Dam Road	0.5	100	*PP1*	*$75*	52.2	5	10	74
038	Beaver Dam Drive	Poplar Avenue	County Road 33	1.2	216	*PP1*	*$180*	52.2	5	10	78
100	Eligh-Beckstead Road	County Road 14	2.0km East of County Road 11	1.3	284	*ST2PA*	*$141*	71.2	7	15	79
240	Yolanda Street	Marydale Avenue	Grantley Drive	0.35	49	*PP1*	*$53*	54.5	5	9	73
006	Delaney Road	Island Road	North Branch Road	2.2	354	*ST2PA*	*$238*	70.1	7	13	77
089B	Dafoe Road	1.2km east of Aultsville Road	2.1km west of County Road 14	2.7	332	*PP1*	*$406*	53.7	5	7	65
035	Cedar View Drive	Headline Road	Dead End	0.4	49	*PP1*	*$60*	53.6	5	10	74
074A	Northfield Road	Dixon Road	2.1km west of County Road 15	1.2	179	*ST2PA*	*$130*	69.5	7	14	77
097	Rombough Road	Pleasant Valley Road	Eligh-Beckstead Road	2.3	336	*ST2PA*	*$249*	68.2	7	13	78
221	Warner Drive	Sixsmith Drive	Dead End	0.45	49	*PP1*	*$68*	54.5	5	10	69
022	Carleton Street	Highway 138	Dead End	0.15	49	*RECON 1R*	*$82*	40.1	4	6	61

Sect. No.	Road Name	From	To	Length (km)	AADT	Preliminary Improvement Type Recommendation	Cost (x1000)	PCI (2021)	Surface Condition	Structural Adequacy	Condition Rating
244	Thomas Street	Jean Street	Daisy Street	0.4	41	*PP1*	*$60*	54.7	5	9	72
110B	May Road	0.70 km south of Hunters Road	Trillium Road	1.3	163	*ST2PA*	*$141*	69.8	7	14	78
261	Stratford Boulevard	Fickes Road	Dead End	0.2	49	*RMP1*	*$31*	87.3	8	16	85
087	Eaman Road	County Road 12	1.7km west of County Road 12	1.7	206	*ST2PA*	*$184*	70.4	7	14	77
110C	May Road	Trillium Road	Bush Glen Road	1.5	179	*ST2PA*	*$162*	69.8	7	14	78
111A	Sandtown Road	County Road 12	1.5km west of County Road 12	1.5	178	*ST2*	*$84*	87.5	9	18	85
105B	Morgan Road	Duffy's Road	Dafoe Road	2	220	*ST2*	*$112*	86.3	9	18	86
074B	Northfield Road	2.1km west of County Road 15	County Road 15	2.1	179	*ST2PA*	*$227*	71.5	7	14	76
065	Valade Road	Highway 138	County Road 18	3.1	230	*ST2PA*	*$336*	70.5	8	15	81
023	Fraser Street	County Road 18	Dead End	0.3	49	*RECON 1R*	*$165*	39.0	4	6	60
257	Penny Lane	Thompson Drive	Columbia Avenue	0.3	49	*RECON 1R*	*$165*	39.1	4	7	68
111B	Sandtown Road	1.5km west of County Road 12	May Road	1.9	147	*ST2*	*$106*	87.5	9	18	85
113	Otto Road	County Road 14	May Road	3.2	201	*ST2PA*	*$346*	68.7	7	14	79
063	Cornett Lane	Myers Road	Dead End	0.4	49	*RECON 1R*	*$220*	40.3	4	6	66
124A	North Lunenburg Road West	0.8km east of County Road 14	0.9km west of County Road 12	4.4	164	*ST2*	*$246*	86.9	9	18	87
2026											
230	Mack Street	Cornwall Center Road	Alguire Avenue	0.4	1529	*RECON 1R*	*$220*	41.7	4	7	68

Sect. No.	Road Name	From	To	Length (km)	AADT	Preliminary Improvement Type Recommendation	Cost (x1000)	PCI (2021)	Surface Condition	Structural Adequacy	Condition Rating
195	Simcoe Street	County Road 35	Mille Roches Road	0.5	1857	*RECON 1R*	*$274*	40.9	3	6	60
149	Farran's Point Road	County Road 2	0.3 km North	0.3	239	*PP1*	*$45*	56.0	5	8	69
249	Cheryl Street	Marydale Avenue	Highway 138	0.45	1061	*RECON 1R*	*$247*	40.6	4	8	59
147	Vin Vista Drive	County Road 2	Dead End	1.1	507	*PP1*	*$165*	54.3	5	9	69
161	St. Lawrence Street	Dead End @ West End	Dickinson Drive	1.4	496	*PP1*	*$210*	54.7	5	10	73
236	Crystal Street	Sunnyview Avenue	Alguire Street	0.15	49	*PP1*	*$23*	55.1	5	10	73
109B	Bush Glen Road	0.4km west of Hart Road	Otto Road	0.4	136	*ST2PA*	*$43*	72.0	8	15	79
110A	May Road	Hunters Road	0.70 km South of Hunters Road	0.7	163	*PP1*	*$105*	57.6	6	9	69
155	Ault Island Road	County Road 2	Willbruck Drive	1.8	400	*PP1*	*$270*	56.8	6	10	62
026	Dow Street	Highway 138	Dead End	0.25	49	*PP1*	*$38*	56.8	5	8	75
228	Jenkins Road	Dead End	County Road 15	0.3	49	*PP1*	*$45*	54.9	5	10	69
036	Marl Street	Cedarview Road	Dead End	0.1	49	*RECON 1R*	*$55*	41.8	4	6	68
218	Chantine Drive	Dead End West	Dead End East	0.6	49	*PP1*	*$90*	57.3	5	10	73
024	MacIntosh Lane	County Road 18	Dead End	0.2	49	*RECON 1R*	*$110*	42.0	4	6	63
080	North Lunenburg Road East	County Road 12	Northfield Road	1.9	189	*ST2PA*	*$206*	76.1	8	16	81
049	Black River Road	County Road 15	County Road 18	2.85	187	*PP1*	*$428*	56.9	5	10	72
077	Dixon Road	MacRae Road	County Road 12	2.8	223	*ST2PA*	*$303*	76.1	8	16	82

Sect. No.	Road Name	From	To	Length (km)	AADT	Preliminary Improvement Type Recommendation	Cost (x1000)	PCI (2021)	Surface Condition	Structural Adequacy	Condition Rating
106	North Valley Road	Otto Road	Eligh-Beckstead Road	2.8	214	*ST2PA*	*$303*	76.1	8	15	82
2027											
199	French Avenue	Cherry Avenue	County Road 35	0.4	828	*PP1*	*$60*	59.5	6	12	77
267	MacLennan Street	Marydale Avenue	Joseph Street	0.1	49	*PP1*	*$15*	61.1	6	12	77
175	Hickory Street	Piercy Street	Ault Drive	0.5	600	*RO1*	*$78*	90.6	8	16	84
163	Maple Street	Farran Drive	Bank Street	0.15	49	*PP1*	*$23*	60.1	6	12	73
171	Shaver Road	Colonial Road	County Road 2	0.15	49	*PP1*	*$23*	60.5	6	11	72
078	Bilmer Road	Dixon Road	Dead End	0.1	49	*RO1*	*$16*	90.6	8	16	85
160	Napier Street	St. Lawrence Street	Hickory Street	0.35	49	*PP1*	*$53*	59.5	6	11	76
227	Moss Drive	County Road 15	Jenkins Road	0.35	49	*PP1*	*$53*	59.8	6	11	72
148	Colonial Drive	Dead End (East End)	County Road 2	2.7	189	*PP1*	*$406*	60.5	6	11	74
029	Speer Road	Cornwall Centre Road	Dead End	0.9	49	*PP1*	*$135*	60.3	6	11	75
2028											
062B	Myers Road	1.0km east of O'Keefe Road	Highway 138	0.7	758	*PP1*	*$105*	64.0	6	11	57
184	Hoople Street	Wales Drive	Elm Street	0.45	185	*PP1*	*$68*	63.8	6	10	74
219	Structured Products Drive	County Road 2	Dead End	0.2	49	*PP1*	*$30*	63.8	6	12	77
234	Virgina Street	Sunnyview Avenue	Dead End	0.2	49	*PP1*	*$30*	63.8	6	11	76
034	Charlotte Avenue	Headline Road	Dead End	0.25	49	*PP1*	*$38*	62.4	6	12	77
056	O'Keefe Road	Myers Road	Wheeler Road	1.85	355	*PP1*	*$278*	64.0	6	12	77
058	Wheeler Road	Highway 138	O'Keefe Road	1.6	274	*PP1*	*$240*	64.4	6	11	73

Sect. No.	Road Name	From	To	Length (km)	AADT	Preliminary Improvement Type Recommendation	Cost (x1000)	PCI (2021)	Surface Condition	Structural Adequacy	Condition Rating
225	Columbia Avenue	Dead End, East	Thompson Drive	0.6	100	*PP1*	*$90*	61.5	5	9	68
194	Brown Street	Dale Street	David Street	0.15	49	*RO1*	*$23*	92.1	8	17	87
248	Stephen Street	Highway 138	Bruce Street	0.15	49	*RO1*	*$23*	93.0	8	16	85
045	Willy Allan Road	Highway 138	3.5km west of Hwy 138	3.5	282	*PP1*	*$526*	62.8	6	10	76
124B	North Lunenburg Road West	0.9km west of County Road 12	County Road 12	0.9	100	*RO1*	*$140*	92.1	9	17	86
2029											
176	Hickory Street	Ault Drive	Farran Drive	0.7	753	*PP1*	*$105*	65.7	6	11	75
051	McClave Road	County Road 18	Maloney Road	0.2	100	*PP1*	*$30*	66.5	6	12	76
020	Willis Street	County Road 18	Haughton Street	0.1	49	*PP1*	*$15*	67.8	6	12	73
141	Loyalist Crescent	County Road 12	County Road 12	0.7	100	*PP1*	*$105*	67.8	6	12	77
220	Sixsmith Drive	County Road 2	Dead End	0.4	49	*PP1*	*$60*	65.9	6	11	76
004	Island Road	Delaney Road	Edge of South Glengarry Boundary	2.2	301	*ST2*	*$123*	89.4	9	18	86
059	Maloney Road	O'Keefe Road	County Road 18	3.2	250	*PP1*	*$481*	66.5	6	12	75
201	Ouellette Avenue	County Road 35	French Avenue	0.4	49	*RECON 2U*	*$394*	48.5	5	9	78
2030											
210	Bethune Avenue	County Road 36	Mille Roches Road	0.65	1200	*PP1*	*$98*	70.5	7	14	78
185	Wales Drive	Dead End	County Road 2	0.6	325	*PP1*	*$90*	68.8	6	12	77
212	Adam Dixon Avenue	Bethune Avenue	Kent Crescent	0.1	49	*PP1*	*$15*	70.5	7	14	82
2031											
191	Dale Street	Manning Road	Moak Street	0.5	490	*PP1*	*$75*	71.4	7	14	82

Sect. No.	Road Name	From	To	Length (km)	AADT	Preliminary Improvement Type Recommendation	Cost (x1000)	PCI (2021)	Surface Condition	Structural Adequacy	Condition Rating
224	Saskatchewan Drive	Alonquin Avenue	Columbia Avenue	0.15	100	*PP1*	*$23*	70.3	7	14	77
157	MacLeod Road	County Road 2	Dead End	0.2	100	*PP1*	*$30*	73.0	7	14	67
123B	Aultsville Road	County Road 2	1.6km north of County Road 2	1.6	610	*PP1*	*$240*	73.0	7	14	82
193	David Street	Moak Street	Manning Road	0.5	134	*PP1*	*$75*	71.4	7	14	82
061	Myers Road	4.0km east of County Road 15	O'Keefe Road	2.1	378	*PP1*	*$315*	74.1	7	13	76

Notes:

1. *Rehabilitation strategy to be confirmed by geotechnical investigations at detail design.*
2. *Timing of storm sewer/culvert work should be considered in conjunction with road reconstruction and vice versa, where applicable.*

Table 13 – Township of South Stormont Preservation Plan

Sect. No.	Road Name	From	To	Length (km)	AADT	Preliminary Improvement Type Recommendation	Cost (x1000)	PCI (2021)	Surface Condition	Structural Adequacy	Condition Rating
2022											
181	45th Parallel Drive	County Road 14	Farran Drive	0.4	1168	*RS*	*$2*	93.0	8	16	82
154	Anderson Road	South Dundas Boundary	Nudell Bush Road	0.2	177	*SS*	*$4*	96.2	10	19	89
015	McPhail Road	2.8km west of Delaney Road	Highway 138	1.8	806	*SS*	*$40*	95.1	9	17	75
247	Marlyn Street	Highway 138	Bruce Street	0.15	49	*SS*	*$3*	93.7	8	16	85
205	Gray Avenue	County Road 35	Johnson Crescent	0.2	49	*RS*	*$1*	95.6	9	17	89
167	Memorial Square East	Maple Street	College Street	0.25	49	*RS*	*$1*	98.7	9	18	90
044	McMillan's Corners Road	Highway 138	Edge of North Stormont Boundary	0.9	250	*SS*	*$20*	96.2	10	19	88
005	Delaney Road	County Road 18	Island Road	1.15	270	*SS*	*$25*	96.2	10	19	89
104	Duffy's Road	County Road 14	Morgan Road	1.2	251	*SS*	*$26*	96.2	10	19	89
001	Island Road	Highway 138	Delaney Road	4.6	421	*SS*	*$101*	94.0	8	16	68
153	Anderson Road	Aultsville Road	Edge of South Dundas Boundary	1.9	177	*SS*	*$42*	96.2	10	19	89
152	Anderson Road	Farron's Point Road	Aultsville Road	3.5	174	*SS*	*$77*	96.2	10	19	89
2023											
179	Farran Drive	Spruce Street	45th Parallel Drive	0.5	892	*SS*	*$11*	95.6	9	17	89
204	Johnson Crescent	County Road 35	County Road 35	0.5	242	*RS*	*$2*	99.7	9	17	89
263	Conner Crescent	George Patrick Drive	Forest Hill Road	0.3	49	*RS*	*$1*	99.9	9	18	89

Sect. No.	Road Name	From	To	Length (km)	AADT	Preliminary Improvement Type Recommendation	Cost (x1000)	PCI (2021)	Surface Condition	Structural Adequacy	Condition Rating
262	George Patrick Drive	Forest Hill Road	Dead End	0.35	49	*RS*	*$1*	100.0	9	18	89
2024											
264	Jim Brownell Boulavard	County Road 36	Barry Street East	0.4	400	*RS*	*$2*	100.0	10	19	92
252A	Barry Street East	Barhart Drive	Dead End	0.25	200	*RS*	*$1*	100.0	10	19	91
137	Cedar Street	Fairground Drive	County Road 14	0.4	200	*RS*	*$2*	100.0	10	20	90
266	Matthew Kieran Crescent	County Road 36	Dead End	0.15	49	*RS*	*$1*	100.0	10	19	92
254	Forest Hill Road	County Road 36	Fickes Road	0.9	239	*RS*	*$4*	100.0	9	18	89
265	Eleanor Drive	Jim Brownell Boulevard	Barry Street East	0.4	49	*RS*	*$2*	100.0	10	19	92
123C	Aultsville Road	1.6km north of County Road 2	1.0km south of County Road 18	2.3	274	*SS*	*$51*	96.9	9	18	90
251	Abagail Crescent	County Road 35	County Road 35	0.5	49	*RS*	*$2*	100.0	10	19	93
197A	Mille Roches Road	Cherry Street	French Avenue	0.15	1400	*RS*	*$1*	100.0	10	19	99
199A	French Avenue	Cherry Avenue	Mille Roches Road	0.25	400	*RS*	*$1*	100.0	10	20	100
2025											
209	Plaza Street	Long Sault Drive	Simcoe Street	0.1	800	*RS*	*$0*	31.4	3	6	65
165	Maple Street	Farran Drive	Dickinson Drive	0.35	737	*SS*	*$8*	98.4	9	18	85
136	Fairground Drive	County Road 14	Cedar Street	0.2	146	*SS*	*$4*	100.0	10	20	91
089A	Dafoe Road	Aultsville Road	1.2km east of Aultsville Road	1.2	332	*SS*	*$26*	98.4	9	18	80
205	Gray Avenue	County Road 35	Johnson Crescent	0.2	49	*SS*	*$4*	95.6	9	17	89

Sect. No.	Road Name	From	To	Length (km)	AADT	Preliminary Improvement Type Recommendation	Cost (x1000)	PCI (2021)	Surface Condition	Structural Adequacy	Condition Rating
011	North Branch Road	South Glengarry Boundary	Delaney Road	1.8	330	*SS*	*$40*	54.7	6	11	74
164	Maple Street	Farran Drive	Farran Drive	0.65	49	*SS*	*$14*	98.4	9	17	84
016C	Cameron Road	Highway 138	Dead End	2.4	295	*SS*	*$53*	54.7	6	11	75
088	Eaman Road	1.7km west of County Road 12	County Road 14	3.5	202	*SS*	*$77*	50.7	5	7	62
115	Hunters Road	County Road 12	County Road 11	8	213	*SS*	*$176*	48.4	5	8	68
2026											
181	45th Parallel Drive	County Road 14	Farran Drive	0.4	1168	*MS*	*$17*	93.0	8	16	82
217	Fickes Road	County Road 2	Forest Hill Road	0.4	950	*SS*	*$9*	98.9	9	18	89
068B	Windfall Road	2.5km north of County Road 35	County Road 18	0.9	469	*SS*	*$20*	60.1	6	12	61
206	Saunders Avenue	Strachan Avenue	Frost Avenue	0.75	600	*SS*	*$17*	76.3	7	14	82
068A	Windfall Road	County Road 35	2.5km northerly	2.6	469	*SS*	*$57*	60.6	6	12	59
013	McPhail Road	Delaney Road	2.8km west of Delaney Road	2.8	407	*SS*	*$62*	61.8	6	11	62
017	Amell & Ranald George Road	Highway 138	Dead End	1.9	146	*SS*	*$42*	56.8	6	10	73
2027											
208B	Long Sault Drive	Plaza Street	County Road 2	0.2	1000	*MS*	*$8*	100.0	9	18	86
142	Bayview Road	County Road 2	Manning Road	0.1	338	*SS*	*$2*	100.0	9	17	84
033	Headline Road	2.5km east of County Road 33	Highway 138	0.4	1227	*MS*	*$17*	100.0	10	19	82
162	Thorold Lane	Dickinson Drive	Bank Street	0.2	600	*SS*	*$4*	100.0	10	19	90
166	Bank Street	County Road 2	Maple Street	0.25	587	*SS*	*$6*	100.0	9	17	88
259	Beech Street	Farran Drive	Ault Drive	0.4	529	*SS*	*$9*	100.0	9	18	89

Sect. No.	Road Name	From	To	Length (km)	AADT	Preliminary Improvement Type Recommendation	Cost (x1000)	PCI (2021)	Surface Condition	Structural Adequacy	Condition Rating
214	Moulinette Island Causeway	Long Sault Parkway	Lakeside Drive	1.2	764	*SS*	*$26*	100.0	10	19	92
138	Ash Street	County Road 14	Cedar Street	0.4	200	*SS*	*$9*	100.0	10	20	93
140	Duval Street	County Road 14	Ash Street	0.1	49	*SS*	*$2*	100.0	10	20	86
255	Hickory Street	Piercy Street	Dead End	0.1	49	*SS*	*$2*	99.9	9	18	90
041	Richmond Road	Cornwall City Limits	Lafarge Quarry Road	0.9	373	*SS*	*$20*	100.0	9	18	89
269	Meadow Lane	Dale Street	David Street	0.15	49	*SS*	*$3*	100.0	10	19	93
258	Grantley Drive	Yolanda Street	Dead End	0.15	49	*SS*	*$3*	100.0	9	18	85
215A	Sunset Drive	Lakeside Drive	Moulinette Island Causeway	0.7	214	*SS*	*$15*	100.0	10	19	92
139	Mill Street	Cedar Street	County Road 14	0.2	49	*SS*	*$4*	100.0	10	20	88
272	Hilda Street	Jim Brownell Boulevard	Dead End	0.2	49	*SS*	*$4*	100.0	10	20	94
264A	Jim Brownell Boulevard	Barry Street East	Dead End	0.2	49	*SS*	*$4*	100.0	10	20	94
145	Stuart Road	Manning Road	Dead End	0.1	49	*SS*	*$2*	64.3	7	14	78
123A	Aultsville Road	County Road 18	1.0km south of County Road 18	1.2	274	*SS*	*$26*	100.0	10	20	94
089C	Dafoe Road	County Road 14	2.1km west of County Road 14	2.1	412	*SS*	*$46*	100.0	10	20	74
167	Memorial Square East	Maple Street	College Street	0.25	49	*SS*	*$6*	98.7	9	18	90
275	NEW ROAD - Industrial Park	Warner Drive	Dead End	0.25	49	*SS*	*$6*	100.0	10	19	90
273	Whitetail Avenue	Fickes Road	Dead End	0.25	49	*SS*	*$6*	100.0	10	19	99
274	Clover Lane	County Road 36	Dead End	0.25	49	*SS*	*$6*	100.0	10	19	99

Sect. No.	Road Name	From	To	Length (km)	AADT	Preliminary Improvement Type Recommendation	Cost (x1000)	PCI (2021)	Surface Condition	Structural Adequacy	Condition Rating
250	Heather Crescent	County Road 18	Dead End	0.3	49	*SS*	*$7*	99.7	9	17	84
215	Lakeside Drive	Moulinette Island Causeway	Moulinette Island Causeway	0.75	115	*SS*	*$17*	100.0	10	19	93
060	Myers Road	County Road 15	4.0km east of County Road 15	4	577	*SS*	*$88*	100.0	10	20	90
143	Windermere Drive	Manning Road	Dead End	0.35	49	*SS*	*$8*	100.0	10	19	93
191A	Dale Street	Moak Street	Meadow Lane	0.35	49	*SS*	*$8*	100.0	10	19	93
193A	David Street	Moak Street	Meadow Lane	0.35	49	*SS*	*$8*	100.0	10	19	93
073	Eamer Road	1.6km east of North Field Road	County Road 15	1.4	320	*SS*	*$31*	65.6	6	12	73
174A	Pine Street	Ault Drive	Ault Drive	0.7	49	*SS*	*$15*	100.0	9	18	90
040C	Atchison Road	1.35km east of Richmond Drive	County Road 33	1.1	151	*SS*	*$24*	65.7	7	13	79
040B	Atchison Road	Richmond Drive	1.35km East of Richmond Drive	2	151	*SS*	*$44*	65.7	7	13	79
098	Neville Road	Rombough Road	County Road 14	2	140	*SS*	*$44*	66.0	7	13	80
169	Shaver Road	Colonial Drive	0.7 km North	0.7	49	*SS*	*$15*	64.3	7	13	76
2028											
204	Johnson Crescent	County Road 35	County Road 35	0.5	242	*SS*	*$11*	99.7	9	17	89
263	Conner Crescent	George Patrick Drive	Forest Hill Road	0.3	49	*SS*	*$7*	99.9	9	18	89
101	Eligh-Beckstead Road	3.5 km West of County Road 14	County Road 11	0.9	284	*SS*	*$20*	71.2	7	14	78
262	George Patrick Drive	Forest Hill Road	Dead End	0.35	49	*SS*	*$8*	100.0	9	18	89

Sect. No.	Road Name	From	To	Length (km)	AADT	Preliminary Improvement Type Recommendation	Cost (x1000)	PCI (2021)	Surface Condition	Structural Adequacy	Condition Rating
100	Eligh-Beckstead Road	County Road 14	2.0km East of County Road 11	1.3	284	*SS*	*$29*	71.2	7	15	79
021	Haughton Street	Willis Street	Dead End	0.2	49	*SS*	*$4*	44.3	5	7	67
006	Delaney Road	Island Road	North Branch Road	2.2	354	*SS*	*$49*	70.1	7	13	77
074A	Northfield Road	Dixon Road	2.1km west of County Road 15	1.2	179	*SS*	*$26*	69.5	7	14	77
097	Rombough Road	Pleasant Valley Road	Eligh-Beckstead Road	2.3	336	*SS*	*$51*	68.2	7	13	78
110B	May Road	0.70 km south of Hunters Road	Trillium Road	1.3	163	*SS*	*$29*	69.8	7	14	78
087	Eaman Road	County Road 12	1.7km west of County Road 12	1.7	206	*SS*	*$37*	70.4	7	14	77
110C	May Road	Trillium Road	Bush Glen Road	1.5	179	*SS*	*$33*	69.8	7	14	78
238	Joseph Street	MacLennan Street	Philip Street	0.3	49	*SS*	*$7*	44.9	5	9	72
074B	Northfield Road	2.1km west of County Road 15	County Road 15	2.1	179	*SS*	*$46*	71.5	7	14	76
065	Valade Road	Highway 138	County Road 18	3.1	230	*SS*	*$68*	70.5	8	15	81
231	Alguire Avenue	Mack Street	Melba Street	0.5	49	*SS*	*$11*	44.2	4	7	67
113	Otto Road	County Road 14	May Road	3.2	201	*SS*	*$71*	68.7	7	14	79
2029											
188	Santa Cruz Drive	Woodlands Road	Wales Drive	0.1	602	*SS*	*$2*	46.7	4	7	68
264	Jim Brownell Boulevard	County Road 36	Barry Street East	0.4	400	*SS*	*$9*	100.0	10	19	92
252A	Barry Street East	Barhart Drive	Dead End	0.25	200	*SS*	*$6*	100.0	10	19	91

Sect. No.	Road Name	From	To	Length (km)	AADT	Preliminary Improvement Type Recommendation	Cost (x1000)	PCI (2021)	Surface Condition	Structural Adequacy	Condition Rating
137	Cedar Street	Fairground Drive	County Road 14	0.4	200	*SS*	*$9*	100.0	10	20	90
266	Matthew Kieran Crescent	County Road 36	Dead End	0.15	49	*SS*	*$3*	100.0	10	19	92
202	Strachan Avenue	County Road 35	St. Laurent Avenue	0.3	400	*SS*	*$7*	88.7	8	16	86
254	Forest Hill Road	County Road 36	Fickes Road	0.9	239	*SS*	*$20*	100.0	9	18	89
203	St. Laurent Avenue	Saunders Avenue	County Road 35	0.4	400	*SS*	*$9*	88.5	8	16	86
237	Marydale Avenue	Dead End	Joseph Street	1.3	725	*SS*	*$29*	48.7	4	7	69
109B	Bush Glen Road	0.4km west of Hart Road	Otto Road	0.4	136	*SS*	*$9*	72.0	8	15	79
085	Saving Street	County Road 14	2.3km east of County Road 14	2.3	157	*SS*	*$51*	35.3	3	5	57
265	Eleanor Drive	Jim Brownell Boulevard	Barry Street East	0.4	49	*SS*	*$9*	100.0	10	19	92
239	Philip Street	Dead End	Marydale Avenue	0.15	49	*SS*	*$3*	48.5	5	10	72
251	Abagail Crescent	County Road 35	County Road 35	0.5	49	*SS*	*$11*	100.0	10	19	93
261	Stratford Boulevard	Fickes Road	Dead End	0.2	49	*SS*	*$4*	87.3	8	16	85
080	North Lunenburg Road East	County Road 12	Northfield Road	1.9	189	*SS*	*$42*	76.1	8	16	81
077	Dixon Road	MacRae Road	County Road 12	2.8	223	*SS*	*$62*	76.1	8	16	82
106	North Valley Road	Otto Road	Eligh-Beckstead Road	2.8	214	*SS*	*$62*	76.1	8	15	82
197A	Mille Roches Road	Cherry Street	French Avenue	0.15	1400	*MS*	*$6*	100.0	10	19	99

Sect. No.	Road Name	From	To	Length (km)	AADT	Preliminary Improvement Type Recommendation	Cost (x1000)	PCI (2021)	Surface Condition	Structural Adequacy	Condition Rating
199A	French Avenue	Cherry Avenue	Mille Roches Road	0.25	400	*SS*	*$6*	100.0	10	20	100
2030											
209	Plaza Street	Long Sault Drive	Simcoe Street	0.1	800	*SS*	*$2*	31.4	3	6	65
232	Melba Street	Alguire Avenue	Marydale Avenue	0.25	801	*SS*	*$6*	49.6	5	10	72
233	Sunnyview Avenue	Melba Street	Mack Street	0.5	801	*SS*	*$11*	51.7	5	10	73
245	Bruce Street	Dead End	Cornwall Center Road	1	318	*SS*	*$22*	49.2	5	9	71
156	Willbruck Drive	Ault Island Road	Dead End	1.8	387	*SS*	*$40*	50.2	5	7	71
124C	North Lunenburg Road West	County Road 14	0.8km east of County Road 14	0.8	171	*SS*	*$18*	51.7	5	6	64
241	Daisy Street	Marydale Avenue	Rosedale Avenue	0.3	23	*SS*	*$7*	49.2	5	9	73
243	Jean Street	Rosedale Avenue	Marydale Avenue	0.3	74	*SS*	*$7*	37.1	4	7	72
242	Rosedale Avenue	Daisy Street	Jean Street	0.4	49	*SS*	*$9*	38.1	4	7	67
127	Cooper Road	County Road 12	2.0km west of County Road 12	2	132	*SS*	*$44*	38.5	4	6	64
2031											
062A	Myers Road	O'Keefe Road	1.0km east of O'Keefe Road	1	758	*SS*	*$22*	52.6	5	9	54
226	Thompson Drive	Penny Lane	County Road 15	0.2	100	*SS*	*$4*	52.6	5	9	68
037	Poplar Avenue	Headline Road	Beaver Dam Road	0.5	245	*SS*	*$11*	54.9	5	9	72
246	Virgina Street	Highway 138	Bruce Street	0.15	49	*SS*	*$3*	54.3	5	9	71
096A	Rombough Road	County Road 18	Pleasant Valley Road	1.1	336	*SS*	*$24*	54.9	5	7	68

Sect. No.	Road Name	From	To	Length (km)	AADT	Preliminary Improvement Type Recommendation	Cost (x1000)	PCI (2021)	Surface Condition	Structural Adequacy	Condition Rating
235	St. James Street	Sunnyview Avenue	Dead End	0.2	49	*SS*	*$4*	51.9	5	10	73
039	Equestrian Drive	Beaver Dam Road	Beaver Dam Road	0.5	100	*SS*	*$11*	52.2	5	10	74
038	Beaver Dam Drive	Poplar Avenue	County Road 33	1.2	216	*SS*	*$26*	52.2	5	10	78
240	Yolanda Street	Marydale Avenue	Grantley Drive	0.35	49	*SS*	*$8*	54.5	5	9	73
089B	Dafoe Road	1.2km east of Aultsville Road	2.1km west of County Road 14	2.7	332	*SS*	*$60*	53.7	5	7	65
035	Cedar View Drive	Headline Road	Dead End	0.4	49	*SS*	*$9*	53.6	5	10	74
221	Warner Drive	Sixsmith Drive	Dead End	0.45	49	*SS*	*$10*	54.5	5	10	69
244	Thomas Street	Jean Street	Daisy Street	0.4	41	*SS*	*$9*	54.7	5	9	72
022	Carleton Street	Highway 138	Dead End	0.15	49	*SS*	*$3*	40.1	4	6	61
023	Fraser Street	County Road 18	Dead End	0.3	49	*SS*	*$7*	39.0	4	6	60
063	Cornett Lane	Myers Road	Dead End	0.4	49	*SS*	*$9*	40.3	4	6	66

Notes:
1. *Priorities in descending order. The higher the priority rating the greater the need.*
2. *Rehabilitation strategy to be confirmed by geotechnical investigations at detail design.*

Table 14 – Township of South Stormont Capital Plan – Existing Budget ($1.5M / Year)

Sect. No.	Road Name	From	To	Length (km)	AADT	Preliminary Improvement Type Recommendation	Cost (x1000)	PCI (2021)	Surface Condition	Structural Adequacy	Condition Rating
2022											
208A	Long Sault Drive	County Road 35	Plaza Street	0.1	1718	*RO1*	*$16*	81.1	8	16	86
188	Santa Cruz Drive	Woodlands Road	Wales Drive	0.1	602	*PP1*	*$15*	46.7	4	7	68
209	Plaza Street	Long Sault Drive	Simcoe Street	0.1	800	*RECON 2S*	*$98*	31.4	3	6	65
197	Mille Roches Road	Cherry Avenue	County Road 36	0.7	2350	*RO1*	*$109*	77.3	8	15	73
002	Lefebvre Road	Island Road	County Road 18	0.1	214	*RO1*	*$16*	79.7	7	14	77
178	Farran Drive	County Road 2	Spruce Street	0.6	1278	*RO1*	*$94*	77.4	7	14	78
237	Marydale Avenue	Dead End	Joseph Street	1.3	725	*PP1*	*$195*	48.7	4	7	69
068B	Windfall Road	2.5km north of County Road 35	County Road 18	0.9	469	*ST2PA*	*$97*	60.1	6	12	61
239	Philip Street	Dead End	Marydale Avenue	0.15	49	*PP1*	*$23*	48.5	5	10	72
206	Saunders Avenue	Strachan Avenue	Frost Avenue	0.75	600	*RMP1*	*$115*	76.3	7	14	82
021	Haughton Street	Willis Street	Dead End	0.2	49	*PP1*	*$30*	44.3	5	7	67
076	Dixon Road	Northfield Road	MacRae Road	0.65	240	*ST2*	*$36*	79.0	8	16	82
183	Elm Street	County Road 14	Wales Drive	0.5	275	*RO1*	*$78*	84.1	7	14	81
238	Joseph Street	MacLennan Street	Philip Street	0.3	49	*PP1*	*$45*	44.9	5	9	72
011	North Branch Road	South Glengarry Boundary	Delaney Road	1.8	330	*ST2PA*	*$195*	54.7	6	11	74
192	Moak Street	Dale Street	David Street	0.15	49	*RO1*	*$23*	79.7	8	16	84
223	Algonquin Drive	County Road 2	Dead End	0.4	100	*RO1*	*$62*	80.8	7	14	77
016C	Cameron Road	Highway 138	Dead End	2.4	295	*ST2PA*	*$260*	54.7	6	11	75
2023											
013	McPhail Road	Delaney Road	2.8km west of Delaney Road	2.8	407	*ST2PA*	*$303*	61.8	6	11	62

Sect. No.	Road Name	From	To	Length (km)	AADT	Preliminary Improvement Type Recommendation	Cost (x1000)	PCI (2021)	Surface Condition	Structural Adequacy	Condition Rating
004	Island Road	Delaney Road	Edge of South Glengarry Boundary	2.2	301	*ST1*	*$77*	89.4	9	18	86
085	Saving Street	County Road 14	2.3km east of County Road 14	2.3	157	*RECON 1R*	*$1,262*	35.3	3	5	57
2024											
232	Melba Street	Alguire Avenue	Marydale Avenue	0.25	801	*PP1*	*$38*	49.6	5	10	72
233	Sunnyview Avenue	Melba Street	Mack Street	0.5	801	*PP1*	*$75*	51.7	5	10	73
180	College Street	Farran Drive	County Road 14	0.4	600	*RO1*	*$62*	83.5	8	16	88
145	Stuart Road	Manning Road	Dead End	0.1	49	*ST2PA*	*$11*	64.3	7	14	78
245	Bruce Street	Dead End	Cornwall Center Road	1	318	*PP1*	*$150*	49.2	5	9	71
207	Frost Avenue	Strachan Avenue	Mille Roches Road	0.5	400	*RO1*	*$78*	85.4	8	15	85
213	Robin Road	County Road 2	Dead End	0.2	143	*RO1*	*$31*	83.4	7	14	79
156	Willbruck Drive	Ault Island Road	Dead End	1.8	387	*PP1*	*$270*	50.2	5	7	71
124C	North Lunenburg Road West	County Road 14	0.8km east of County Road 14	0.8	171	*PP1*	*$120*	51.7	5	6	64
068A	Windfall Road	County Road 35	2.5km northerly	2.6	469	*ST2PA*	*$282*	60.6	6	12	59
100A	Eligh-Beckstead Road	0.9km east of County Road 11	2.0km east of County Road 11	2.1	284	*ST2*	*$118*	83.1	8	16	82
260	Primrose Lane	Columbia Aveneue	Dead End	0.3	49	*RO1*	*$47*	82.0	8	16	81
017	Amell & Ranald George Road	Highway 138	Dead End	1.9	146	*ST2PA*	*$206*	56.8	6	10	73

Sect. No.	Road Name	From	To	Length (km)	AADT	Preliminary Improvement Type Recommendation	Cost (x1000)	PCI (2021)	Surface Condition	Structural Adequacy	Condition Rating
2025											
158	Killarney Avenue	County Road 2	St. Lawrence Street	0.1	400	*RECON 1R*	*$55*	39.3	4	7	68
062A	Myers Road	O'Keefe Road	1.0km east of O'Keefe Road	1	758	*PP1*	*$150*	52.6	5	9	54
172	Ault Drive	St. Lawrence Street	Hickory Street	0.4	600	*RO1*	*$62*	87.5	8	15	85
202	Strachan Avenue	County Road 35	St. Laurent Avenue	0.3	400	*RMP1*	*$46*	88.7	8	16	86
105A	Morgan Road	County Road 18	Duffy's Road	0.3	220	*ST2*	*$17*	86.3	9	18	86
203	St. Laurent Avenue	Saunders Avenue	County Road 35	0.4	400	*RMP1*	*$62*	88.5	8	16	86
101	Eligh-Beckstead Road	3.5 km West of County Road 14	County Road 11	0.9	284	*ST2PA*	*$97*	71.2	7	14	78
240	Yolanda Street	Marydale Avenue	Grantley Drive	0.35	49	*PP1*	*$53*	54.5	5	9	73
089B	Dafoe Road	1.2km east of Aultsville Road	2.1km west of County Road 14	2.7	332	*PP1*	*$406*	53.7	5	7	65
035	Cedar View Drive	Headline Road	Dead End	0.4	49	*PP1*	*$60*	53.6	5	10	74
221	Warner Drive	Sixsmith Drive	Dead End	0.45	49	*PP1*	*$68*	54.5	5	10	69
040C	Atchison Road	1.35km east of Richmond Drive	County Road 33	1.1	151	*ST2PA*	*$119*	65.7	7	13	79
261	Stratford Boulevard	Fickes Road	Dead End	0.2	49	*RMP1*	*$31*	87.3	8	16	85
111A	Sandtown Road	County Road 12	1.5km west of County Road 12	1.5	178	*ST2*	*$84*	87.5	9	18	85
105B	Morgan Road	Duffy's Road	Dafoe Road	2	220	*ST2*	*$112*	86.3	9	18	86
074B	Northfield Road	2.1km west of County Road 15	County Road 15	2.1	179	*ST2PA*	*$227*	71.5	7	14	76

Sect. No.	Road Name	From	To	Length (km)	AADT	Preliminary Improvement Type Recommendation	Cost (x1000)	PCI (2021)	Surface Condition	Structural Adequacy	Condition Rating
2026											
149	Farran's Point Road	County Road 2	0.3 km North	0.3	239	*PP1*	*$45*	56.0	5	8	69
161	St. Lawrence Street	Dead End @ West End	Dickinson Drive	1.4	496	*PP1*	*$210*	54.7	5	10	73
236	Crystal Street	Sunnyview Avenue	Alguire Street	0.15	49	*PP1*	*$23*	55.1	5	10	73
109B	Bush Glen Road	0.4km west of Hart Road	Otto Road	0.4	136	*ST2PA*	*$43*	72.0	8	15	79
155	Ault Island Road	County Road 2	Willbruck Drive	1.8	400	*PP1*	*$270*	56.8	6	10	62
026	Dow Street	Highway 138	Dead End	0.25	49	*PP1*	*$38*	56.8	5	8	75
228	Jenkins Road	Dead End	County Road 15	0.3	49	*PP1*	*$45*	54.9	5	10	69
080	North Lunenburg Road East	County Road 12	Northfield Road	1.9	189	*ST2PA*	*$206*	76.1	8	16	81
077	Dixon Road	MacRae Road	County Road 12	2.8	223	*ST2PA*	*$303*	76.1	8	16	82
106	North Valley Road	Otto Road	Eligh-Beckstead Road	2.8	214	*ST2PA*	*$303*	76.1	8	15	82
2027											
267	MacLennan Street	Marydale Avenue	Joseph Street	0.1	49	*PP1*	*$15*	61.1	6	12	77
175	Hickory Street	Piercy Street	Ault Drive	0.5	600	*RO1*	*$78*	90.6	8	16	84
163	Maple Street	Farran Drive	Bank Street	0.15	49	*PP1*	*$23*	60.1	6	12	73
171	Shaver Road	Colonial Road	County Road 2	0.15	49	*PP1*	*$23*	60.5	6	11	72
078	Bilmer Road	Dixon Road	Dead End	0.1	49	*RO1*	*$16*	90.6	8	16	85
032	Headline Road	County Road 33	2.5km east of County Road 33	2.5	1344	*RECON 1R*	*$1,372*	84.7	8	16	75

Sect. No.	Road Name	From	To	Length (km)	AADT	Preliminary Improvement Type Recommendation	Cost (x1000)	PCI (2021)	Surface Condition	Structural Adequacy	Condition Rating
2028											
062B	Myers Road	1.0km east of O'Keefe Road	Highway 138	0.7	758	*PP1*	*$105*	64.0	6	11	57
186	Woodlands Road	Santa Cruz Drive	0.2km North	0.4	600	*RECON 1R*	*$220*	39.1	4	3	64
037	Poplar Avenue	Headline Road	Beaver Dam Road	0.5	245	*PP1*	*$75*	54.9	5	9	72
246	Virgina Street	Highway 138	Bruce Street	0.15	49	*PP1*	*$23*	54.3	5	9	71
096A	Rombough Road	County Road 18	Pleasant Valley Road	1.1	336	*PP1*	*$165*	54.9	5	7	68
219	Structured Products Drive	County Road 2	Dead End	0.2	49	*PP1*	*$30*	63.8	6	12	77
234	Virgina Street	Sunnyview Avenue	Dead End	0.2	49	*PP1*	*$30*	63.8	6	11	76
034	Charlotte Avenue	Headline Road	Dead End	0.25	49	*PP1*	*$38*	62.4	6	12	77
056	O'Keefe Road	Myers Road	Wheeler Road	1.85	355	*PP1*	*$278*	64.0	6	12	77
058	Wheeler Road	Highway 138	O'Keefe Road	1.6	274	*PP1*	*$240*	64.4	6	11	73
100	Eligh-Beckstead Road	County Road 14	2.0km East of County Road 11	1.3	284	*ST2PA*	*$141*	71.2	7	15	79
225	Columbia Avenue	Dead End, East	Thompson Drive	0.6	100	*PP1*	*$90*	61.5	5	9	68
194	Brown Street	Dale Street	David Street	0.15	49	*RO1*	*$23*	92.1	8	17	87
248	Stephen Street	Highway 138	Bruce Street	0.15	49	*RO1*	*$23*	93.0	8	16	85
2029											
051	McClave Road	County Road 18	Maloney Road	0.2	100	*PP1*	*$30*	66.5	6	12	76
020	Willis Street	County Road 18	Haughton Street	0.1	49	*PP1*	*$15*	67.8	6	12	73

Sect. No.	Road Name	From	To	Length (km)	AADT	Preliminary Improvement Type Recommendation	Cost (x1000)	PCI (2021)	Surface Condition	Structural Adequacy	Condition Rating
235	St. James Street	Sunnyview Avenue	Dead End	0.2	49	*PP1*	*$30*	51.9	5	10	73
039	Equestrian Drive	Beaver Dam Road	Beaver Dam Road	0.5	100	*PP1*	*$75*	52.2	5	10	74
038	Beaver Dam Drive	Poplar Avenue	County Road 33	1.2	216	*PP1*	*$180*	52.2	5	10	78
006	Delaney Road	Island Road	North Branch Road	2.2	354	*ST2PA*	*$238*	70.1	7	13	77
220	Sixsmith Drive	County Road 2	Dead End	0.4	49	*PP1*	*$60*	65.9	6	11	76
074A	Northfield Road	Dixon Road	2.1km west of County Road 15	1.2	179	*ST2PA*	*$130*	69.5	7	14	77
097	Rombough Road	Pleasant Valley Road	Eligh-Beckstead Road	2.3	336	*ST2PA*	*$249*	68.2	7	13	78
110B	May Road	0.70 km south of Hunters Road	Trillium Road	1.3	163	*ST2PA*	*$141*	69.8	7	14	78
087	Eaman Road	County Road 12	1.7km west of County Road 12	1.7	206	*ST2PA*	*$184*	70.4	7	14	77
004	Island Road	Delaney Road	Edge of South Glengarry Boundary	2.2	301	*ST2*	*$123*	89.4	9	18	86
2030											
199	French Avenue	Cherry Avenue	County Road 35	0.4	828	*PP1*	*$60*	59.5	6	12	77
210	Bethune Avenue	County Road 36	Mille Roches Road	0.65	1200	*PP1*	*$98*	70.5	7	14	78
176	Hickory Street	Ault Drive	Farran Drive	0.7	753	*PP1*	*$105*	65.7	6	11	75
185	Wales Drive	Dead End	County Road 2	0.6	325	*PP1*	*$90*	68.8	6	12	77
226	Thompson Drive	Penny Lane	County Road 15	0.2	100	*PP1*	*$30*	52.6	5	9	68
212	Adam Dixon Avenue	Bethune Avenue	Kent Crescent	0.1	49	*PP1*	*$15*	70.5	7	14	82

Sect. No.	Road Name	From	To	Length (km)	AADT	Preliminary Improvement Type Recommendation	Cost (x1000)	PCI (2021)	Surface Condition	Structural Adequacy	Condition Rating
147	Vin Vista Drive	County Road 2	Dead End	1.1	507	*PP1*	*$165*	54.3	5	9	69
184	Hoople Street	Wales Drive	Elm Street	0.45	185	*PP1*	*$68*	63.8	6	10	74
110A	May Road	Hunters Road	0.70 km South of Hunters Road	0.7	163	*PP1*	*$105*	57.6	6	9	69
073	Eamer Road	1.6km east of North Field Road	County Road 15	1.4	320	*ST2PA*	*$152*	65.6	6	12	73
141	Loyalist Crescent	County Road 12	County Road 12	0.7	100	*PP1*	*$105*	67.8	6	12	77
160	Napier Street	St. Lawrence Street	Hickory Street	0.35	49	*PP1*	*$53*	59.5	6	11	76
227	Moss Drive	County Road 15	Jenkins Road	0.35	49	*PP1*	*$53*	59.8	6	11	72
110C	May Road	Trillium Road	Bush Glen Road	1.5	179	*ST2PA*	*$162*	69.8	7	14	78
2031											
230	Mack Street	Cornwall Center Road	Alguire Avenue	0.4	1529	*RECON 1R*	*$220*	41.7	4	7	68
195	Simcoe Street	County Road 35	Mille Roches Road	0.5	1857	*RECON 1R*	*$274*	40.9	3	6	60
191	Dale Street	Manning Road	Moak Street	0.5	490	*PP1*	*$75*	71.4	7	14	82
224	Saskatchewan Drive	Alonquin Avenue	Columbia Avenue	0.15	100	*PP1*	*$23*	70.3	7	14	77
249	Cheryl Street	Marydale Avenue	Highway 138	0.45	1061	*RECON 1R*	*$247*	40.6	4	8	59
157	MacLeod Road	County Road 2	Dead End	0.2	100	*PP1*	*$30*	73.0	7	14	67
123B	Aultsville Road	County Road 2	1.6km north of County Road 2	1.6	610	*PP1*	*$240*	73.0	7	14	82
193	David Street	Moak Street	Manning Road	0.5	134	*PP1*	*$75*	71.4	7	14	82
061	Myers Road	4.0km east of County Road 15	O'Keefe Road	2.1	378	*PP1*	*$315*	74.1	7	13	76

Sect. No.	Road Name	From	To	Length (km)	AADT	Preliminary Improvement Type Recommendation	Cost (x1000)	PCI (2021)	Surface Condition	Structural Adequacy	Condition Rating
036	Marl Street	Cedarview Road	Dead End	0.1	49	*RECON 1R*	*$55*	41.8	4	6	68

Notes:
1. *Priorities in descending order. The higher the priority rating the greater the need.*
2. *Rehabilitation strategy to be confirmed by geotechnical investigations at detail design.*

6.2 Annual Rehabilitation Program

Based on typical degradation rates for gravel roads, surface treatment, and hot mix, a baseline resurfacing program / budget is recommended.

Hot Mix Paved Roads:

- 112.8 km of paved roads (HCB).
- 20-year resurfacing period.
- Annual resurfacing 5.6 km / year.
- Annual budget $862,400: (5.6 km / year x $154,000 / km RMP1).

Surface Treated Roads:

- 83.8 km of surface treated roads (LCB).
- 7 year resurfacing period.
- Annual resurfacing 12.0 km / year.
- Annual budget $420,000 (12.0 km / year x $35,000 / km ST1).

The hard top resurfacing program, (hot mix, and surface treatment) is estimated at $1,282,400 per year.

Gravel roads require regular maintenance. Maintenance includes regular grading and reapplication of new gravel. Typically, gravel roads should be resurfaced on a 3 - 5 year cycle. Gravel road refreshment is currently considered an operation cost at the Township of South Stormont.

Gravel Roads:

- 113.0 km of earth / gravel roads.
- 50 mm gravel every 3 years.
- Annual gravelling of 37.7 km.
- Granular M ($12,000 / km).
- Annual budget $452,400 (37.7 km / year x $12,000 G) **.

** *Township Staff currently conduct shaping and grading of new material as an operational expense. Provided costing based on application by outside forces.*

6.3 Preservation Management

Preservation techniques seal the surface as to prevent water infiltration into the granular base. Route and Seal is used on HCB pavements to seal individual cracks. Slurry Seal / Microsurfacing is used on LCB and HCB pavements to seal large areas, although wide / active cracks will reflect through the treatment. An annual preservation management budget has been estimated as follows:

Slurry Seal / Microsurfacing

- 112.8 km of paved roads (HCB).
- 83.8 km of surface treated roads (LCB).
- Assume that slurry seal / microsurfacing will be applied, on average, once per resurfacing cycle.
- 17.6 km of road to preserve per year (5.6 km HCB and 12.0 km of LCB).
- Annual budget $387,200 (17.6 km x $22,000/ km Slurry Sealing / Microsurfacing).

6.4 Road Maintenance

Preventative road and roadside maintenance is critical to prolonging the useful service life of a road and maximizing the capital investment. A continuous road and roadside maintenance program is recommended to reduce the road degradation rates. Ditch cleanout and clearing of vegetation from the right-of-way should be carried out on a regular basis. This can either be accomplished through dedicated internal Township forces or sub-contracting to private contractors. Consideration may be given to a dedicated capital program of ditch cleanout and clearing, to ensure resources are dedicated to these important activities.

7.0 Replacement Cost

In conjunction with this Road Needs Study Report, a replacement cost for the road asset was calculated based on the provided replacement costs in Section 5. The price for Recon G, Recon LCB, Recon 1/2R, Recon 2S, and Recon 2U were used to estimate the price to replace each road section individually, with the assumption that no changes to the road section or pavement structure would occur, with the exception of roads with existing curb and gutter, in which case a double lift of asphalt was specified. If sidewalks are present, the price of sidewalk replacement was also factored in.

The total replacement cost for the Township's road infrastructure is approximately $151M.

Table 15 – Replacement Cost by Asset Class and Surface Type

Class	HCB	LCB	Loose-Top (Gravel and Earth)	All
Arterial	-	-	-	-
Collector Roads	$ 3.8 M	-	-	$ 3.8 M
Local Roads	$ 67.5 M	$ 41.9 M	$ 34.3 M	$ 146.9 M
All	$ 71.3 M	$ 41.9 M	$ 34.3 M	$ 150.7 M

8.0 O. Reg. 588/17 Reporting Requirements

This study meets the reporting requirements under Table 4 of O. Reg. 588/17. For convenience, all items required under Table 4 are presented below, with the exception of mapping.

Table 16 – Road Class Density

Class	Lane-kilometres	Lane-kilometres / Municipal Area[6]
Arterial	0.0	0.00
Collector Roads	11.9	0.03
Local Roads	607.30	1.28
All	619.2	1.31

The average PCI for hard top surfaces in the Township is 73.7.

The average surface condition of unpaved roads is 7.2 as per the inventory Manual. This would broadly translate into a road with "good" rating.

Table 17 – Condition Ratings per Road Class and Surface Type

Class or Surface Type	Very Good	Good	Fair	Poor	Very Poor
Arterial	-	-	-	-	-
Collector Roads	9.2%	63.9%	10.9%	16.0%	0.0%
Local Roads	19.2%	50.1%	14.1%	15.6%	2.0%
HCB	31.6%	10.2%	14.1%	38.7%	5.4%
LCB	27.7%	51.3%	21.0%	0.0%	0.0%
G or E	0.0%	89.9%	8.7%	1.4%	0.0%
All	19.0%	50.4%	14.0%	14.6%	2.0%

Descriptions that illustrate the different levels of road class pavement condition are presented in the tables below.

[6] South Stormont covers an area of approximately 473.05 as per South Stormont's GIS

Table 18 – Qualitative Descriptions of PCI for HCB Roads[7]

Descriptive Ratings	PCI Range	Qualitative Description
Very Good	90 - 100	Pavement is in excellent condition with few cracks. The Ride Condition Rating is excellent with few areas of very slight to slight distortion.
Good	75 - 90	The pavement is in good condition with frequent very slight or slight cracking. The Ride Condition Rating is good with a few slightly rough and uneven sections.
Fair	65 - 75	The pavement is in fairly good condition with slight cracking, slight or very slight distortion and a few areas of slight alligatoring. The Ride Condition Rating is fairly good with intermittent rough and uneven sections.
	50 - 65	The pavement is in fair condition with intermittent moderate and frequent slight cracking, and with intermittent slight or moderate alligatoring and distortion. The Ride Condition Rating is fair and the surface is slightly rough and uneven.
Poor	40 - 50	The pavement is in poor to fair condition with frequent moderate cracking and distortion, and intermittent moderate alligatoring. The Ride Condition Rating is poor to fair and the surface is moderately rough and uneven.
	30 - 40	The pavement is in poor to fair condition with frequent moderate alligatoring and extensive moderate cracking and distortion. The Ride Condition Rating is poor to fair and the surface is moderately rough and uneven.
Very Poor	20 - 30	The pavement is in poor condition with moderate alligatoring and extensive severe cracking and distortion. The Ride Condition Rating is poor and the surface is very rough and uneven.
	0 - 20	The pavement is in poor to very poor condition with extensive severe cracking, alligatoring and distortion. The Ride Condition Rating is very poor and the surface is very rough and uneven.

[7] Adapted from Table B-1 of the MTO's Manual for Condition Rating of Flexible Pavements, SP-024.

Table 19 – Qualitative Descriptions of PCI for LCB Roads[8]

Descriptive Ratings	PCI Range	Qualitative Description
Very Good	80 - 100	Pavement is in excellent condition with just a few bumps or depressions from slight surface deformation. No surface defects such as streaking, potholes or cracking distresses. The Ride Condition Rating is very good.
Good	60 - 79	Pavement is in good condition with just a few bumps or depressions from slight to moderate surface deformation. Intermittent slight to moderate surface defects and/or cracking distresses. The Ride Condition Rating is good.
Fair	40 - 59	Pavement is in fair condition with intermittent to frequent bumps or depressions from slight to moderate surface deformation. Intermittent to frequent moderate surface defects and/or cracking distresses. The Ride Condition Rating is fair.
Poor	20 - 39	Pavement is in poor condition with frequent bumps or depressions from moderate surface deformation. Frequent moderate to severe surface defects and/or cracking distresses. Localized slight to moderate alligatoring may be present indicating pavement structural failure. The Ride Condition Rating is poor.
Very Poor	0 - 19	Pavement is in very poor condition with extensive bumps or depressions from moderate to sever surface deformation. Extensive to severe surface defects and/or cracking distresses. Frequent slight to moderate alligatoring may be present, indicating pavement structural failure. The Ride Condition Rating is very poor.

[8] Adapted from Table B-1 of the MTO's Manual for Condition Rating of Surface-Treated Roads, SP-021.

Table 20 – Qualitative Descriptions of Surface Condition for Gravel Roads[9]

Descriptive Ratings	Surface Condition	Qualitative Description
Very Good	10	The section affords a fully adequate standard of service, with no annoyance or discomfort. Gravel roads rarely score a "10" rating due to their inherent roughness.
Good	8-9	It is possible to maintain the lesser of the Minimum Tolerable Average Operating Speed or the legal Speed Limit with only a noticeable amount of annoyance to the driver due to sway, vibration or steering effort, but with no noticeable feeling of hazard.
Fair	6-7	
Poor	4 - 5	Maintaining even the lesser of the Minimum Tolerable Average Speed or the legal Speed Limit results in either a "tug-of-war" with a too-steep crown, or a feeling that the car is taking undue punishment.
Very Poor	1 - 3	The surface irregularities are so severe that a driver will tend to reduce speed considerably, possibly even steering an irregular course, or if the crown is to steep as to be hazardous in winter.

9.0 Road Age and Risk Framework

The useful remaining life is time until a pavement reaches the end of its useful service life. For HCB and LCB roads, this is assumed to be 30 and 14 years respectively from the new surface to the time that the surface is expected to fail. Gravel roads are considered to last indefinitely as long as regular refreshment of surface granular occurs.

In-service dates are recorded for all sections. However, it is suspected that the recorded in service dates do not reflect the true age of the extant pavement on many sections. 35 km of HCB and 12 km of LCB road are older than 30 years based on their in-service dates.

For this reason, the useful remaining life was also estimated based on the perceived age of the hard top surface. Using the PCI curve provided in Section 4, the age of a surface was estimated based on the formula below:

$$t = \frac{ln\left(\frac{b}{PCI - a} - 1\right) - d}{c}$$

Where $a,\ b,\ c,$ and d are constants used to fit the curve to the data, ln is the natural logarithm, and t represents the perceived age.

[9] Adapted from Item 83 from the MTO's Ministry of Transportation's Inventory Manual for Municipal Roads (February 1991).

There are, however, some issues deriving the age of a road from the PCI. For newer pavements, the perceived age is less accurate: LCB generally roads skew older while HCB roads skew younger than the true age.

To provide a realistic estimate of the network's road age, a reasoned approach using the recorded age for roads with a recorded age less than 20 years old and the age derived from PCI for other road segments.

Table 21 – Estimated Road Age

Surface Type	Road Age		
	Based on Recorded In-Service Date	Derived from PCI	Reasoned Approach
HCB	21.6	13.0	14.6
LCB	10.1	9.2	8.0
Gravel and Earth	30.1	-	30.1

9.1 Risk Framework

The Township currently calculates a risk rating from 1 to 25 for its roads that combines the probability of failure with the consequence of failure as per the following equation:

$$Risk\ Rating = Probability\ of\ Failure \times Consequence\ of\ Failure$$

Table 22 and Table 23 summarize sub-rating calculations. Risk Ratings for each road as per the frameworks have been included in the database.

Table 22 – Probability of Failure Matrix

Risk Criteria	Criteria Weighting	Value / Range	Chance of Failure Score
Descriptive Rating (Tables 18 – 20)	60%	Very Good	1
		Good	2
		Fair	3
		Poor	4
		Very Poor	5

Condition Rating (Inventory Manual)	40%	91 – 100	1
		81 – 90	2
		71 – 80	3
		61 – 70	4
		0 – 60	5

Table 23 – Consequence of Failure Matrix

Risk Criteria	Criteria Weighting	Value / Range	Consequence of Failure Score
Criticality Rating (Asset Class)	10%	Class 1 - Freeway	5
		Class 2 - Arterial	4
		Class 3 - Collector	3
		Class 4 - Local	2
		Class 5 - Lanes, alleys, and Other i.e., Sidewalks	1
Surface Type	35%	Earth	1
		Gravel	2
		LCB	3
		HCB - Single Lift	4
		HCB - Double Lift	5
Traffic count	25%	800+	5
		400-799	4
		200-399	3
		50-199	2
		1-49	1
Replacement Cost	30%	$65,500 and below	1
		$130,000 and below	2
		$260,000 and below	3
		$640,000 and below	4
		$640,001 and above	5

10.0 Summary

D.M. Wills Associates (Wills) undertook a review of the Township of South Stormont (Township) existing road network to assess its physical condition and confirm various road attributes. Data collected as a result of the field review was used to develop a prioritized listing of the road network needs based treatment cost/benefit and traffic volumes.

Wills undertook the field study in November of 2021. A visual assessment of each road within the Township was undertaken to assess the current condition of the road.

Two primary indicators of the relative health of a road are the structural adequacy and surface condition ratings. The current average structural adequacy rating for the Township's road network is 13.9/20. The current average surface condition rating for the Township's road network is 7.2/10. The average PCI, weighted by traffic levels is 73.7 for the Township's Hardtop surfaces.

Preservation Management

In addition to addressing currently deficient roads (i.e. capital reconstruction), a dedicated preservation management approach is required, and perhaps even more importantly, to "keep the good roads good"; the fundamental principle being that it costs much less to maintain a good road than it does to let it fail and then reconstruct it, from a life cycle cost perspective. Ultimately, the goal of preservation management is to extend the useful life of a road and road network, maximizing the Township's investment over the road life-cycle.

Road resurfacing is an effective way of extending the overall life of the pavement structure and therefore a road resurfacing program is highly recommended. Preliminary recommendations and prioritization for road resurfacing are based on PCI. Specific resurfacing treatment recommendations must be assessed through further field investigation and detail design effort, prior to selecting and implementing the resurfacing strategy.

Based on typical degradation rates for hard top roads a total resurfacing and preservation program, is estimated at $1,282,400 per year. Gravel resurfacing is handled as an operational cost by the Township and is therefore not part of the Capital Plan. It would be estimated at $452,400 per year if outside forces were conducting the work.

Further to the recommendations above with respect to resurfacing, it is also recommended that regular maintenance in the form of roadside ditch cleanout and clearing be undertaken as a critical component to preservation management in order to extend the useful service life of the existing roads.

Capital Improvements

Capital Plan

Two capital plans were developed as part of this report. A fully funded plan and a plan constrained by the Township's existing budget was developed as per the following table.

Item	Fully Funded Plan	Existing Budget
Annual Capital Funding	$ 2.3 M	$ 1.5 M
Annual Reconstruction Budget	$ 0.6	$ 0.4
Annual Rehabilitation Budget	$ 1.7	$ 1.1
Length of roads rehabilitated or reconstructed	152 km	100 km
Annual Preservation Budget *(Considered an Operational Cost)*	$ 0.3 M	$ 0.3 M

If the budget was increased to implement the fully funded Plan with the Preservation Program, the PCI would rise 19 points by 2031. The fully funded program would address all construction needs as well as apply rehabilitation and preservation treatments at the ideal timing (according to PCI). Although this may not be fiscally feasible in the near term, the budget needs at the end of 2031 would be expected to drop significantly and approach the rehabilitation and preservation program base rates.

If the capital budget does not increase in real terms in the next 10 years, the PCI is expected to fall by 3 points without a preservation program. With a rigorously implemented preservation program, the PCI may rise by 3 points. A significant number of rehabilitation candidates will not be addressed and may require more costly interventions in the future. It is therefore highly recommended that the Township endeavor to consistently increase the annual capital budget over the next 10 years.

The time of inspection plays a significant role in assessing a road's condition. The field work for this study was carried out in November of 2021.

We trust the above and attached information will be of benefit to the Township and appreciate the opportunity to assist the Township in developing its road improvement plan.

Respectfully submitted,

Eric St. Pierre, P.Eng.
Transportation Engineer

Turner Kuhlmeyer, E.I.T.
Transportation E.I.T.

TK/ESP/jl

Statement of Limitations

This report has been prepared by D.M. Wills Associates on behalf of the Township of South Stormont. The conclusions and recommendations in this report are based on available background documentation and discussions with applicable Township staff at the time of preparation.

The report is intended to document the 2021 Roads Needs Study Report findings and assist the Township in developing budgetary plans for investment into their road network.

Any use which a third party makes of this report, other than as a Road Needs Study Report is the responsibility of such third parties. D.M. Wills Associates Limited accepts no responsibility for damages, if any, suffered by a third party as a result of decisions made or action taken based on using this report for purposes other than as a summary of the 2021 Road Needs Study Report findings.

Appendix A

Unit Price Form

ROAD IMPROVEMENT COSTS
Township of South Stormont

Unit Costs	Units	Unit Cost
Granular M (Road Base / Shoulder Work)	t	$16.00
Granular M (Belly Dump)	t	$10.85
Granular B (Road Base / Shoulder Work)	t	$14.00
Granular B (Belly Dump)	t	$11.00
Hot Mix	t	$130.00
Earth Excavation	m3	$18.00
Asphalt Removal	m2	$6.00
Asphalt Removal - Partial Depth	m2	$3.00
Removal of Concrete Curb & Gutter	m	$25.00
Concrete Curb & Gutter	m	$125.00
In-Place Full Depth Reclamation	m2	$1.75
Surface Treatment - Single	m2	$5.00
Surface Treatment - Double (+fog seal)	m2	$8.00
Concrete Sidewalk	m2	$180.00
Granular M Conversion	2.2	t/m3
Granular B Conversion	2	t/m3
Hot Mix Conversion	2.45	t/m3

Gravel (50mm)

Item	*Width - m*	*Depth - mm*	*Conversion Factor*	*Unit*		*Quantity*	*Unit Cost*	*Cost/km (x 1000)*
Granular M	7.0	50	2.2	t		770	$16.00	$ 12
							G	**12**

Surface Treatment - Rural/Semi Urban - Single [ST1]

Item	*Width - m*	*Depth - mm*	*Conversion Factor*	*Unit*		*Quantity*	*Unit Cost*	*Cost/km (x 1000)*
Surface Treatment - Single (Overlay)	7.0			m2		7000	$5.00	$ 35
							ST1	**35**

Surface Treatment - Rural/Semi Urban - Double [ST2]

Item	*Width - m*	*Depth - mm*	*Conversion Factor*	*Unit*		*Quantity*	*Unit Cost*	*Cost/km (x 1000)*
Surface Treatment - Double (Overlay)	7.0			m2		7000	$8.00	$ 56
							ST2	**56**

Surface Treatment - Rural/Semi Urban - Double with Pulverization and Granular Base [ST2PA]

Item	*Width - m*	*Depth - mm*	*Conversion Factor*	*Unit*	*Crossfall Correction*	*Quantity*	*Unit Cost*	*Cost/km (x 1000)*
Surface Treatment - Double	7.0			m2		7000	$8.00	$ 56
Granular M	7.0	150	2.2	t		2310	$16.00	$ 37
Pulverizing	7.0			m2		7000.0	$1.75	$ 12
Minor Items @ 25%								$ 3
							ST2PA	**108**

Resurfacing - Rural/Semi Urban Single Lift Overlay [RO1]

Item	*Width - m*	*Depth - mm*	*Conversion Factor*	*Unit*	*Crossfall Correction* **	*Quantity*	*Unit Cost*	*Cost/km (x 1000)*
Hot Mix	6.5	50	2.45	t	159	956	$130.00	$ 124
Granular M	6.5	50	2.2	t		715	$16.00	$ 11
Minor Items @ 15%								$ 20
							RO1	**156**

Resurfacing - Rural - Single Lift Mill and Pave [RMP1]								
Item	*Width - m*	*Depth - mm*	*Conversion Factor*	*Unit*	*Crossfall Correction*	*Quantity*	*Unit Cost*	*Cost/km (x 1000)*
Hot Mix	6.5	50	2.45	t		796	$130.00	$ 104
Milling	6.5			m2		6500	$3.00	$ 19.50
Minor Items @ 25%								$ 31
							RMP1	**154**

Pulverize and Pave One Lift [PP1] Rural/Semi-Urban								
Item	*Width - m*	*Depth - mm*	*Conversion Factor*	*Unit*	*Crossfall Correction*	*Quantity*	*Unit Cost*	*Cost/km (x 1000)*
Hot Mix	6.5	50	2.45	t		796.25	$130.00	$ 104
Granular M	3	50	2.2	t		330	$16.00	$ 5
Pulverize	6.5			m2		6500	$1.75	$ 11.38
Minor Items @ 25%								$ 30
							PP1	**150**

Pulverize and Pave Two Lifts [PP2] Rural/Semi-Urban								
Item	*Width - m*	*Depth - mm*	*Conversion Factor*	*Unit*	*Crossfall Correction*	*Quantity*	*Unit Cost*	*Cost/km (x 1000)*
Hot Mix	6.5	90	2.45	t		1433.25	$130.00	$ 186
Granular M	3	90	2.2	t		594	$16.00	$ 10
Pulverize	6.5			m2		6500	$1.75	$ 11
Minor Items @ 25%								$ 52
							PP2	**259**

Rural: Full Excavation and Reconstruction - Gravel (6 m surface width) [RECON G]								
Item	*Width - m*	*Depth - mm*	*Conversion Factor*	*Unit*	*Crossfall Correction*	*Quantity*	*Unit Cost*	*Cost/km (x 1000)*
Earth Excavation	10	600		m3		6000	$18.00	$ 108
Granular M	6	150	2.2	t		1980	$16.00	$ 32
Granular B	10	450	2	t		9000	$14.00	$ 126
Minor Items @ 25%								$ 66
							Recon G	**332**

Rural: Full Excavation and Reconstruction - Double Surface Treatment [RECON LCB]								
Item	*Width - m*	*Depth - mm*	*Conversion Factor*	*Unit*	*Crossfall Correction*	*Quantity*	*Unit Cost*	*Cost/km (x 1000)*
Removal of Surface Treatment	6			m2		6000	$6.00	$ 36
Earth Excavation	11	600		m3		6600	$18.00	$ 119
Granular M	9.5	150	2.2	t		3135	$16.00	$ 50
Granular B	11	450	2	t		9900	$14.00	$ 139
Double Surface Treatment	7.0			m2		7000	$8.00	$ 56
Minor Items @ 25%								$ 100
							Recon LCB	**499**

Rural: Full Excavation and Reconstruction - 1 Lift [RECON 1R]								
Item	*Width - m*	*Depth - mm*	*Conversion Factor*	*Unit*	*Crossfall Correction*	*Quantity*	*Unit Cost*	*Cost/km (x 1000)*
Asphalt Removal - Full Depth	6			m2		6000	$6.00	$ 36
Earth Excavation	11	600		m3		6600	$18.00	$ 119
Granular M	9.5	150	2.2	t		3135	$16.00	$ 50
Granular B	11	450	2	t		9900	$14.00	$ 139
Hot Mix	6	50	2.45	t		735	$130.00	$ 96
Minor Items @ 25%								$ 110
							Recon 1R	**549**

Rural: Full Excavation and Reconstruction - 2 Lifts [RECON 2R]								
Item	*Width - m*	*Depth - mm*	*Conversion Factor*	*Unit*	*Crossfall Correction*	*Quantity*	*Unit Cost*	*Cost/km (x 1000)*
Asphalt Removal - Full Depth	6			m2		6000	$6.00	$ 36
Earth Excavation	11	600		m3		6600	$18.00	$ 119
Granular M	9.5	150	2.2	t		3135	$16.00	$ 50
Granular B	11	450	2	t		9900	$14.00	$ 139
Hot Mix	6	100	2.45	t		1470	$130.00	$ 191
Minor Items @ 25%								$ 134
							Recon 2R	**668**

Semi-Urban (Curb on one side): Full Excavation and Reconstruction - 2 Lifts [RECON-2S]								
Item	*Width - m*	*Depth - mm*	*Conversion Factor*	*Unit*	*Crossfall Correction*	*Quantity*	*Unit Cost*	*Cost/km (x 1000)*
Asphalt Removal - Full Depth	8			m2		8000	$6.00	$ 48
Earth Excavation	12	750		m3		9000	$18.00	$ 162
Granular M (base)	10	150	2.2	t		3300	$16.00	$ 53
Granular M (shoulder)	1.5	100	2.2	t		330	$16.00	$ 5
Granular B	12	600	2	t		14400	$14.00	$ 202
Hot Mix	8	100	2.45	t		1960	$130.00	$ 255
Remove Curb and Gutter				m		500	$25.00	$ 12.50
Curb and Gutter				m		500	$125.00	$ 62.50
Minor Items @ 25%								$ 181
							Recon 2S	**981**

Urban: Full Excavation and Reconstruction - 2 Lifts [RECON-2U]								
Item	*Width - m*	*Depth - mm*	*Conversion Factor*	*Unit*	*Crossfall Correction*	*Quantity*	*Unit Cost*	*Cost/km (x 1000)*
Asphalt Removal - Full Depth	8.5			m2		8500	$6.00	$ 51
Earth Excavation	11	750		m3		8250	$18.00	$ 149
Granular M	9	150	2.2	t		2970	$16.00	$ 48
Granular B	9	600	2	t		10800	$14.00	$ 151
Hot Mix	8.5	100	2.45	t		2083	$130.00	$ 271
Remove Curb and Gutter				m		1000	$25.00	$ 25.00
Curb and Gutter				m		1000	$125.00	$ 125.00
Minor Items @ 25%								$ 167
							Recon 2U	**986**

Rout and Seal

Item				*Unit*		*Quantity*	*Unit Cost*	*Cost/km (x 1000)*
Rout and Seal				m		1000	$4.00	$ 4
							RS	**4**

Slurry Seal

Item	*Width - m*			*Unit*		*Quantity*	*Unit Cost*	*Cost/km (x 1000)*
Slurry Seal	7			m2		7000	$3.15	$ 22
							SS	**22**

Microsurfacing

Item	*Width - m*			*Unit*		*Quantity*	*Unit Cost*	*Cost/km (x 1000)*
Microsurfacing	7			m2		7000	$6.00	$ 42
							MS	**42**

Appendix B

Ideal Deterioration Curves

Master Deterioration Curves

Age	HCB	LCB	Gravel
0	100	100	100
1	99.23890491	98.90644567	90
2	98.36129754	97.54698903	80
3	97.35301799	95.86973541	70
4	96.19944215	93.81963742	60
5	94.88592775	91.34223725	50
6	93.3984177	88.38941151	40
7	91.72421044	84.92713801	30
8	89.85289025	80.94468683	20
9	87.77738662	76.46377287	10
10	85.49510111	71.54534469	0
11	83.00900584	66.29130279	0
12	80.32858652	60.83906139	0
13	77.47048282	55.34867058	0
14	74.45868003	49.98467867	0
15	71.3241358	44.89690484	0
16	68.10378701	40.20472586	0
17	64.8389669	35.98810744	0
18	61.57335731	32.28620713	0
19	58.35068223	29.10215836	0
20	55.21239656	26.41146561	0
21	52.19562517	24.17141617	0
22	49.33156066	22.32962422	0
23	46.64444805	20.83073329	0
24	44.15118979	19.62105003	0
25	41.86151897	18.65133723	0
26	39.77862601	17.87818664	0
27	37.90009349	17.26441051	0
28	36.21899143	16.77882392	0
29	34.72500498	16.39569515	0
30	33.40549746	16.09405255	0
31	32.24644604	15.85696537	0
32	31.233218	15.67086485	0
33	30.35117999	15.52493805	0
34	29.58614942	15.41060599	0
35	28.92470696	15.32108536	0
36	28.35439366	15.25102688	0
37	27.86381675	15.19622087	0
38	27.44268653	15.15335987	0
39	27.08180346	15.11984849	0
40	26.77301153	15.09365213	0

Age	HCB	LCB	Gravel
41	26.50913027	15.07317703	0
42	26.28387483	15.05717552	0
43	26.09177112	15.04467128	0
44	25.92807072	15.03490064	0
45	25.7886689	15.0272664	0
46	25.67002765	15.0213017	0
47	25.56910493	15.01664157	0
48	25.48329053	15.01300078	0
49	25.41034873	15.01015642	0
50	25.34836735	15.0079343	0

Appendix C

HCB Lifecycle Costing Tables

HCB Lifecycle Cost Analysis – Tables

No Intervention

Year	PCI	Effective Age	Intervention	Cost
0	100	0		0
1	99.23890491	1		0
2	98.36129754	2		0
3	97.35301799	3		0
4	96.19944215	4		0
5	94.88592775	5		0
6	93.3984177	6		0
7	91.72421044	7		0
8	89.85289025	8		0
9	87.77738662	9		0
10	85.49510111	10		0
11	83.00900584	11		0
12	80.32858652	12		0
13	77.47048282	13		0
14	74.45868003	14		0
15	71.3241358	15		0
16	68.10378701	16		0
17	64.8389669	17		0
18	61.57335731	18		0
19	58.35068223	19		0
20	55.21239656	20		0
21	52.19562517	21		0
22	49.33156066	22		0
23	46.64444805	23		0
24	44.15118979	24		0
25	41.86151897	25		0
26	39.77862601	26		0
27	37.90009349	27		0
28	36.21899143	28		0
29	34.72500498	29		0
30	100	0	RECON 1R	549

Regular Resurfacing

Year	PCI	Effective Age	Intervention	Cost
0	100	0		0
1	99.23890491	1		0
2	98.36129754	2		0
3	97.35301799	3		0

Year	PCI	Effective Age	Intervention	Cost
4	96.19944215	4		0
5	94.88592775	5		0
6	93.3984177	6		0
7	91.72421044	7		0
8	89.85289025	8		0
9	87.77738662	9		0
10	85.49510111	10		0
11	83.00900584	11		0
12	80.32858652	12		0
13	97.35301799	3	RO1	156
14	96.19944215	4		0
15	94.88592775	5		0
16	93.3984177	6		0
17	91.72421044	7		0
18	89.85289025	8		0
19	87.77738662	9		0
20	85.49510111	10		0
21	83.00900584	11		0
22	80.32858652	12		0
23	77.47048282	13		0
24	74.45868003	14		0
25	71.3241358	15		0
26	68.10378701	16		0
27	64.8389669	17		0
28	61.57335731	18		0
29	58.35068223	19		0
30	55.21239656	20		0
31	52.19562517	21		0
32	49.33156066	22		0
33	46.64444805	23		0
34	44.15118979	24		0
35	100	0	PP1	150
36	99.23890491	1		0
37	98.36129754	2		0
38	97.35301799	3		0
39	96.19944215	4		0
40	94.88592775	5		0
41	93.3984177	6		0
42	91.72421044	7		0
43	89.85289025	8		0
44	87.77738662	9		0
45	85.49510111	10		0
46	83.00900584	11		0
47	80.32858652	12		0
48	97.35301799	3	RO1	156

Year	PCI	Effective Age	Intervention	Cost
49	96.19944215	4		0
50	94.88592775	5		0
51	93.3984177	6		0
52	91.72421044	7		0
53	89.85289025	8		0
54	87.77738662	9		0
55	85.49510111	10		0
56	83.00900584	11		0
57	80.32858652	12		0
58	77.47048282	13		0
59	74.45868003	14		0
60	71.3241358	15		0
61	68.10378701	16		0
62	64.8389669	17		0
63	61.57335731	18		0
64	58.35068223	19		0
65	55.21239656	20		0
66	52.19562517	21		0
67	49.33156066	22		0
68	46.64444805	23		0
69	44.15118979	24		0
70	41.86151897	25		0
71	39.77862601	26		0
72	37.90009349	27		0
73	36.21899143	28		0
74	34.72500498	29		0
75	100	0	RECON 1R	549

Preventative Maintenance – Single Lift

Year	PCI	Effective Age	Intervention	Cost
0	100	0		0
1	99.23890491	1		0
2	98.36129754	2		0
3	97.35301799	3		0
4	96.19944215	4		0
5	94.88592775	5		0
6	100	0	SS	22
7	99.23890491	1		0
8	98.36129754	2		0
9	97.35301799	3		0
10	96.19944215	4		0
11	94.88592775	5		0

Year	PCI	Effective Age	Intervention	Cost
12	93.3984177	6		0
13	91.72421044	7		0
14	89.85289025	8		0
15	87.77738662	9		0
16	85.49510111	10		0
17	83.00900584	11		0
18	80.32858652	12		0
19	97.35301799	3	RO1	156
20	96.19944215	4		0
21	94.88592775	5		0
22	93.3984177	6		0
23	91.72421044	7		0
24	89.85289025	8		0
25	87.77738662	9		0
26	85.49510111	10		0
27	83.00900584	11		0
28	80.32858652	12		0
29	77.47048282	13		0
30	74.45868003	14		0
31	71.3241358	15		0
32	68.10378701	16		0
33	64.8389669	17		0
34	61.57335731	18		0
35	58.35068223	19		0
36	55.21239656	20		0
37	52.19562517	21		0
38	49.33156066	22		0
39	46.64444805	23		0
40	44.15118979	24		0
41	100	0	PP1	150
42	99.23890491	1		0
43	98.36129754	2		0
44	97.35301799	3		0
45	96.19944215	4		0
46	94.88592775	5		0
47	100	0	SS	22
48	99.23890491	1		0
49	98.36129754	2		0
50	97.35301799	3		0
51	96.19944215	4		0
52	94.88592775	5		0
53	93.3984177	6		0
54	91.72421044	7		0
55	89.85289025	8		0
56	87.77738662	9		0

Year	PCI	Effective Age	Intervention	Cost
57	85.49510111	10		0
58	83.00900584	11		0
59	80.32858652	12		0
60	97.35301799	3	RO1	156
61	96.19944215	4		0
62	94.88592775	5		0
63	93.3984177	6		0
64	91.72421044	7		0
65	89.85289025	8		0
66	87.77738662	9		0
67	85.49510111	10		0
68	83.00900584	11		0
69	80.32858652	12		0
70	77.47048282	13		0
71	74.45868003	14		0
72	71.3241358	15		0
73	68.10378701	16		0
74	64.8389669	17		0
75	61.57335731	18		0
76	58.35068223	19		0
77	55.21239656	20		0
78	52.19562517	21		0
79	49.33156066	22		0
80	46.64444805	23		0
81	44.15118979	24		0
82	41.86151897	25		0
83	39.77862601	26		0
84	37.90009349	27		0
85	36.21899143	28		0
86	34.72500498	29		0
87	100	0	RECON 1R	549

Preventative Maintenance – Double Lift

Year	PCI	Effective Age	Intervention	Cost
0	100	0		0
1	99.23890491	1		0
2	98.36129754	2		0
3	99.23890491	1	RS	4
4	98.36129754	2		0
5	97.35301799	3		0

Year	PCI	Effective Age	Intervention	Cost
6	96.19944215	4		0
7	94.88592775	5		0
8	100	0	SS	22
9	99.23890491	1		0
10	98.36129754	2		0
11	97.35301799	3		0
12	96.19944215	4		0
13	94.88592775	5		0
14	93.3984177	6		0
15	91.72421044	7		0
16	89.85289025	8		0
17	87.77738662	9		0
18	85.49510111	10		0
19	83.00900584	11		0
20	80.32858652	12		0
21	97.35301799	3	RMP1	154
22	96.19944215	4		0
23	94.88592775	5		0
24	93.3984177	6		0
25	91.72421044	7		0
26	98.36129754	2	SS	22
27	97.35301799	3		0
28	96.19944215	4		0
29	94.88592775	5		0
30	93.3984177	6		0
31	91.72421044	7		0
32	89.85289025	8		0
33	87.77738662	9		0
34	85.49510111	10		0
35	83.00900584	11		0
36	80.32858652	12		0
37	97.35301799	3	RMP1	154
38	96.19944215	4		0
39	94.88592775	5		0
40	93.3984177	6		0
41	91.72421044	7		0
42	89.85289025	8		0
43	87.77738662	9		0
44	85.49510111	10		0
45	83.00900584	11		0
46	80.32858652	12		0
47	77.47048282	13		0
48	74.45868003	14		0
49	71.3241358	15		0
50	68.10378701	16		0

Year	PCI	Effective Age	Intervention	Cost
51	64.8389669	17		0
52	61.57335731	18		0
53	58.35068223	19		0
54	55.21239656	20		0
55	52.19562517	21		0
56	49.33156066	22		0
57	46.64444805	23		0
58	44.15118979	24		0
59	100	0	PP2	259
60	99.23890491	1		0
61	98.36129754	2		0
62	99.23890491	1	RS	4
63	98.36129754	2		0
64	97.35301799	3		0
65	96.19944215	4		0
66	94.88592775	5		0
67	100	0	SS	22
68	99.23890491	1		0
69	98.36129754	2		0
70	97.35301799	3		0
71	96.19944215	4		0
72	94.88592775	5		0
73	93.3984177	6		0
74	91.72421044	7		0
75	89.85289025	8		0
76	87.77738662	9		0
77	85.49510111	10		0
78	83.00900584	11		0
79	80.32858652	12		0
80	97.35301799	3	RMP1	154
81	96.19944215	4		0
82	94.88592775	5		0
83	93.3984177	6		0
84	91.72421044	7		0
85	98.36129754	2	SS	22
86	97.35301799	3		0
87	96.19944215	4		0
88	94.88592775	5		0
89	93.3984177	6		0
90	91.72421044	7		0
91	89.85289025	8		0
92	87.77738662	9		0
93	85.49510111	10		0
94	83.00900584	11		0
95	80.32858652	12		0

Year	PCI	Effective Age	Intervention	Cost
96	97.35301799	3	RMP1	154
97	96.19944215	4		0
98	94.88592775	5		0
99	93.3984177	6		0
100	91.72421044	7		0
101	89.85289025	8		0
102	87.77738662	9		0
103	85.49510111	10		0
104	83.00900584	11		0
105	80.32858652	12		0
106	77.47048282	13		0
107	74.45868003	14		0
108	71.3241358	15		0
109	68.10378701	16		0
110	64.8389669	17		0
111	61.57335731	18		0
112	58.35068223	19		0
113	55.21239656	20		0
114	52.19562517	21		0
115	49.33156066	22		0
116	46.64444805	23		0
117	44.15118979	24		0
118	41.86151897	25		0
119	39.77862601	26		0
120	37.90009349	27		0
121	36.21899143	28		0
122	34.72500498	29		0
123	100	0	RECON 2R	668

Appendix D

LCB Lifecycle Costing Tables

LCB Lifecycle Cost Analysis – Tables

No Intervention

Year	PCI	Effective Age	Intervention	Cost
0	100	0		0
1	98.90644567	1		0
2	97.54698903	2		0
3	95.86973541	3		0
4	93.81963742	4		0
5	91.34223725	5		0
6	88.38941151	6		0
7	84.92713801	7		0
8	80.94468683	8		0
9	76.46377287	9		0
10	71.54534469	10		0
11	66.29130279	11		0
12	60.83906139	12		0
13	55.34867058	13		0
14	49.98467867	14		0
15	44.89690484	15		0
16	100	0	RECON LCB	449

Regular Resurfacing

True Age	PCI	Effective Age	Intervention	Cost
0	100	0		0
1	98.90644567	1		0
2	97.54698903	2		0
3	95.86973541	3		0
4	93.81963742	4		0
5	91.34223725	5		0
6	95.86973541	3	ST1	34
7	93.81963742	4		0
8	91.34223725	5		0
9	88.38941151	6		0
10	84.92713801	7		0
11	80.94468683	8		0
12	76.46377287	9		0
13	95.86973541	3	ST2	55
14	93.81963742	4		0
15	91.34223725	5		0
16	88.38941151	6		0
17	84.92713801	7		0
18	80.94468683	8		0

19	76.46377287	9		0
20	71.54534469	10		0
21	66.29130279	11		0
22	60.83906139	12		0
23	55.34867058	13		0
24	100	0	ST2PA	107
25	98.90644567	1		0
26	97.54698903	2		0
27	95.86973541	3		0
28	93.81963742	4		0
29	91.34223725	5		0
30	95.86973541	3	ST1	34
31	93.81963742	4		0
32	91.34223725	5		0
33	88.38941151	6		0
34	84.92713801	7		0
35	80.94468683	8		0
36	76.46377287	9		0
37	95.86973541	3	ST2	55
38	93.81963742	4		0
39	91.34223725	5		0
40	88.38941151	6		0
41	84.92713801	7		0
42	80.94468683	8		0
43	76.46377287	9		0
44	71.54534469	10		0
45	66.29130279	11		0
46	60.83906139	12		0
47	55.34867058	13		0
48	100	0	ST2PA	107
49	98.90644567	1		0
50	97.54698903	2		0
51	95.86973541	3		0
52	93.81963742	4		0
53	91.34223725	5		0
54	95.86973541	3	ST1	34
55	93.81963742	4		0
56	91.34223725	5		0
57	88.38941151	6		0
58	84.92713801	7		0
59	80.94468683	8		0
60	76.46377287	9		0
61	95.86973541	3	ST2	55
62	93.81963742	4		0
63	91.34223725	5		0
64	88.38941151	6		0
65	84.92713801	7		0
66	80.94468683	8		0

67	76.46377287	9		0
68	71.54534469	10		0
69	66.29130279	11		0
70	60.83906139	12		0
71	55.34867058	13		0
72	100	0	ST2PA	107
73	98.90644567	1		0
74	97.54698903	2		0
75	95.86973541	3		0
76	93.81963742	4		0
77	91.34223725	5		0
78	95.86973541	3	ST1	34
79	93.81963742	4		0
80	91.34223725	5		0
81	88.38941151	6		0
82	84.92713801	7		0
83	80.94468683	8		0
84	76.46377287	9		0
85	95.86973541	3	ST2	55
86	93.81963742	4		0
87	91.34223725	5		0
88	88.38941151	6		0
89	84.92713801	7		0
90	80.94468683	8		0
91	76.46377287	9		0
92	71.54534469	10		0
93	66.29130279	11		0
94	60.83906139	12		0
95	55.34867058	13		0
96	49.98467867	14		0
97	44.89690484	15		0
98	100	0	RECON LCB	449

Preventative Maintenance

True Age	PCI	Effective Age	Intervention	Cost
0	100	0		0
1	98.9064457	1		0
2	97.546989	2		0
3	100	-1	SS	22
4	100	0		0
5	98.9064457	1		0
6	97.546989	2		0
7	95.8697354	3		0
8	93.8196374	4		0

9	91.3422373	5		0
10	88.3894115	6		0
11	84.927138	7		0
12	80.9446868	8		0
13	76.4637729	9		0
14	95.8697354	3	ST2	55
15	93.8196374	4		0
16	91.3422373	5		0
17	88.3894115	6		0
18	84.927138	7		0
19	80.9446868	8		0
20	76.4637729	9		0
21	71.5453447	10		0
22	66.2913028	11		0
23	60.8390614	12		0
24	55.3486706	13		0
25	100	0	ST2PA	107
26	98.9064457	1		0
27	97.546989	2		0
28	100	-1	SS	22
29	100	0		0
30	98.9064457	1		0
31	97.546989	2		0
32	95.8697354	3		0
33	93.8196374	4		0
34	91.3422373	5		0
35	88.3894115	6		0
36	84.927138	7		0
37	80.9446868	8		0
38	76.4637729	9		0
39	95.8697354	3	ST2	55
40	93.8196374	4		0
41	91.3422373	5		0
42	88.3894115	6		0
43	84.927138	7		0
44	80.9446868	8		0
45	76.4637729	9		0
46	71.5453447	10		0
47	66.2913028	11		0
48	60.8390614	12		0
49	55.3486706	13		0
50	100	0	ST2PA	107
51	98.9064457	1		0
52	97.546989	2		0
53	100	-1	SS	22
54	100	0		0
55	98.9064457	1		0
56	97.546989	2		0

57	95.8697354	3		0
58	93.8196374	4		0
59	91.3422373	5		0
60	88.3894115	6		0
61	84.927138	7		0
62	80.9446868	8		0
63	76.4637729	9		0
64	95.8697354	3	ST2	55
65	93.8196374	4		0
66	91.3422373	5		0
67	88.3894115	6		0
68	84.927138	7		0
69	80.9446868	8		0
70	76.4637729	9		0
71	71.5453447	10		0
72	66.2913028	11		0
73	60.8390614	12		0
74	55.3486706	13		0
75	100	0	ST2PA	107
76	98.9064457	1		0
77	97.546989	2		0
78	100	-1	SS	22
79	100	0		0
80	98.9064457	1		0
81	97.546989	2		0
82	95.8697354	3		0
83	93.8196374	4		0
84	91.3422373	5		0
85	88.3894115	6		0
86	84.927138	7		0
87	80.9446868	8		0
88	76.4637729	9		0
89	95.8697354	3	ST2	55
90	93.8196374	4		0
91	91.3422373	5		0
92	88.3894115	6		0
93	84.927138	7		0
94	80.9446868	8		0
95	76.4637729	9		0
96	71.5453447	10		0
97	66.2913028	11		0
98	60.8390614	12		0
99	55.3486706	13		0
100	49.9846787	14		0
101	44.8969048	15		0
102	100	0	RECON LCB	449

Appendix E

Road Maps

Township of South Stormont Road Needs Study

Overall Roads Map

Legend

Municipal Boundary

Roads

- Provincial Highway
- County Road
- Municipal Road
- Municipal Roads - Future Development
- Municipal - Seasonal Road or Road Under Constuction
- Private or Other Roads

Scale: 1:100,000

340 170 0 340 680 Meters

NAD 1983 UTM Zone 18N

Data Sources

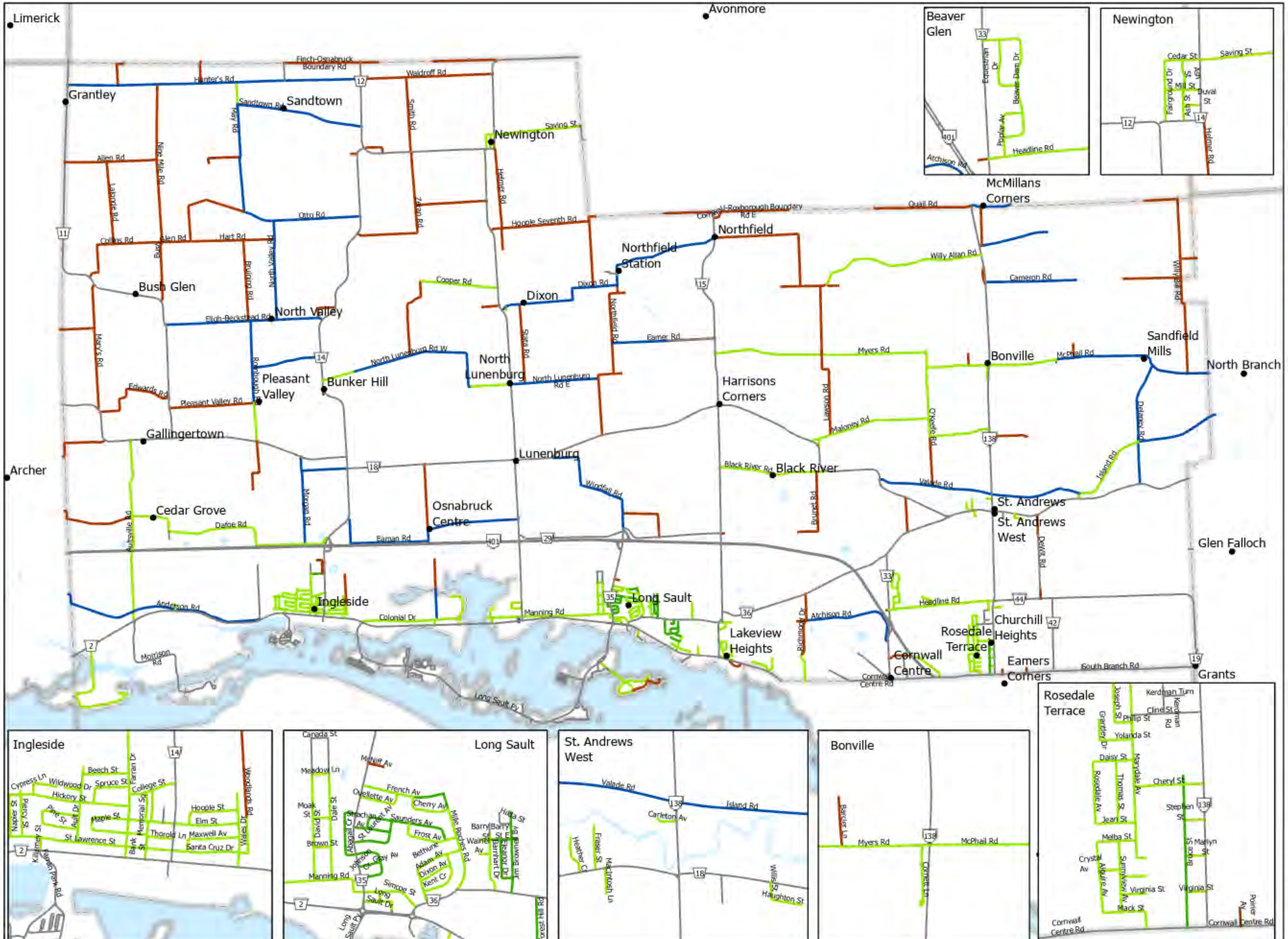
Road data provided by the Township of South Stormont.

Ground truthing and field data collected and provide by D.M. Wills Associates

Created In:	ArcMap 10.7	Map Date:	2022-05-27
Drawn By:	JW	Project Number:	4782

Map produced by D.M. Wills Associates Limited on behalf of the United Counties of Stormont, Dundas and Glengarry.

WILLS



Township of South Stormont Road Needs Study

Road Surface Type

Legend

- Municipal Boundary

Road Surface Type

- HCB - Double Lift
- HCB - Single Lift
- LCB
- Gravel/Earth
- Roads Not in Inventory

Scale: 1:100,000

340 170 0 340 680 Meters

NAD 1983 UTM Zone 18N

Data Sources
Road data provided by the Township of South Stormont.
Ground truthing and field data collected and provide by D.M. Wills Associates

Created In: ArcMap 10.7	Map Date: May, 2022
Drawn By: JW	Project Number: 4782

Map produced by D.M. Wills Associates Limited on behalf of the United Counties of Stormont, Dundas and Glengarry.

Township of South Stormont Road Needs Study

Roadside Environment

Legend

Municipal Boundary

Roadside Environment

- Urban (Collector)
- Urban (Local)
- Semi-Urban (Collector)
- Semi-Urban (Local)
- Rural (Local)
- Roads Not in Inventory

Scale: 1:100,000

340 170 0 340 680 Meters

NAD 1983 UTM Zone 18N

Data Sources

Road data provided by the Townships of South Stormont.

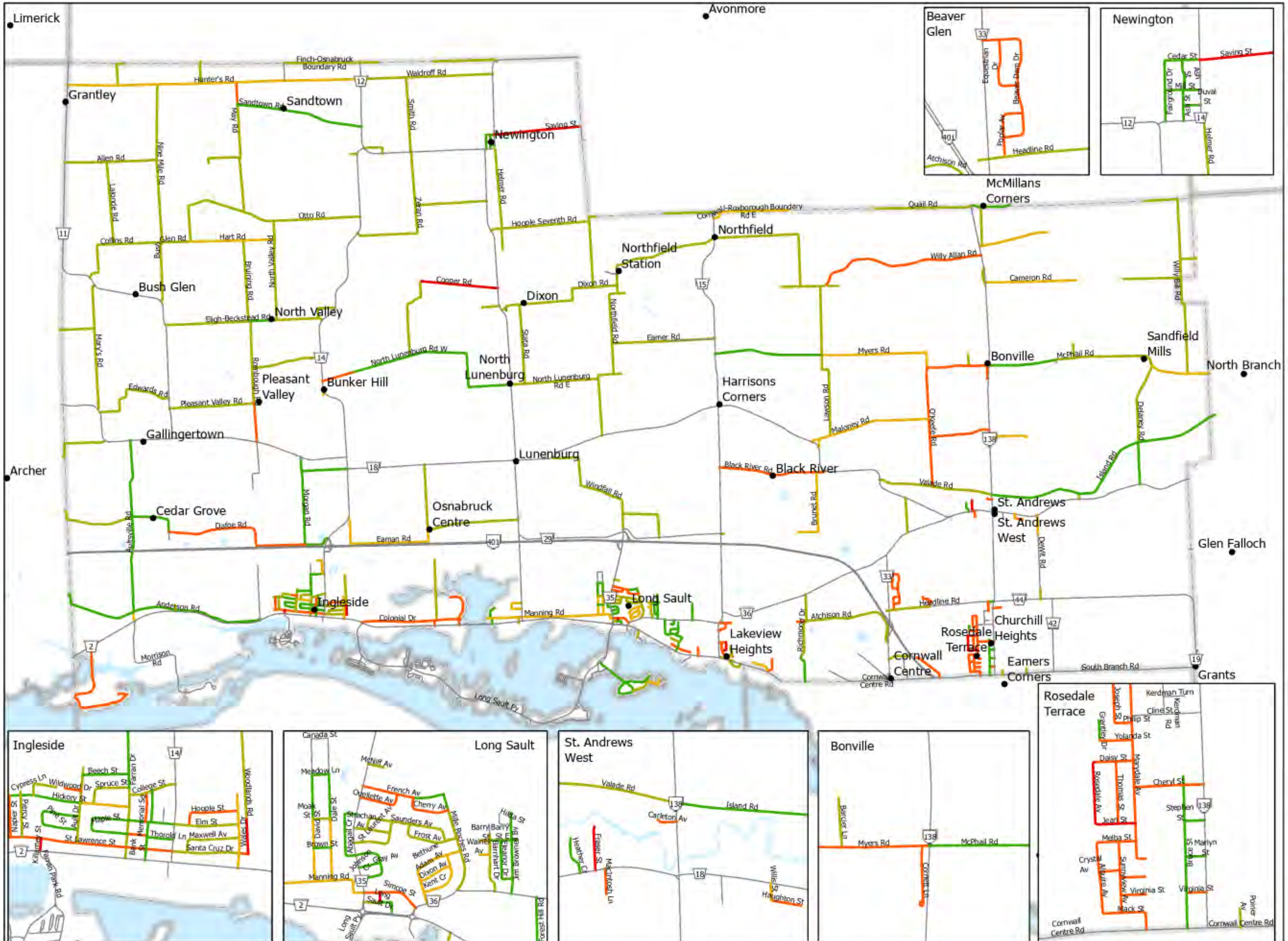
Ground-truthing and field data collected and provide by D.M. Wills Associates

Created in:	ArcMap 10.7	Map Date:	June, 2022
Drawn By:	JW	Project Number:	4782

WILLS

Map produced by D.M. Wills Associates Limited on behalf of the United Counties of Stormont, Dundas and Glengarry.

Limerick
Avonmore
Grantley
Sandtown
Newington
Bush Glen
North Valley
Pleasant Valley
Bunker Hill
North Lunenburg
Dixon
Northfield
Northfield Station
McMillans Corners
Harrisons Corners
Bonville
Sandfield Mills
North Branch
Gallingertown
Lunenburg
Archer
Cedar Grove
Osnabruck Centre
Black River
St. Andrews
St. Andrews West
Glen Falloch
Ingleside
Long Sault
Lakeview Heights
Rosedale Terrace
Churchill Heights
Cornwall Centre
Eamers Corners
Grants
Finch-Osnabruck Boundary Rd
Hunter's Rd
Waldroff Rd
Sandtown Rd
Saving St
Allen Rd
Nine Mile Rd
May Rd
Smith Rd
Helmer Rd
Zeran Rd
Otto Rd
Hoople Seventh Rd
Collins Rd
Hart Rd
Bruhning Rd
North Valley Rd
Glen Rd
Lalonde Rd
Cooper Rd
Dixon Rd
Northfield Rd
Eamer Rd
Stata Rd
Eligh-Beckstead Rd
North Lunenburg Rd W
North Lunenburg Rd E
Mary's Rd
Edwards Rd
Pleasant Valley Rd
Rombough Rd
Aultsville Rd
Morgan Rd
Dafoe Rd
Eaman Rd
Windfall Rd
Brunet Rd
Lawson Rd
Maloney Rd
O'Keefe Rd
Myers Rd
McPhail Rd
Willy Allan Rd
Cameron Rd
Willy Bill Rd
Delaney Rd
Island Rd
Valade Rd
DeWitt Rd
Anderson Rd
Colonial Dr
Manning Rd
Morrison Rd
Long Sault Py
Hartline Rd
Atchison Rd
Richmond Dr
Cornwall Centre Rd
South Branch Rd
Cornwall-Roxborough Boundary Rd E
Quail Rd
Beaver Glen
Equestrian Dr
Beaver Dam Dr
Poplar Av
Headline Rd
Atchison Rd
Newington
Cedar St
Saving St
Fairground Dr
Ash St
Mill St
Duval St
Helmer Rd
Ingleside
Cypress Ln
Wildwood Dr
Beech St
Spruce St
Hickory St
Pine St
Maple St
St Lawrence St
Farran Dr
College St
Bank Memorial St
Thorold Ln
Hoople St
Elm St
Maxwell Av
Santa Cruz Dr
Woodlands Rd
Napier St
Percy St
Killarney St
Farran Park Rd
Aud Dr
Long Sault
Meadow Ln
McNiff Av
French Av
Ouellette Av
Cherry Av
Saunders Av
Frost Av
Bethune Av
Adam Av
Dixon Av
Kent Cr
Millie Boothe Rd
Barry St
Barry St E
Walnut Av
Eleanor Dr
Barnhart Dr
Hilda St
Jim Brownell Dr
Moak St
Dale St
David St
Brown St
Abagail Cr
St Laurent Av
Johnson Dr
Gray Av
Simcoe St
Long Sault Dr
Forest Hill Rd
St. Andrews West
Valade Rd
Carleton Av
Island Rd
Heather Cr
Fraser St
MacIntosh Ln
Willis St
Haughton St
Bonville
Barcler Ln
Myers Rd
McPhail Rd
Cornett Ln
Rosedale Terrace
Kerdman Turn
Joseph St
Phillip St
Cline St
Kerdman Rd
Yolanda St
Daisy St
Marydale Av
Cheryl St
Rosedale Av
Thomas St
Jean St
Stephen St
Melba St
Marilyn St
Crystal Av
Allaire Av
Sunnyview Av
Virginia St
Black St
Poirier Av
Cornwall Centre Rd



Limerick
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McMillans Corners
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Northfield Station
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Dixon
Pleasant Valley
Bunker Hill
North Lunenburg
Harrissons Corners
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Hart Rd
Quail Rd
Willy Allan Rd
Cameron Rd
Cooper Rd
Dixon Rd
Elgh-Beckstead Rd
Earner Rd
Myers Rd
McPhail Rd
North Lunenburg Rd W
North Lunenburg Rd E
Edwards Rd
Pleasant Valley Rd
Maloney Rd
Black River Rd
Valade Rd
Windfall Rd
Dafoe Rd
Eaman Rd
Anderson Rd
Colonial Dr
Manning Rd
Atchison Rd
Headline Rd
South Branch Rd
Morrison Rd
Long Sault Py
Cornwall Centre Rd
Island Rd
Ingleside
Long Sault
St. Andrews West
Bonville
Rosedale Terrace

Township of South Stormont Road Needs Study

Road Condition

Legend

- Municipal Boundary

Road Condition Rating

- Very Good
- Good
- Fair
- Poor
- Very Poor
- Roads Not in Inventory

Scale: 1:100,000

340 170 0 340 680 Meters

NAD 1983 UTM Zone 18N

Data Sources

Road data provided by the Township of South Stormont.

Ground truthing and field data collected and provide by D.M. Wills Associates

Created In:	ArcMap 10.7	Map Date:	May, 2022
Drawn By:	JW	Project Number:	4782

WILLS

Map produced by D.M. Wills Associates Limited on behalf of the United Counties of Stormont, Dundas and Glengarry.

Township of South Stormont Road Needs Study

Capital Improvement Plan
1.5M/Year

Legend

- Municipal Boundary
- Roads not included in Capital Improvement Plan

Capital Plan Work

Year	Reconstruction	Rehabilitation
2022		
2023		
2024		
2025		
2026		
2027		
2028		
2029		
2030		
2031		

Scale: 1:100,000

340 170 0 340 680 Meters

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Map produced by G.M. Wills Associates Limited on behalf of the United Counties of Stormont, Dundas and Glengarry

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Saving St
Alton Rd
Nine Mile Rd
Lapointe Rd
Otto Rd
Collins Rd
Glen Rd
Hart Rd
Hoople Seventh Rd
Cooper Rd
Dixon Rd
Nicholson Rd
Eamer Rd
North Lunenburg Rd W
North Lunenburg Rd E
Edwards Rd
Pleasant Valley Rd
Elgh-Beckstead Rd
Myers Rd
Lawson Rd
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Morrison Rd
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Headline Rd
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Cornwall Centre Rd
Cedar St
Fairgland Dr
Mill St
Duval St
Helmer Rd
Equestrian Dr
Beaver Dam Dr
Poplar Av
Ingleside
Canada St
Meadow Ln
Moak St
Brown St
Manning Rd
Simpson St
Long Sault Pky
Forest Hill Rd
Long Sault
St. Andrews West
Valade Rd
Island Rd
Carleton Av
Fraser St
Heather Ct
Macintosh Ln
Haughton St
Bonville
Myers Rd
McPhail Rd
Rosedale Terrace
Joseph St
Kerdman Turn
Kerdman Rd
Clinel St
Philip St
Yolanda St
Daisy St
Maryvale Av
Cheryl St
Thomas St
Rosedale Av
Jean St
Melba St
Crystal Av
Allaire Av
Summerview Av
Virginia St
Mack St
Cornwall Centre Rd

Township of South Stormont Road Needs Study

Preservation Plan

Legend

Municipal Boundary

Preservation Work Plan

- 2022
- 2023
- 2024
- 2025
- 2026
- 2027
- 2028
- 2029
- 2030
- 2031

Roads Not in Inventory

Scale: 1:100,000

340 170 0 340 680 Meters

NAD 1983 UTM Zone 18N

Data Sources

Road data provided by the Township of South Stormont

Ground truthing and field data collected and provided by G.M. Wills Associates

Created In:	ArcMap 10.7	Map Date:	May, 2022
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