Comprehensive Road Needs Study 2024

Contract #2024-PW-03

PREPARED FOR

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Executive Summary

Montague Township's road infrastructure comprises loose top, surface-treated, and asphalt roads that serve a variety of traffic levels across the municipality. This report outlines a comprehensive Ten-Year Capital Program and a Loose Top Maintenance Program, developed based on historical capital expenditures and field assessments. These programs are designed to guide Municipal Staff and Council in making informed, strategic decisions that address both immediate maintenance priorities and long-term road sustainability needs. The Ten-Year Capital Program emphasizes high-traffic and semi-urban roads, which are most critical to residents and more prone to accelerated deterioration. Recommended strategies include overlay projects for asphalt roads and single surface treatments for surface-treated roads, ensuring cost-effective approaches tailored to road conditions and traffic patterns. For asphalt, overlays remain the preferred method, with pulverize and pave or partial depth reconstruction employed where more substantial interventions are required. For surface-treated roads, single surface treatments offer the best value, supplemented by partial depth reconstruction when necessary.

Despite an anticipated investment of approximately $2.5 million over the next decade, the study underscores that this funding level will not fully address ongoing road deterioration. Roads identified as deficient in both the 2019 and 2024 assessments remain problematic, as current resources primarily support temporary measures rather than addressing deeper structural deficiencies. These short-term solutions, though necessary, fall short of ensuring long-term infrastructure stability and may lead to escalating costs if underlying issues are not resolved.

The study encourages the Township to pursue alternative funding sources, such as provincial or federal grants, partnerships with boundary municipalities, and innovative infrastructure financing models. Such efforts will be instrumental in enabling critical upgrades and reconstructions while minimizing the financial burden on local taxpayers. Additionally, the report recognizes the value of micro-sealing as a preservation strategy for roads in good condition. While not suitable as a repair method for structurally deficient roads, micro-sealing should be incorporated into the Township's routine maintenance program to extend the lifespan of sound infrastructure and prevent minor issues from escalating.

Proactive and cost-effective maintenance remains vital to the Township's road network strategy. Regular condition assessments, conducted every five years, will provide crucial data to track evolving road conditions, adapt maintenance priorities, and allocate resources efficiently. Furthermore, the report stresses the importance of incorporating safety enhancements, such as road alignment corrections, improved drainage, and the removal of obstructions like trees and brush from the right-of-way, to address risks to public end-users. By prioritizing comprehensive repair strategies, such as partial and full-depth reconstruction, the Township can achieve long-term cost savings while ensuring the resilience and functionality of its road network.

The study concludes with a call for strategic, forward-thinking decision-making and a commitment to securing adequate financial resources. By aligning its road maintenance efforts with these recommendations, Montague Township can not only maintain but improve the quality and safety of its infrastructure, supporting the needs of its residents and fostering sustainable growth over the coming decade.

1.0 INTRODUCTION

The Comprehensive Roads Needs Study provides Council and Township staff with an inventory of all roads within the Township, a review of the existing conditions, with a plan for maintenance and repair of roads to maintain a satisfactory level of service as deemed acceptable by council.

The report provides the Township with a suggested capital program to manage the roads over the next 10 years. It is recommended that the study be repeated on a 5-year cycle to allow for a meaningful review of assumptions made, results of implementation of maintenance strategies and to review updated needs of the roads and how to improve road networks to address these needs. This report represents an update to the study performed in 2019.

The RNS will achieve:

1) Identify current and future needs within the road networks;
2) Provide a cost-effective maintenance strategy, and;
3) Provide a 10-year Capital Plan for consideration.

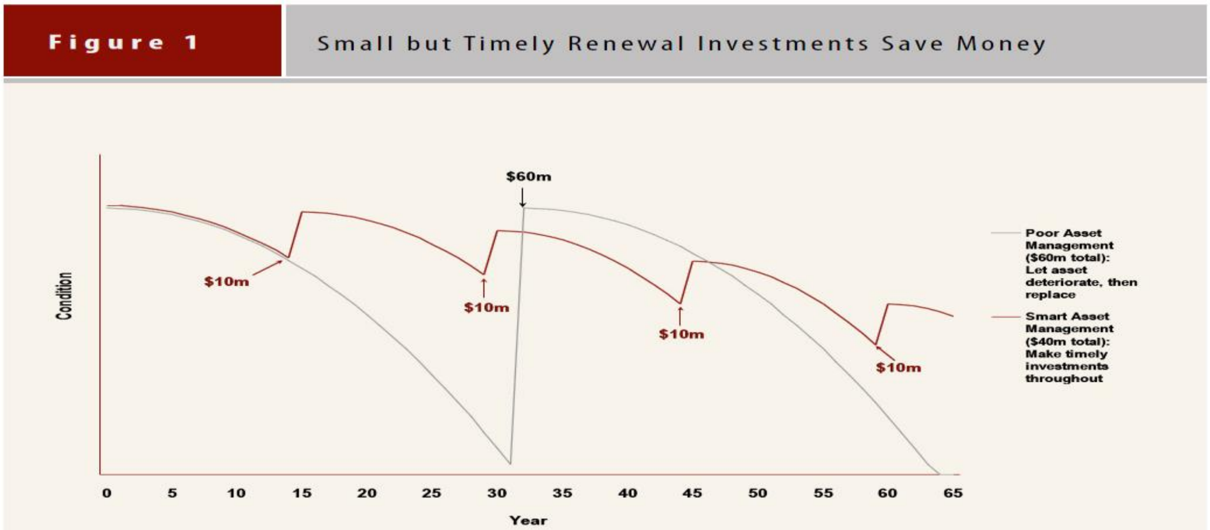
The study contains:

1) 2024 field review;
2) Recommendations for maintaining assets;
3) Updated road inventory;
4) Condition rating;
5) Recommendation on deficient or deteriorated roadways;
6) Cost-effective long-term maintenance and upgrade strategy;
7) Recommend 10-year capital improvement plan using proposed capital budgets, and;
8) Summary of capital improvements/maintenance that cannot be addressed with current budgets.

Effective asset management is vital for all governmental levels, as it leads to well-informed and strategic decisions that maximize investments and mitigate risks, including infrastructure failures and the effects of climate change, such as damage from severe weather. The Ministry of Transportation demonstrates this by employing preventative maintenance methods to prolong pavement lifespan. Methods like crack sealing, hot mix patching, and applying thin surface layers help keep pavements in excellent condition.

When these treatments are performed timely, they can extend pavement life by up to 15 years, postponing the need for expensive road reconstruction.

See the figure on the following page provided by the Ministry of Infrastructure, Ontario. It demonstrates that effective inventory, condition assessment and timely maintenance can save costs in the long term while maintaining a more consistent level of service.



(Resource from "Building Together, Guide for Municipal Asset Management Plans", Ministry of Infrastructure, Ontario)

2.0 STUDY METHODOLOGY

2.1. General

The method developed by the Ministry of Transportation of Ontario and outlined in the "Inventory Manual for Municipal Roads for Small Lower Tier Municipalities", will be used to develop a short term (1-4 years), mid-term (5-7 years) and medium term (8-10 years), including a 10-Year Capital Plan from 2025 to 2034. The Manual was developed to assist Municipalities and Consultants in preparing Roads Needs Studies and provides the framework to manage the road network with a computerized system. The methodology is outlined below.

All road sections are listed and their condition rating by road type:

a) Earth Roads (listed in inventory but not rated)
b) Gravel Roads
c) Surface Treated or Low Class Bituminous (LCB) Roads
d) Hot Mix Paved or High Class Bituminous (HCB) Roads

Condition ratings of less than 50 are unsatisfactory, and road improvements costs are calculated. Roads with a rating of 50 or less are deemed deficient.

Except for earth roads, future condition ratings are calculated for each road, and predicted maintenance and capital expenditures can be produced. Newly reconstructed roads would have a 100-point condition rating, and roads requiring reconstruction would be assigned 30 points.

The condition rating for each road type should decrease every year, based on the following calculation for low volume roads:

Gravel:	No change in rating with regular maintenance.
Surface:	100 – 30 point condition rating = 4.7 per year.
Treatment:	15 year life cycle before reconstructing.
Hot Mixed Pave:	100 – 30 point condition rating = 2.3 per year.
	30 year life cycle before reconstructing.

Based on the foregoing discussion, Table 1 provides an example of how the condition rating is forecasted for each surface type. In this example, it is assumed the road types were reconstructed in 2024.

SURFACE TYPE	2024	2025	2026	2027	2028	2029
Gravel [1]	65.0	65.0	65.0	65.0	65.0	65.0
Surface Treatment	100.0	95.3	90.6	85.9	81.2	76.5
Asphalt	100.0	97.7	95.4	93.1	90.8	88.5

Table 1: Forecasting Condition Rating Example

[1] Gravel Roads have a stable unchanging life expectancy, if routine loose top maintenance is performed, until such time improvements are made.

The average condition rating is determined for each road type by summing the product of length multiplying by the condition rating and then dividing by the total length of the road system. This will result in an average condition rating for the three road surface types. An example is demonstrated in Table 2.

STREET	LENGTH, Km (L)	CONDITION RATING (CR)	PRODUCT (L x CR)
1	1.00	70.0	70.0
2	2.00	30.0	60.0
3	3.00	50.0	150.0
TOTAL	6.00		280.0

Table 2: Average Condition Rating Example

By combining the three (3) surface types an overall condition rating can be calculated for the total municipal system as shown here: Average Condition Rating = 280.0 / 6.00 = 47.0

The above analysis will determine if and when a road requires improvements within a 10-year planning period. Roads with a rating of 50 or less during the study period are flagged for appropriate improvements. This process helps identify the total road needs for the decade.

When prioritizing road improvements, the first consideration for available funds is given to asphalt resurfacing projects, particularly for roads with a condition rating of 50. This approach rehabilitates roads at a reasonable cost. Without these improvements, roads will continue to deteriorate, eventually necessitating major, costly repairs to restore their structural integrity.

If funds remain after addressing roads rated at 50, they should be allocated to improvements that offer the best cost/benefit return. This study evaluates the cost of reconstruction based on road use (rural, semi-urban, and urban) against the Average Annual Daily Traffic (AADT). For example, if reconstructing a dead-end street costs the same per kilometer as a minor collector street, the minor collector street would be prioritized due to serving more commuters.

Other considerations include safety, truck traffic, development, environmental impacts, economic and social factors, and coordinating construction with other infrastructure projects (e.g., culvert replacements). Some roads may not require upgrading due to limited usage and may remain acceptable with normal maintenance despite a low condition rating for many years.

Benchmark costs, based on recent local construction expenses, are used to estimate the cost of construction associated with different types of capital improvements. Fixed costs, covering maintenance of the existing road system, overhead, and salaries, are typically covered by the Township's budget before capital construction funds are allocated. These fixed costs for forecasted requirements are derived from historical expenditures.

2.2. Traffic Counts

Through discussions with the Township, it was determined that there has not been significant population growth since the 2019 Roads Needs Study (RNS), and that the annual average daily traffic (AADT) data from the previous 2019 report would likely serve as an effective starting point for the current study. However, additional traffic counts were conducted by Township staff in 2022 and 2023. These counts were collected at intervals throughout the year to provide an averaged representation of traffic, aiming to capture regular daily volumes rather than data restricted to specific seasons or times of the week.

In our review, we incorporated both the 2019 counts and the more recent data from 2022/2023, carefully considering the highest recorded traffic volumes to provide a complete picture of current conditions. Given that the Township does carry out traffic counts on an ongoing basis, no additional counts were performed for this study. Instead, the recent data provided by the Township was utilized to support our analysis, and this information played a role in guiding recommendations for short-, medium-, and long-term maintenance plans.

3.0 ROAD STANDARDS

The design and construction guidelines of most municipalities within Ontario are derived from the below reference manuals:

1) Ontario Provincial Standards (OPS) for Roads and Municipal Services;
2) Ontario Traffic Manual;
3) Transportation Association of Canada (TAC) Geometric Design Guide for Canadian Roads, and;
4) Ministry of Transportation of Ontario, Drainage Management Manual.

4.0 BENCHMARK COSTS

4.1. Maintenance Costs

The term benchmark cost refers to the typical cost associated with repair or improvements to the roads. These costs can include maintenance of an existing road, upgrade of road to higher standard or construction of new road. To ensure relevance all costs are based on local construction costs.

The cost of suggested improvements is provided on an approximate basis for the purposes of estimation and planning. Each improvement is comprised of various items at their associated benchmark cost to provide an estimate.

Line Item	Cost	Unit
Asphalt – Base Course (50mm)	$170.00	per tonne
Asphalt – Top Course (40mm)	$170.00	per tonne
Driveway Culvert	$1,360.00	each
Rock Excavation, Ditching	$75.00	per meter
Earth Excavation, Ditching	$27.50	per meter
Earth Excavation, Grading	$21.50	per cubic meter
Granular A, Rehab	$25.00	per tonne
Granular A, Gravel Road	$45.00	per tonne
Granular A, Maintenance	$15.00	per tonne
Granular B	$42.50	per tonne
Grinding - Asphalt Key	$425.00	each
Removal – Asphalt	$7.50	per square meter
Removal – Mill Top Course	$5.00	per square meter
Removal – Pulverize	$1.50	per square meter
Remove and Replace 600mm Diameter CSP	$400.00	per meter
Road Widening per Shoulder	$38.00	per meter
Topsoil & Seed	$25.50	per square meter
Topsoil & Sod	$42.50	per square meter

Table 3: Benchmarking Costs

The estimated costs for common types of hard surface road reconstruction (resurfacing, partial reconstruction, and full depth reconstruction) are outlined in Tables 4 and 5. Lower course bitumen focuses on the structural integrity of the road, generally it is less expensive and involves coarser material suitable for load-bearing. Higher course bitumen reconstruction focuses on the road's surface quality, requiring high-performance materials and precise finishing. It is generally more expensive but essential for providing a smooth, durable finish. For full-deep reconstruction, there are allowances for geotechnical investigation and testing, as well as engineering design and construction supervision, estimated at 4% and 15% of the costs respectively. It is suggested the Township retain the services of a professional engineer for resurfacing and/or partial reconstruction due to the complexity of the project or high workload. These estimated costs are based on 2024 figures, and adjustments for inflation should be made for each budget year.

Repair Type	Description	Unit Price ($/km)
LCB-R1	**Resurfacing** – Single surface treatment, 6.0m wide	$35,000
LCB-R2	**Partial Depth Reconstruction** – Pulverize surface, add 50-150mm gran A, double surface treatment, spot drainage improvements and culvert replacements, 10% Contingency.	$175,000
LCB-R3	**Full Depth Reconstruction** - Excavation, add new 150mm gran A, 300mm gran B, double surface treatment, culvert replacements, engineering design, geotechnical services, 10% contingency	$600,000

Table 4: LCB -Low Class Bitumen Repair Costs

Repair Type	Description	Unit Price ($/km)
HCB-R1	**Resurfacing** – 40mm lift of HL3 Asphalt 6-8m wide	$103,000
HCB-R2	**Partial Depth Reconstruction** – Mill surface asphalt, , 150mm gran A, 50mm HL3 asphalt, shouldering, minor drainage improvements, Culvert repair/replacement, 10% Contingency.	$220,000
HCB-R3	**Full Depth Reconstruction** – Remove asphalt, earth excavation, 150mm gran A, 400mm Gran B, 50mm HL3 asphalt, shouldering, culvert repair/replacement as needed, engineering design, geotechnical services, 10% contingency.	$900,000
HCB-R4	**Pulverize and Pave/Stabilization** – Grind existing pavement, addition of asphalt cement stabilizer, compaction by roller.	$200,000
HCB-R5	**Pulverize in Place (without pave)** - Grind existing asphalt and leave in place.	$75,000

Table 5: HCB - High Class Bitumen Repair Costs

4.2. Low-Class Bitumen (LCB) VS High-Class Bitumen (HCB)

Low-Cost Bituminous (LCB) surface treatment is commonly used on rural or low-traffic roads. This method typically involves a single or double layer of bitumen, applied over a prepared base and topped with aggregate (gravel or stone). This sealed surface provides a smooth driving experience, limits dust, and protects the road from minor weather effects, all at a relatively low cost. However, LCB treatments generally have a shorter lifespan and may require frequent maintenance in areas with higher traffic or harsh weather conditions.

High-Cost Bituminous (HCB) treatment, also known as hot-mix asphalt, is a more robust and durable bituminous paving approach suitable for urban areas, highways, and roads with high traffic volumes. HCB uses a thicker, denser layer of asphalt combined with high-quality aggregates, providing superior resistance to wear, cracking, and weather-related damage. Although HCB comes with a higher initial cost due to the use of more extensive materials, labor, and equipment, it offers a longer lifespan and requires less frequent repairs than LCB.

The key differences between LCB and HCB treatments lie in their durability, cost, maintenance needs, and suitability. HCB is significantly more durable than LCB, making it ideal for areas with heavy traffic demands or extreme weather. While LCB is less expensive and appeals to projects with limited budgets, it is best suited for rural, low-traffic roads. LCB surfaces often need more maintenance in higher-traffic areas, whereas HCB's denser structure requires less maintenance, leading to potential cost savings over time. Ultimately, LCB provides a cost-effective solution for lighter-use roads, while HCB offers the longevity and resilience required in more demanding traffic conditions.

4.3. Upgrading Gravel Roads to LCB

Upgrading a gravel road to Low-Class Bituminous (LCB) surface in Ontario is a significant investment that offers advantages like improved durability, reduced maintenance needs, and better driving conditions. However, the process involves several key components that each affect the overall cost. Let's explore these aspects in detail, along with recent cost examples and common challenges faced.

4.3.1. Process of Upgrading

Base Preparation: Involves grading, reshaping, and compacting to ensure a stable base. Drainage improvements, such as ditches or culverts, may also be added.

Cost: $12,000 to $25,000 per kilometer.

Surface Treatment: Prepares the road for a Single or Double Surface Treatment (SST or DST) with bitumen and aggregate, depending on traffic volume.

Cost: SST around $35,000/km; DST about $70,000/km.

Widening and Shoulders: Widening the road and reinforcing shoulders to meet safety standards and ensure durability.

Cost: $30,000 to $60,000 per kilometer.

Optional Stabilization: Adds materials like cement or lime to strengthen the base, especially in high-traffic areas.

Cost: $15,000 to $25,000 per kilometer.

Additional Overheads: Traffic management and environmental compliance as needed.

Cost: $5,000 to $15,000 per kilometer.

These components combined typically total $97,000 to $200,000 per kilometer, with the exact figure depending on the specific road requirements.

4.3.2. Factors Affecting the Cost of LCB Upgrades

Traffic Volume and Weight: Higher traffic or heavy vehicle usage (e.g., trucks, agricultural machinery) will require a stronger base and more durable surface, potentially increasing costs.
Local Material Availability: Proximity to asphalt plants or gravel pits can reduce transport costs, whereas remote locations may face higher prices.
Geographic and Environmental Conditions: Hilly terrain, poor soil stability, or high water tables demand additional measures, such as increased grading, more drainage, or stabilization.

4.3.3. Benefits to Upgrading to LCB

Upgrading to LCB, though costly, provides several benefits:

- Reduced Maintenance Costs: LCB surfaces require less frequent grading, pothole repair, and re-graveling.
- Improved Driving Conditions: LCB roads offer a smoother, more reliable driving experience, increasing safety and potentially improving local connectivity.
- Longevity and Value: With proper design, LCB roads can last 7–10 years before requiring significant resurfacing.

4.3.4. Challenges and Considerations

While upgrading to LCB offers notable benefits, challenges and considerations need to be addressed:

- Initial Cost vs. Long-Term Savings: While the upfront cost of converting gravel to LCB is substantial, municipalities often find that long-term maintenance savings offset initial expenses.
- Environmental Impact: Adding bituminous materials to rural areas can have environmental impacts, especially if drainage is not properly managed.
- Climate Adaptability: LCB roads may face issues with freeze-thaw cycles common in Ontario's colder climates, so additional reinforcement or thicker layers might be required.

4.3.5. Cost to Upgrade

The total approximate cost of upgrading is detailed below:

Item	Cost per Kilometer (Approximate)
Base Preparation (Grading)	$2,000 – $5,000
Drainage Improvements	$10,000 – $20,000
Single Surface Treatment (SST)	$35,000
Double Surface Treatment (DST)	$70,000
Widening and Shoulder Reinforcement	$30,000 – $60,000
Stabilization (Optional)	$15,000 – $25,000
Traffic Management and Compliance	$5,000 – $15,000
Total Estimate	**$97,000 – $200,000**

Table 6: Cost to Upgrade to LCB from Gravel

Entire Gravel Road Length: 98.10 km	
Cost Per Kilometer	Cost for Entire Gravel Road
Low - $97,000	$ 9,515,700
High - $200,000	$ 19,620,000

Table 7: Total Gravel Road Upgrade Cost

Upgrading gravel roads offers numerous benefits, including improved safety, reduced maintenance, and enhanced accessibility, which can have lasting positive impacts on communities. However, for small municipalities with constrained budgets, these upgrades come with significant financial challenges. With estimated costs for a 98.1 km upgrade ranging from approximately $9.5 million to $19.6 million, the expense is substantial. The high initial investment required for grading, drainage improvements, and surface treatments often stretches limited municipal resources, potentially impacting other critical services. As such, while the advantages of upgrading are clear, the cost poses a considerable barrier, making it essential for smaller municipalities to carefully weigh benefits against budget constraints when planning infrastructure improvements

5.0 CULVERTS

The Ministry of Transportation of Ontario defines a structure as a culvert with a span of 3.0m or greater. The Township has existing culverts that fall under this classification.

Replacing a culvert or constructing a new one can be a complex situation involving considerations related to environmental impact, structural integrity, and regulatory compliance. Triggers for culvert replacement include:

- Structural Failure – Visible signs of damage such as cracks, deformation, or collapse.
- Capacity Issues – The existing culvert no longer handles the required water flow due to increased runoff, changes in land use, or upstream development.
- Upgrading Infrastructure – Road widening or reconstruction.

Techniques for culvert replacement/construction vary depending on site conditions, applicable techniques include:

- Open Cut Method – The road is excavated to remove the old culvert and install a new one.
- Horizontal Directional Drilling – A new path is drilled for the culvert under the existing road, a useful technique for avoiding surface disruption and preserving existing structures.

It is important that existing culverts in the Township be inspected regularly to ensure they are functioning properly. As larger culverts can be expensive to replace, additional funds should be set aside over time to account for the reconstruction of these structures as they do have a limited lifespan.

6.0 ROAD MAINTENANCE AND IMPROVEMENT PROGRAM

6.1. Proposed Maintenance Strategies

Summarized below are numerous road maintenance strategies that the Township can implement into its maintenance strategy.

6.1.1. Single Surface Treatment Overlay (LCB – R1)

Resurfacing with a Single Surface Treatment (SST) is a maintenance technique aimed at protecting and extending the lifespan of an existing road by applying a single layer of protective material over the surface. This treatment involves spreading a layer of asphalt binder, followed by aggregate, over a 6.0-meter-wide area, providing a sealed, skid-resistant surface that reduces dust, improves traction, and helps prevent further surface degradation.

The resurfacing process begins with the preparation of the existing pavement. The road surface is thoroughly cleaned to remove any dust, debris, and loose particles, which could interfere with the adhesion of the treatment. Minor cracks or defects are typically repaired to create a smooth, stable base.

Next, a layer of liquid asphalt binder is evenly applied across the surface. This binder, usually a heated asphalt emulsion, serves as an adhesive, allowing the aggregate layer to bond securely to the road. Once the binder is in place, a layer of crushed stone or gravel is spread over it. The aggregate layer not only strengthens the surface but also enhances skid resistance and provides a durable, textured finish.

The aggregate is then embedded into the binder through rolling and compaction, which ensures a solid, stable surface and reduces loose stones. This compacted surface is left to cure, during which the binder sets and fully secures the aggregate, forming a cohesive, weather-resistant layer.

The Single Surface Treatment resurfacing provides a durable, low-maintenance roadway suitable for low to moderate traffic volumes. While not as smooth as full asphalt paving, it is a cost-effective solution for maintaining rural or secondary roads, enhancing traction, and reducing the risk of dust and surface wear without extensive reconstruction.

6.1.2. Partial Depth Reconstruction (LCB- R2)

Partial Depth Reconstruction is a road rehabilitation process designed to restore and strengthen an existing roadway by addressing surface and base issues without the need for complete reconstruction. The process begins with pulverizing the existing surface, breaking down the existing asphalt or bituminous layer into smaller fragments. This pulverized material is blended with the existing base to form a more consistent foundation.

Following pulverization, an additional 50 to 150 mm layer of Granular A material (a well-graded aggregate mix typically composed of crushed stone) is applied. This layer reinforces the base, ensuring stability and providing a supportive layer for future surface treatments. Granular A material improves load distribution, reduces rutting, and enhances the road's ability to withstand traffic stresses.

A double surface treatment is then applied over the reinforced base. This involves two applications of a bituminous binder, followed by two layers of aggregate. The first binder layer acts as an adhesive to secure the aggregate, and the second layer further strengthens the surface by embedding an additional layer of aggregate. This double surface treatment provides enhanced protection, durability, and skid resistance, making the road suitable for light to moderate traffic.

The process also includes spot drainage improvements and culvert replacements to address any existing drainage issues. Poor drainage can lead to water pooling on or beneath the surface, accelerating deterioration. By improving drainage and replacing outdated or damaged culverts, the reconstruction process helps to prolong the road’s lifespan, reducing water damage and minimizing maintenance needs.

Lastly, a 10% contingency is added to account for unforeseen conditions or minor adjustments in material or labor requirements, providing a buffer to ensure the project can accommodate any minor, unexpected challenges. Overall, Partial Depth Reconstruction with these enhancements is an effective method for rehabilitating roads, providing a stronger, more resilient surface while addressing base and drainage concerns.

6.1.3. Full Depth Reconstruction (LCB – R3)

Full Depth Reconstruction is a comprehensive road rehabilitation method that involves completely reconstructing the road’s surface and base layers to improve strength, durability, and lifespan. This process begins with the excavation of the existing pavement, removing the entire surface and underlying materials to expose a fresh subgrade, allowing engineers to address foundational issues that may compromise the road’s stability.

Following excavation, a new 150 mm layer of Granular A material is added. Granular A, a well-graded mixture of crushed stone, provides a stable, load-bearing surface, helping to evenly distribute vehicle loads and improve the road’s ability to withstand traffic stress. Beneath this, an additional 300 mm layer of Granular B material (a coarser aggregate mix) is laid, providing additional support and drainage for the road structure. This dual-layer base system helps create a resilient foundation designed to handle significant traffic loads and environmental stresses.

A double surface treatment is applied to create a strong, durable surface layer. This involves two applications of a bituminous binder followed by two layers of aggregate. The first layer of binder acts as an adhesive for the aggregate, forming the initial protective layer. The second layer further enhances the road’s durability and skid resistance, making it suitable for heavy use. This double treatment approach also seals the road surface, helping to prevent water infiltration and subsequent damage.

Culvert replacements are performed as part of the drainage improvement process. By replacing damaged or outdated culverts, the project addresses potential water management issues, reducing the risk of erosion, water pooling, and pavement degradation. Proper drainage infrastructure helps extend the lifespan of the road, particularly in areas prone to heavy rainfall or variable weather conditions.

Engineering design and geotechnical services play a vital role in the Full Depth Reconstruction process. Engineering design ensures that all aspects of the reconstruction, from grading to materials selection, are precisely tailored to meet traffic demands and environmental conditions. Geotechnical services, including soil testing and analysis, are critical for assessing the underlying soil conditions, ensuring that the subgrade and base layers are appropriately designed to handle expected loads.

A 10% contingency is included in the project budget to account for unforeseen conditions or adjustments, ensuring flexibility in the project to handle minor unexpected challenges. Overall, Full Depth Reconstruction is a robust, thorough approach to road rehabilitation, providing a strong and stable foundation and surface designed to accommodate high traffic volumes and demanding conditions.

6.1.4. Resurfacing (HCB – R1)

Resurfacing with a 40 mm lift of HL3 asphalt is a pavement maintenance technique used to restore the surface quality and extend the lifespan of an existing road without requiring extensive reconstruction. This process involves adding a new 40 mm layer (or “lift”) of HL3 asphalt, a fine-graded hot mix designed for smoothness and durability. The HL3 mix is ideal for resurfacing, as it provides a balanced blend of strength and flexibility, making it resistant to cracking and surface wear caused by traffic and environmental conditions.

The resurfacing operation typically begins with thorough surface preparation. The existing road is cleaned to remove any debris, loose materials, or contaminants that could interfere with the bonding of the new asphalt layer. Any significant cracks, potholes, or structural imperfections are repaired to ensure a stable and uniform base for the new asphalt layer.

Once the surface is prepared, the HL3 asphalt is applied in a 40 mm layer, covering a width of 6 to 8 meters, depending on the road’s dimensions. This new layer enhances the road’s surface quality by providing a fresh, smooth driving surface, improving ride comfort, and reducing noise. The asphalt layer is then compacted using specialized equipment to ensure proper bonding with the existing pavement and to achieve the necessary density for durability and performance.

The compaction process is critical, as it ensures that the new asphalt is tightly packed and able to withstand traffic loads without deforming. Properly compacted asphalt minimizes water infiltration, which can otherwise cause the pavement to deteriorate over time. The final resurfaced layer also improves skid resistance, enhancing safety for vehicles, especially in wet conditions.

Overall, resurfacing with a 40 mm lift of HL3 asphalt is an efficient and cost-effective way to rejuvenate worn pavements, improving surface quality, appearance, and performance without the need for full-depth reconstruction.

6.1.5. Partial Depth Reconstruction (HCB – R2)

Partial Depth Reconstruction is a targeted road rehabilitation process that focuses on improving the road’s surface and upper base layers, providing a refreshed, durable driving surface without a full reconstruction. The process starts with milling the existing asphalt surface, where specialized equipment grinds down the old asphalt to a specified depth, typically removing worn or damaged layers. This milling process ensures a clean and even surface for the new materials to bond effectively, reducing the need for complete excavation.

Once the surface is milled, a 150 mm layer of Granular A material is added. This aggregate layer forms a supportive base, helping to distribute loads and enhancing the stability of the new asphalt layer. Granular A is a high-quality, well-graded material that strengthens the road structure, making it more resilient to traffic and environmental stresses.

A 50 mm layer of HL3 asphalt is then applied as the final surface layer. HL3 asphalt is a fine-graded hot mix that provides a smooth and durable finish, designed to improve ride quality, skid resistance, and overall road safety. The asphalt layer is compacted thoroughly to achieve the desired density, ensuring a strong bond with the base and providing long-lasting performance.

Shouldering is conducted to reinforce the edges of the road, where material is placed along the sides to prevent edge cracking and erosion, maintaining the structural integrity of the pavement. Minor drainage improvements are also made as part of this process to ensure effective water management, reducing the risk of water damage and extending the life of the road. Additionally, any damaged or outdated culverts are repaired or replaced to enhance drainage capacity and prevent erosion or pooling.

A 10% contingency is included in the budget to address any unforeseen issues or adjustments that may arise during the project, providing a buffer to accommodate minor changes in materials or conditions. Overall, Partial Depth Reconstruction is a cost-effective solution for renewing the road surface and upper base, offering enhanced durability and performance with targeted drainage improvements for a longer-lasting roadway.

6.1.6. Full Depth Reconstruction (HCB – R3)

Full Depth Reconstruction is an in-depth process of road rebuilding that addresses the entire pavement structure, creating a new, long-lasting foundation and surface layer. This method begins with the removal of the existing asphalt layer, stripping it down to expose the underlying subgrade. Next, earth excavation is conducted to remove any compromised soil or material, ensuring a stable base for the new pavement structure.

After excavation, a new 150 mm layer of Granular A material is applied. Granular A is a well-graded aggregate that provides a strong, stable base layer, supporting the pavement and helping to distribute loads from traffic. Below this, a 400 mm layer of Granular B material is placed to further strengthen the base. Granular B, a coarser and more economical aggregate than Granular A, supports the structure by adding bulk and improving drainage, critical for long-term stability.

Once the base layers are in place, a 50 mm layer of HL3 asphalt is applied as the final surface. HL3 asphalt is a fine-graded hot mix designed for high durability, providing a smooth and resilient surface. This layer not only enhances driving comfort and safety but also improves skid resistance and reduces noise. Proper compaction of this asphalt layer is essential to achieve the desired density and ensure a strong bond with the underlying layers, protecting the pavement against premature wear and deformation.

Shouldering is also performed as part of the reconstruction. This process involves placing material along the road edges to support the asphalt surface, preventing edge cracking and maintaining the integrity of the pavement structure. Culvert repair or replacement is completed as needed to address any drainage issues. By replacing or repairing culverts, the process improves water flow management, preventing erosion and water damage to the road.

Engineering design and geotechnical services are integral to Full Depth Reconstruction, ensuring that every element is carefully planned and customized to meet site-specific requirements. Engineering design provides precise specifications for materials and construction methods, while geotechnical services assess the soil and subgrade conditions to confirm that the foundation is suitable for the expected loads.

Finally, a 10% contingency is included in the budget to account for any unforeseen adjustments, providing flexibility to manage unexpected challenges during construction. Full Depth

Reconstruction with these comprehensive steps is a highly effective approach for renewing roads, creating a robust structure designed to endure heavy traffic and environmental stress for years to come.

6.1.7. Pulverize and Pave/Stabilization (HCB – R4)

Pulverize and Pave/Stabilization is a road rehabilitation technique designed to enhance the strength and durability of existing pavement by reusing the old material and stabilizing it with additional binders. This process begins with pulverizing, where the existing asphalt pavement is ground down to create a uniform, recycled material. Specialized equipment breaks down the old asphalt surface into a consistent, granular form, blending it with the top layer of the existing base. This pulverized material provides a solid, homogenous foundation for further stabilization.

Following pulverization, an asphalt cement stabilizer is added to the recycled material. The stabilizer, typically a type of asphalt binder, enhances the strength and cohesion of the pulverized layer, bonding the material particles together. This stabilization process improves the structural integrity of the road, making it more resistant to traffic loads, temperature changes, and environmental stresses. The asphalt cement stabilizer also helps to create a flexible yet durable base that can better withstand shifting and settling, which is especially important for areas prone to freeze-thaw cycles.

Once the stabilizer is mixed thoroughly with the pulverized material, compaction is carried out using a heavy roller. This step is crucial, as proper compaction ensures that the material is densely packed, which minimizes voids and increases stability. The roller presses the material down, locking it into a firm and level base layer, creating a stable foundation for the final paving or surface treatment.

The Pulverize and Pave/Stabilization method is an effective way to rejuvenate worn pavements while conserving resources, as it reuses the existing materials in place. By adding a stabilizing agent and compacting the recycled material, this process produces a robust and resilient foundation suitable for paving, making it a cost-effective and environmentally friendly option for road rehabilitation projects.

6.1.8. Pulverize in Place (without paving) (HCB – R5)

Pulverize in Place (without paving) is a road rehabilitation technique intended to convert a deteriorated paved road back into a low-maintenance gravel surface. This method involves grinding the existing asphalt layer into smaller particles and leaving the pulverized material in place. Specialized equipment is used to mill the old asphalt down to a consistent, granular form, effectively blending the asphalt with the top layer of the base material below.

The pulverized material is left on the roadway, creating a stable and uniform gravel-like surface. By recycling the existing asphalt directly into the roadbed, this process provides a durable, low-maintenance surface suitable for rural and low-traffic roads. The pulverized material retains some binding properties from the asphalt, which helps reduce dust and improves compaction compared to traditional gravel surfaces.

Without the addition of a new asphalt layer, this converted surface becomes more manageable and cost-effective for maintenance, as it eliminates the need for resurfacing and reduces the frequency of repairs associated with paved roads. Routine grading and minor compaction may be required to maintain a smooth driving surface, but the Pulverize in Place method reduces long-term maintenance costs and is particularly beneficial for municipalities or rural areas aiming to downgrade paved roads to a lower-maintenance state.

6.2. Additional Maintenance Strategies Available

6.2.1. Chip and Seal

Chip and Seal is a surface treatment process, similar to Single Surface Treatment (SST), used to improve the durability and lifespan of a road by applying a protective layer over an existing base, often gravel or deteriorated pavement. Like SST, this method provides a cost-effective, skid-resistant surface that reduces dust, enhances traction, and extends the road's life without the higher expenses associated with full asphalt paving. Chip and Seal is commonly used on rural roads, low-traffic streets, and driveways, providing a reliable and low-maintenance surface for lighter traffic.

The process begins with the application of a liquid asphalt binder to the prepared road surface. This binder, often a heated asphalt emulsion, acts as an adhesive layer, ensuring the aggregate (or "chip") layer bonds securely to the road. The binder is sprayed evenly across the surface, creating a tacky layer that will hold the aggregate firmly in place.

Once the binder is applied, a layer of aggregate, typically small crushed stones or gravel, is spread uniformly over the asphalt binder. The aggregate layer is chosen based on desired texture and skid resistance; it provides both durability and improved traction, making the road surface safer for vehicles. After spreading, the aggregate is immediately embedded into the binder through rolling and compaction with specialized equipment. Proper compaction ensures that the aggregate is securely set, reducing loose stones and creating a stable surface.

After the aggregate has been compacted, the road is left to cure. During this curing phase, the binder fully sets, securing the aggregate in place and creating a cohesive, water-resistant surface. Chip and Seal, much like SST, is a quick-setting process, allowing the road to be opened to traffic soon after completion, though traffic is generally encouraged to drive slowly to assist with the final settling.

The resulting Chip and Seal surface provides a durable, skid-resistant roadway that requires minimal maintenance. While it does not provide the smoothness of a full asphalt pavement, it is an economical and effective solution for maintaining roads in rural or low-traffic areas. Similar to SST, it helps to reduce dust, improve traction, and extend the usability of the road surface without significant cost.

6.2.2. Micro-Sealing

Micro-sealing, or micro-surfacing, is a pavement preservation technique designed to protect and rejuvenate aging asphalt surfaces. It involves applying a thin, protective layer of specially formulated slurry made from a mixture of asphalt emulsion, water, fine aggregate, and chemical additives. This blend is designed to seal minor cracks, restore surface texture, and improve skid resistance, extending the road's lifespan while providing a smoother driving surface.

The micro-sealing process begins with cleaning the existing pavement to remove debris, dust, and loose particles, which ensures proper adhesion. Any significant cracks or defects are repaired before the treatment. The micro-seal mixture is then evenly spread across the surface using specialized equipment that creates a consistent, thin coat, typically about 3/8 inch thick. The quick-setting nature of the emulsion enables the mixture to cure rapidly, allowing the road to reopen to traffic shortly after application.

Micro-sealing is especially useful for urban streets, highways, and high-traffic roads that require a durable, weather-resistant surface with minimal downtime. Unlike traditional asphalt overlays, micro-sealing is a cost-effective solution, as it uses less material and requires less time to apply, yet it still provides a lasting improvement in road performance.

This technique is ideal for preserving roads in good structural condition but showing surface wear, as it slows down deterioration, reduces maintenance needs, and helps prevent more costly repairs. Micro-sealing enhances road aesthetics and safety while minimizing disruption to traffic, making it a popular choice for pavement preservation.

6.3. Exclusion of Micro-Sealing as a Repair Method

Micro-sealing was excluded as a repair method in this plan because it does not address the underlying structural and systemic issues affecting many of the Township's roads. While micro-sealing is an effective pavement preservation technique, its primary function is to seal minor cracks and restore surface texture, which can extend the lifespan of roads that are already in good condition. However, for roads with significant structural deficiencies, drainage problems, or subgrade instability, micro-sealing provides only a superficial improvement. It does not strengthen the road's foundation or resolve systemic issues, making it an ineffective repair method for deteriorated roads in the Township's network.

The Township has chosen to prioritize comprehensive repair strategies, such as partial or full-depth reconstruction, which directly address the root causes of road deterioration. These approaches provide more durable and long-lasting solutions, ensuring the structural stability of roads and reducing the need for frequent, repeated repairs. While the upfront costs of these comprehensive methods may be higher than micro-sealing, they are significantly more cost-effective in the long term. Investing in robust repairs now will save the Township money by minimizing future maintenance expenses, preventing severe road failures, and extending the overall service life of the road network.

That said, the value of micro-sealing as a preservation strategy for roads in good condition is acknowledged. To maintain the quality of the Township's road infrastructure, it is recommended that micro-sealing be used regularly as part of a preventative maintenance program for roads that are structurally sound but showing early signs of surface wear. Regular micro-sealing can prevent minor surface issues from escalating into more significant damage, delaying the need for more extensive and costly repairs. This dual approach—using micro-sealing for preventative maintenance and prioritizing comprehensive repair strategies for deteriorated roads—ensures that the Township's resources are allocated effectively, balancing short-term preservation needs with long-term cost savings and infrastructure resilience.

7.0 ROAD MAINTENANCE AND IMPROVEMENT PROGRAM

7.1. Typical Road Structure

Table 8 below shows the typical road structure based on AADT.

ADDT AT TIME OF CONSTRUCTION	SURFACE TYPE
0 – 400	Gravel
400 – 700	Low Class Bituminous
700 – 1000	50mm of Hot Mix

Table 8: Typical Road Structure Based on AADT

The grade upon which surface type is applied is to be structurally adequate. Typical road structure includes a base of 150mm Granular 'A' and 300m Granular 'B', Type II.

7.2. Typical Road Cross Section

	Geometric Design Guidelines			Lanark County Minimum Pavement Widths				
AADT	Min Lane Width (m)	Min Shoulder Width (m)	Total Platform Width (m)	Total Pavement Width (m)	Min Granular Shoulder (m)	Total Platform Width (m)	Lane Width (m)	Resulting Paved Shoulder Width (m)
0-999	3.25	1	8.5	8	0.25	8.5	3.25	0.75
1,000-2,999	3.25	2	10.5	9.5	0.5	10.5	3.3	1.45
3,000 - 4,999	3.5	2.5	12	10.4	0.8	12	3.5	1.7
5,000 >	3.5	2.5	12	11.6	0.8	13.6	3.75	2.05

Table 9: Lanark County Geometric Road design Parameters

It is noted that the majority of roads within the township do not have paved shoulders. Table 9 serves as a general guideline for road geometry and not all horizontal elements will apply.

8.0 RURAL ROAD DRAINAGE IMPROVEMENT PLAN

The drainage improvement initiative is a critical component of maintaining the functionality and safety of rural roads in the Township. This plan emphasizes the importance of proactive measures to address water management challenges, which, if left unchecked, can lead to significant structural damage, safety hazards, and escalating maintenance costs. The strategy focuses on clearing and maintaining roadside ditches to facilitate efficient water flow and prevent issues such as roadbed saturation, erosion, and surface damage. Properly functioning ditches reduce the likelihood of water accumulation, which can compromise road stability and create hazardous driving conditions for public users.

In addition to ditch maintenance, the plan highlights the importance of managing culvert conditions to ensure their effectiveness in handling water flow. Regular inspections and maintenance of culverts are essential to identify structural weaknesses, capacity limitations, or blockages. Proactive repair or replacement of damaged culverts can prevent flooding, reduce erosion, and support the integrity of adjacent roadways. The plan also recommends strategically adding new culverts in areas where current infrastructure is inadequate, particularly in high-risk zones identified through past incidents or field assessments.

To enhance safety, the drainage improvement plan extends beyond water management to address road alignment and visibility challenges. Hazardous road segments, such as those with sharp turns or steep hills, should be re-evaluated for alignment corrections. This includes reducing curves to improve sightlines and removing obstructions that hinder visibility. Similarly, the removal of trees, brush, and other vegetation from the Right-of-Way (ROW) is critical to reducing collision risks, particularly in areas with limited clearance or frequent wildlife crossings. These measures are essential for ensuring the safety of public end-users and minimizing risks associated with poor visibility and sudden obstacles.

Addressing site-specific issues such as Matheson at the big pipe, Burchill at the big culvert(s), and the Pinery deep ditch is integral to this initiative. These locations pose particular risks to the public, including poor visibility, inadequate drainage, and structural vulnerabilities. For example, reinforcing the embankments near large culverts, improving water flow at critical drainage points, and stabilizing deep ditches will mitigate existing hazards and provide long-term resilience to these problem areas. These targeted improvements should be prioritized as part of the Township's broader safety strategy.

Finally, the plan advocates for the incorporation of these drainage and safety enhancements into the Township's Ten-Year Capital Plan. By aligning funding and resources with these priorities, the Township can ensure that routine maintenance, emergency repairs, and planned upgrades collectively address both immediate risks and long-term sustainability. Enhanced monitoring programs, including annual condition assessments and post-storm inspections, are recommended to continually identify and address emerging concerns. This comprehensive approach to drainage improvement and road safety not only protects infrastructure investments but also enhances the overall quality of life for the Township's residents by creating safer, more reliable roadways.

9.0 TEN YEAR CAPITAL PLAN FOR ROADS

This section of report is comprised of two sections; a condition assessment of existing roads network with a comparison to the conditions noted in the 2019 Report, and a suggested ten-year capital plan.

9.1. Condition of Existing Roads

The existing condition of the road network is presented in the table below with lengths, weighted average condition for the three surface types: gravel, low class bituminous, high class bituminous roadways as observed in 2024.

Category	Length (km) 2019 (1)	Average Condition Rating (1)	Length (km) 2024 (2)	Average Condition Rating
Gravel	97.75	47.1	96.61	63.3
Hard Surfaces	60.3	68.3	61.69	69.2
All Roads	158.05*	55.2	158.3*	65.6

Table 10: Average Condition Rating 2019 vs 2024

*There is a discrepancy in the total road lengths from 2019 to 2024 because section 56 Andrewsville Main Street was included in the 2019 report road inventory but not in the provided road inventory form the Township of Montague. Section 630 Industrial Road was included in the Township of Montague but not in the 2019 Report.

(1) 2019 lengths and condition ratings are based on the 2019 comprehensive roads needs study prepared by Mcintosh Perry.
(2) Appendix B provides a comprehensive assessment of each segment.

9.2. Ten Year Maintenance Plan

The Ten Year maintenance plan for hard surfaces is present in Appendix C. This plan is based on provided budgets.

A life cycle analysis was performed to determine which year a road resurfacing or reconstruction effort would be the most cost-effective. The strategies below were considered for the allocation of resources:

1) High traffic volume roads will be given priority over low traffic volume roads;
2) Asphalt overlays are given priority over reconstruction repairs;
3) For hard surfaces, partial depth reconstruction will be given priority over full depth reconstruction as it more long-term cost-effective;
4) Pavement preservation techniques mentioned above are preferred as maintenance of current condition ratings, and;
5) Projects that are geographically close will be given special consideration due to potential savings.

It is important to note that roads experiencing higher-than-average traffic volumes or substantial truck traffic may deteriorate at an accelerated rate. Consequently, the Township should be prepared to make necessary adjustments to the Ten-Year Capital Program to address these conditions. The figures provided are expressed in 2024 dollars; therefore, it is imperative that the Township accounts for construction inflation in each annual budget to ensure accurate financial planning.

To achieve and maintain an acceptable condition rating for the roads, as described in Section 12.1, the capital budget allocation for road maintenance and improvements needs to be significantly higher. It is noted annual spending amounts do not consider funding provided by the Canadian Community-Building Fund (CCBF) or the Ontario Community Infrastructure Fund (OCIF).

Addressing this budgetary shortfall is crucial for the sustainable maintenance and improvement of the Township's road network. Without appropriate funding adjustments, the Township may face escalating road deterioration, leading to higher future repair costs and potential impacts on traffic safety and efficiency. Therefore, it is recommended that the Township undertake a comprehensive review of its capital budget strategy to ensure that adequate resources are allocated to meet the evolving needs of its road infrastructure. It is our recommendation that a policy should be created by the Township to clearly identify the future needs of upgrading gravel roads. The policy should take into consideration current uses, possible connectivity, traffic counts, and future growth opportunities.

Below is a summary of the proposed works for each year in the 10-year plan:

2025 Maintenance Plan		
Road Section Number	Road Name	Maintenance Scope
245	McLachlin Road	LCB-R2
315*	Rosedale Road North	HCB-R1
630	Industrial Road	HCB-R5

Note: Beckwith was notified about our desire to reconstruct McLachlin Road in 2023. We suggest that McLachlin Road be designed in conjunction with a professional engineer to determine the best reconstruction methods across the total sections noting there are some sections of roadway in good condition.

2026 Maintenance Plan		
Road Section Number	Road Name	Maintenance Scope
315*	Rosedale Road North	HCB-R1
450	Minto Street	LCB-R1
470	Uphill Street	LCB-R2
480	Grange	LCB-R2
490	Dean Street	HCB-R2
565	Third Street	HCB-R2
570	Third Street	HCB-R2
575	Third Street	HCB-R2

*Note: First half to be completed in 2025 and second half to be completed in 2026.

2027 Maintenance Plan		
Road Section Number	Road Name	Maintenance Scope
35	Rideau River Road	HCB-R1
45	Boat Launch Road	HCB-R2

2028 Maintenance Plan		
Road Section Number	Road Name	Maintenance Scope
300	Rosedale Road North	HCB-R2
505	Union Street	HCB-R2

2029 Maintenance Plan		
Road Section Number	Road Name	Maintenance Scope
205	Ferguson-Tetlock Road	HCB-R2
5	Bayview Crescent	HCB-R2

2030 Maintenance Plan		
Road Section Number	Road Name	Maintenance Scope
310	Rosedale Road North	HCB-R1
485	Dean Street	HCB-R2
555	Fourth Street	HCB-R2
550	Fourth Street	HCB-R2

2031 Maintenance Plan		
Road Section Number	Road Name	Maintenance Scope
40*	Rideau River Road	HCB-R2
165	Caroll Road	LCB-R1
520	Alice Street	HCB-R1

2032 Maintenance Plan		
Road Section Number	Road Name	Maintenance Scope
40*	Rideau River Road	HCB-R2
525	Lila Street	LCB-R1

*Note: First half to be completed in 2031 and second half to be completed in 2032.

2033 Maintenance Plan		
Road Section Number	Road Name	Maintenance Scope
30	Kilmarnock Road	HCB-R2
195	Kelly Jordan Road	HCB-R1
445	Dufferin Street	HCB-R2
595	First Street	HCB-R1

2034 Maintenance Plan		
Road Section Number	Road Name	Maintenance Scope
250	Code Drive	LCB-R2

9.3. Approach and Assumptions

There are several road repair and maintenance recommendations provided in the previous section that may initially seem counterintuitive, as other roads might appear to be in greater need of repair or have higher traffic volumes. The approach outlined below explains the rationale behind these decisions:

1) Uphill and others are proposed in 2026 while Ferguson-Tetlock is proposed for 2029. This is proposed because the cost of upgrading Fergeson-Tetlock will cost approximately $500,000 which represents more than the entire annual budget and must be planned. As well, at the time of the study, Fergeson-Tetlock is a road that needs reconstruction and intervention prior to 2029 will not change the need for reconstruction.
2) It is noted that both sections of Rideau River Road received a micro-sealing treatment in 2022. While this treatment helps extend the road's surface life, it is only a temporary measure. A more comprehensive resurfacing is scheduled for 2027 to ensure long-term durability. Any specific identification of subsurface conditions or contributing factors must be assessed by a qualified geotechnical engineer
3) When reviewing traffic counts, specific details such as vehicle type, traffic concentration during different times of day, seasonal variations, and other relevant factors were not available. As a result, these elements did not influence the determination of road repair priorities and decisions.
4) Several roads, when compared to the 2019 study, appear to have shifted from being classified as deficient to not-deficient, despite not receiving significant maintenance. Similarly, some roads that were previously classified as non-deficient are now categorized as deficient. These changes are attributed to the fact that many of these roads were on the borderline of deficiency. Variations in the rate of deterioration and differences in observer assessments have resulted in some roads crossing the threshold in either direction.

9.4. Projected Annual Average Condition Rating

The table below shows the projected annual weighted average condition rating with the proposed ten-year maintenance strategy. It is evident that the roads maintenance program is underfunded.

Category	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034
LCB	76.6	75.2	73.4	71.1	68.8	66.5	68.8	69.1	66.8	64.5
HCB	69.5	67.5	66.9	66.0	68.4	66.4	67.4	65.7	65.0	65.0
Hard Surface	71.0	69.1	68.3	67.1	68.5	66.5	67.7	66.4	65.4	64.9
All	67.3	66.6	66.3	65.8	66.4	65.6	66.0	65.6	65.1	65.0

Table 11: Projected Annual Condition Rating

10.0 SUMMARY

The Comprehensive Roads Needs Study for Montague Township evaluates the current state of road infrastructure and provides strategic recommendations for maintenance and improvements over a ten-year period. The study focuses on ensuring cost-effective management of asphalt and surface-treated roads, emphasizing overlay projects and single surface treatments to extend the lifespan of existing roads.

Key recommendations include:

Ten-Year Capital Program: Prioritizes high-traffic and semi-urban roads for cost-effective rehabilitation as they are more likely to degrade with use, and high traffic volumes directly correlate with increased importance to residents. Overlay projects and partial depth reconstruction are highlighted as primary methods for maintaining asphalt roads.

Funding and Budget Considerations: Recognizes the critical need for increased funding to maintain and improve the road network effectively. The study emphasizes that current funding levels are insufficient to meet long-term road maintenance needs, and additional financial resources are required to prevent further deterioration. This includes exploring government grants, collaborating with boundary municipalities to share the costs of joint road maintenance, and considering alternative funding options to bridge the existing budgetary shortfall.

Proactive Maintenance: Advocates for regular condition rating assessments and updates to adapt to changing needs and conditions, ensuring timely rehabilitation and cost efficiency.

Policy Adaptation: Recommends that the Township develop a clear policy to identify future needs for upgrading gravel roads.

Provided recommendations are essential to maintain service levels, they also underscore the urgent need for a larger budgetary allocation to address the growing gap between current funding and actual maintenance needs. The study indicates that without a significant increase in financial support, Montague Township's road system will continue to deteriorate, leading to higher long-term costs and diminished road quality. Securing additional funds is crucial to achieving the study's objectives, ensuring that road conditions meet resident expectations, and supporting the township's long-term growth.

The study concludes with a call for strategic and well-informed decision-making, backed by adequate financial commitment, to ensure sustainable maintenance and improvement of Montague Township's road network, ultimately benefiting the community and supporting long-term growth.

2024 COMPRENSIVE ROADS NEED STUDY

THE TOWNSHIP OF MONTAGUE

COUNTRY LIVING AT ITS BEST

APPENDIX A

ROAD INVENTORY

Number	Road	From	To	Surface Type	Length (km)	Road Rideability	2024 Roadway Conditon	Traffic Count
5	Bayview Crescent	43-County Road 43	43-County Road 43	HCB	0.60	70.0	60.0	209.0
10	Bayview Lane	Bayview Crescent	South End	HCB	0.10	70.0	65.0	44.0
15	Rainbow Valley Drive	43-County Road 43	West End	HCB	0.50	50.0	60.0	127.0
20	Hutton Road	43-County Road 43	East End	G/S	0.30	65.0	65.0	22.0
25	Acton Drive	43-County Road 43	North End	G/S	0.50	65.0	65.0	11.0
30	Kilmarnock Road	43-County Road 43	Rideau Canal	HCB	0.70	70.0	65.0	550.0
35	Rideau River Road	43-County Road 43	Boat Launch Road	HCB	3.90	70.0	65.0	220.0
40	Rideau River Road	Boat Launch Road	43-County Road 43	HCB	3.60	70.0	65.0	220.0
45	Boat Launch Road	Rideau River Road	South End	HCB	0.30	65.0	55.0	72.0
55	Water Street, Andrewsville	Main Street	East End	HCB	0.20	80.0	75.0	33.0
56	Andrewsville Main Street	Heritage Drive	Township Limits	HCB	0.20	80.0	80.0	NA
60	Wood Road	23-Rosedale Road South	Allington Road	G/S	0.60	65.0	65.0	94.0
65	Wood Road	Allington Road	43-County Road 43	G/S	1.90	65.0	65.0	94.0
66	Wood Road	McCrea Road	County Road 43	HCB	0.10	90.0	90.0	NA
70	Allington Road	Wood Road	North End	G/S	1.10	65.0	65.0	11.0
75	Guthrie Road	23-Rosedale Road South	0.9 km East of 23-Rosedale Road	G/S	0.90	65.0	65.0	187.0
80	Guthrie Road	0.9 km East of 23-Rosedale Road	East End	G/S	1.90	65.0	65.0	61.0
85	Bower Boulevard	23-Rosedale Road South	East End Turnaround	HCB	0.50	80.0	75.0	61.0
90	Matheson Drive	23-Rosedale Road South	1.4 km East of 23-Rosedale Road South	HCB	1.40	65.0	65.0	127.0
95	Matheson Drive	1.4 km East of 23-Rosedale Road South	East End	HCB	0.30	65.0	65.0	11.0
100	Van Exan Drive	4-Roger Stevens Drive	South End	HCB	0.80	65.0	70.0	72.0
105	McCrea Road	Wood Road	1.5 km East of Wood Road	HCB	1.50	70.0	70.0	115.0
110	McCrea Road	1.5 km East of Wood Road	Buffam Road	HCB	2.30	70.0	75.0	160.0
115	McCrea Road	Buffam Road	43-County Road 43	HCB	1.20	70.0	70.0	182.0
120	Richardson Road	Buffam Road	Burchill Road	G/S	1.70	65.0	65.0	116.0
125	Richardson Road	Burchill Road	2-Heritage Drive	G/S	4.20	65.0	65.0	81.0
130	Gilroy Road	2-Heritage Drive	North End	G/S	1.40	65.0	65.0	11.0
135	Burchill Road	Merrickville North Limits	Richardson Road	G/S	2.00	65.0	65.0	123.0
140	Burchill Road	Richardson Road	McConnell Road	G/S	1.60	65.0	65.0	137.0
145	Burchill Road	McConnell Road	4-Roger Stevens Drive	G/S	6.00	65.0	65.0	80.0
150	McConnell Road	Buffam Road	West End	G/S	0.40	65.0	65.0	22.0
155	McConnell Road	Buffam Road	Burchill Road	G/S	1.70	65.0	65.0	33.0
160	Buffam Road	McCrea Road	McConnell Road	G/S	1.80	65.0	65.0	22.0
165	Carroll Road	Smiths Falls North Limit	Kelly Jordan Road	LCB	3.00	60.0	65.0	919.0
170	Carroll Road	Kelly Road	0.1 km North of Ferguson-Tetlock Road	LCB	1.70	60.0	65.0	596.0
175	Carroll Road	0.1 km North of Ferguson-Tetlock Road	McGuire Road	G/S	3.20	50.0	50.0	243.0
180	Carroll Road	McGuire Road	McLachlin Road	G/S	1.40	65.0	65.0	231.0
185	Sturgess Road	Highway 15	West End	G/S	0.70	65.0	65.0	11.0
190	Sturgess Road	Highway 15	East End	G/S	0.10	65.0	65.0	22.0
195	Kelly Jordan Road	Carroll Road	Highway 15	HCB	1.90	60.0	70.0	325.0
200	Kelly Jordan Road	Highway 15	East End	HCB	0.15	50.0	55.0	33.0
205	Ferguson-Tetlock Road	Carroll Road	Highway 15	HCB	2.70	50.0	50.0	298.0
210	Ford Road	Highway 15	Brown Road	LCB	0.70	80.0	75.0	275.0
215	Ford Road	Brown Road	#328	LCB	0.43	80.0	75.0	165.0
220	Ford Road	#328	McLachlin Road	G/S	3.20	65.0	65.0	165.0

Number	Road	From	To	Surface Type	Length (km)	Road Rideability	2024 Roadway Conditon	Traffic Count
225	Brown Road	Ford Road	West End	G/S	1.50	65.0	65.0	39.0
230	McGuire Road	Carroll Road	Ford Road	G/S	3.00	65.0	65.0	160.0
235	McLachlin Road	Carroll Road	Drummond Boundary	G/S	1.60	65.0	65.0	103.0
240	McLachlin Road	Drummond Boundary	Lawford Lane	G/S	1.26	50.0	50.0	135.0
245	McLachlin Road	Lawford Lane	Highway 15	LCB	2.94	65.0	50.0	522.0
250	Code Drive	4-Roger Stevens Drive	Nolan's Road	LCB	2.60	70.0	70.0	453.0
255	Code Drive	Nolan's Road	Rosedale Road North	LCB	2.60	80.0	80.0	453.0
260	Nolan's Road	Code Drive	Rosedale Road North	G/S	2.40	65.0	65.0	215.0
265	Nolan's Road	Rosedale Road North	Holbrook Road	G/S	3.40	65.0	65.0	212.0
270	Nolan's Road	Holbrook Road	Weedmark Road	G/S	1.80	65.0	65.0	192.0
275	Prescott Road	Rosedale Road North	West End	G/S	0.40	65.0	65.0	28.0
280	William Campbell Road	Weedmark Road	Bennett Road	G/S	2.40	65.0	65.0	136.0
285	William Campbell Road	Bennett Road	Montague Boundary Road	G/S	2.20	65.0	65.0	149.0
290	Fletcher Road	4-Roger Stevens Drive	North End	G/S	0.50	65.0	65.0	72.0
295	Douglas Road	4-Roger Stevens Drive	North End	G/S	0.40	65.0	65.0	61.0
300	Rosedale Road North	4-Roger Stevens Drive	Nolan's Road	HCB	2.00	60.0	65.0	657.0
305	Rosedale Road North	Nolan's Road	0.2 km North of Prescott Road	HCB	1.80	60.0	60.0	396.0
310	Rosedale Road North	0.2 km North of Prescott Road	MacPherson Road	HCB	3.20	60.0	65.0	547.0
315	Rosedale Road North	MacPherson Road	McLachlin Road	HCB	3.50	60.0	60.0	474.0
320	McLachlin Road	Highway 15	Rosedale Road North	HCB	0.90	100.0	100.0	536.0
325	McLachlin Road	Rosedale Road North	East End	G/S	0.70	65.0	65.0	33.0
330	Salter Road	Rosedale Road North	McLachlin Road	G/S	1.10	65.0	65.0	22.0
335	MacPherson Road	Highway 15	Rosedale Road North	LCB	2.40	100.0	100.0	300.0
340	MacPherson Road	Rosedale Road North	East End	G/S	0.60	65.0	65.0	33.0
345	Holbrook Road	Nolan's Road	Pinery Road	G/S	5.60	65.0	65.0	51.0
350	Weedmark Road	Nolan's Road	William Campbell Road	G/S	1.60	65.0	65.0	121.0
355	Weedmark Road	William Campbell Road	North End	G/S	1.70	65.0	65.0	61.0
360	Bennett Road	William Campbell Road	North End	G/S	0.80	65.0	65.0	22.0
365	Montague Boundary Road	4-Roger Stevens Drive	Ellen Maloney Road	G/S	3.60	65.0	65.0	102.0
370	Montague Boundary Road	Ellen Maloney Road	Pinery Road	G/S	2.90	65.0	65.0	61.0
375	Montague Boundary Road	Pinery Road	Beckwith Boundary Road	G/S	0.50	65.0	65.0	145.0
380	Ellen Maloney Road	Montague Boundary Road	West End	G/S	1.20	65.0	65.0	6.0
385	Pinery Road	Rosedale Road North	Holbrook Road	G/S	4.50	50.0	50.0	222.0
390	Pinery Road	Holbrook Road	1.3 km East of Holbrook Road	G/S	1.30	50.0	50.0	72.0
395	Pinery Road	1.3 km East of Holbrook Road	4.7 km East of Holbrook Road	G/S	3.40	50.0	50.0	137.0
400	Pinery Road	4.7 km East of Holbrook Road	Montague Boundary Road	G/S	3.10	50.0	50.0	171.0
405	Beckwith Boundary Road	Brunton Side Road	Montague Boundary Road	G/S	2.60	65.0	65.0	171.0
410	Matheson Drive	Smiths Falls East Limit	0.3 km East of Smiths Falls East Limit	HCB	0.30	90.0	90.0	884.0
415	Matheson Drive	0.3 km East of Smiths Falls East Limit	23-Rosedale Road South	HCB	4.70	90.0	90.0	721.0
420	Riceville Road	Matheson Drive	South End	HCB	0.20	90.0	80.0	11.0
425	Matheson Drive	Rideau Avenue	Jubilee Street	HCB	0.13	100.0	100.0	22.0
435	Jubilee Street	Matheson Drive	Dufferin Street	HCB	0.13	80.0	80.0	77.0
440	Charlotte Street	Matheson Drive	North End	HCB	0.08	80.0	80.0	33.0
445	Dufferin Street	Rideau Avenue	Minto Street	HCB	0.40	70.0	65.0	143.0
450	Minto Street	Dufferin Street	Wellington Street	LCB	0.18	70.0	65.0	110.0

Number	Road	From	To	Surface Type	Length (km)	Road Rideability	2024 Roadway Conditon	Traffic Count
455	Wellington Street	Minto Street	Harper Condie Road	LCB	0.05	70.0	70.0	110.0
460	Harper Condie Road	Wellington Street	4-Roger Stevens Drive	LCB	1.00	70.0	75.0	110.0
465	O'Malley Street	4-Roger Stevens Drive	Dean Street	HCB	0.15	60.0	60.0	22.0
470	Uphill Street	4-Roger Stevens Drive	0.3 km North of 4-Roger Stevens Drive	LCB	0.30	70.0	75.0	66.0
475	Uphill Street	0.3 km North of 4-Roger Stevens Drive	Ruthven Street	G/S	0.25	50.0	50.0	66.0
480	Grange Street	4-Roger Stevens Drive	Ruthven Street	LCB	0.40	60.0	65.0	110.0
485	Dean Street	Grange Street	Uphill Street	HCB	0.35	60.0	70.0	132.0
490	Dean Street	Uphill Street	East End	HCB	0.35	65.0	65.0	110.0
495	Ruthven Street	Highway 15	Uphill Street	G/S	1.00	65.0	65.0	110.0
500	Field Street	Ruthven Street	North End Turnaround	G/S	0.10	65.0	65.0	22.0
505	Union Street	Highway 15	North End	HCB	0.30	60.0	60.0	77.0
520	Alice Street	Lorne Street	First Street	HCB	0.42	60.0	65.0	315.0
525	Lila Street	Lorne Street	First Street	HCB	0.42	60.0	65.0	286.0
535	Fifth Street	Rideau Street	Alice Street	HCB	0.15	70.0	70.0	154.0
540	Fifth Street	Alice Street	Lila Street	HCB	0.15	70.0	70.0	88.0
545	Fifth Street	Lila Street	East End	HCB	0.10	70.0	70.0	44.0
550	Fourth Street	Rideau Street	Alice Street	HCB	0.15	70.0	65.0	154.0
555	Fourth Street	Alice Street	Lila Street	HCB	0.15	70.0	65.0	121.0
560	Fourth Street	Lila Street	East End	HCB	0.10	70.0	65.0	66.0
565	Third Street	Rideau Street	Alice Street	HCB	0.15	60.0	60.0	165.0
570	Third Street	Alice Street	Lila Street	HCB	0.15	60.0	60.0	110.0
575	Third Street	Lila Street	East End	HCB	0.10	60.0	60.0	66.0
580	Second Street	Rideau Street	Alice Street	HCB	0.15	70.0	70.0	198.0
585	Second Street	Alice Street	Lila Street	HCB	0.15	70.0	70.0	110.0
590	Second Street	Lila Street	East End	HCB	0.10	70.0	70.0	55.0
595	First Street	Rideau Street	Lila Street	HCB	0.30	70.0	70.0	391.0
600	King Street	Rideau Street	East End	HCB	0.15	100.0	100.0	66.0
625	Bristow Drive	23-Rosedale Road South	East End	HCB	1.10	80.0	80.0	0.0
630	Industrial Road	Highway 15	South End	HCB	0.60	20.0	20.0	0.0

2024 COMPRENSIVE ROADS NEED STUDY

THE TOWNSHIP OF MONTAGUE

COUNTRY LIVING AT ITS BEST

APPENDIX B

FORECAST OF CONDITION RATING BY YEAR

Number	Road	From	To	Surface Type	Length (km)	2024 Roadway Conditon	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034
5	Bayview Crescent	43-County Road 43	43-County Road 43	HCB	0.60	60	57.7	55.4	53.1	50.8	90	87.7	85.4	83.1	80.8	78.5
10	Bayview Lane	Bayview Crescent	South End	HCB	0.10	65	62.7	60.4	58.1	55.8	53.5	51.2	48.9	46.6	44.3	42
15	Rainbow Valley Drive	43-County Road 43	West End	HCB	0.50	60	57.7	55.4	53.1	50.8	48.5	46.2	43.9	41.6	39.3	37
20	Hutton Road	43-County Road 43	East End	G/S	0.30	65	65	65	65	65	65	65	65	65	65	65
25	Acton Drive	43-County Road 43	North End	G/S	0.50	65	65	65	65	65	65	65	65	65	65	65
30	Kilmarnock Road	43-County Road 43	Rideau Canal	HCB	0.70	65	62.7	60.4	58.1	55.8	53.5	51.2	48.9	46.6	90	87.7
35	Rideau River Road	43-County Road 43	Boat Launch Road	HCB	3.90	65	62.7	60.4	78.1	75.8	73.5	71.2	68.9	66.6	64.3	62
40	Rideau River Road	Boat Launch Road	43-County Road 43	HCB	3.60	65	62.7	60.4	58.1	55.8	53.5	51.2	90	87.7	85.4	83.1
45	Boat Launch Road	Rideau River Road	South End	HCB	0.30	55	52.7	50.4	68.1	65.8	63.5	61.2	58.9	56.6	54.3	52
55	Water Street, Andrewsville	Main Street	East End	HCB	0.20	75	72.7	70.4	68.1	65.8	63.5	61.2	58.9	56.6	54.3	52
56	Andrewsville Main Street	Heritage Drive	Township Limits	HCB	0.20	80	77.7	75.4	73.1	70.8	68.5	66.2	63.9	61.6	59.3	57
60	Wood Road	23-Rosedale Road South	Allington Road	G/S	0.60	65	65	65	65	65	65	65	65	65	65	65
65	Wood Road	Allington Road	43-County Road 43	G/S	1.90	65	65	65	65	65	65	65	65	65	65	65
66	Wood Road	McCrea Road	County Road 43	HCB	0.10	90	87.7	85.4	83.1	80.8	78.5	76.2	73.9	71.6	69.3	67
70	Allington Road	Wood Road	North End	G/S	1.10	65	65	65	65	65	65	65	65	65	65	65
75	Guthrie Road	23-Rosedale Road South	0.9 km East of 23-Rosedale Road	G/S	0.90	65	65	65	65	65	65	65	65	65	65	65
80	Guthrie Road	0.9 km East of 23-Rosedale Road	East End	G/S	1.90	65	65	65	65	65	65	65	65	65	65	65
85	Bower Boulevard	23-Rosedale Road South	East End Turnaround	HCB	0.50	75	72.7	70.4	68.1	65.8	63.5	61.2	58.9	56.6	54.3	52
90	Matheson Drive	23-Rosedale Road South	1.4 km East of 23-Rosedale Road	HCB	0.30	65	62.7	60.4	58.1	55.8	53.5	71.2	68.9	66.6	64.3	62
95	Matheson Drive	1.4 km East of 23-Rosedale Road Sout	East End	HCB	0.13	65	62.7	60.4	58.1	55.8	53.5	51.2	48.9	46.6	44.3	42
100	Van Exan Drive	4-Roger Stevens Drive	South End	HCB	0.80	70	67.7	65.4	63.1	60.8	58.5	56.2	53.9	51.6	49.3	47
105	McCrea Road	Buffam Road	43-County Road 43	HCB	1.50	70	67.7	65.4	63.1	60.8	58.5	56.2	53.9	51.6	49.3	47
110	McCrea Road	1.5 km East of Wood Road	Buffam Road	HCB	2.30	75	72.7	70.4	68.1	65.8	63.5	61.2	58.9	56.6	54.3	52
115	McCrea Road	Wood Road	1.5 km East of Wood Road	HCB	1.20	70	67.7	65.4	63.1	60.8	58.5	56.2	53.9	51.6	49.3	47
120	Richardson Road	Buffam Road	Burchill Road	G/S	1.70	65	65	65	65	65	65	65	65	65	65	65
125	Richardson Road	Burchill Road	2-Heritage Drive	G/S	4.20	65	65	65	65	65	65	65	65	65	65	65
130	Gilroy Road	2-Heritage Drive	North End	G/S	1.40	65	65	65	65	65	65	65	65	65	65	65
135	Burchill Road	Richardson Road	McConnell Road	G/S	2.00	65	65	65	65	65	65	65	65	65	65	65
140	Burchill Road	Merrickville North Limits	Richardson Road	G/S	1.60	65	65	65	65	65	65	65	65	65	65	65
145	Burchill Road	McConnell Road	4-Roger Stevens Drive	G/S	6.00	65	65	65	65	65	65	65	65	65	65	65
150	McConnell Road	Buffam Road	Burchill Road	G/S	0.40	65	65	65	65	65	65	65	65	65	65	65
155	McConnell Road	Buffam Road	West End	G/S	1.70	65	65	65	65	65	65	65	65	65	65	65
160	Buffam Road	McCrea Road	McConnell Road	G/S	1.80	65	65	65	65	65	65	65	65	65	65	65
165	Carroll Road	Smiths Falls North Limit	Kelly Jordan Road	LCB	3.00	65	62.7	60.4	58.1	55.8	53.5	51.2	68.9	66.6	64.3	62
170	Carroll Road	Kelly Road	0.1 km North of Ferguson-Tetlock	LCB	1.70	65	62.7	60.4	58.1	55.8	53.5	51.2	48.9	66.6	64.3	62
175	Carroll Road	0.1 km North of Ferguson-Tetlock Road	McGuire Road	G/S	3.20	50	65	65	65	65	65	65	65	65	65	65
180	Carroll Road	McGuire Road	McLachlin Road	G/S	1.40	65	65	65	65	65	65	65	65	65	65	65
185	Sturgess Road	Highway 15	East End	G/S	0.70	65	65	65	65	65	65	65	65	65	65	65
190	Sturgess Road	Highway 15	West End	G/S	0.10	65	65	65	65	65	65	65	65	65	65	65
195	Kelly Jordan Road	Carroll Road	Highway 15	HCB	1.90	70	67.7	65.4	63.1	60.8	58.5	56.2	53.9	51.6	69.3	67
200	Kelly Jordan Road	Highway 15	East End	HCB	0.15	55	52.7	50.4	48.1	45.8	43.5	41.2	38.9	36.6	34.3	32
205	Ferguson-Tetlock Road	Carroll Road	Highway 15	HCB	2.70	50	47.7	45.4	43.1	40.8	90	87.7	85.4	83.1	80.8	78.5
210	Ford Road	Highway 15	Brown Road	LCB	0.70	75	72.7	70.4	68.1	65.8	63.5	61.2	58.9	56.6	54.3	52
215	Ford Road	Brown Road	#328	LCB	0.43	75	72.7	70.4	68.1	65.8	63.5	61.2	58.9	56.6	54.3	52
220	Ford Road	#328	McLachlin Road	G/S	3.20	65	65	65	65	65	65	65	65	65	65	65
225	Brown Road	Ford Road	West End	G/S	1.50	65	65	65	65	65	65	65	65	65	65	65
230	McGuire Road	Carroll Road	Ford Road	G/S	3.00	65	65	65	65	65	65	65	65	65	65	65
235	McLachlin Road	Highway 15	Rosedale Road North	G/S	1.60	100	65	65	65	65	65	65	65	65	65	65
240	McLachlin Road	Drummond Boundary	Lawford Lane	G/S	1.26	50	65	65	65	65	65	65	65	65	65	65
245	McLachlin Road	Lawford Lane	Highway 15	LCB	2.90	50	90	87.7	85.4	83.1	80.8	78.5	76.2	73.9	71.6	69.3
250	Code Drive	4-Roger Stevens Drive	Nolan's Road	HCB	2.60	70	67.7	65.4	63.1	60.8	58.5	56.2	53.9	51.6	49.3	90
255	Code Drive	Nolan's Road	Rosedale Road North	G/S	2.60	80	65	65	65	65	65	65	65	65	65	65

Number	Road	From	To	Surface Type	Length (km)	2024 Roadway Conditon	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034
260	Nolan's Road	Code Drive	Rosedale Road North	G/S	2.40	65	65	65	65	65	65	65	65	65	65	65
265	Nolan's Road	Rosedale Road North	Holbrook Road	G/S	3.40	65	65	65	65	65	65	65	65	65	65	65
270	Nolan's Road	Holbrook Road	Weedmark Road	G/S	1.80	65	65	65	65	65	65	65	65	65	65	65
275	Prescott Road	Rosedale Road North	West End	G/S	0.40	65	65	65	65	65	65	65	65	65	65	65
280	William Campbell Road	Bennett Road	Montague Boundary Road	G/S	2.40	65	65	65	65	65	65	65	65	65	65	65
285	William Campbell Road	Weedmark Road	Bennett Road	G/S	2.20	65	65	65	65	65	65	65	65	65	65	65
290	Fletcher Road	4-Roger Stevens Drive	North End	G/S	0.50	65	65	65	65	65	65	65	65	65	65	65
295	Douglas Road	4-Roger Stevens Drive	North End	G/S	0.40	65	65	65	65	65	65	65	65	65	65	65
300	Rosedale Road North	4-Roger Stevens Drive	Nolan's Road	HCB	2.00	65	62.7	60.4	58.1	90	87.7	85.4	83.1	80.8	78.5	76.2
305	Rosedale Road North	0.2 km North of Prescott Road	MacPherson Road	HCB	1.80	65	62.7	60.4	58.1	55.8	53.5	51.2	48.9	46.6	44.3	42
310	Rosedale Road North	MacPherson Road	McLachlin Road	HCB	3.20	60	57.7	55.4	53.1	50.8	68.5	66.2	63.9	61.6	59.3	57
315	Rosedale Road North	Nolan's Road	0.2 km North of Prescott Road	HCB	3.50	60	80	77.7	75.4	73.1	70.8	68.5	66.2	63.9	61.6	59.3
320	McLachlin Road	Carroll Road	Drummond Boundary	HCB	0.90	65	62.7	60.4	58.1	55.8	53.5	51.2	48.9	46.6	44.3	42
325	McLachlin Road	Rosedale Road North	East End	G/S	0.70	65	65	65	65	65	65	65	65	65	65	65
330	Salter Road	Rosedale Road North	McLachlin Road	G/S	1.10	65	65	65	65	65	65	65	65	65	65	65
335	MacPherson Road	Highway 15	Rosedale Road North	LCB	2.40	100	97.7	95.4	93.1	90.8	88.5	86.2	83.9	81.6	79.3	77
340	MacPherson Road	Rosedale Road North	East End	G/S	0.60	65	65	65	65	65	65	65	65	65	65	65
345	Holbrook Road	Nolan's Road	Pinery Road	G/S	5.60	65	65	65	65	65	65	65	65	65	65	65
350	Weedmark Road	Nolan's Road	William Campbell Road	G/S	1.60	65	65	65	65	65	65	65	65	65	65	65
355	Weedmark Road	William Campbell Road	North End	G/S	1.70	65	65	65	65	65	65	65	65	65	65	65
360	Bennett Road	William Campbell Road	North End	G/S	0.80	65	65	65	65	65	65	65	65	65	65	65
365	Montague Boundary Road	Pinery Road	Beckwith Boundary Road	G/S	3.60	65	65	65	65	65	65	65	65	65	65	65
370	Montague Boundary Road	4-Roger Stevens Drive	Ellen Maloney Road	G/S	2.90	65	65	65	65	65	65	65	65	65	65	65
375	Montague Boundary Road	Ellen Maloney Road	Pinery Road	G/S	0.50	65	65	65	65	65	65	65	65	65	65	65
380	Ellen Maloney Road	Montague Boundary Road	West End	G/S	1.20	65	65	65	65	65	65	65	65	65	65	65
385	Pinery Road	Rosedale Road North	Holbrook Road	G/S	4.50	50	65	65	65	65	65	65	65	65	65	65
390	Pinery Road	4.7 km East of Holbrook Road	Montague Boundary Road	G/S	1.30	50	65	65	65	65	65	65	65	65	65	65
395	Pinery Road	1.3 km East of Holbrook Road	4.7 km East of Holbrook Road	G/S	3.40	50	65	65	65	65	65	65	65	65	65	65
400	Pinery Road	Holbrook Road	1.3 km East of Holbrook Road	G/S	3.10	50	65	65	65	65	65	65	65	65	65	65
405	Beckwith Boundary Road	Brunton Side Road	Montague Boundary Road	G/S	2.60	65	65	65	65	65	65	65	65	65	65	65
410	Matheson Drive	Smiths Falls East Limit	0.3 km East of Smiths Falls East L	HCB	1.40	90	87.7	85.4	83.1	80.8	78.5	76.2	73.9	71.6	69.3	67
415	Matheson Drive	0.3 km East of Smiths Falls East Limit	23-Rosedale Road South	HCB	0.30	90	87.7	85.4	83.1	80.8	78.5	76.2	73.9	71.6	69.3	67
420	Riceville Road	Matheson Drive	South End	HCB	0.20	80	77.7	75.4	73.1	70.8	68.5	66.2	63.9	61.6	59.3	57
425	Matheson Drive	Rideau Avenue	Jubilee Street	HCB	4.70	100	97.7	95.4	93.1	90.8	88.5	86.2	83.9	81.6	79.3	77
435	Jubilee Street	Matheson Drive	Dufferin Street	HCB	0.13	80	77.7	75.4	73.1	70.8	68.5	66.2	63.9	61.6	59.3	57
440	Charlotte Street	Matheson Drive	North End	HCB	0.08	80	77.7	75.4	73.1	70.8	68.5	66.2	63.9	61.6	59.3	57
445	Dufferin Street	Rideau Avenue	Minto Street	HCB	0.40	65	62.7	60.4	58.1	55.8	53.5	51.2	48.9	90	87.7	85.4
450	Minto Street	Dufferin Street	Wellington Street	LCB	0.18	65	62.7	80.4	78.1	75.8	73.5	71.2	68.9	66.6	64.3	62
455	Wellington Street	Minto Street	Harper Condie Road	LCB	0.05	70	67.7	65.4	63.1	60.8	58.5	56.2	53.9	51.6	49.3	47
460	Harper Condie Road	Wellington Street	4-Roger Stevens Drive	LCB	1.00	75	72.7	70.4	68.1	65.8	63.5	61.2	58.9	56.6	54.3	52
465	O'Malley Street	4-Roger Stevens Drive	Dean Street	HCB	0.15	60	57.7	55.4	53.1	50.8	48.5	46.2	43.9	41.6	39.3	37
470	Uphill Street	4-Roger Stevens Drive	0.3 km North of 4-Roger Stevens I	LCB	0.30	55	52.7	50.4	68.1	65.8	63.5	61.2	58.9	56.6	54.3	52
475	Uphill Street	0.3 km North of 4-Roger Stevens Drive	Ruthven Street	G/S	0.25	50	65	65	65	65	65	65	65	65	65	65
480	Grange Street	4-Roger Stevens Drive	Ruthven Street	LCB	0.40	65	62.7	80.4	78.1	75.8	73.5	71.2	68.9	66.6	64.3	62
485	Dean Street	Grange Street	Uphill Street	HCB	0.35	70	67.7	65.4	63.1	60.8	58.5	76.2	73.9	71.6	69.3	67
490	Dean Street	Uphill Street	East End	HCB	0.35	65	62.7	80.4	78.1	75.8	73.5	71.2	68.9	66.6	64.3	62
495	Ruthven Street	Highway 15	Uphill Street	G/S	1.00	65	65	65	65	65	65	65	65	65	65	65
500	Field Street	Ruthven Street	North End Turnaround	G/S	0.10	65	65	65	65	65	65	65	65	65	65	65
505	Union Street	Highway 15	North End	HCB	0.30	60	57.7	55.4	53.1	50.8	48.5	46.2	43.9	41.6	39.3	37
520	Alice Street	Lorne Street	First Street	HCB	0.42	65	62.7	60.4	58.1	55.8	53.5	51.2	68.9	66.6	64.3	62
525	Lila Street	Lorne Street	First Street	HCB	0.42	65	62.7	60.4	58.1	55.8	53.5	51.2	48.9	66.6	64.3	62
535	Fifth Street	Rideau Street	Alice Street	HCB	0.15	70	67.7	65.4	63.1	60.8	58.5	56.2	53.9	51.6	49.3	47

Number	Road	From	To	Surface Type	Length (km)	2024 Roadway Conditon	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034
540	Fifth Street	Alice Street	Lila Street	HCB	0.15	70	67.7	65.4	63.1	60.8	58.5	56.2	53.9	51.6	49.3	47
545	Fifth Street	Lila Street	East End	HCB	0.10	70	67.7	65.4	63.1	60.8	58.5	56.2	53.9	51.6	49.3	47
550	Fourth Street	Rideau Street	Alice Street	HCB	0.15	65	62.7	60.4	58.1	55.8	53.5	51.2	48.9	90	87.7	85.4
555	Fourth Street	Alice Street	Lila Street	HCB	0.15	65	62.7	60.4	58.1	55.8	53.5	71.2	68.9	66.6	64.3	62
560	Fourth Street	Lila Street	East End	HCB	0.10	65	62.7	60.4	58.1	55.8	53.5	51.2	48.9	46.6	44.3	42
565	Third Street	Rideau Street	Alice Street	HCB	0.15	60	57.7	75.4	73.1	70.8	68.5	66.2	63.9	61.6	59.3	57
570	Third Street	Alice Street	Lila Street	HCB	0.15	60	57.7	75.4	73.1	70.8	68.5	66.2	63.9	61.6	59.3	57
575	Third Street	Lila Street	East End	HCB	0.10	60	57.7	75.4	73.1	70.8	68.5	66.2	63.9	61.6	59.3	57
580	Second Street	Rideau Street	Alice Street	HCB	0.15	70	67.7	65.4	63.1	60.8	58.5	56.2	53.9	51.6	49.3	47
585	Second Street	Alice Street	Lila Street	HCB	0.15	70	67.7	65.4	63.1	60.8	58.5	56.2	53.9	51.6	49.3	47
590	Second Street	Lila Street	East End	HCB	0.10	70	67.7	65.4	63.1	60.8	58.5	56.2	53.9	51.6	49.3	47
595	First Street	Rideau Street	Lila Street	HCB	0.30	70	67.7	65.4	63.1	60.8	58.5	56.2	53.9	51.6	69.3	67
600	King Street	Rideau Street	East End	HCB	0.15	100	97.7	97.7	95.4	93.1	90.8	88.5	86.2	83.9	81.6	79.3
625	Bristow Drive	23-Rosedale Road South	East End	HCB	1.10	80	77.7	75.4	73.1	70.8	68.5	66.2	63.9	61.6	59.3	57
630	Industrial Road	Highway 15	South End	HCB	0.60	20	100	97.7	95.4	93.1	90.8	88.5	86.2	83.9	81.6	79.3

Weighted Condition Rating Average - Gravel	63.3	65.0	65.0	65.0	65.0	65.0	65.0	65.0	65.0	65.0	65.0
Total KM	96.61	96.61	96.61	96.61	96.61	96.61	96.61	96.61	96.61	96.61	96.61

Weighted Condition Rating Average - LCB	69.5	76.6	75.2	73.4	71.1	68.8	66.5	68.8	69.1	66.8	64.5
Total KM	13.06	13.06	13.06	13.06	13.06	13.06	13.06	13.06	13.06	13.06	13.06

Weighted Condition Rating Average -HCB	69.2	69.5	67.5	66.9	66.0	68.4	66.4	67.4	65.7	65.0	65.0
Total KM	48.63	48.63	48.63	48.63	48.63	48.63	48.63	48.63	48.63	48.63	48.63

Weighted Condition Rating Average -HCB + LCB	69.2	71.0	69.1	68.3	67.1	68.5	66.5	67.7	66.4	65.4	64.9
Total KM	61.69	61.69	61.69	61.69	61.69	61.69	61.69	61.69	61.69	61.69	61.69

Weighted Condition Rating Average -Gravel + LCB + HCB	65.6	67.3	66.6	66.3	65.8	66.4	65.6	66.0	65.6	65.1	65.0
Total KM	158.3	158.3	158.3	158.3	158.3	158.3	158.3	158.3	158.3	158.3	158.3

2024 COMPRENSIVE ROADS NEED STUDY

APPENDIX C

10 YEAR MAINTENANCE PROGRAM

10 Year Capital Plan

SSS	Road	From	To	Surface Type	Road Rideability	2024 Roadway Conditon	Length (km)	AADT2	Type of Construction	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034
5	Bayview Crescent	43-County Road 43	43-County Road 43	HCB	70.00	60.00	0.60	209.0	HCB-R2					$132,000					
30	Kilmarnock Road	43-County Road 43	Rideau Canal	HCB	70.00	65.00	0.70	550.0	HCB-R2									$154,000	
35	Rideau River Road	Boat Launch Road	43-County Road 43	HCB	70.00	65.00	3.90	220.0	HCB-R1			$401,700							
40	Rideau River Road	43-County Road 43	Boat Launch Road	HCB	70.00	65.00	3.60	220.0	HCB-R2							$396,000	$396,000		
45	Boat Launch Road	Rideau River Road	South End	HCB	65.00	55.00	0.30	22.0	HCB- R2			$66,000							
165	Carroll Road	Smiths Falls North Li	Kelly Jordan Road	LCB	60.00	65.00	3.00	919.0	LCB-R1 *							$52,500			
195	Kelly Jordan Road	Carroll Road	Highway 15	HCB	60.00	70.00	1.90	325.0	HCB-R1									$195,700	
205	Ferguson-Tetlock Road	Carroll Road	Highway 15	HCB	50.00	50.00	2.70	298.0	HCB-R2					$594,000					
245	McLachlin Road	Lawford Lane	Highway 15	LCB	65.00	50.00	2.94	522.0	LCB-R2 *	$257,250									
250	Code Drive	4-Roger Stevens Dri	Nolan's Road	LCB	70.00	70.00	2.60	453.0	LCB-R2										$455,000
300	Rosedale Road North	Nolan's Road	0.2 km North of Pres	HCB	60.00	65.00	2.00	657.0	HCB-R2				$440,000						
310	Rosedale Road North	MacPherson Road	McLachlin Road	HCB	60.00	60.00	3.20	547.0	HCB-R1						$329,600				
315	Rosedale Road North	4-Roger Stevens Dri	Nolan's Road	HCB	60.00	60.00	3.50	474.0	HCB-R1	$180,250	$180,250								
445	Dufferin Street	Rideau Avenue	Minto Street	HCB	70.00	65.00	0.40	143.0	HCB-R2									$88,000	
450	Minto Street	Dufferin Street	Wellington Street	LCB	70.00	65.00	0.18	110.0	LCB-R1		$6,300								
470	Uphill Street	4-Roger Stevens Dri	0.3 km North of 4-Ro	LCB	70.00	50.00	0.25	66.0	LCB-R2		$43,750								
480	Grange Street	4-Roger Stevens Dri	Ruthven Street	LCB	60.00	65.00	0.40	110.0	LCB-R2		$70,000								
485	Dean Street	Uphill Street	East End	HCB	65.00	70.00	0.35	132.0	HCB-R2						$77,000				
490	Dean Street	Grange Street	Uphill Street	HCB	60.00	65.00	0.35	110.0	HCB-R2		$77,000								
505	Union Street	Highway 15	North End	HCB	60.00	60.00	0.30	77.0	HCB-R2				$66,000						
520	Alice Street	Lorne Street	First Street	HCB	60.00	65.00	0.42	315.0	HCB-R1							$43,260			
525	Lila Street	Lorne Street	First Street	HCB	60.00	65.00	0.42	286.0	HCB-R1								$43,260		
550	Fourth Street	Rideau Street	Alice Street	HCB	70.00	65.00	0.15	154.0	HCB-R2						$33,000				
555	Fourth Street	Alice Street	Lila Street	HCB	70.00	65.00	0.15	121.0	HCB-R2						$33,000				
565	Third Street	Rideau Street	Alice Street	HCB	60.00	60.00	0.15	165.0	HCB-R2		$33,000								
570	Third Street	Alice Street	Lila Street	HCB	60.00	60.00	0.15	110.0	HCB-R2		$33,000								
575	Third Street	Lila Street	East End	HCB	60.00	60.00	0.10	66.0	HCB-R2		$22,000								
595	First Street	Rideau Street	Lila Street	HCB	70.00	70.00	0.30	391.0	HCB-R1									$30,900	
630	Industrial Road	Highway 15	South End	HCB	20.00	20.00	0.60	0.0	HCB-R5	$45,000									

* Roads are boundary/shared roads and will have 50% cost sharing.

	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034
Budget	478,000	478,000	478,000	478,000	478,000	478,000	478,000	478,000	478,000	478,000
Cost	$482,500	$465,300	$467,700	$506,000	$726,000	$472,600	$491,760	$439,260	$468,600	$455,000
Deficiet/Surplus	$ (4,500.00)	$ 12,700.00	$ 10,300.00	$ (28,000.00)	$ (248,000.00)	$ 5,400.00	$ (13,760.00)	$ 38,740.00	$ 9,400.00	$ 23,000.00