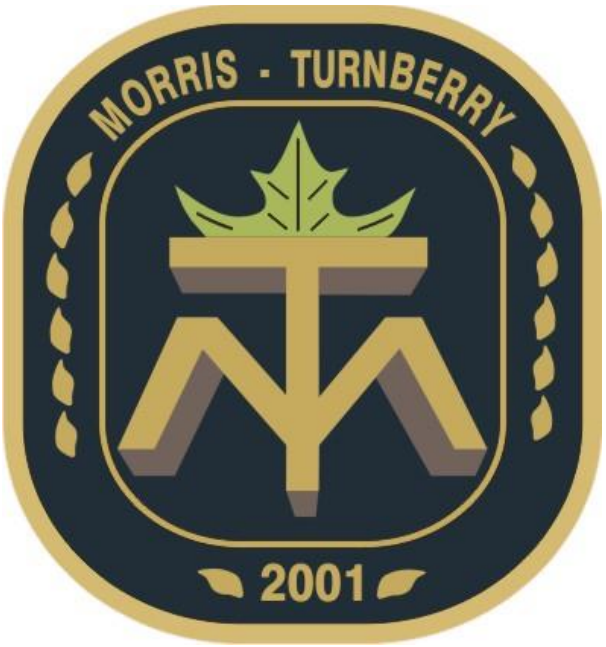

2022 Asset Management Plan
Municipality of Morris-Turnberry

June 2022

Contents

1. Municipal Information

The Municipality of Morris-Turnberry is a lower tier Municipality located within the County of Huron. The Municipality is 376.89 square kilometers in size and is largely comprised of rural properties interspersed with urban communities. As of 2021, the municipal population is 3,590 residents among 1,318 households. The municipality's core asset categories are Bridges, Culverts, Roads, Belgrave Water System and Stormwater assets. This asset management plan is endorsed by the executive lead of the municipality and approved by a resolution passed by municipal council.

2. Bridges

2.1. Inventory Summary

There are 21 bridges located within the Municipality of Morris-Turnberry. The bridges vary in size, construction materials and structure type. The average age of the bridges is approximately 58 years old. The construction dates range from an estimated 1910s up to 2021/2022. Structure M230 located on Abraham Road is undergoing a replacement over the 2021 and 2022 fiscal periods.

The traffic supported by the municipal bridges is also varied. Large agricultural equipment, heavy transport vehicles, motor vehicles, emergency vehicles, cyclists and pedestrians all utilize the bridges to travel throughout the municipality.

A summary of the municipality's bridge assets can be found below:

Number of Bridges	Average Span (meters)	Average Age (years)	Bridges with Load or Dimension Restrictions	Total Current Bridge Value	Average Current Bridge Value
21	44.536	58	2	$40,284,550	$1,918,312

Of the 21 bridges maintained by the municipality, 2 or 9.5% of these bridges have a load or dimension restrictions. Additional details on specific bridges may be found on Table 1.

All municipal bridges are inspected biannually in compliance with OSIM requirements. The most recent bridge inspection report was conducted in 2020 by B. M. Ross & Associates Limited (B.M. Ross). Details regarding individual bridge components including images may be found in the 2020 bridge inspection report. A copy of the report is available upon request. An updated bridge inspection report is scheduled to be completed in 2022.

2.2. Current Replacement Values

The 2020 bridge inspection report calculated each bridge's current value. This value is a representation of the current structure being replaced by an identical structure using identical design and materials. This value does not take into consideration the costs of removing the existing bridge or the cost of bringing the structure's engineering and construction materials up to a modern standard. New bridges must also meet modern hydrology, safety, and dimension standards. In order to estimate the total replacement cost of a bridge the municipality uses the following methodology based on the span of the

bridge. The structure span values, and anticipated replacement cost ranges were provided by B.M. Ross. The ranges are used to estimate the current replacement costs of the municipality's bridges.

Bridge Span (m)	Anticipated Replacement Cost Range
Less than 6m	$250,000 to $450,000
6 m to 12 m	$400,000 to $750,000
12m to 18m	$700,000 to $1,300,000
18m to 24m	$1,200,000 to $1,900,000
24m to 30m	$1,800,000 to $2,500,000
30m to 40m	$2,400,000 to 3,200,000
40m to 50m	$3,100,000 to $4,000,000
50m to 60m+	$3,900,000 to $5,000,000+

The current replacement values of the municipality's bridges range from $425,000 up to $5,990,000. A summary of the replacement values can be found below and values for individual bridges are on table 1.

Summary of Bridge Current Replacement Values		
Range	**# Of Bridges**	**Current Replacement Value**
Less than $1,000,000	3	$1,586,666
$1,000,000 to $2,000,000	1	$1,025,000
$2,000,000 to $3,000,000	1	$2,752,000
$3,000,000 to $4,000,000	8	$28,467,000
$4,000,000 to $5,000,000	5	$21,524,000
Greater than $5,000,000	3	$18,465,000
Total	**21**	**$73,819,666**
Average		**$3,515,222**

2.3. Condition

The most recent bridge inspection report conducted in 2020 calculated a Bridge Condition Index (BCI) value for each bridge within the municipality. The BCI values are grouped into the following categories: Excellent, Good, Fair, Poor, Very Poor and Failed. Details regarding the condition ratings and corresponding criteria can be found on Table 2.

Category:	Excellent	Good	Fair	Poor	Very Poor	Failed	Total
BCI Range	100 to 90	89 to 70	69 to 40	39 to 10	9 to 1	0	
# In Category	4	5	12	0	0	0	21
% Of Total	19%	24%	57%	0%	0%	0%	100%

The average BCI rating of the municipality's 21 bridges is 67.8 or an overall Fair condition. The bridge inspection report is scheduled to be updated in 2022.

2.4. Levels of Service

The municipality has established levels of service (LOS) to evaluate each bridge's operating efficiency, capacity to meet demands, and environmental resiliency. The LOS criteria and ranking definitions are outlined in Table 3.

Average Distribution - Level of Service Ratings						
	Excellent	Good	Fair	Poor	Very Poor	Failed
Operational Functionality	-	15	5	1	-	-
Capacity to Meet Demands	-	21	-	-	-	-
Environmental Resiliency	-	20	1	-	-	-

Each bridge was evaluated and assigned a ranking based on municipal staff's first-hand knowledge and observation. Any bridge that did not have designs available, a performance-based assessment was conducted, and rating assigned.

Overall, the municipality's bridges have an average rating of Good in operating efficiency, capacity to meet demands and environmental resiliency.

2.5. Lifecycle Activities

The bridges within the Municipality of Morris-Turnberry have an expected useful life of 80 years. The life cycle activities include a 30-year rehabilitation and a 60-year rehabilitation before a complete replacement at 80 years. The municipality uses the following methodology based on the span of the bridge when calculating the costs of the 30 year and 60-year rehabilitations. The structure span and anticipated rehabilitation cost ranges were provided by B.M. Ross.

Bridge Span (m)	30 Year Rehabilitation Cost Range	60 Year Rehabilitation Cost Range
Less than 6m	$85,000 to $150,000	$50,000 to $85,000
6 m to 12 m	$125,000 to $350,000	$100,000 to $200,000
12m to 18m	$250,000 to $450,000	$150,000 to $300,000
18m to 24m	$350,000 to $550,000	$250,000 to $400,000
24m to 30m	$400,000 to $650,000	$300,000 to $450,000
30m to 40m	$500,000 to $750,000	$400,000 to $600,000
40m to 50m	$600,000 to $850,000	$500,000 to $700,000
50m to 60m+	$750,000 to $1,000,000	$600,000 to $750,000

The municipality takes into consideration the recommendations of the bi-annual bridge inspection report, grant availability and geographic synergies when planning bridge rehabilitations and replacements. Using the lifecycle activities and estimated cost ranges, the anticipated lifecycle costs from 2023 to 2032 are as follows:

Anticipated Bridge Lifecycle Costs (2023 to 2032)										
Year:	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032
Estimated Cost ($):	$91,000	$145,000	$510,000	$-	$148,000	$-	$580,833	$5,033,000	$1,225,000	$618,000

2.6. Risks related to lifecycle activities

Financial Risk
Failure to perform scheduled lifecycle activities or forecast future needs can expose the municipality to financial risk. If a bridge fails due to lack of maintenance and repair, the cost to replace it can be significant. An unbudgeted bridge replacement will have a significant impact on the municipal budget. Cost overruns and volatile market prices can also pose a financial risk to the municipality.

Environmental Risk
Climate change can pose an environmental risk to municipal bridges. Significant weather events have increased in frequency and severity due to climate change. These events can cause damage to a structure during a storm or slowly damage a structure over time. When repairing, rehabilitating, or replacing a bridge, the impact of climate change on the structure will be evaluated.

Economic Risk
Municipal assets with capacity restrictions could potentially deter economic growth within the municipality. Commercial development cannot occur in an area serviced by a bridge that cannot accommodate the size or weight of large commercial vehicles. When repairing, rehabilitating, or replacing a bridge, the municipality will evaluate the economic growth potential of the area and evaluate if the bridge is an impediment to that growth.

Reputation Risk
Municipal bridges are used by motorists and the public daily. If lifecycle activities and general maintenance are postponed the structure can deteriorate. The daily use of a structure in disrepair can result in the public developing a negative impression of the municipality. A tarnished reputation can be exceedingly difficult to correct and can impact a municipality's ability to recruit qualified staff or attract economic growth to the area.

Health & Safety Risk
It is the municipality's goal to maintain bridges to allow for the safe passage of vehicles, cyclists, and pedestrians. If the municipal bridges are not maintained in a timely and appropriate manner, the public could be exposed to an unnecessary health and safety risk. When repairing, rehabilitating, or replacing a bridge, the municipality will consider the health and safety risks to the public. The municipality will also ensure appropriate health & safety measures are taken on the job site while bridge construction is occurring to protect staff and the public.

2.7. Economic & Population Growth Assumptions

Current population and economic growth within Morris-Turnberry is minimal. Recent residential development is small in scale and will have minimal impact on the bridge's lifecycle activities. The municipality is currently serviced by bridges of appropriate size and capacity.

Much of the economic growth within the municipality is related to agricultural operations. The location of this growth is in areas suited for the development and already serviced by bridges capable of accommodating large agricultural machinery. Additional growth in these areas within the municipality will not have a significant impact on the bridge's lifecycle activities. Current lifecycle activities are scheduled to meet the current population and economic activity levels. When a bridge is identified for repair, rehabilitation or replacement, these assumptions will be reevaluated.

Table 1 - Bridges - Inventory Summary											
Bridge Number	Structure Name	Road Name	Span (m)	Width (m)	Year Built	Estimated Year Built	Age of Structure	2020 BCI Rating	2020 Bridge Value	Current Replacement Value	Load or Dimension Restrictions
BB1	Victoria St. Bridge	Victoria St. West	53.40	11.90	1975		47	61	$ 2,730,500	$ 4,274,000	None
BB2		Clyde Street	34.40	10.15		1970	52	63	$ 1,569,500	$ 2,752,000	None
BB3		Ramsay Line	53.00	8.60		1970	52	80	$ 1,995,200	$ 4,230,000	None
M040		Elevator Line	9.10	5.90		1940	82	52	$ 541,800	$ 580,833	Load Restriction
M060		Moncrieff Road	5.50	8.35	1945		77	58	$ 328,950	$ 425,000	None
M110	Martin Bridge	Martin Line	74.60	9.30		1980	42	83	$ 3,040,100	$ 6,606,000	None
M120	Clark Bridge	Clyde Line	51.20	9.25	1972		50	71	$ 2,059,700	$ 4,032,000	None
M140	Bodmin Bridge	Brandon Road	50.00	8.65		1950	72	40	$ 1,870,500	$ 3,900,000	None
M160	Garniss Bridge	Cardiff Road	47.20	8.65	1957		65	63	$ 1,797,400	$ 3,748,000	None
M190	Stone School Bridge	Clegg Line	47.60	9.80	1965		57	53	$ 2,042,500	$ 3,784,000	None
M200		Browntown Road	9.10	8.60	1962		60	57	$ 356,900	$ 580,833	None
M210	Campbell Bridge	Jamestown Road	53.40	9.90	1963		59	52	$ 2,322,000	$ 4,274,000	None
M220		Jamestown Road	15.25	8.45		1960	62	68	$ 589,100	$ 1,025,000	None
M230	Blind Line Bridge	Abraham Road	38.70	5.05		1910	112	44	$ 2,618,700	$ 3,096,000	Load and Dimension
M250	Jamestown Bridge	Jamestown Road	40.90	9.80		1970	52	74	$ 1,750,100	$ 3,181,000	None
T010	Lower Town Bridge	Helena Street	69.00	12.40	1991		31	96	$ 3,710,900	$ 5,990,000	None
T030	B Line Bridge	B Line Road	57.40	9.75	1977		45	91	$ 2,472,500	$ 4,714,000	None
T060	Eadie Bridge	Gilmour Line	67.90	9.30	1982		40	96	$ 2,782,100	$ 5,869,000	None
T090	Bolt Bridge	Kieffer Line	44.00	8.65	1975		47	92	$ 1,672,700	$ 3,460,000	None
T100	Willit Bridge	Salem Road	47.60	9.86	1966		56	52	$ 2,094,100	$ 3,784,000	None
T110	Henning's Bridge	Orange Hill Road	44.60	9.90	1967		55	78	$ 1,939,300	$ 3,514,000	None

Summary		Length (m)	Width (m)	Year Built	Approx. Age	BCI Rating	2020 Bridge Value	Replacement Value
21	Bridges							
	Average	43.52	9.15	1964	58	68	$ 1,918,312	$ 3,515,222
	Totals	913.85					$ 40,284,550	$ 73,819,666

Table 2 - Bridges - Condition Categories & Corresponding Criteria						
	Excellent	**Good**	**Fair**	**Poor**	**Very Poor**	**Failed**
BCI	**100 to 90**	**89 to 70**	**69 to 40**	**39 to 10**	**9 to 1**	**0**
	• Structure is in a **"Excellent"** condition overall • Insignificant defects/damage to a few critical load bearing elements • Capacity unaffected •No repairs are required in the foreseeable future	• Structure is in a **"Good"** condition overall • Minor defects/damage, but may also have some moderate defects to some critical load bearing elements • Capacity unlikely to be affected •Can be upgraded to new condition with little effort and cost •Significant maintenance or repair work is not usually required within the next 10 years	• Structure is in a **"Fair"** to **"Good"** condition overall • Minor-to-Moderate defects/damage to several critical load bearing elements • Capacity may be slightly affected • One or more functions of the structure may be significantly affected •Maintenance or repair work is required within 6 to 10 years	• Structure is in a **"Fair"** to **"Poor"** condition overall • Moderate-to-Severe defects/damage to many critical load bearing elements • Capacity may be significantly affected • One or more functions of the bridge may be severely affected •Maintenance or repair work is required within 1 to 5 years.	• Structure is in a **"Very Poor"** condition overall • Severe defects/damage on a number of critical load bearing elements • Failure and/or possible failure of one or more critical load bearing elements • Capacity may be severely affected • Structure may be unserviceable •Emergency work is required within 1 year and/or structure may need to be weight restricted or closed to traffic	• Structure has failed • Structure is unserviceable

Table 3 - Bridges - Levels of Service Definitions

	Level of Service Criteria	Excellent	GOOD	FAIR	POOR	VERY POOR
Operational Functionality	- Appropriate design for traffic volumes and speed limits	- Structure designed to accommodate higher traffic volumes and speed limits	- Design is appropriate for traffic volumes and speed limits	- Design is substandard to modern standards, but sufficient for current volumes and speed limits	- Design is substandard for current traffic volumes and speed limits	- Design is negatively impacting traffic volumes and speed of traffic
	- Sufficient platform to accommodate current traffic volumes and speeds (not related to capacity)	- Structure's platform can accommodate additional traffic volumes and speeds	- Structure's platform accommodates current traffic volumes and speeds	- Platform can accommodate small traffic in both directions, Large vehicles limited to single lane crossing, minimal to no impact on traffic flow	- Single lane crossing for large and small traffic, minimal to no impact on traffic flow	- Single lane crossing for large and small traffic, negatively impacting traffic flow
	- Adequate structural capacity to accommodate traffic volumes and loading	- Structure capacity can accommodate additional traffic volume and loading	- Structure capacity accommodates current traffic volume and loading	- Structure's ability to accommodate heavy vehicles is limited, but no to minimal impact to traffic flow	- Structure's ability to accommodate heavy vehicles is limited, negatively impacting traffic flow	- Structure ability to accommodate heavy and light vehicles is limited, negatively impacting traffic flow
	- Maintenance of bridges is fully compliant with the "Minimum Maintenance Standards for Municipal Highways" (O.Reg 388/18)	- Maintenance exceeds Minimum Maintenance Standards	- Maintenance is fully compliant with Minimum Maintenance Standards	- Maintenance is partially compliant with Minimum Maintenance Standards	- Maintenance is not compliant with Minimum Maintenance Standards	- No Maintenance is conducted on Structures
Capacity to Meet Demands	- Sufficient width and structural capacity to meet peak traffic volumes and loads for given speed limits.	- Structural Capacity exceeds current peak traffic volumes and loads for given speed limits	- Structural capacity meets current peak traffic volumes and loads for given speed limits	- Structural capacity just meets current peak traffic volumes and loads for given speed limits, minimal to no impact on traffic flow	- Structural capacity is below current peak traffic volumes and loads for given speed limits, noticeable impact on traffic flow	- Structural capacity is significantly below current peak traffic volumes and loads for given speed limits, negatively impacting traffic flow
Environmental Resiliency	- Sufficient span and elevation to accommodate a 100-year or regional storm event	- Span and Elevation exceed requirements to accommodate a 100-year or regional storm event	- Span and Elevation are sufficient to accommodate a 100-year or regional storm event	- Span and Elevation barely accommodate a 100-year or regional storm event	- Span and Elevation cannot accommodate a 100-year or regional storm event, minimal repercussions upon failure to accommodate	- Span and Elevation cannot accommodate a 100-year or regional storm event, major repercussions upon failure to accommodate
	- Adequate embankment and watercourse protection to protect the structure during high flows	- Embankment and watercourse protection provides excess protection during high flows	- Embankment and watercourse protection provides adequate protection during high flows	- Embankment and watercourse protection provides barely adequate protection during high flows	- Embankment and watercourse protection does not provide protection during high flows, minimal damage to area	- Embankment and watercourse protection does not provide protection during high flows, major damage to area

3. Culverts

3.1. Inventory Summary

There are 19 culverts greater than 3 meters located within the Municipality of Morris-Turnberry. The culverts vary in length, construction materials and structure type. The average age of the culverts is approximately 50 years old. The construction dates range from an estimated 1950s up to 2016. Structure M020 on McCall Line is undergoing replacement in the 2022 fiscal period.

The traffic supported by the culverts is also varied. Large agricultural equipment, heavy transport vehicles, motor vehicles, emergency vehicles, cyclists and pedestrians all utilize the culverts to travel throughout the municipality.

A summary of the municipality's bridge assets can be found below:

Number of Culverts	Average Span (meters)	Average Age (years)	Culverts with Load or Dimension Restrictions	Total Current Culvert Value	Average Current Bridge Value
19	4.47	50	0	$5,227,000	$275,105

None of the 19 culverts maintained by the municipality have load or dimension restrictions. Additional details on specific culverts may be found on Table 4.

All municipal culverts are inspected biannually in compliance with OSIM requirements. The most recent inspection report was conducted in 2020 by B.M. Ross & Associates. Details regarding individual culverts including images may be found in the 2020 bridge inspection report. A copy of the report is available upon request. An updated bridge needs study is scheduled to be completed in 2022.

3.2. Current Replacement Values

The 2020 bridge inspection report calculated each culvert's current value. This value is a representation of the current structure being replaced by an identical structure using identical design and materials. This value does not take into consideration the costs of removing the existing culvert or the cost of bringing the structure's engineering and construction materials up to a modern standard. New culverts must also meet modern hydrology, safety, and dimension standards. In order to estimate the total replacement cost of a culvert the municipality uses the following methodology based on the span of the culvert. The structure span values, and anticipated replacement cost ranges were provided by B.M. Ross. The ranges were used to develop a formula to estimate the current replacement costs of the municipality's culverts.

Culvert Span (m)	Anticipated Replacement Cost Range
Less than 6m	$250,000 to $450,000
6 m to 12 m	$400,000 to $750,000

The current replacement values of the municipality's culverts range from $220,000 up to $425,000. A summary of the replacement values can be found below and values for individual culverts are on Table 4.

Summary of Culvert Replacement Values		
Range	**# Of Culverts**	**Current Replacement Value**
Less than $250,000	2	$461,000
$250,000 to $300,000	4	$1,087,000
$300,000 to $350,000	6	$1,979,000
$350,000 to $400,000	3	$1,122,000
Greater than $400,000	4	$1,636,666
Total	**19**	**$6,285,666**
Average		**$330,825**

3.3. Condition

The most recent bridge inspection report conducted in 2020 calculated a Bridge Condition Index (BCI) value for each culvert greater than 3m within the municipality. The BCI values are grouped into the following categories: Excellent, Good, Fair, Poor, Very Poor and Failed. Details regarding the condition ratings and corresponding criteria can be found on Table 5.

Category:	Excellent	Good	Fair	Poor	Very Poor	Failed	Total
BCI Range	100 to 90	89 to 70	69 to 40	39 to 10	9 to 1	0	
# In Category	4	6	8	1	-	-	19
% Of Total	21	32	42	5	-	-	100%

The average BCI rating of the municipality's 19 culverts is 70.9 or an overall "Good" condition. The bridge inspection report is scheduled to be updated in 2022.

3.4. Levels of Service

The municipality has established levels of service (LOS) to evaluate each culvert's operating efficiency, capacity to meet demands, and environmental resiliency. The LOS criteria and ranking definitions are outlined in Table 6.

Average Distribution - Level of Service Ratings						
	Excellent	Good	Fair	Poor	Very Poor	Failed
Operational Functionality	-	19	-	-	-	-
Capacity to Meet Demands	-	19	-	-	-	-
Environmental Resiliency	-	18	-	1	-	-

Each culvert was evaluated and assigned a ranking based on municipal staff's first-hand knowledge and observation. Any bridge that did not have designs available, a performance-based assessment was conducted, and rating assigned. Overall, the municipality's culverts have an average rating of Good in operating efficiency, capacity to meet demands and environmental resiliency.

3.5. Lifecycle Activities

The culverts within the Municipality of Morris-Turnberry have an expected useful life of 80 years. The life cycle activities include a 30-year rehabilitation and a 60-year rehabilitation before complete

replacement at 80 years. The municipality uses the following methodology based on the span of the culvert when calculating the cost of a 30 year or 60-year rehabilitation. The structure span and anticipated rehabilitation cost ranges were provided by B.M. Ross. The span and cost ranges were used to develop a cost formula to estimate the 30 year and 60-year rehabilitation costs.

Culvert Span (m)	30 Year Rehabilitation Cost Range	60 Year Rehabilitation Cost Range
Less than 6m	$85,000 to $150,000	$50,000 to $85,000
6 m to 12 m	$125,000 to $350,000	$100,000 to $200,000

The municipality takes into consideration the recommendations of the bi-annual bridge inspection report, grant availability and geographic synergies when planning culvert rehabilitations and replacements. Using the lifecycle activities and formula for estimated costs, the anticipated lifecycle costs from 2023 to 2032 are as follows:

Anticipated Culvert Lifecycle Costs (2023 to 2032)										
Year:	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032
Estimated Cost ($):	$102.063	$ -	$ -	$121,400	$ -	$ -	$150,000	$2,531,833	$109,375	$ -

3.6. Risks related to lifecycle activities

Financial Risk

Failure to perform scheduled lifecycle activities or forecast future needs can expose the municipality to financial risk. If a culvert fails due to lack of maintenance and repair, the cost to replace it can be significant. An unbudgeted culvert replacement will have a significant impact on the municipal budget. Cost overruns and volatile market prices can also pose a financial risk to the municipality.

Environmental Risk

Climate change can pose an environmental risk to municipal culverts. Significant weather events have increased in frequency and severity due to climate change. These events can cause damage to a structure during a storm or slowly damage a structure over time. When repairing, rehabilitating, or replacing a culvert, the impact of climate change on the structure will be evaluated.

Economic Risk

Municipal assets with capacity restrictions could potentially deter economic growth within the municipality. Development cannot occur in an area serviced by a culvert that cannot accommodate the size or weight of motor vehicles. When repairing, rehabilitating, or replacing a culvert, the municipality will evaluate the economic growth potential of the area and evaluate if the culvert is an impediment to that growth.

Reputation Risk

Municipal culverts are used by motorists and the public daily. If lifecycle activities and general maintenance are postponed the structure can deteriorate. The daily use of a structure in disrepair can result in the public developing a negative impression of the municipality. A tarnished reputation can be exceedingly difficult to correct and can impact a municipality's ability to recruit qualified staff or attract economic growth to the area.

Health & Safety Risk

It is the municipality's goal to maintain culverts to allow for the safe passage of vehicles, cyclists, and pedestrians. If the municipal culverts are not maintained in a timely and appropriate manner, the public could be exposed to an unnecessary health and safety risk. When repairing, rehabilitating, or replacing a bridge, the municipality will consider the health and safety risks to the public. The municipality will also ensure appropriate health & safety measures are taken on the job site while culvert construction is occurring to protect staff and the public.

3.7. Economic & Population Growth Assumptions

Current population and economic growth within Morris-Turnberry is minimal. Recent development is small in scale and will have a minimal impact on the culvert's lifecycle activities. The municipality is currently serviced by culverts of appropriate size and capacity.

Much of the economic growth within the municipality is related to agricultural operations. The locations of this growth are in areas suited for this type of growth and already serviced by culverts capable of accommodating large agricultural machinery. Additional growth in these areas within the municipality will not have a significant impact on the culvert's lifecycle activities. Current lifecycle activities are scheduled to meet the current population and economic activity levels. When a culvert is identified for repair, rehabilitation or replacement, these assumptions will be reevaluated.

Table 4 - Culverts - Inventory Summary											
Culvert Number	Structure Name	Road Name	Span (m)	Width (m)	Year Built	Estimated Year Built	Age of Structure	2020 BCI Rating	2020 Bridge Value	Current Replacement Value	Load or Dimension Restrictions
M010		Clyde Line	4.70	12.20		1960	62	58	$ 290,700	$ 330,000	None
M020		McCall Line	7.00	12.20		1960	62	24	$ 433,500	$ 405,833	None
M030		Walton Road	5.10	19.00	1996		26	98	$ 329,800	$ 362,000	None
M050	Brown's Bridge	Martin Line	6.60	17.00	1989		33	75	$ 380,800	$ 400,000	None
M070		Moncrieff Road	7.00	9.30		1950	72	59	$ 442,000	$ 395,000	None
M080		Clyde Line	5.80	16.70		1950	72	55	$ 329,800	$ 350,000	None
M090		Elevator Line	2.70	18.00		1980	42	73	$ 166,600	$ 285,000	None
M100		St. Michaels Road	2.20	18.00	2007		15	73	$ 136,000	$ 260,000	None
M130		Nichol Line	3.50	14.00	1993		29	100	$ 249,900	$ 302,500	None
M150		Brandon Road	2.80	15.00		1950	72	64	$ 178,000	$ 241,000	None
M170		Clyde Line	6.80	18.20		1950	72	54	$ 421,600	$ 405,833	None
M180		Quarter Line	6.10	18.30		1960	62	75	$ 380,800	$ 425,000	None
M240		Clyde Line	5.30	18.70		1950	72	64	$ 336,600	$ 365,000	None
T020		Holmes Line	4.20	19.40		1960	62	63	$ 275,400	$ 335,000	None
T040		Gilmour Line	4.30	17.00	2001		21	100	$ 248,200	$ 325,000	None
T048		Salem Road	1.40	18.30		1980	42	75	$ 88,400	$ 220,000	None
T050		Salem Road	2.80	11.70		1950	72	62	$ 168,300	$ 270,000	None
T070		Powell Line	2.90	14.60		1960	62	75	$ 142,800	$ 272,000	None
T080		Centre Line Road	3.73	18.00	2016		6	100	$ 227,800	$ 336,500	None

Summary		Length (m)	Width (m)	Year Built	Approx. Age	BCI Rating	2020 Culvert Value	Replacement Value
19	Culverts							
	Average	4.47	16.08	1972	50	71	$ 275,105	$ 330,825
	Totals	84.93					$ 5,227,000	$ 6,285,666

Table 5 - Culverts - Condition Categories & Corresponding Criteria						
	Excellent	**Good**	**Fair**	**Poor**	**Very Poor**	**Failed**
BCI	**100 to 90**	**89 to 70**	**69 to 40**	**39 to 10**	**9 to 1**	**0**
	• Structure is in a **"Excellent"** condition overall • Insignificant defects/damage to a few critical load bearing elements • Capacity unaffected •No repairs are required in the foreseeable future	• Structure is in a **"Good"** condition overall • Minor defects/damage, but may also have some moderate defects to some critical load bearing elements • Capacity unlikely to be affected •Can be upgraded to new condition with little effort and cost •Significant maintenance or repair work is not usually required within the next 10 years	• Structure is in a **"Fair"** to **"Good"** condition overall • Minor-to-Moderate defects/damage to several critical load bearing elements • Capacity may be slightly affected • One or more functions of the structure may be significantly affected •Maintenance or repair work is required within 6 to 10 years	• Structure is in a **"Fair"** to **"Poor"** condition overall • Moderate-to-Severe defects/damage to many critical load bearing elements • Capacity may be significantly affected • One or more functions of the bridge may be severely affected •Maintenance or repair work is required within 1 to 5 years.	• Structure is in a **"Very Poor"** condition overall • Severe defects/damage on a number of critical load bearing elements • Failure and/or possible failure of one or more critical load bearing elements • Capacity may be severely affected • Structure may be unserviceable •Emergency work is required within 1 year and/or structure may need to be weight restricted or closed to traffic	• Structure has failed • Structure is unserviceable

Table 6 - Culverts - Levels of Service Definitions

	Level of Service Criteria	Excellent	GOOD	FAIR	POOR	VERY POOR
Operational Functionality	- Appropriate design for traffic volumes and speed limits	- Structure designed to accommodate higher traffic volumes and speed limits	- Design is appropriate for traffic volumes and speed limits	- Design is substandard to modern standards, but sufficient for current volumes and speed limits	- Design is substandard for current traffic volumes and speed limits	- Design is negatively impacting traffic volumes and speed of traffic
	- Sufficient platform to accommodate current traffic volumes and speeds (not related to capacity)	- Structure's platform can accommodate additional traffic volumes and speeds	- Structure's platform accommodates current traffic volumes and speeds	- Platform can accommodate small traffic in both directions, Large vehicles limited to single lane crossing, minimal to no impact on traffic flow	- Single lane crossing for large and small traffic, minimal to no impact on traffic flow	- Single lane crossing for large and small traffic, negatively impacting traffic flow
	- Adequate structural capacity to accommodate traffic volumes and loading	- Structure capacity can accommodate additional traffic volume and loading	- Structure capacity accommodates current traffic volume and loading	- Structure's ability to accommodate heavy vehicles is limited, but no to minimal impact to traffic flow	- Structure's ability to accommodate heavy vehicles is limited, negatively impacting traffic flow	- Structure ability to accommodate heavy and light vehicles is limited, negatively impacting traffic flow
	- Maintenance of culverts is fully compliant with the "Minimum Maintenance Standards for Municipal Highways" (O.Reg 388/18)	- Maintenance exceeds Minimum Maintenance Standards	- Maintenance is fully compliant with Minimum Maintenance Standards	- Maintenance is partially compliant with Minimum Maintenance Standards	- Maintenance is not compliant with Minimum Maintenance Standards	- No Maintenance is conducted on Structures
Capacity to Meet Demands	- Sufficient width and structural capacity to meet peak traffic volumes and loads for given speed limits.	- Structural Capacity exceeds current peak traffic volumes and loads for given speed limits	- Structural capacity meets current peak traffic volumes and loads for given speed limits	- Structural capacity just meets current peak traffic volumes and loads for given speed limits, minimal to no impact on traffic flow	- Structural capacity is below current peak traffic volumes and loads for given speed limits, noticeable impact on traffic flow	- Structural capacity is significantly below current peak traffic volumes and loads for given speed limits, negatively impacting traffic flow
Environmental Resiliency	- Sufficient span and elevation to accommodate a 100-year or regional storm event	- Span and Elevation exceed requirements to accommodate a 100-year or regional storm event	- Span and Elevation are sufficient to accommodate a 100-year or regional storm event	- Span and Elevation barely accommodate a 100-year or regional storm event	- Span and Elevation cannot accommodate a 100-year or regional storm event, minimal repercussions upon failure to accommodate	- Span and Elevation cannot accommodate a 100-year or regional storm event, major repercussions upon failure to accommodate
	- Adequate embankment and watercourse protection to protect the structure during high flows	- Embankment and watercourse protection provides excess protection during high flows	- Embankment and watercourse protection provides adequate protection during high flows	- Embankment and watercourse protection provides barely adequate protection during high flows	- Embankment and watercourse protection does not provide protection during high flows, minimal damage to area	- Embankment and watercourse protection does not provide protection during high flows, major damage to area

4. Roads – High Class Bituminous (HCB) Paving

4.1. Inventory Summary

The Municipality segments its HCB roads into individual assets that run from intersection to intersection. Each HCB road segment is assigned a unique road identification number. The entirety of the municipality's HCB road network would be classified as local roads. Details regarding the municipality's HCB road inventory can be found on Table 7.

HCB Road Summary:	Number of Road Segments	Total Kilometers (KMs)	Total Lane Kilometers (KMs)	Average Segment Age (Years)	Total Surface Area (km^2)
Local Roads	100	43.71	87.42	14	0.383

The HCB road network represent 15% of Morris-Turnberry's total road network. The HCB roads have a combined surface area of 0.383 KM^2 which represents 0.10% of the land area within the Municipality.

4.2. Current Replacement Values

The municipality separates the cost of replacing a road's surface from the cost of replacing a road's base when calculating an estimated replacement value. Using 2022 budget data and staff estimations the cost of surfacing materials, replacing an HCB road's surface would cost approximately $150,000/km. The cost of replacing a road's base is estimated to be $175,000/km.

HCB Estimated Replacement Cost	Number of Road Segments	Total Kilometers (KMs)	Estimated Replacement Cost - Surface -	Estimated Replacement Cost - Base -	Estimated Replacement Cost - Total -
Local Roads	100	43.71	$6,556,500	$7,649,250	$14,205,750

4.3. Condition

The Municipality's HCB roads are evaluated on a scale of 100 to 0 and grouped into the following categories. Details regarding the condition ratings and corresponding criteria can be found on Table 8.

	Excellent	Good	Fair	Poor	Very Poor	Failed
Rating:	100 to 90	89 to 70	69 to 40	39 to 10	9 to 1	0
# Of Segments	11	52	37	-	-	-
Length (KMs)	11.2	24.8	7.7	-	-	-

The average condition rating on an HCB road segment is 71.25 or Good.

4.4. Levels of Service

The municipality has established levels of service (LOS) to evaluate each HCB road segment's operating efficiency, capacity to meet demands, and environmental resiliency. The LOS criteria and ranking definitions are outlined in Table 9.

A summary of the municipality's 100 HBC road segments are as follows:

Average Distribution - Level of Service Ratings						
	Excellent	Good	Fair	Poor	Very Poor	Failed
Operational Functionality	-	98	2	-	-	-
Capacity to Meet Demands	1	99	-	-	-	-
Environmental Resiliency	-	93	6	1	-	-

Each segment was evaluated and assigned a ranking based on municipal staff's first-hand knowledge and observation. Any road segment that did not have designs available, a performance-based assessment was conducted, and rating assigned.

Overall, the municipality's HCB road network has an average rating of Good in operating efficiency, capacity to meet demands and environmental resiliency.

4.5. Lifecycle Activities

An HCB road segment has an estimated useful life of 25 years. When the road segment has reached the end of its useful life, the municipality will repave the road section. The municipality takes into consideration the condition of the pavement, grant availability and geographic synergies when planning HCB paving projects.

Using the 2022 estimated replacement cost of $150,000/KM and each segment's last paved date, the municipality can extrapolate the next time a segment will need to be resurfaced and the approximate cost. The municipality strives to implement the right treatment method in the right location at the right time.

Anticipated HCB Lifecycle Costs (2023 to 2032)										
Year:	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032
Estimated Cost ($):	$147,000	$309,900	$ -	$111,750	$ -	$ -	$950,100	$ -	$88,500	$ -

4.6. Risks Related to Lifecycle Activities

Financial Risk

Failure to perform scheduled lifecycle activities or forecast future needs can expose the municipality to financial risk. If an HCB road surface remains in poor condition, the underlying road base may become damaged. Then overall cost to repair the surface and base will be significantly more than just repaving the surface. Cost overruns and volatile market prices for materials can also pose a financial risk to the municipality.

Environmental Risk

Climate change can pose an environmental risk to the municipality's HCB roads. Significant weather events have increased in frequency and severity due to climate change. These events could cause immediate damage to a road or slowly damage them over time. When repaving a road segment, the impact of past weather events and potential future events will be evaluated.

Economic Risk

Municipal assets with capacity restrictions could potentially deter economic growth within the municipality. Development may be deterred if the road network is undersized or in disrepair. When repaving HCB roads, the municipality will evaluate the economic growth potential of the area and evaluate if the HCB road network is an impediment to that growth.

Reputation Risk

HCB roads are used by motorists and the public daily. If lifecycle activities and general maintenance are postponed the road can deteriorate. The daily use of an HCB road in poor condition can result in the public developing a negative impression of the municipality. A tarnished reputation can be exceedingly difficult to correct and can impact a municipality's ability to recruit qualified staff or attract economic growth to the area.

Health & Safety Risk

It is the municipality's goal to maintain the HCB network to allow for the safe passage of motorists. If the roads are not maintained in a timely and appropriate manner, the public could be exposed to an unnecessary health and safety risk. When repaving an HCB road, the municipality will also ensure appropriate health & safety measures are taken on the job site.

4.7. Economic & Population Growth Assumptions

Current population and economic growth within Morris-Turnberry is minimal. Any recent residential development is small in scale and will have minimal to no impact on the municipal HCB network. Much of the municipality's urban development is already serviced by HCB paving and major expansion of the network is not anticipated

Much of the economic growth within the municipality is related to agricultural operations in rural areas. Growth in these areas is not anticipated to impact the HCB road network located mostly in urban areas. Current lifecycle activities are scheduled to meet the current population and economic activity levels. If a significant development is proposed or when an HCB segment is repaved, these assumptions will be reevaluated.

Table 7 - HCB Paved Roads - Inventory Summary										
Road Segment ID	Road Name	Location		Date of Last Paving Project	Length (km)	# of Lanes	Lane-Kilometers	Platform Width (m)	Surface Area (km^2)	Condition Rating
		From:	To:							
9	Huron Bruce Rd	100 m west of Belmore Line	Belmore Line (Cty Rd 12)	2017	0.100	2	0.200	10	0.001000	90
11	Glenannon Rd	Belmore Rd	Lewis Line	2021	0.939	2	1.878	8.1	0.007606	100
12	Glenannon Rd	Lewis Line	2.3km West of Lewis Rd	2021	2.300	2	4.600	8.6	0.019780	100
31	B Line Rd	Harriston Rd	Gilmour Line	2018	2.038	2	4.076	7.7	0.015693	90
32	B Line Rd	Gilmour Line	McLean Line	2012	2.555	2	5.110	9	0.022995	70
33	B Line Rd	McLean Line	0.6km E of London Rd (Hwy 4)	2014	1.417	2	2.834	9	0.012753	70
33.1	B Line Rd	0.6km East of Hwy4	0.3km East of London Rd (Hwy 4)	2014	0.471	2	0.942	9.2	0.004333	70
33.2	B Line Rd	0.3km East of Hwy4	London Rd (Hwy4)	2014	0.286	2	0.572	9.7	0.002774	70
34	North St W	Hwy 4 (London Rd)	Pine St	2012	0.166	2	0.332	9.2	0.001527	70
35	North St W	Pine St	Arthur St	2012	0.412	2	0.824	9.2	0.003790	70
36	North St W	Arthur St	Alice St	2001	0.515	2	1.030	8.3	0.004275	50
41	Josephine St N	London Rd	London Rd	1994	0.951	2	1.902	9	0.008559	55
53	Black Line	B Line Rd	Harriston Rd (Hwy 87)	1999	0.649	2	1.298	9	0.005841	55
61	Fischer Line	Amberley Rd	Dead End	2001	0.230	2	0.460	5	0.001150	75
72	Jamestown Rd	Clegg Line	London Rd	2011	2.026	2	4.052	8.8	0.017829	75
107	Walton Rd	100m E of Ann St in Blyth	Elevator Line	1995	0.812	2	1.624	8	0.006496	70
124	Clyde Line	Blyth Rd	Walton Rd	2021	0.652	2	1.304	8.5	0.005542	100
125	Clyde Line	Walton Rd	Moncrieff Rd	2021	2.040	2	4.080	8.6	0.017544	100
136	Elevator Line	Blyth Rd	Walton Rd	1995	0.645	2	1.290	8.5	0.005483	70
154	Clyde Line	600 m S of Morris St.	Jamestown Rd	2004	1.519	2	3.038	9	0.013671	70
155	Clyde Line	Jamestown Rd	Browntown Rd	2004	2.042	2	4.084	9	0.018378	70
156	Clyde Line	Browntown Rd	Cardiff Rd	2019	2.045	2	4.090	9	0.018405	95
157	Clyde Line	Cardiff Rd	Brandon Rd	2013	2.033	2	4.066	9.8	0.019923	85
158	Clyde Line	Brandon Rd	Morris Rd	2012	2.030	2	4.060	9.8	0.019894	85
1002	Kate St	Turnberry St	Princess St	2004	0.120	2	0.240	7	0.000840	65
1003	Mary St	Princess St	Turnberry St	2015	0.125	2	0.250	7	0.000875	80
1004	Mary St	Turnberry St	Stacey St	2015	0.131	2	0.262	8	0.001048	80
1005	Mary St.	Stacey St	Royal Rd	2015	0.755	2	1.510	9	0.006795	80
1008	Arthur St	North St	Water St	2019	0.468	2	0.936	9.2	0.004306	95
1009	Arthur St	Water St	Royal Rd	1994	0.189	2	0.378	9.2	0.001739	75
1011	Adelaide St	Potter St	Dead End	2004	0.228	2	0.456	7.5	0.001710	80
1012	Laidlaw St	Potter St	Casemore	2004	0.162	2	0.324	7	0.001134	80
1013	Helena St	Royal Rd	Potter St	2010	0.445	2	0.890	8.9	0.003961	80
1014	Helena St	Potter St	Casemore	2010	0.178	2	0.356	8.9	0.001584	80
1015	Helena St	Casemore	MacIntosh St	2010	0.309	2	0.618	8.5	0.002627	80
1016	Helena St	MacIntosh St	Augusta St	1991	0.322	2	0.644	9.9	0.003188	70
1017	Helena St	Augusta St	Amberley Rd (Hwy 86)	1991	0.127	2	0.254	9.9	0.001257	70
1018	Royal Rd	Mary St	Alice St	2015	0.446	2	0.892	8	0.003568	85
1019	Royal Rd	Alice St	Helena St	2015	0.128	2	0.256	8.5	0.001088	85
1020	Royal Rd	Helena St	Arthur St	2015	0.384	2	0.768	8.5	0.003264	85
1021	Potter St	30m E of Helena (dead end)	Helena St	2010	0.142	2	0.284	8.9	0.001264	70
1022	Potter St	Helena St	Adelaide St	2004	0.231	2	0.462	7.5	0.001733	65
1023	Potter St	Adelaide St	Dean End	2004	0.037	2	0.074	7.5	0.000278	65

Table 7 - HCB Paved Roads - Inventory Summary										
Road Segment ID	Road Name	Location		Date of Last Paving Project	Length (km)	# of Lanes	Lane-Kilometers	Platform Width (m)	Surface Area (km^2)	Condition Rating
		From:	To:							
1024	Stacey St	Mary St	Dead End	2004	0.157	2	0.314	5.5	0.000864	50
1026	Turnberry St	West St	Kate St	2014	0.267	2	0.534	8	0.002136	85
1027	Turnberry St	Kate St	Mary St	2014	0.223	2	0.446	8	0.001784	85
1028	Turnberry St	Mary St	Helena St	2014	0.570	2	1.140	8	0.004560	85
1029	Princess St	Kate St	Mary St	2004	0.217	2	0.434	7	0.001519	60
1031	Victoria St	Helena St	To Bridge	1991	0.163	2	0.326	8	0.001304	60
1032	Augusta St	Amberley Rd	Helena St	2004	0.210	2	0.420	6.5	0.001365	60
1033	Augusta St	Helena St	100m West	2004	0.104	2	0.208	65	0.006760	60
1035	Maitland	Amberley Rd	Dead End	2004	0.501	2	1.002	5	0.002505	60
2000	Mckinnon Drive	Amberley Rd (Hwy 86)	Dead End	2004	0.198	2	0.396	8	0.001584	55
2001	Queen St.	Amberley Rd	Amberley Rd (Hwy 86)	2006	0.378	2	0.756	6	0.002268	55
2002	Queen St	Amberley Rd	George St	1999	0.072	2	0.144	10	0.000720	55
2003	Queen St	George St	Duncan St	1999	0.119	2	0.238	10	0.001190	55
2004	Queen St	Duncan St	Clyde St	1999	0.120	2	0.240	10	0.001200	55
2005	Orange St	Clyde St	William St	1998	0.103	2	0.206	9	0.000927	60
2006	Orange St	William St	Dead End	1998	0.119	2	0.238	8	0.000952	60
2007	William St	Orange St	Jacob St	1998	0.150	2	0.300	8	0.001200	60
2008	William St	Jacob St	Margaret St	1998	0.146	2	0.292	8	0.001168	60
2009	William St	Margaret St	Dead End	1998	0.107	2	0.214	8	0.000856	60
2010	Margaret St	William St	Victoria St	1998	0.116	2	0.232	7.5	0.000870	60
2011	Victoria St	Margaret St	Jacob St	1998	0.119	2	0.238	8	0.000952	60
2012	Jacob St	Victoria St	William St	1998	0.094	2	0.188	7.5	0.000705	60
2013	Jacob St	William St	Clyde St	1999	0.102	2	0.204	8	0.000816	60
2014	Clyde St	Amberley Rd	Amberley Rd	1999	0.080	2	0.160	9	0.000720	70
2015	Clyde St	80 m S of Amberley Rd	James St	1999	0.164	2	0.328	9	0.001476	45
2016	Clyde St	James St	Jacob St	1999	0.088	2	0.176	10	0.000880	45
2017	Clyde St	Jacob St	Queen St	1999	0.067	2	0.134	10	0.000670	45
2018	Clyde St	Queen St	Morris St	1999	0.253	2	0.506	10	0.002530	45
2019	Clyde St	Morris St	Country	1999	0.618	2	1.236	9	0.005562	45
2021	James St	Clyde St	Amberley Rd (Hwy 86)	2020	0.199	2	0.398	8	0.001592	95
2022	Duncan St	dead end	James St	2004	0.092	2	0.184	6	0.000552	60
2023	Duncan St	James St	Queen St	2020	0.155	2	0.310	8	0.001240	95
2024	Duncan St	Queen St	Bell St	2006	0.145	2	0.290	8	0.001160	65
2025	Bell St	Duncan St	George St	2006	0.133	2	0.266	9	0.001197	65
2026	George St	Bell St	Queen St	2006	0.140	2	0.280	9	0.001260	65
2027	Johnson Lane	Duncan St	Clyde St	2004	0.121	2	0.242	5	0.000605	60
2028	Morris St.	Clyde St	Morris-Turnberry Rd.	2020	0.305	2	0.610	8.5	0.002593	95
2029	Mckinnon Drive	McKinnon Dr	Dead End	2004	0.077	2	0.154	0	0.000000	60
3000	Parker Dr	Queen St	John St	2011	0.144	2	0.288	8	0.001152	75
3001	Parker Dr	John St	King St	2011	0.245	2	0.490	9	0.002205	75
3002	Parker Dr	King St	Corbett Dr	2011	0.134	2	0.268	9	0.001206	75
3003	Corbett Dr	Parker Dr	Crae St	2011	0.122	2	0.244	8.5	0.001037	75
3004	Mccrae St	Corbett Dr	King St	2011	0.127	2	0.254	8.5	0.001080	75

Table 7 - HCB Paved Roads - Inventory Summary										
Road Segment ID	Road Name	Location		Date of Last Paving Project	Length (km)	# of Lanes	Lane-Kilometers	Platform Width (m)	Surface Area (km^2)	Condition Rating
		From:	To:							
3005	Mccrae St	King St	Hamilton St	2011	0.116	2	0.232	8.5	0.000986	75
3006	Mccrae St	Hamilton St	John St	2011	0.123	2	0.246	8.5	0.001046	75
3007	King St	McCrae St	Parker Dr	2011	0.123	2	0.246	9	0.001107	75
3008	Hamilton St	McCrae St	Jane St	2011	0.223	2	0.446	8.5	0.001896	75
3009	Hamilton St	Jane St	Brandon St	2011	0.120	2	0.240	8.5	0.001020	75
3010	Jane St	Queen St	John St	2011	0.151	2	0.302	7	0.001057	75
3011	Jane St	John St	Hamilton St	2011	0.121	2	0.242	8.5	0.001029	75
3012	Jane St	Hamilton St	Dead End	2011	0.203	2	0.406	8.5	0.001726	75
3012.1	John St	Parker Dr	McCrea St	2011	0.126	2	0.252	8.5	0.001071	75
3013	John St	McCrae St	Jane St	2011	0.224	2	0.448	8.5	0.001904	75
3014	John St	Jane St	Brandon St	2011	0.120	2	0.240	8.5	0.001020	75
3015	Brandon St	Queen St (Hwy 4)	John St	2011	0.151	2	0.302	9.4	0.001419	75
3016	Brandon St	John St	Hamilton St	2011	0.122	2	0.244	10	0.001220	75
3017	Brandon St	Hamilton St	Brandon Rd	2011	0.223	2	0.446	10.2	0.002275	75

HCB Road Summary	Average Paving Date	Total Length (km)		Total Lane-Kilometers		Total Surface Area (km^2)	Average Condition
100 Road Segments	**2007**	**43.71**		**87.42**		**0.383**	**71.250**

Table 8 - HCB Roads - Condition Ratings & Corresponding Criteria						
	Excellent	**Good**	**Fair**	**Poor**	**Very Poor**	**Failed**
Condition Rating	**100 to 90**	**89 to 70**	**69 to 40**	**39 to 10**	**9 to 1**	**0**
Surface	In Like New Condition, no defects or repairs required	Minor defects observed with no impact to the function of the road	Multiple defects observed, with minor impact to function of the road. Resurfacing required to restore the road to a good condition.	Multiple defects observed, with major impact to function of the road. Resurfacing required to restore the road to a good condition.	Significate damage to the road Surface. Resurfacing required to restore the road to a good condition	Full reconstruction of the base and double lift repaving.
Base	Structurally Sound, No Repairs Required	Structurally Sound, No Repairs Required	Structurally Sound, No Repairs Required	Road Base Damaged, Minor Repairs Required	Road Base Damaged, Requires Repair	Road Base Damaged, Requires Replacement

Table 9 - HCB Paved Roads - Levels of Service Definitions

	Level of Service Criteria	Excellent	GOOD	FAIR	POOR	VERY POOR
Operational Functionality	- Appropriate speed limits	- Road can accommodate a higher speed limit	- Speed limit is appropriate for the road	- Minimal traffic must travel at speeds lower than the posted limit	- Majority of traffic must travel at speeds lower than the posted limit	- All traffic must travel as speeds lower than the posted speed limit
	- Suitable road surface material type for traffic volumes and speeds	- The road surface material exceeds requirements for the traffic volume and speeds	- The road surface material is appropriate for the traffic volume and speeds	- The road surface material is not appropriates, but successfully accommodates traffic volumes and speeds	- The road surface material is not appropriate for traffic volumes **OR** - The road surface material is not appropriate for traffic speed	- The road surface material is not appropriate for traffic volumes **AND** - The road surface material is not appropriate for traffic speed
	- Sufficient road platform (pavement surface and shoulder width) to accommodate current traffic volumes and speeds (not related to capacity)	- The road platform can accommodate additional traffic volume and speeds	- The road platform accommodates current traffic volumes and speeds	- The road platform accommodates the majority of current traffic volume and speeds, with minimal exceptions/problems	- The road platform has difficulty accommodating the majority of current traffic volume and speeds,	- The road platform is insufficient and inhibits current traffic volume and speeds
	- Adequate road structural capacity to accommodate traffic volumes and loading	- Road Structural capacity can accommodate additional traffic volumes and loading	- Road Structural capacity can accommodate current traffic volumes and loading	- Road Structural capacity can accommodate the majority of current traffic volumes and loading, with minimal exceptions/problems	- Road structural capacity has difficulty accommodating the majority of current traffic volumes and loading	- Road Structural capacity does not accommodate additional traffic volumes and loading
	- Adequate elevation and drainage to prevent seasonal and/or reoccurring flooding	- Road elevation and drainage exceeds seasonal and/or reoccurring flooding requirements	- Road elevation and drainage adequately meets seasonal and/or reoccurring flooding requirements	- Road elevation and drainage satisfactory meets seasonal and/or reoccurring flooding requirements, with minimal exceptions	- Road elevation and drainage does not prevent seasonal and/or reoccurring flooding during major events	- Road elevation and drainage does not prevent seasonal and/or reoccurring flooding
	- Roadway flooding during major storm events limited to criteria per MOE Stormwater Planning and Design Manual	- Roadway flooding during major storm events exceeds the criteria per MOE Stormwater Planning and Design manual	- Roadway flooding during major storm events is limited to criteria per MOE Stormwater Planning and Design manual	- Roadway flooding during major storm events meets the majority, but not all of the criteria per MOE Stormwater Planning and Design manual	- Roadway flooding during major storm events meets few of the criteria per MOE Stormwater Planning and Design manual	- Roadway flooding during major storm events fails to meet any of the criteria per MOE Stormwater Planning and Design manual
	- Adequate erosion control	- Road erosion control is adequate and exceeds requirements	- Road erosion control is adequate and meets requirements	- Road erosion control is satisfactory and meets minimal requirements	- Road erosion control is lacking and minimal repairs required to meet minimal requirements	- Road erosion control is lacking and damage has been done to the road
	- Adequate ditching	- Ditching is adequate and exceeds requirements	- Ditching is adequate and meets all requirements	- Ditching is satisfactory and meets minimal requirements	- Ditching is lacking or in need of repair, minimal impact on the operation of the road	- Ditching is non-effective, negatively impacting the operation of the road

Table 9 - HCB Paved Roads - Levels of Service Definitions

	Level of Service Criteria	Excellent	GOOD	FAIR	POOR	VERY POOR
	- Appropriate geometric designs and sightlines for posted speeds (vertical and horizontal alignments)	- Geometric Designs are appropriate, designs exceed current standards	- Geometric Designs are appropriate, designs meet current standards	- Geometric Designs are appropriate, designs do not meet current standards, roadway was not built to an engineered design, but no concerns with geometric design.	- Geometric designs are inappropriate, designs do not meet current standards, design has minimal impact on the function of the road	- Geometric designs are inappropriate, designs do not meet current standards, design negatively impacting function of the road
	- Adequate quantity of roadside safety devices/protection	- Roadside safety devices/protection exceeds requirements	- Adequate quantity of roadside safety devices/protection	- Adequate quantity of roadside safety devices/protection, requiring minimal repairs or maintenance	- Inadequate quantity of roadside safety devices/protection OR - Adequate quantity of roadside safety devices/protection, in disrepair	- Inadequate quantity of roadside safety devices/protection in disrepair
	- Maintenance of the road network is fully compliant with the "Minimum Maintenance Standards for Municipal Highways" (O.Reg 388/18)	- Maintenance exceeds Minimum Maintenance Standards	- Maintenance is fully compliant with Minimum Maintenance Standards	- Maintenance is partially compliant with Minimum Maintenance Standards	- Maintenance is not compliant with Minimum Maintenance Standards	- No Maintenance is conducted on Structures
Capacity to Meet Demands	- Sufficient number of lanes along each road segment to accommodate peak traffic volumes	- Lanes are sufficient to accommodate additional traffic beyond peak traffic volumes	- Lanes are sufficient to accommodate peak traffic volumes	- Lanes are sufficient to accommodate peak traffic volumes, with minimal interruption to traffic flow	- Lanes accommodate off-peak traffic volumes, with regular interruption to traffic flow during peak traffic flows	- Lanes are insufficient to accommodate off-peak traffic flow, with significant interruption to traffic flow during peak traffic volumes
Environmental Resiliency	- Adequate embankment protection/retention	Embankment protection / retention is more than adequate	- Embankment protection/retention is adequate	- Embankment protection/retention is below standard, but no negative effects on the road	- Embankment protection/retention is below standard, with negative effects emerging	- No embankment protection/retention is present
	- Roads surfaces are protected against a 5-year return storm (per reporting requirements of O.Reg 588/17).	- N/A	- Road surface protected against 5-year storm	- Road surface is protected against 5-year storm, except for during seasonal (spring) flooding	- Road surface is not protected against 5-year return storm	- N/A

5. Roads – Low Class Bituminous (LCB) Surface Treatment

5.1. Inventory Summary

The Municipality segments its LCB roads into individual assets that run from intersection to intersection. Each LCB road segment is assigned a unique road identification number. The entirety of the municipality's LCB road network would be classified as a local road. Details regarding the municipality's LCB road inventory can be found on Table 10.

LCB Road Summary:	Number of Road Segments	Total Kilometers (KMs)	Total Lane Kilometers (KMs)	Average Segment Age (Years)	Total Surface Area (km^2)
Local Roads	22	41.17	82.34	3	0.359

The LCB road network represent 14% of Morris-Turnberry's total road network. The LCB roads have a combined surface area of 0.359 KM^2 which represents 0.10% of the land area within the Municipality.

5.2. Current Replacement Values

The municipality separates the cost of replacing a road's surface from the cost of replacing a road's base when calculating an estimated replacement value. When an LCB road is paved, a double lift is applied in year one and a single layer is applied the following year. Using 2022 budget data and staff estimations of the cost of emulsion and aggregate, the estimated cost of replacing an LCB road's surface is approximately $75,000/km. The cost of replacing a road's base is estimated to be $175,000/km.

LCB Estimated Replacement Cost	Number of Road Segments	Total Kilometers (KMs)	Estimated Replacement Cost - Surface -	Estimated Replacement Cost - Base -	Estimated Replacement Cost - Total -
Local Roads	22	41.17	$3,087,750	$7,204,750	$10,292,500

5.3. Condition

The Municipality's LCB roads are evaluated on a scale of 100 to 0 and grouped into the following categories. Details regarding the condition ratings and corresponding criteria can be found on Table 11.

	Excellent	Good	Fair	Poor	Very Poor	Failed
Rating:	100 to 90	89 to 70	69 to 40	39 to 10	9 to 1	0
# Of Segments	-	11	11	-	-	-
Length (KMs)	-	21.1	20.0	-	-	-

The average condition rating on an LCB road segment is 69.09 or Fair.

5.4. Levels of Service

The municipality has established levels of service (LOS) to evaluate each LCB road segment's operating efficiency, capacity to meet demands, and environmental resiliency. The LOS criteria and ranking definitions are outlined in Table 12.

A summary of the municipality's 22 LBC road segments are as follows:

Average Distribution - Level of Service Ratings						
	Excellent	Good	Fair	Poor	Very Poor	Failed
Operational Functionality	-	22	-	-	-	-
Capacity to Meet Demands	-	22	-	-	-	-
Environmental Resiliency	-	22	-		-	-

Each segment was evaluated and assigned a ranking based on municipal staff's first-hand knowledge and observation. Any road segment that did not have designs available, a performance-based assessment was conducted, and rating assigned.

Overall, the municipality's LCB road network has an average rating of Good in operating efficiency, capacity to meet demands and environmental resiliency.

5.5. Lifecycle Activities

An LCB road segment has an estimated useful life of 7 years. When the road segment has reached the end of its useful life, the municipality will repave the road section. The municipality takes into consideration the condition of the pavement, grant availability and geographic synergies when planning LCB paving projects.

Using an estimated replacement cost of $25,000/KM for the top layer of paving and each road segment's last paved date, the municipality can extrapolate the next time a segment will need to be resurfaced and the estimated cost.

Anticipated LCB Lifecycle Costs (2023 to 2032)										
Year:	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032
Estimated Cost ($):	$153,750	$156,775	$190,500	$ -	$222,300	$305,950	$ -	$153,750	$156,775	$190,500

5.6. Risks Related to Lifecycle Activities

Financial Risk

Failure to perform scheduled lifecycle activities or forecast future needs can expose the municipality to financial risk. If an LCB road surface remains in poor condition, the underlying paving and road base may become damaged. The overall cost to repair additional layers of paving or damage to the base will be significantly more than just replacing the top layer. Cost overruns and volatile market prices for materials can also pose a financial risk to the municipality.

Environmental Risk

Climate change can pose an environmental risk to the municipality's LCB roads. Significant weather events have increased in frequency and severity due to climate change. These events could cause immediate damage to a road or slowly damage them over time. When repaving a road segment, the impact of past weather events and potential future events will be evaluated.

Economic Risk

Municipal assets with capacity restrictions could potentially deter economic growth within the municipality. Development may be deterred if the road network is undersized or in disrepair. When repaving LCB roads, the municipality will evaluate the economic growth potential of the area and evaluate if the LCB road network is an impediment to that growth.

Reputation Risk

LCB roads are used by motorists and the public daily. If lifecycle activities and general maintenance are postponed the road can deteriorate. The daily use of an LCB road in poor condition can result in the public developing a negative impression of the municipality. A tarnished reputation can be exceedingly difficult to correct and can impact a municipality's ability to recruit qualified staff or attract economic growth to the area.

Health & Safety Risk

It is the municipality's goal to maintain the LCB network to allow for the safe passage of motorists. If the roads are not maintained in a timely and appropriate manner, the public could be exposed to an unnecessary health and safety risk. When repaving an LCB road, the municipality will also ensure appropriate health & safety measures are taken on the job site.

5.7. Economic & Population Growth Assumptions

Current population and economic growth within Morris-Turnberry is minimal. Any recent residential development is small in nature and will have minimal to no impact on the municipal LCB network. The LCB road network services the rural areas of the municipality and major expansion of the network is not anticipated

Much of the economic growth within the municipality is related to agricultural operations in rural areas. Growth in these areas is not anticipated to impact the LCB road network at this time. Current lifecycle activities are scheduled to meet the current population and economic activity levels. If a significant development is brought forward to the municipality or when an LCB road segment is repaved, these assumptions will be reevaluated.

Table 10 - LCB Paved Roads - Inventory Summary										
Road Segment ID	Road Name	Location		Date of Last Paving Project	Length (km)	# of Lanes	Lane-Kilometers	Platform Width (m)	Surface Area (km^2)	Condition Rating
		From:	To:							
2	Turnberry-Culross	Kings Rd	Holmes Line	2020	1.000	2	2.000	8.5	0.008500	75
3	Turnberry-Culross	Holmes Line	Versteeg Line	2017	2.053	2	4.106	7.5	0.015398	60
4	Turnberry-Culross	Versteeg Line	London Rd (Hwy 4)	2017	0.384	2	0.768	7.5	0.002880	60
5	Huron Bruce Rd	London Rd (Hwy 4)	Gilmour Line	2021	0.223	2	0.446	9.0	0.002007	80
6	Huron Bruce Rd	Gilmour Line	Jeffray Line	2021	2.049	2	4.098	9.0	0.018441	80
7	Huron Bruce Rd	Jeffray Line	Schiestel Line	2021	2.032	2	4.064	9.0	0.018288	80
8	Huron Bruce Rd	Schiestel Line	100m west of Belmore Line	2021	2.893	2	5.786	9.0	0.026037	80
13	Glenannon Rd	2.3 km west of Lewis Line	Jeffray Line	2017	1.789	2	3.578	8.6	0.015385	60
14	Glenannon Rd	Jeffray Line	Gilmour Line	2016	2.049	2	4.098	8.5	0.017417	55
15	Glenannon Rd	Gilmour Line	London Rd (Hwy 4)	2016	2.048	2	4.096	8.6	0.017613	55
19	Salem Rd	B Line Rd	Gilmour Line	2020	1.761	2	3.522	9.0	0.015849	75
20	Salem Rd	Gilmour Line	Powell Line	2020	2.072	2	4.144	9.6	0.019891	75
21	Salem Rd	Powell Line	Kieffer Line	2021	2.054	2	4.108	8.5	0.017459	80
22	Salem Rd	Kieffer Line	Belmore Line (Cty Rd 12)	2021	2.987	2	5.974	9.0	0.026883	80
39	Holmes Line	Turnberry-Culross Rd	Glenannon Rd	2020	2.036	2	4.072	9.0	0.018324	75
40	Holmes Line	Glenannon Rd	North St. West	2020	2.023	2	4.046	9.0	0.018207	75
84	Brandon Rd	.5 km E of London Rd	Clegg Line	2018	1.502	2	3.004	9.0	0.013518	65
85	Brandon Rd	Clegg Line	Martin Line	2018	2.040	2	4.080	9.0	0.018360	65
86	Brandon Rd	Martin Line	Clyde Line	2018	2.040	2	4.080	9.0	0.018360	65
126	Clyde Line	Moncrieff Rd	St. Michaels Rd	2017	2.045	2	4.090	8.5	0.017383	60
127	Clyde Line	St. Michaels Rd	Cranbrook Rd	2018	2.038	2	4.076	8.5	0.017323	65
128	Clyde Line	Cranbrook Rd	Morris Rd	2016	2.053	2	4.106	7.5	0.015398	55

LCB Road Summary	Average Paving Date	Total Length (km)		Total Lane-Kilometers		Total Surface Area (km^2)	Average Condition
22 Road Segments	**2019**	**41.17**		**82.34**		**0.359**	**69.09**

Table 11 - LCB Roads - Condition Ratings & Corresponding Criteria						
	Excellent	**Good**	**Fair**	**Poor**	**Very Poor**	**Failed**
Condition Rating	**100 to 90**	**89 to 70**	**69 to 40**	**39 to 10**	**9 to 1**	**0**
Surface	In Like New Condition, no defects or repairs required	Minor defects observed with no impact to the function of the road	Multiple defects observed, with minor impact to function of the road. Resurfacing required to restore the road to a good condition.	Multiple defects observed, with major impact to function of the road. Resurfacing required to restore the road to a good condition.	Significate damage to the road Surface. Resurfacing required to restore the road to a good condition	Full reconstruction of the base and double lift repaving.
Base	Structurally Sound, No Repairs Required	Structurally Sound, No Repairs Required	Structurally Sound, No Repairs Required	Road Base Damaged, Minor Repairs Required	Road Base Damaged, Requires Repair	Road Base Damaged, Requires Replacement

Table 12 - LCB Paved Roads - Levels of Service Definitions

	Level of Service Criteria	Excellent	GOOD	FAIR	POOR	VERY POOR
Operational Functionality	- Appropriate speed limits	- Road can accommodate a higher speed limit	- Speed limit is appropriate for the road	- Minimal traffic must travel at speeds lower than the posted limit	- Majority of traffic must travel at speeds lower than the posted limit	- All traffic must travel as speeds lower than the posted speed limit
	- Suitable road surface material type for traffic volumes and speeds	- The road surface material is exceeds requirements for the traffic volume and speeds	- The road surface material is appropriate for the traffic volume and speeds	- The road surface material is not appropriates, but successfully accommodates traffic volumes and speeds	- The road surface material is not appropriate for traffic volumes **OR** - The road surface material is not appropriate for traffic speed	- The road surface material is not appropriate for traffic volumes **AND** - The road surface material is not appropriate for traffic speed
	- Sufficient road platform (pavement surface and shoulder width) to accommodate current traffic volumes and speeds (not related to capacity)	- The road platform can accommodate additional traffic volume and speeds	- The road platform accommodates current traffic volumes and speeds	- The road platform accommodates the majority of current traffic volume and speeds, with minimal exceptions/problems	- The road platform has difficulty accommodating the majority of current traffic volume and speeds,	- The road platform is insufficient and inhibits current traffic volume and speeds
	- Adequate road structural capacity to accommodate traffic volumes and loading	- Road Structural capacity can accommodate additional traffic volumes and loading	- Road Structural capacity can accommodate current traffic volumes and loading	- Road Structural capacity can accommodate the majority of current traffic volumes and loading, with minimal exceptions/problems	- Road structural capacity has difficulty accommodating the majority of current traffic volumes and loading	- Road Structural capacity does not accommodate additional traffic volumes and loading
	- Adequate elevation and drainage to prevent seasonal and/or reoccurring flooding	- Road elevation and drainage exceeds seasonal and/or reoccurring flooding requirements	- Road elevation and drainage adequately meets seasonal and/or reoccurring flooding requirements	- Road elevation and drainage satisfactory meets seasonal and/or reoccurring flooding requirements, with minimal exceptions	- Road elevation and drainage does not prevent seasonal and/or reoccurring flooding during major events	- Road elevation and drainage does not prevent seasonal and/or reoccurring flooding
	- Roadway flooding during major storm events limited to criteria per MOE Stormwater Planning and Design Manual	- Roadway flooding during major storm events exceeds the criteria per MOE Stormwater Planning and Design manual	- Roadway flooding during major storm events is limited to criteria per MOE Stormwater Planning and Design manual	- Roadway flooding during major storm events meets the majority, but not all of the criteria per MOE Stormwater Planning and Design manual	- Roadway flooding during major storm events meets few of the criteria per MOE Stormwater Planning and Design manual	- Roadway flooding during major storm events fails to meet any of the criteria per MOE Stormwater Planning and Design manual
	- Adequate erosion control	- Road erosion control is adequate and exceeds requirements	- Road erosion control is adequate and meets requirements	- Road erosion control is satisfactory and meets minimal requirements	- Road erosion control is lacking and minimal repairs required to meet minimal requirements	- Road erosion control is lacking and damage has been done to the road
	- Adequate ditching	- Ditching is adequate and exceeds requirements	- Ditching is adequate and meets all requirements	- Ditching is satisfactory and meets minimal requirements	- Ditching is lacking or in need of repair, minimal impact on the operation of the road	- Ditching is non-effective, negatively impacting the operation of the road
	- Appropriate geometric designs and sightlines for posted speeds (vertical and horizontal alignments)	- Geometric Designs are appropriate, designs exceed current standards	- Geometric Designs are appropriate, designs meet current standards	- Geometric Designs are appropriate, designs do not meet current standards, roadway was not built to an engineered design, but no concerns with geometric design	- Geometric designs are inappropriate, designs do not meet current standards, design has minimal impact on the function of the road	- Geometric designs are inappropriate, designs do not meet current standards, design negatively impacting function of the road

Table 12 - LCB Paved Roads - Levels of Service Definitions

	Level of Service Criteria	Excellent	GOOD	FAIR	POOR	VERY POOR
	- Adequate quantity of roadside safety devices/protection	- Roadside safety devices/protection exceeds requirements	- Adequate quantity of roadside safety devices/protection	- Adequate quantity of roadside safety devices/protection, requiring minimal repairs or maintenance	- Inadequate quantity of roadside safety devices/protection OR - Adequate quantity of roadside safety devices/protection, in disrepair	- Inadequate quantity of roadside safety devices/protection in disrepair
	- Maintenance of the road network is fully compliant with the "Minimum Maintenance Standards for Municipal Highways" (O.Reg 388/18)	- Maintenance exceeds Minimum Maintenance Standards	- Maintenance is fully compliant with Minimum Maintenance Standards	- Maintenance is partially compliant with Minimum Maintenance Standards	- Maintenance is not compliant with Minimum Maintenance Standards	- No Maintenance is conducted on Structures
Capacity to Meet Demands	- Sufficient number of lanes along each road segment to accommodate peak traffic volumes	- Lanes are sufficient to accommodate additional traffic beyond peak traffic volumes	- Lanes are sufficient to accommodate peak traffic volumes	- Lanes are sufficient to accommodate peak traffic volumes, with minimal interruption to traffic flow	- Lanes accommodate off-peak traffic volumes, with regular interruption to traffic flow during peak traffic flows	- Lanes are insufficient to accommodate off-peak traffic flow, with significant interruption to traffic flow during peak traffic volumes
Environmental Resiliency	- Adequate embankment protection/retention	Embankment protection / retention is more than adequate	- Embankment protection/retention is adequate	- Embankment protection/retention is below standard, but no negative effects on the road	- Embankment protection/retention is below standard, with negative effects emerging	- No embankment protection/retention is present
	- Roads surfaces are protected against a 5-year return storm (per reporting requirements of O.Reg 588/17).	- N/A	- Road surface protected against 5-year storm	- Road surface is protected against 5-year storm, except for during seasonal (spring) flooding	- Road surface is not protected against 5-year return storm	- N/A

6. Roads – Gravel Roads

6.1. Inventory Summary

The Municipality segments its gravel roads into individual assets that run from intersection to intersection. Each gravel road segment is assigned a unique road identification number. The entirety of the municipality's gravel road network would be classified as a local road. Details regarding the municipality's gravel road inventory can be found on Table 13.

Gravel Road Summary:	Number of Road Segments	Total Kilometers (KMs)	Total Lane Kilometers (KMs)	Average Segment Age (Years)	Total Surface Area (km^2)
Local Roads	124	210.60	421.2	N/A	1.52

The gravel road network represents 71% of Morris-Turnberry's total road network. The gravel roads have a combined surface area of 1.52 KM^2 which represents 0.40% of the land area within the Municipality. Gravel roads have evolved through the years. Due to the continuously renewal nature of a gravel road many segments are estimated to be well over 100 years old.

6.2. Current Replacement Values

The municipality separates the cost of replacing a road's surface from the cost of replacing a road's base when calculating an estimated replacement value. When a new gravel road is constructed, a nominal amount of granular M gravel is placed as the initial driving surface. Using 2022 budget data and staff estimations of the cost of gravel, the cost of replacing a gravel road's surface is approximately $5,000/km. The cost of replacing a road's base is estimated to be $175,000/km.

Gravel Road Estimated Replacement Cost	Number of Road Segments	Total Kilometers (KMs)	Estimated Replacement Cost - Surface -	Estimated Replacement Cost - Base -	Estimated Replacement Cost - Total -
Local Roads	124	210.60	$1,053,000	$36,855,000	$37,908,000

6.3. Condition

The Municipality's gravel roads are evaluated on a scale from excellent to failed. The Details regarding the condition ratings and corresponding criteria can be found on Table 14.

	Excellent	Good	Fair	Poor	Very Poor	Failed
# Of Segments	-	119	5	-	-	-
Length (KMs)	-	203.3	7.3	-	-	-

The average condition of a gravel road segment is Good.

6.4. Levels of Service

The municipality has established levels of service (LOS) to evaluate each gravel road segment's operating efficiency, capacity to meet demands, and environmental resiliency. The LOS criteria and ranking definitions are outlined in Table 15.

A summary of the municipality's 127 gravel road segments are as follows:

Average Distribution - Level of Service Ratings						
	Excellent	Good	Fair	Poor	Very Poor	Failed
Operational Functionality	-	108	19	-	-	-
Capacity to Meet Demands	-	118	9	-	-	-
Environmental Resiliency	-	122	5	-	-	-

Each segment was evaluated and assigned a ranking based on municipal staff's first-hand knowledge and observation. Any road segment that did not have designs available, a performance-based assessment was conducted, and rating assigned.

Overall, the municipality's gravel road network has an average rating of Good in operating efficiency, capacity to meet demands and environmental resiliency.

6.5. Lifecycle Activities

A gravel road segments do not require replacement but are maintained annually. The annual activities conducted by the municipality to maintain an overall "Good" condition are road grading and the application of dust control. New gravel is applied to gravel road segments every two years. One half of the municipality's roads are treated each year, resulting in an alternating two-year cycle of new gravel application. When planning annual lifecycle activities, the municipality takes into consideration staff & financial resources available, geographic synergies and the impact of weather events. These costs are funded through the road department's maintenance budget.

Using the 2022 budgeted values as a benchmark and grossing them up by 2.5% per year, the estimated lifecycle costs for the 2023 to 2032 period are:

Anticipated Gravel Road Lifecycle Costs (2023 to 2032)											
Year:	**2022 (Budget)**	**2023**	**2024**	**2025**	**2026**	**2027**	**2028**	**2029**	**2030**	**2031**	**2032**
New Gravel	$450,000	$461,250	$472,781	$484,601	$496,716	$509,134	$521,862	$534,909	$548,281	$561,988	$576,038
Road Grading	$100,000	$102,500	105,063	$107,689	$110,381	$113,141	$115,969	$118,869	$121,840	$124,886	$128,008
Dust Control	$170,000	$174,250	$178,606	$183,071	$187,648	$192,339	$197,148	$202,077	$207,128	$212,307	$217,614
Total	**$720,000**	**$738,000**	**$756,450**	**$775,361**	**$794,745**	**$814,614**	**$834,979**	**$855,854**	**$877,250**	**$899,181**	**$921,661**

6.6. Risks related to lifecycle activities

Financial Risk
Failure to perform scheduled lifecycle activities can expose the municipality to financial risk. If a gravel road is not maintained, the road base may become damaged. The overall cost to repair the road base will be significantly more than just maintaining the road's gravel surface. Cost overruns and volatile market prices for materials can also pose a financial risk to the municipality.

Environmental Risk
Climate change can pose an environmental risk to the municipality's gravel roads. Significant weather events have increased in frequency and severity due to climate change. These events could cause immediate damage to a road or slowly damage them over time. Gravel roads are more susceptible to washouts when compared to paved roads. When maintaining a gravel road segment, the impact of past weather events and potential future events will be evaluated.

Economic Risk
Municipal assets with capacity restrictions could potentially deter economic growth within the municipality. Development may be deterred if the road network is undersized or in disrepair. When development is proposed in a rural area serviced by gravel roads, the municipality will evaluate if the gravel roads are an impediment to that growth. If the gravel roads are impacting growth in an area, that road may be a candidate for LCB or HCB paving.

Reputation Risk
Gravel roads are used by motorists and the public daily. If lifecycle activities and general maintenance are postponed the road can deteriorate. The daily use of a gravel road in poor condition can result in the public developing a negative impression of the municipality. A tarnished reputation can be difficult to correct and can impact a municipality's ability to recruit qualified staff or attract economic growth to the area.

Health & Safety Risk
It is the municipality's goal to maintain the gravel road network to allow for the safe passage of motor vehicles. If the roads are not maintained in a timely and appropriate manner, the public could be exposed to an unnecessary health and safety risk. The dust generated by traveling on a gravel road is a unique health and safety hazard. This dust can impact the safe travel of vehicles and negatively impact properties alongside the road. When performing annual maintenance of a gravel road, the municipality will also ensure appropriate health & safety measures are taken on the job site.

6.7. Economic & Population Growth Assumptions

Current population and economic growth within Morris-Turnberry is minimal. Any recent residential development is small in nature and will have minimal to no impact on the municipal gravel road network. The gravel road network services the rural areas of the municipality and major expansion of the network is not anticipated.

Much of the economic growth within the municipality is related to agricultural operations in rural areas. Growth in these areas is not anticipated to impact the gravel road network at this time. Current lifecycle activities are scheduled to meet the current population and economic activity levels. If a significant development is brought forward to the municipality these assumptions will be reevaluated.

Table 13 - Gravel Roads - Inventory Summary									
Road Segment ID	Road Name	Location		Length (km)	# of Lanes	Lane-Kilometers	Platform Width (m)	Surface Area (km^2)	Condition Rating
		From:	To:						
1	Turnberry-Kinloss	S Kinloss Ave.	Turnberry Culross	0.395	2	0.790	4.5	0.001778	Fair
1.1	Turnberry-Culross	Turnberry-Kinloss Rd	Kings Rd	0.976	2	1.952	4.5	0.004392	Fair
2	Turnberry-Culross	Kings Rd	Holmes Line	0.844	2	1.688	8.5	0.007174	Good
4.1	Versteeg Line	Turnberry-Culross Rd	London Rd	0.383	2	0.766	8.7	0.003332	Good
10	Renwick Rd	Belmore Rd	Dean End	0.065	2	0.130	7.5	0.000488	Good
16	Glenannon Rd	Hwy 4 (London Rd)	Holmes Line	2.047	2	4.094	7.0	0.014329	Good
17	Glenannon Rd	Holmes Line	North St	2.199	2	4.398	7.5	0.016493	Good
18	Gibbons Line	North St	Amberley Rd.	2.067	2	4.134	5.0	0.010335	Fair
23	Orange Hill Rd	Belmore Line Cty Rd 12	Kieffer Line	2.987	2	5.974	8.5	0.025390	Good
24	Orange Hill Rd	Kieffer Line	Powell Line	2.060	2	4.120	8.5	0.017510	Good
24.1	Orange Hill Rd	Powell Line	B Line Rd	1.600	2	3.200	8.5	0.013600	Good
25	McDonald Line	Amberley Rd	C Line Rd	2.035	2	4.070	7.5	0.015263	Good
26	McDonald Line	C Line Rd	Brussels Line	2.197	2	4.394	7.5	0.016478	Good
27	Gough Rd	Brussels Line	McDonald Line	0.244	2	0.488	6.5	0.001586	Good
28	C Line Rd	McDonald Line	Brussels Line	2.028	2	4.056	4.0	0.008112	Fair
29	C Line Rd	Brussels Line	Kieffer Line	1.930	2	3.860	7.0	0.013510	Good
30	C Line Rd	Kieffer Line	Harriston Rd (Hwy87)	1.897	2	3.794	7.0	0.013279	Good
37	North St W	Alice St	West St	0.936	2	1.872	8.3	0.007769	Good
38	North St W	West St	Gibbons Line	1.309	2	2.618	6.8	0.008901	Good
42	Bok Line	London Rd	Howick-Turnberry Rd	0.605	2	1.210	6.5	0.003933	Good
43	Bok Line	Howick-Turnberry Rd	B Line Rd	1.785	2	3.570	5.0	0.008925	Fair
44	Gilmour Line	B Line Rd	Salem Rd	1.602	2	3.204	7.0	0.011214	Good
45	Gilmour Line	Salem Rd	Howick-Turnberry Rd	2.044	2	4.088	8.0	0.016352	Good
46	Gilmour Line	Howick-Turnberry Rd	Glenannon Rd	2.078	2	4.156	7.0	0.014546	Good
47	Gilmour Line	Glenannon Rd	Huron-Bruce Rd	2.043	2	4.086	8.0	0.016344	Good
48	Jeffray Line	Huron Bruce Rd	Glenannon Rd	2.043	2	4.086	7.0	0.014301	Good
49	Jeffray Line	Glenannon Rd	Howick-Turnberry Rd	2.167	2	4.334	6.0	0.013002	Good
50	Powell Line	Howick-Turnberry Rd	Salem Rd	2.045	2	4.090	6.5	0.013293	Good
51	Powell Line	Salem Rd	Orange Hill Rd	2.047	2	4.094	7.0	0.014329	Good
52	Black Line	Orange Hill Rd	B Line Rd	0.584	2	1.168	7.5	0.004380	Good
54	Kieffer Line	C Line Rd	Harriston Rd (Hwy87)	1.278	2	2.556	5.5	0.007029	Good
55	Kieffer Line	Harriston Rd (Hwy 87)	Orange Hill Rd	2.051	2	4.102	7.0	0.014357	Good
56	Kieffer Line	Orange Hill Rd	Salem Rd	2.049	2	4.098	7.0	0.014343	Good
57	Kieffer Line	Salem Rd	Howick-Turnberry Rd	2.050	2	4.100	7.0	0.014350	Good
58	Lewis Line	Glennanon Rd	Dean End	0.585	2	1.170	5.0	0.002925	Good
59	Schiestel Line	Huron Bruce Rd	Dean End	0.524	2	1.048	4.5	0.002358	Good
62	Mclean Line	Amberley Rd (Hwy 86)	B Line Rd	2.071	2	4.142	7.5	0.015533	Good
63	Maple Rd	Amberley Rd	Amberley Rd.	0.425	2	0.850	5.0	0.002125	Good
64	Former Mto Park	Amberley Rd	Dean End	0.312	2	0.624	8.0	0.002496	Good

Table 13 - Gravel Roads - Inventory Summary									
Road Segment ID	Road Name	Location		Length (km)	# of Lanes	Lane-Kilometers	Platform Width (m)	Surface Area (km^2)	Condition Rating
		From:	To:						
65	Morris-Turnberry Rd	Morris St	Wheeler Line	1.851	2	3.702	8.5	0.015734	Good
66	Morris-Turnberry Rd	Wheeler Line	Ramsay Line	2.063	2	4.126	8.5	0.017536	Good
67	Jamestown Rd	Brussels Line	Ramsay Line	2.040	2	4.080	8.5	0.017340	Good
68	Jamestown Rd	Ramsay Line	Wheeler Line	2.039	2	4.078	8.5	0.017332	Good
69	Jamestown Rd	Wheeler Line	Clyde Line	2.040	2	4.080	9.0	0.018360	Good
70	Jamestown Rd	Clyde Line	Abraham Line	2.197	2	4.394	9.0	0.019773	Good
71	Jamestown Rd	Abraham Line	Clegg Line	2.121	2	4.242	9.0	0.019089	Good
73	Stone School Rd	London Rd	Clegg Line	2.024	2	4.048	8.0	0.016192	Good
74	Brownstown Rd	Clegg Line	Clyde Line	4.126	2	8.252	8.0	0.033008	Good
75	Brownstown Rd	Clyde St	Quarter Line	2.039	2	4.078	8.0	0.016312	Good
76	Brownstown Rd	Quarter Line	Ramsay Line	2.041	2	4.082	8.0	0.016328	Good
77	Brownstown Rd	Ramsay Line	Brussels Line	2.027	2	4.054	8.0	0.016216	Good
78	Cardiff Rd	Brussels Line	Mair Line	2.022	2	4.044	8.0	0.016176	Good
79	Cardiff Rd	Mair Line	Quarter Line	2.043	2	4.086	8.0	0.016344	Good
80	Cardiff Rd	Quarter Line	Clyde Line	2.042	2	4.084	8.0	0.016336	Good
81	Cardiff Rd	Clyde St	Higgins Line	2.038	2	4.076	8.0	0.016304	Good
82	Cardiff Rd	Higgins	Clegg Line	2.039	2	4.078	8.0	0.016312	Good
83	Cardiff Rd	Clegg Line	London Rd	2.019	2	4.038	8.5	0.017162	Good
87	Brandon Rd	Clyde Line	Mari St.	4.097	2	8.194	8.0	0.032776	Good
88	Brandon Rd	Mair Line	Brussels Line	2.026	2	4.052	8.5	0.017221	Good
89	Cranbrook Rd	Brussels Line	Nichol Line	2.025	2	4.050	9.0	0.018225	Good
90	Cranbrook Rd	Nichol Line	Button Line	2.042	2	4.084	8.0	0.016336	Good
91	Cranbrook Rd	Button Line	Clyde Line	2.044	2	4.088	8.5	0.017374	Good
92	Cranbrook Rd	Clyde Line	Martin Line	2.048	2	4.096	7.5	0.015360	Good
93	Cranbrook Rd	Martin Line	Clegg Line	2.035	2	4.070	7.5	0.015263	Good
94	Cranbrook Rd	Clegg Line	London Rd	1.985	2	3.970	7.5	0.014888	Good
95	St.Michaels Rd	London Rd	Elevator Line	1.979	2	3.958	8.0	0.015832	Good
96	St.Michaels Rd	Elevator Line	Martin Line	2.033	2	4.066	8.5	0.017281	Good
97	St.Michaels Rd	Martin Line	Clyde Line	2.046	2	4.092	8.0	0.016368	Good
98	St.Michaels Rd	Clyde Line	Button Line	2.040	2	4.080	7.0	0.014280	Good
99	St.Michaels Rd	Button Line	Nichol Line	2.038	2	4.076	7.0	0.014266	Good
100	St.Michaels Rd	Nichol Line	Brussels Line	2.034	2	4.068	9.0	0.018306	Good
101	Moncrieff Rd	Brussels Line	McCall Line	2.036	2	4.072	9.0	0.018324	Good
102	Moncrieff Rd	McCall Line	Button Line	2.047	2	4.094	8.8	0.018014	Good
103	Moncrieff Rd	Button Line	Clyde Line	2.040	2	4.080	8.0	0.016320	Good
104	Moncrieff Rd	Clyde Line	Martin Line	2.038	2	4.076	8.0	0.016304	Good
105	Moncrieff Rd	Martin Line	Elevator Line	2.033	2	4.066	8.8	0.017890	Good
106	Moncrieff Rd	Elevator Line	London Rd	1.975	2	3.950	8.5	0.016788	Good
108	Walton Rd	Elevator Line	Martin Line	2.035	2	4.070	9.0	0.018315	Good

Table 13 - Gravel Roads - Inventory Summary									
Road Segment ID	Road Name	Location		Length (km)	# of Lanes	Lane-Kilometers	Platform Width (m)	Surface Area (km^2)	Condition Rating
		From:	To:						
109	Walton Rd	Martin Line	Clyde Line	2.040	2	4.080	8.5	0.017340	Good
110	Walton Rd	Clyde Line	Button Line	2.036	2	4.072	8.5	0.017306	Good
111	Walton Rd	Button Line	McCall Line	2.049	2	4.098	8.5	0.017417	Good
112	Walton Rd	McCall Line	Brussels Line	2.023	2	4.046	8.5	0.017196	Good
114	McCall Line	Blyth Rd	Walton Rd	0.677	2	1.354	5.0	0.003385	Good
115	McCall Line	Walton Rd	Moncrieff Rd	2.040	2	4.080	5.5	0.011220	Good
116	Nichol Line	St. Michaels Rd	Cranbrook Rd	2.037	2	4.074	4.0	0.008148	Good
117	Nichol Line	Cranbrook Rd	Morris Rd	2.025	2	4.050	5.5	0.011138	Good
118	Nichol Line	Morris Rd	Dean End	2.000	2	4.000	4.5	0.009000	Good
119	Button Line	Morris Rd	Cranbrook Rd	2.034	2	4.068	7.0	0.014238	Good
120	Button Line	Cranbrook Rd	St. Michaels Rd	2.039	2	4.078	4.5	0.009176	Good
121	Button Line	St. Michaels Rd	Moncrieff Rd	2.053	2	4.106	4.3	0.008828	Good
122	Button Line	Moncrieff Rd	Walton Rd	2.037	2	4.074	4.5	0.009167	Good
123	Button Line	Walton Rd	Blyth Rd	0.653	2	1.306	4.5	0.002939	Good
129	Martin Line	dead end	Brandon Rd	0.207	2	0.414	4.5	0.000932	Good
130	Martin Line	Brandon Rd	Morris Rd	2.039	2	4.078	6.0	0.012234	Good
131	Martin Line	Morris Rd	Cranbrook Rd	2.039	2	4.078	7.0	0.014273	Good
132	Martin Line	Cranbrook Rd	St. Michaels Rd	2.044	2	4.088	7.0	0.014308	Good
133	Martin Line	St. Michaels Rd	Moncrieff Rd	2.044	2	4.088	7.0	0.014308	Good
134	Martin Line	Moncrieff Rd	Walton Rd	2.038	2	4.076	7.0	0.014266	Good
135	Martin Line	Walton Rd	Blyth Rd	0.646	2	1.292	6.5	0.004199	Good
137	Elevator Line	Walton Rd	Moncrieff Rd	2.032	2	4.064	7	0.014224	Good
138	Elevator Line	Moncrieff Rd	St. Michaels Rd	2.036	2	4.072	5.5	0.011198	Good
139	Elevator Line	St. Michaels Rd	Dean End	0.618	2	1.236	5.5	0.003399	Good
140	Clegg Line	Cranbrook Rd	Morris Rd	2.052	2	4.104	7.0	0.014364	Good
141	Clegg Line	Morris Rd	Brandon Rd	2.032	2	4.064	7.0	0.014224	Good
142	Clegg Line	Brandon Rd	Cardiff Rd	2.049	2	4.098	7.0	0.014343	Good
143	Clegg Line	Cardiff Rd	Browntown Rd	2.224	2	4.448	7.0	0.015568	Good
144	Clegg Line	Browntown Rd	Jamestown Rd	1.852	2	3.704	8.0	0.014816	Good
145	Higgins Line	Cardiff Rd	Dean End	0.355	2	0.710	4.2	0.001491	Good
146	Abraham Line	Jamestown Rd	Dean End	0.418	2	0.836	5.0	0.002090	Good
147	Wheeler Line	Jamestown Rd	Morris-Turnberry Rd	2.041	2	4.082	4.0	0.008164	Good
148	Ramsay Line	C-Line Rd	Amberley Rd.	2.040	2	4.080	5.5	0.011220	Good
149	Ramsay Line	Amberley Rd	Jamestown Rd	2.026	2	4.052	5.0	0.010130	Good
150	Ramsay Line	Jamestown Rd	Brownstown Rd	2.043	2	4.086	7.5	0.015323	Good
151	Ramsay Line	Brownstown Rd	Dean End	0.100	2	0.200	5.0	0.000500	Good
152	Quarter Line	Brownstown Rd	Cardiff Rd	2.040	2	4.080	5.0	0.010200	Good
153	Mair Line	Cardiff Rd	Brandon Rd	2.040	2	4.080	4.0	0.008160	Good
1000	West St	North St. W	Turnberry St. W	1.546	2	3.092	7.0	0.010822	Good

Table 13 - Gravel Roads - Inventory Summary									
Road Segment ID	Road Name	Location		Length (km)	# of Lanes	Lane-Kilometers	Platform Width (m)	Surface Area (km^2)	Condition Rating
		From:	To:						
1001	West St	Turnberry St	Dean End	0.091	2	0.182	7.0	0.000637	Good
1006	Mary St	Royal Rd	North St W	0.654	2	1.308	6.0	0.003924	Good
1007	Alice St	North St. W	Royal Rd	0.654	2	1.308	6.0	0.003924	Good
1025	Casemore St	Helena St	Laidlaw St	0.129	2	0.258	8.1	0.001045	Good
1030	Princess St	Mary St	Dead End	0.069	2	0.138	5.0	0.000345	Good
1034	Augusta St	100 m west of Helena	Dead End	0.411	2	0.822	5.0	0.002055	Good
2020	Park Rd	Clyde St	Dead End	0.172	2	0.344	5.0	0.000860	Good

Gravel Road Summary		Total Length (km)		Total Lane-Kilometers		Total Surface Area (km^2)	Average Condition
124 Road Segments		**210.60**		**421.20**		**1.517**	**Good**

Table 14 - Gravel Roads - Condition Rankings & Corresponding Criteria						
	Excellent	**Good**	**Fair**	**Poor**	**Very Poor**	**Failed**
Surface	- N/A	Little to no defects impacting the function of the road. Scheduled maintenance sufficient to maintain road function	Multiple defects observed, with minimal impact to function of the road. Scheduled maintenance sufficient to maintain road function.	Multiple defects observed, impacting the function of the road. Additional maintenance suggested in conjunction with annual maintenance to restore road back to desired condition	Multiple defects observed, impacting the function of the road. Immediate maintenance suggested to restore road back to operational condition	Road Failed
Base	- N/A	Structurally Sound, No Repairs Required	Structurally Sound, No Repairs Required	Road Base Damaged, Minor Repairs Required	Road Base Damaged, Requires Repair	Road Base Damaged, Requires Replacement

Table 15 - Gravel Roads - Levels of Service Definitions

	Level of Service Criteria	Excellent	GOOD	FAIR	POOR	VERY POOR
Operational Functionality	- Appropriate speed limits	- Road can accommodate a higher speed limit	- Speed limit is appropriate for the road	- Minimal traffic must travel at speeds lower than the posted limit	- Majority of traffic must travel at speeds lower than the posted limit	- All traffic must travel as speeds lower than the posted speed limit
	- Suitable road surface material type for traffic volumes and speeds	- The road surface material exceeds requirements for the traffic volume and speeds	- The road surface material is appropriate for the traffic volume and speeds	- The road surface material is not appropriates, but successfully accommodates traffic volumes and speeds	- The road surface material is not appropriate for traffic volumes **OR** - The road surface material is not appropriate for traffic speed	- The road surface material is not appropriate for traffic volumes **AND** - The road surface material is not appropriate for traffic speed
	- Sufficient road platform (pavement surface and shoulder width) to accommodate current traffic volumes and speeds (not related to capacity)	- The road platform can accommodate additional traffic volume and speeds	- The road platform accommodates current traffic volumes and speeds	- The road platform accommodates the majority of current traffic volume and speeds, with minimal exceptions	- The road platform has difficulty accommodating the majority of current traffic volume and speeds,	- The road platform is insufficient and inhibits current traffic volume and speeds
	- Adequate road structural capacity to accommodate traffic volumes and loading	- Road Structural capacity can accommodate additional traffic volumes and loading	- Road Structural capacity can accommodate current traffic volumes and loading	- Road Structural capacity can accommodate the majority of current traffic volumes and loading, with minimal exceptions	- Road structural capacity has difficulty accommodating the majority of current traffic volumes and loading	- Road Structural capacity does not accommodate additional traffic volumes and loading
	- Adequate elevation and drainage to prevent seasonal and/or reoccurring flooding	- Road elevation and drainage exceeds seasonal and/or reoccurring flooding requirements	- Road elevation and drainage adequately meets seasonal and/or reoccurring flooding requirements	- Road elevation and drainage satisfactory meets seasonal and/or reoccurring flooding requirements, with minimal exceptions	- Road elevation and drainage does not prevent seasonal and/or reoccurring flooding during major events	- Road elevation and drainage does not prevent seasonal and/or reoccurring flooding
	- Roadway flooding during major storm events limited to criteria per MOE Stormwater Planning and Design Manual	- Roadway flooding during major storm events exceeds the criteria per MOE Stormwater Planning and Design manual	- Roadway flooding during major storm events is limited to criteria per MOE Stormwater Planning and Design manual	- Roadway flooding during major storm events meets the majority, but not all of the criteria per MOE Stormwater Planning and Design manual	- Roadway flooding during major storm events meets few of the criteria per MOE Stormwater Planning and Design manual	- Roadway flooding during major storm events fails to meet any of the criteria per MOE Stormwater Planning and Design manual
	- Adequate erosion control	- Road erosion control is adequate and exceeds requirements	- Road erosion control is adequate and meets requirements	- Road erosion control is satisfactory and meets minimal requirements	- Road erosion control is lacking and minimal repairs required to meet minimal requirements	- Road erosion control is lacking and damage has been done to the road
	- Adequate ditching	- Ditching is adequate and exceeds requirements	- Ditching is adequate and meets all requirements	- Ditching is satisfactory and meets minimal requirements	- Ditching is lacking or in need of repair, minimal impact on the operation of the road	- Ditching is non-effective, negatively impacting the operation of the road

Table 15 - Gravel Roads - Levels of Service Definitions

	Level of Service Criteria	Excellent	GOOD	FAIR	POOR	VERY POOR
	- Appropriate geometric designs and sightlines for posted speeds (vertical and horizontal alignments)	- Geometric Designs are appropriate, designs exceed current standards	- Geometric Designs are appropriate, designs meet current standards	- Geometric Designs are appropriate, designs do not meet current standards, roadway was not built to an engineered design, but no concerns with geometric design.	- Geometric designs are inappropriate, designs do not meet current standards, design has minimal impact on the function of the road	- Geometric designs are inappropriate, designs do not meet current standards, design negatively impacting function of the road
	- Adequate quantity of roadside safety devices/protection	- Roadside safety devices/protection exceeds requirements	- Adequate quantity of roadside safety devices/protection	- Adequate quantity of roadside safety devices/protection, requiring minimal repairs or maintenance	- Inadequate quantity of roadside safety devices/protection OR - Adequate quantity of roadside safety devices/protection, in disrepair	- Inadequate quantity of roadside safety devices/protection in disrepair
	- Maintenance of the road network is fully compliant with the "Minimum Maintenance Standards for Municipal Highways" (O.Reg 388/18)	- Maintenance exceeds Minimum Maintenance Standards	- Maintenance is fully compliant with Minimum Maintenance Standards	- Maintenance is partially compliant with Minimum Maintenance Standards	- Maintenance is not compliant with Minimum Maintenance Standards	- No Maintenance is conducted on Structures
Capacity to Meet Demands	- Sufficient number of lanes along each road segment to accommodate peak traffic volumes	- Lanes are sufficient to accommodate additional traffic beyond peak traffic volumes	- Lanes are sufficient to accommodate peak traffic volumes	- Lanes are sufficient to accommodate peak traffic volumes, with minimal interruption to traffic flow	- Lanes accommodate off-peak traffic volumes, with regular interruption to traffic flow during peak traffic flows	- Lanes are insufficient to accommodate off-peak traffic flow, with significant interruption to traffic flow during peak traffic volumes
Environmental Resiliency	- Adequate embankment protection/retention	Embankment protection / retention is more than adequate	- Embankment protection/retention is adequate	- Embankment protection/retention is below standard, but no negative effects on the road	- Embankment protection/retention is below standard, with negative effects emerging	- No embankment protection/retention is present
	- Roads surfaces are protected against a 5-year return storm (per reporting requirements of O.Reg 588/17).	- N/A	- Road surface protected against 5-year storm	- Road surface is protected against 5-year storm, except for during seasonal (spring) flooding	- Road surface is not protected against 5-year return storm	- N/A

7. Belgrave Water System

7.1. Inventory Summary

The Hamlet of Belgrave is split along London Road (County Road 4) between the Municipality of Morris-Turnberry and the Township of North Huron. The Belgrave Water System provides services to all users located in Belgrave. In 2004, a Schedule B Class Environmental Assessment was completed to determine the most cost-effective method of delivering water to Belgrave. The recommendation was to interconnect the existing small water systems by constructing a new pumphouse and reservoir. The Belgrave Water System now consists of two groundwater wells (Jane Well and McCrea Well) a pumphouse containing treatment and control facilities, and an in-ground storage reservoir and distribution system. The pumphouse is equipped with a dedicated standby generator to provide standby power in the event of a power outage. The system is sized such that it could serve the entire Hamlet of Belgrave rather than just the current serviced areas. The capacity is sufficient to accommodate additional users as they connect in the future. There are 201 properties eligible to connect to the water system. The daily operation of the system is contracted to a third-party operator Veolia Water Canada.

Belgrave Water System Statistics	2021	2020	2019	2018	2017	5yr Average
Properties Connected:	140	134	128	125	122	130
% Of total eligible properties	70%	67%	64%	62%	61%	65%
# Of Boil Water Advisories	0	0	0	0	0	0
# Of Connection Days Lost – Boil Water	0	0	0	0	0	0
Water Main Breaks	0	0	0	0	0	0
# Of Connection Days Lost - Main Breaks	0	0	0	0	0	0
Total Treated Water Flows (m^3)	35,078	37,984	21,129	27,964	23,510	29,133
System Energy Use (kWh/yr.)	82,235	87,603	74,552	68,120	61,177	74,737
Energy Consumption kWh/m^3	2.34	2.31	3.53	2.44	2.60	2.57

The Belgrave Water System does not provide water for fire protection. None of the properties located in Belgrave have access to fire flow.

7.2. Current Replacement Values

The municipality separates the in-ground infrastructure from the building and equipment. The assets are further separated between the new system constructed in 2006 and the remaining legacy assets constructed in the 1980s. The 75mm diameter water lines run from the wells to the treatment facility. They are estimated to have a current replacement cost of $700/m. The 150mm water lines run from the treatment facility to users of the systems. They are estimated to have a current replacement cost of $800/m. There is a service stub located at each property capable of connecting to the system. The stubs have an estimated current replacement value of $2,500/stub.

To calculate the current replacement value of the treatment facility and equipment a historical cost approach was used. The original construction costs from 2006 were inflated using the Non-Residential Buildings CPI (NRBCPI) for Toronto, from Q1 2006 to Q1 2022.

The McCrea well is currently undergoing a replacement during the 2021/2022 budget year. Costs to date plus anticipated costs to complete the project will be approximately $210,000. These costs include land acquisition, engineering, permit fees, well construction, regulator, and source water management costs.

Category	Description	Count	Length (m)	Replacement Method	Current Replacement Cost
In Ground Infrastructure					
- 150mm Water Mains	New System	-	1,915	$/Unit	$1,532,000
- 75mm dia water line	New System	-	410	$/Unit	$287,000
- 150mm Water Mains	Legacy System	-	600	$/Unit	$480,000
- Service Stubs	Total System	201	-	$/Unit	$502,500
Pumphouse	New System	1	-	NRBCPI	$970,284
Pumphouse Equipment	New System	1	-	NRBCPI	$2,263,998
McCrea Well	Legacy System	1	-	$/Unit	$210,000
Jane Well	Legacy System	1	-	$/Unit	$210,000
Total					**$6,455,782**

7.3. Condition

The Belgrave Water System utilizes an age-based condition assessment for its in-ground infrastructure and facilities. The condition ratings and definitions are on Table 17. Estimated useful lives are assigned to each category. These are the expected service life for an asset in that category. Inspection of the McCrea well in 2017 has revealed the well casing is near failure. Once replaced the estimated useful life of the new well will be 80 years.

Category	Description	Date Constructed / Est Date Constructed	Age	Estimated Useful Life (EUL)	EUL Remaining	Condition Rating
In Ground Infrastructure						
- 150mm Water Mains	New System	2006	16	80	64	Excellent
- 75mm dia water line	New System	2006	16	80	64	Excellent
- 150mm Water Mains	Legacy System	1985 est	37	80	43	Excellent
- Service Stubs	Total System	2006	16	80	64	Excellent
Pumphouse	New System	2006	16	50	34	Excellent
Pumphouse Equipment	New System	2006	16	25	9	Fair
McCrea Well	Legacy System	1987 est	35	50	15	Good
Jane Well	Legacy System	1983 est	39	50	11	Good

The average age-based condition of the Belgrave Water System is Good to Excellent.

7.4. Levels of Service

The municipality has established levels of service (LOS) to evaluate the in-ground infrastructure and above ground facilities and equipment operating functionality, capacity to meet demands, and operational resiliency. The LOS criteria and ranking definitions are outlined in Table 18.

		Level of Service Criteria	Water Mains - New System	Water Mains - Legacy	Service Stubs
In-Ground Infrastructure	Operational Functionality	- Constructed using appropriate materials	Good	Fair	Fair
		- Asset dimensions meet current standards	Good	Fair	Fair
		- Minimal system leakage/water loss	Good	Good	Fair
	Capacity to Meet Demands	- Able to provide adequate minimum pressures and flows for peak operating hours	Good	Good	Good
	Operational Resiliency	- System designed to withstand maximum operating pressures plus the transient pressures including negative pressures	Good	Good	Good

		Level of Service Criteria	Pumphouse & Equipment (32 McCrea)	McCrea Well & Equipment	Jane Well & Equipment
Buildings & Equipment	Operational Functionality	- Systems and technology meet current standards	Good	Good	Good
		- Systems operate within recommended minimum and maximum pressures and flows during normal conditions	Good	Good	Good
		- Efficient and effective chemical application and disinfection processes	Good	Good	Good
		- Compliant with Provincial and Municipal codes/Regulations	Good	Good	Good
	Capacity to Meet Demands	- Able to provide adequate minimum pressures and flows for peak operating hours	Good	Good	Good
	Operational Resiliency	- Adequate back-up / units for critical pumping station processes	Good	Good	Good
		- Adequate standby power generation capacity	Good	Good	Good
		- Adequate site and facility security	Good	Good	Good

Each asset category was evaluated and assigned a ranking based on municipal staff's first-hand knowledge and observation. Anything that did not have designs available, a performance-based assessment was conducted, and rating assigned.

Overall, the in-ground infrastructure has a rating of Fair for operational functionality, and Good for capacity to meet demands and operational resiliency. The buildings and equipment have a rating of Good for operational functionality, capacity to meet demands and operational resiliency.

7.5. Lifecycle Activities

Each asset category is assigned an Estimated Useful Life (EUL) based on how long the asset is expected to last before replacement. In-ground infrastructure is estimated at 80 years, buildings 50 years, equipment 25 years and wells 50 years. The McCrea well is undergoing replacement over the 2021/2022 fiscal periods. Once replaced, the well will meet modern standards and will be expected to last approximately 80 years. Due to the similar material and age of the McCrea and Jane wells, it is anticipated that the Jane well will need to be replaced within the next 3-5 years. The Jane well is scheduled to be inspected in 2023. When planning the water system's lifecycle activities, the municipality takes into consideration staff & financial resources available, geographic synergies and the impact of weather events.

Anticipated Water System Lifecycle Costs (2023 to 2032)										
Year:	**2023**	**2024**	**2025**	**2026**	**2027**	**2028**	**2029**	**2030**	**2031**	**2032**
In-Ground Infrastructure	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Pumphouse	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Pumphouse Equipment	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
McCrea Well	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Jane Well	$ -	$ -	$210,000	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Total	**$ -**	**$ -**	**$210,000**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**

7.6. Risks related to lifecycle activities

Financial Risk

Failure to perform scheduled lifecycle activities can expose the municipality to financial risk. If the water system is not maintained, the individual components can degrade faster than anticipated. The overall cost to repair the water system is borne by the connected users of the system therefore, the Municipality must make sound financial decisions on behalf of all the users. Cost overruns and volatile market prices for materials can also pose a financial risk to the water system.

Environmental Risk

Climate change can pose an environmental risk to the Belgrave Water System. Significant weather events have increased in frequency and severity due to climate change. These events could cause damage to above ground buildings or equipment. The municipality will evaluate the risk of climate change whenever a component of the Belgrave Water System is replaced, the effects of past weather events and potential future events will be evaluated. The municipality will also evaluate and purchase environmentally friendly alternatives whenever economically or practically possible.

Economic Risk

Municipal assets with capacity restrictions could potentially deter economic growth within the municipality. Development within Belgrave may be deterred if the water system is undersized or in disrepair. When development is proposed in Belgrave, the system's capacity to accommodate additional connections will be evaluated. If the size of the water system is preventing growth within Belgrave, the cost of constructing additional capacity will be compared to the benefit of additional growth.

Reputation Risk

Residents utilize the Belgrave Water System daily. Maintaining the system in a good working condition is essential. Failing to provide a reliable source of treated water would harm the Municipality's reputation of providing effective and efficient services. A tarnished reputation can be difficult to correct and can impact a municipality's ability to recruit qualified staff or attract economic growth to the area.

Health & Safety Risk

It is the municipality's responsibility to maintain the Belgrave Water System to provide reliable and potable drinking water. The system is subject to numerous legislative requirements and regular testing and inspections occur. The system is operated by Veolia Canada and regulated by the Ministry of the Environment, Conservation and Parks. Annual operation and maintenance reports are published and available to the public.

7.7. Economic & Population Growth Assumptions

Much of the economic growth within the municipality is related to agricultural operations located outside the area serviced by the Belgrave Water System. Current lifecycle activities are scheduled to meet the current population and economic activity levels. Residential development within the hamlet of Belgrave is anticipated to be approximately 15 households within the next 5 years. As more eligible users connect to the system, the operational costs become more economically affordable for all users.

Table 16 - Belgrave Water System - Summary							
Category	**Description**	**Count**	**Length (m)**	**Date Constructed**	**Estimated Date Constructed**	**Approximate Age**	**Current Replacement Value**
In Ground Infrastructure							
- 150mm Water Mains	New System		1,915	2006		16	$ 1,532,000
- 75mm dia water line	New System		410	2006		16	$ 287,000
- 150mm Water Mains	Legacy System		600		1985	37	$ 480,000
- Service Stubs	Total System	201		2006		16	$ 502,500
Pumphouse	New System	1	-	2006		16	$ 970,284
Pumphouse Equipment	New System	1	-	2006		16	$ 2,263,998
McCrea Well	Legacy System	1	-		1987	35	$ 210,000
Jane Well	Legacy System	1	-		1983	39	$ 210,000

Table 17 - Belgrave Water System - Condition Ratings & Corresponding Criteria						
	Excellent	**Good**	**Fair**	**Poor**	**Very Poor**	**Failed**
Est Useful Life Remaining:	**20+ Years Remaining**	**10 to 19 Years Remaining**	**5 to 10 Years Remaining**	**1 to 5 Years Remaining**	**Less than 1 Year Remaining**	**0**
In-Ground Infrastructure Pumphouse Pumphouse Equipment Wells	In Like New Condition, no defects or repairs required	Minor defects observed with no impact to the asset's function	Multiple defects observed, with minor impact to function of the asset. Possible failure within the next 5 to 10 years.	Multiple defects observed, with major impact to function of the asset. Possible failure likely within the next 5 years. Repair required.	Significate damage observed. Possible failure within the year. Replacement required.	Asset has failed. Replacement required

		Table 18 - Belgrave Water System - Levels of Service Definitions					
		Level of Service Criteria	**Excellent**	**GOOD**	**FAIR**	**POOR**	**VERY POOR**
In Ground Infrastructure	**Operational Functionality**	- Constructed using appropriate materials	- Construction material exceed modern requirements	- Construction material meet modern requirements	- Construction material does not meet current standards or are unknown, but are not impacting the system	- Construction material does not meet current standards or are unknown, with minimal negative impact on the system	- Construction material does not meet current standards or are unknown, with significant negative impact on the system
		- Asset dimensions meet current standards	- Dimensions exceed current standards	- Dimensions meet current standards	- Asset is undersized or unknown, but not impacting system operations	- Asset is undersized or unknown, and negatively impacting system operations	- Asset is undersized or unknown, and significantly impacting system operations
		- Minimal system leakage/water loss	- No water leakage/loss is detected	- Minimal water leakage/loss is detected	- Minimal water leakage/loss is detected, with minimal impact on system operations	- Water leakage/loss is detected, impacting the operations of the system	- Significant water leakage/loss is detected
	Capacity to Meet Demands	- Able to provide adequate minimum pressures and flows for peak operating hours	- Able to provide adequate minimum pressures and flows at peak operating hours, with no interruptions	- Able to provide adequate minimum pressures and flows at peak operating hours, with occasional interruptions related to system maintenance	- Able to provide adequate minimum pressures and flows at peak operating hours, with occasional interruptions	- System struggles to provide adequate minimum pressures at peak operating hours, with regular interruptions	- Cannot provide minimum pressures and flows at peak operating hours
	Operational Resiliency	- System designed to withstand maximum operating pressures plus the transient pressures including negative pressures	- System designed to withstand excessive operating pressures	- System designed to withstand operating pressures	- System design does not meet modern code, but can withstand operating pressures	- System design does not meet modern code, operating pressures causing minimal damage to system	- System design cannot withstand operating pressures resulting in system damage

Table 18 - Belgrave Water System - Levels of Service Definitions							
		Level of Service Criteria	Excellent	GOOD	FAIR	POOR	VERY POOR
Buildings & Equipment	Operational Functionality	- Systems and technology meet current standards	- Systems and technology exceed current standards	- Systems and technology meet current standards	- Systems and technology do not meet current standards, but are considered acceptable legacy systems	- Systems and technology do not meet current standards, but are considered acceptable legacy systems, but should be replaced as soon as possible	- Systems and technology do not meet current standards and pose a risk to system users, should be replaced immediately
		- Systems operate within recommended minimum and maximum pressures and flows during normal conditions	- Systems operate without exceeding recommended minimum and maximum pressures and flows	- Systems rarely exceed recommended minimum and maximum pressures and flows, with satisfactory explanation	- Systems occasionally exceed recommended minimum and maximum pressures and flows, with satisfactory explanation	- Systems occasionally exceed recommended minimum and maximum pressures and flows, with unknown explanation	- Systems regularly operate beyond the recommended minimum and maximum pressures and flows
		- Efficient and effective chemical application and disinfection processes	- Chemical application and disinfection process exceed efficiency and effectiveness requirements	- Chemical application and disinfection process meet efficiency and effectiveness requirements	- Chemical application and disinfection process is satisfactory with minimal discrepancy from expected cost or material usage	- Chemical application and disinfection process is satisfactory, with a large discrepancy from expected cost or material usage	- Chemical application and disinfection process is not effective or efficient
		- Compliant with Provincial and Municipal codes/Regulations	- Building and equipment exceed provincial and municipal codes and regulations	- Buildings and equipment are compliant with provincial and municipal codes and regulations	- Buildings and equipment are compliant with all provincial codes and regulation and partially compliant with municipal codes and regulations	- Buildings and equipment are partially compliant with provincial and municipal codes and regulations	- Buildings and equipment are not compliant with provincial and municipal codes and regulations
	Capacity to Meet Demands	- Able to provide adequate minimum pressures and flows for peak operating hours	- Able to provide adequate minimum pressures and flows at peak operating hours, with no interruptions	- Able to provide adequate minimum pressures and flows at peak operating hours, with occasional interruptions related to system maintenance	- Able to provide adequate minimum pressures and flows at peak operating hours, with occasional interruptions	- System struggles to provide adequate minimum pressures at peak operating hours, with regular interruptions	- Cannot provide minimum pressures and flows at peak operating hours
	Operational Resiliency	- Adequate back-up / units for critical pumping station processes	- More than an adequate number of backup units on site	- Adequate number of backup units on site	- Appropriate backup units available, but stored offsite	- Backup units available, but they do not meet current standards	- No backup units available
		- Adequate standby power generation capacity	- Extra standby power generation capacity available	- Adequate standby power generation capacity available to operate all systems	- Adequate standby power generation capacity available for critical systems	Standby power not adequate to power critical systems.	- No standby power generation capacity available
		- Adequate site and facility security	- Site and facility security exceeds requirements	- Site and facility security is adequate	- Security is adequate, rare unauthorized attempts to access site prevented with minimal damage	- Security is inadequate, unauthorized attempts to access site successful, but access to critical systems prevented	- Security is inadequate, regular security breaches occurring, access to critical systems not prevented

8. Stormwater Assets

8.1. Inventory Summary

The Municipality of Morris-Turnberry's stormwater assets are located in the hamlets of Belmore, Belgrave, Bluevale and Lower Town, Wingham. The pipes vary in length, diameter, materials used, date constructed and design. Numerous pipes throughout the various systems are undersized and use materials that do not meet current standards. The systems resiliency to a 5-year storm is estimated by considering the systems design, pipe size, material used and actual performance. Overall, the municipality estimates 54.80% of its stormwater assets would be resilient to a 5-year storm. Based on staff observation and the actual performance of the existing stormwater assets, it is not believed the stormwater assets were designed for, or provide protection from, a 100-year storm.

Location	Estimated Construction Date	Pipe Length (m)	# Of Catch Basins	Estimated % of System Resilient to 5-Year Storm	# Of Properties in Service Area	# Of Properties Protected from 100-Year Storm
Belmore	2017	245	12	100%	18	0
Belgrave	1966	3,055	68	40%	166	0
Bluevale	1997	1,129	17	70%	149	0
Lower Town, Wingham	1990	1,118	26	70%	200	0
Total		**5,547**	**123**	**54.8%**	**533**	**0**

Additional details can be found on Table 19

8.2. Current Replacement Values

The municipality separates its stormwater assets into pipes and catch basins. Any pipe under 300mm in diameter is considered undersized and would need to be replaced with a 300mm diameter or larger pipe.

Total of All Systems	Replacement Cost ($/Unit)	Length of Pipe (m) and # of Catch Basins	Current Replacement Value
150mm Pipe	$500.00	137.0	$68,500
200mm Pipe	$500.00	1,090.0	$545,000
250mm Pipe	$500.00	760.0	$380,000
300mm Pipe	$500.00	1,330.4	$665,200
350mm Pipe	$550.00	640.0	$352,000
400mm Pipe	$600.00	370.0	$222,000
450mm Pipe	$650.00	582.3	$378,495
500mm Pipe	$700.00	416.0	$291,200
525mm Pipe	$750.00	21.2	$15,900
600mm Pipe	$800.00	200.0	$160,000
Catch Basins	$5,000.00	123.0	$615,000
Total			**$3,693,295**

Details for specific areas are available on Table 19.

8.3. Condition

The stormwater assets utilize an age-based condition assessment to calculate the estimated useful life remaining. The condition ratings and definitions are in Table 20. Estimated useful lives of 80 years are assigned to the pipes and catch basins. These are the expected service life for an asset in that category.

Location	Estimated Construction Date	Estimated Useful Life	Estimated Useful Life Remaining	Aged Based Condition
Belmore	2017	80	75	Excellent
Belgrave	1966	80	24	Excellent
Bluevale	1997	80	55	Excellent
Lower Town, Wingham	1990	80	48	Excellent

The average age-based condition of the stormwater assets is Excellent due to the expected useful life remaining exceeding 20 years.

8.4. Levels of Service

The municipality has established levels of service (LOS) to evaluate the stormwater infrastructure's operating functionality, capacity to meet demands and environmental resiliency. The LOS criteria and ranking definitions are outlined in Table 21.

	Level of Service Criteria	Belgrave Stormwater System	Belmore Stormwater System	Bluevale Stormwater System	Lowertown Stormwater System
Operational Functionality	- Materials used meet modern standards	Very Poor	Excellent	Excellent	Good
	- Asset dimensions meet modern standards	Poor	Excellent	Good	Good
	- System design meets modern standards	Poor	Good	Fair	Fair
Capacity to Meet Demands	- Capacity meets the standards for the sizing as set by the municipality.	Poor	Good	Good	Good
	- Adequate capacity to limit roadway flooding during major storm events per MOE Stormwater Planning and Design Manual	Fair	Good	Good	Good
Environmental Resiliency	- Percentage of the municipal stormwater system resilient to a 5-year return storm. (Per O.Reg 588/17)	Fair	Excellent	Good	Good

Each asset category was evaluated and assigned a ranking based on municipal staff's first-hand knowledge and observation. Anything that did not have designs available, a performance-based assessment was conducted, and rating assigned.

Overall, Belmore, Bluevale and Lowertown have a rating of Good for operational functionality, capacity to meet demands and environmental resiliency. Belgrave has a rating of poor in operational functionality and poor to fair in capacity to meet demands and environmental resiliency.

8.5. Lifecycle Activities

The stormwater pipes and catch basins have an Estimated Useful Life (EUL) of 80 years. At that time, the asset would be scheduled to be replaced, with consideration given to the assets overall condition and performance. A flush and camera of the stormwater assets occurs approximately every 10 years. Spot repairs are performed as required and cleanout of the catch basins is performed annually. Currently half of the Belgrave stormwater assets are scheduled to be flushed and camera in 2022. An inflator of 2.5% has been applied to the 2022 budgeted cost of the catch basin cleanout to estimate future annual costs.

Anticipated Stormwater System Lifecycle Costs (2023 to 2032)										
Year:	**2023**	**2024**	**2025**	**2026**	**2027**	**2028**	**2029**	**2030**	**2031**	**2032**
Belgrave	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Belmore	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Bluevale	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Lowertown, Wingham	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Catch Basin Cleanout – All Areas	$3,075	$3,152	$3,231	$3,311	$3,394	$3,479	$3,566	$3,655	$3,747	$3,840
Total	**$3,075**	**$3,152**	**$3,231**	**$3,311**	**$3,394**	**$3,479**	**$3,566**	**$3,655**	**$3,747**	**$3,840**

8.6. Risks related to lifecycle activities

Financial Risk

Failure to perform scheduled lifecycle activities can expose the municipality to financial risk. If the stormwater systems are not maintained, the individual components can degrade faster than anticipated. The overall cost to replace components ahead of schedule would be greater than the cost to maintain the systems. Cost overruns and volatile market prices for materials can also pose a financial risk when repairing or replacing parts of the stormwater system.

Environmental Risk

Climate change can pose an environmental risk to the stormwater systems. Significant weather events have increased in frequency and severity due to climate change. These events could cause damage to the stormwater systems. It is more important than ever that the stormwater systems function as designed to protect the residents from the effects of climate change. The municipality will evaluate the effects of past weather events and potential future events when a part of a stormwater system is repaired or replaced.

Economic Risk

Municipal assets with capacity restrictions could potentially deter economic growth within the municipality. Development within an area serviced by a stormwater system may be deterred if the system is not functioning properly. When a development is proposed in an area serviced by a stormwater system the municipality will evaluate the impact of the development on the current system and if additional system capacity is required.

Reputation Risk

The stormwater systems are utilized when major or minor weather events occur. Maintaining the system in a good working condition is essential to protect municipal and resident's property from flooding. Failing to provide a reliable stormwater system can harm the Municipality's reputation of providing effective and efficient services. A tarnished reputation can be difficult to correct and can impact a municipality's ability to recruit qualified staff or attract economic growth to the area.

Health & Safety Risk

It is the municipality's responsibility to maintain the stormwater systems to provide reliable stormwater management during weather events. The system protects municipal roads from flooding and allows motorists to use the roads safely. A properly functioning stormwater system also assists with the prevention of flooding on private property. Many basement drains are connected to stormwater. Failure in the system could back up water and cause health hazard to connected homes or flooding septic systems causing health hazards.

8.7. Economic & Population Growth Assumptions

Much of the economic growth within the municipality is related to agricultural operations located outside the areas serviced by the stormwater assets. Current stormwater systems are built to accommodate the current population and economic activity. Current lifecycle activities are scheduled to meet the current population and economic activity levels. Any significant development within a service area will require a stormwater management plan. As additional development occurs, the municipality's stormwater systems will grow to accommodate.

Table 19 - Stormwater - Summary								
Location	**Description**	**Count**	**Length (m)**	**Date Constructed**	**Approximate Date Constructed**	**Estimated Replacement Cost**	**# of Properties Serviced**	**# of Properties Protected from 100-Year Storm**
Belgrave Stormwater Assets	150mm Pipe	3	68.0		1966	$ 34,000	166	**0**
	200mm Pipe	27	817.0		1966	$ 408,500		
	250mm Pipe	11	715.0		1966	$ 357,500		
	300mm Pipe	20	793.0		1966	$ 396,500		
	350mm Pipe	1	107.0		1966	$ 58,850		
	400mm Pipe	5	240.0		1966	$ 144,000		
	450mm Pipe	2	150.0		1966	$ 97,500		
	500mm Pipe	2	165.0		1966	$ 115,500		
	525mm Pipe	-	-		1966	$ -		
	600mm Pipe	-	-		1966	$ -		
	Catch Basins/Manholes	68	N/A		1966	$ 340,000		
Belmore Stormwater Assets	150mm Pipe	-	-	2017		$ -	18	0
	200mm Pipe	-	-	2017		$ -		
	250mm Pipe	-	-	2017		$ -		
	300mm Pipe	9	177.4	2017		$ 88,700		
	350mm Pipe	-	-	2017		$ -		
	400mm Pipe	-	-	2017		$ -		
	450mm Pipe	1	46.3	2017		$ 30,095		
	500mm Pipe	-	-	2017		$ -		
	525mm Pipe	1	21.2	2017		$ 15,900		
	600mm Pipe	-	-	2017		$ -		
	Catch Basins/Manholes	12	N/A	2017		$ 60,000		
Bluevale Stormwater Assets	150mm Pipe	1	9.0		1997	$ 4,500	149	0
	200mm Pipe	2	188.0		1997	$ 94,000		
	250mm Pipe	-	-		1997	$ -		
	300mm Pipe	3	173.0		2019	$ 86,500		
	350mm Pipe	5	401.0		1997	$ 220,550		
	400mm Pipe	3	110.0		1997	$ 66,000		
	450mm Pipe	3	248.0		1997	$ 161,200		
	500mm Pipe	-	-		1997	$ -		
	525mm Pipe	-	-		1997	$ -		
	600mm Pipe	-	-		1997	$ -		
	Catch Basins/Manholes	17	N/A		1997	$ 85,000		

Table 19 - Stormwater - Summary								
Location	**Description**	**Count**	**Length (m)**	**Date Constructed**	**Approximate Date Constructed**	**Estimated Replacement Cost**	**# of Properties Serviced**	**# of Properties Protected from 100-Year Storm**
Lowertown, Wingham Stormwater Assets	150mm Pipe	3	60.0		1990	$ 30,000	200	0
	200mm Pipe	1	85.0		1990	$ 42,500		
	250mm Pipe	2	45.0		1990	$ 22,500		
	300mm Pipe	7	187.0		1990	$ 93,500		
	350mm Pipe	3	132.0		1990	$ 72,600		
	400mm Pipe	2	20.0		1990	$ 12,000		
	450mm Pipe	2	138.0		1990	$ 89,700		
	500mm Pipe	4	251.0		1990	$ 175,700		
	525mm Pipe	-	-		1990	$ -		
	600mm Pipe	2	200.0		1990	$ 160,000		
	Catch Basins/Manholes	26	N/A		1990	$ 130,000		
Total	**150mm Pipe**	**7**	**137.0**			**$ 68,500.00**	**533**	-
	200mm Pipe	**30**	**1,090.0**			**$ 545,000.00**		
	250mm Pipe	**13**	**760.0**			**$ 380,000.00**		
	300mm Pipe	**39**	**1,330.4**			**$ 665,200.00**		
	350mm Pipe	**9**	**640.0**			**$ 352,000.00**		
	400mm Pipe	**10**	**370.0**			**$ 222,000.00**		
	450mm Pipe	**8**	**582.3**			**$ 378,495.00**		
	500mm Pipe	**6**	**416.0**			**$ 291,200.00**		
	525mm Pipe	**1**	**21.2**			**$ 15,900.00**		
	600mm Pipe	**2**	**200.0**			**$ 160,000.00**		
	Catch Basins/Manholes	**123**	**N/A**			**$ 615,000.00**		

Table 20 - Stormwater Assets - Condition Ratings & Corresponding Criteria						
	Excellent	**Good**	**Fair**	**Poor**	**Very Poor**	**Failed**
Est Useful Life Remaining:	**20+ Years Remaining**	**10 to 19 Years Remaining**	**5 to 10 Years Remaining**	**1 to 5 Years Remaining**	**Less than 1 Year Remaining**	**0**
Pipes	In Like New Condition, no defects or repairs required	Minor defects observed with no impact to the function of the pipe	Multiple defects observed, with minor impact to function of the pipe. Possible failure within the next 5 to 10 years.	Multiple defects observed, with major impact to function of the pipe. Possible failure likely within the next 5 years. Repair required.	Significate damage observed. Possible failure within the year. Replacement required.	Pipe has failed. Replacement required
Catch Basins/ Manholes	Structurally Sound, No Repairs Required	Structurally Sound, Standard Maintenance Required	Structurally Sound with minor defects. Spot repairs required	Structure compromised or about to be compromised. Repair required.	Structure damaged beyond repair. Replacement Required	Structure Failed. Replacement required.

Table 21 - Stormwater Assets - Levels of Service Definitions						
	Level of Service Criteria	**Excellent**	**GOOD**	**FAIR**	**POOR**	**VERY POOR**
Operational Functionality	- Materials used meet modern standards	- Greater then 90% of the system would meet modern standards	- 70 to 89% of the system would meet modern standards	- 40% to 69% of the system would meet modern standards	- 20% to 39% of the system would meet modern standards	- Less then 20% of the system would meet modern standards
	- Asset dimensions meet modern standards	- 90%+ of the system would meet modern dimension standards	- 70 to 89% of the system would meet modern standards	- 40% to 69% of the system would meet modern standards	- 20% to 39% of the system would meet modern standards	- Less then 20% of the system would meet modern standards
	- System design meets modern standards	- System designs exceeds modern standards	- System design meets modern standards	- System design does not meet modern standards, but is not negatively impacting overall system function	- System design does not meet modern standards, and is negatively impacting overall system function	- System design does not meet modern standards and is impeding the system's ability to function
Capacity to Meet Demands	- Capacity meets the standards for the sizing as set by the municipality.	- Capacity exceeds the standards for sizing of stormwater assets as set out by the municipality	- Capacity meets the standards for sizing of stormwater assets as set out by the municipality	- Capacity meets the standards for sizing of stormwater assets as set out by the municipality with seasonal exceptions	- Capacity struggles to meet the standards for sizing of stormwater assets as set out by the municipality	- Capacity does not meet the standards for sizing of stormwater assets as set out by the municipality
	- Adequate capacity to limit roadway flooding during major storm events per MOE Stormwater Planning and Design Manual	- Stormwater system has excess capacity to limit roadway flooding during major storm events	- Stormwater system has adequate capacity to limit roadway flooding during major storm events	- Stormwater system has adequate capacity to limit roadway flooding during major storm events, with seasonal exceptions	- Stormwater system struggles to limit roadway flooding during major storm events.	- Stormwater system does not limit roadway flooding during major storm events
Environmental Resiliency	- Percentage of the municipal stormwater system resilient to a 5-year return storm. (Per O.Reg 588/17)	- Greater than 90% of the system is resilient to a 5-year storm	- 70 to 89% of the system is resilient to a 5-year storm	- 40% to 69% of the system is resilient to a 5-year storm	- 20% to 39% of the system is resilient to a 5-year storm	- Less then 20% of the system is resilient to a 5-year storm

Appendix A: Anticipated Lifecycle Activity Costs (2023 to 2032) Summary										
Category:	**2023**	**2024**	**2025**	**2026**	**2027**	**2028**	**2029**	**2030**	**2031**	**2032**
Bridges	$ 91,000	$ 145,000	$ 510,000	$ -	$ 148,000	$ -	$ 580,833	$ 5,033,000	$ 1,225,000	$ 618,000
Culverts	$ 102,063	$ -	$ -	$ 121,400	$ -	$ -	$ 150,000	$ 2,531,833	$ 109,375	$ -
HBC Roads	$ 147,000	$ 309,900	$ -	$ 111,750	$ -	$ -	$ 950,100	$ -	$ 88,500	$ -
LCB Roads	$ 153,750	$ 156,755	$ 190,500	$ -	$ 222,300	$ 305,950	$ -	$ 153,750	$ 156,775	$ 190,500
Gravel Roads	$ 738,000	$ 756,450	$ 775,361	$ 794,745	$ 814,614	$ 834,979	$ 855,854	$ 877,250	$ 899,181	$ 921,661
Belgrave Water System	$ -	$ -	$ 210,000	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Stormwater Assets	$ 3,075	$ 3,152	$ 3,231	$ 3,311	$ 3,394	$ 3,479	$ 3,566	$ 3,655	$ 3,747	$ 3,840
Total	$ 1,234,888	$ 1,371,257	$ 1,689,092	$ 1,031,206	$ 1,188,308	$ 1,144,408	$ 2,540,353	$ 8,599,488	$ 2,482,578	$ 1,734,001