



BURNSIDE

2022 OSIM Bridge Inspections Report

**Municipality of South Bruce
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**February 2023
300042391.2022**

Distribution List

No. of Hard Copies	PDF	Email	Organization Name
3	Yes	Yes	Municipality of South Bruce

Record of Revisions

Revision	Date	Description
-	December 2022	Draft Report
1	February 2023	Final Report

R.J. Burnside & Associates Limited

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Executive Summary

R.J. Burnside & Associates Limited (Burnside) was engaged by the Municipality of South Bruce to undertake the inspection of 45 bridge and culvert structures. It should be noted that Structure 1010 (Adam Street Structure), previously not inspected in 2020 due to access restrictions, was inspected in 2022 and structures 1022, 1023, and 1024 have been added to the Structure Inventory as requested by the Municipality. The visual inspections were carried out on an element-by-element basis in accordance with the Ministry of Transportation - Ontario Structure Inspection Manual (OSIM). The inspections were completed under the direction of a Professional Engineer to assess their condition and identify any material defects, performance deficiencies, maintenance needs, additional studies and/or repairs/rehabilitation work required on a structure-by-structure basis.

Following the field inspections, recommendations were made based on the data collected and the review of the previous inspection reports. Depending on the condition of each structure, the remedial needs have been provided in three classifications: routine maintenance, additional investigations and repairs and rehabilitations (Capital Works).

The routine maintenance work often requires a minimal scope of work, and in most cases can be carried out by municipal staff. It is anticipated that all maintenance needs identified can be addressed within the Municipality's routine maintenance program and will be completed within the calendar year of receiving this report. The total estimated value of the work to be completed by the Municipality is **\$97,000.00**. We recommend that a general allowance to complete the works described above be included in the Municipality's annual road budget.

Additional studies, investigations, and monitoring programs, as summarized in the table below, are recommended to structures currently demonstrating severe material defects or performance deficiencies which may necessitate an inspector to require more detailed information. These investigations have been identified based on a "normal" or "urgent" priority.

Table 1 - Additional Investigations

Structure No./Name	Additional Investigation	Reasoning	Estimated Cost
0001	Structure Evaluation	Determine if the structure can accommodate the additional fill loading.	\$5,000.00
0003	Monitoring bolt hole cracks and movement	Monitor deformations, bolt hole cracking and cusping during future biennial inspections to determine if actively progressing. If actively progressing, consider more frequent monitoring.	\$0.00
0008	Load Limit Evaluation	Determine the extent of strength reduction given the vintage and condition of the structure.	\$15,000.00
0010	Monitoring of Deformations, Settlements and Movements	Monitor approach slab settlement during future biennial inspections to determine if actively progressing.	\$0.00
0020	Monitoring of Deformations, Settlements and Movements	Monitor deformations and cusping during future biennial inspections to determine if actively progressing.	\$0.00
0021	Monitoring of Deformations, Settlements and Movements	Due to severe disintegration of concrete throughout the structure, it is recommended the Municipality monitor this structure closely and consider reducing the load posting to 5 tonnes until replacement is a feasible option.	\$0.00
1002	Monitoring of Deformations, Settlements and Movements	Monitor deformations during future biennial inspections to determine if actively progressing.	\$0.00
1009	Monitoring of Deformations, Settlements and Movements	Monitor movement of gabion baskets during future biennial inspections to determine if actively progressing and unstable.	\$0.00
1011	Feasibility Study	Compare lining and grouting versus replacing the structure.	\$10,000.00
1016	Detailed Deck Condition Survey	Determine the extents of deck top rehabilitation work.	\$10,000.00
1020	Monitoring of Deformations, Settlements and Movements	Monitor cusping and reverse curvature during future biennial inspections to ensure structure stability.	\$0.00
1024	Load Limit Evaluation	Determine the current load carrying capacity.	\$5,000.00
Total			\$45,000.00

The Capital Works needs include any repair, rehabilitation or replacement work which would typically be completed by a Municipality hired Contractor, to assist in extending the service life of a structure and increasing the Bridge Condition Index (BCI). In accordance with the OSIM, the capital works required are based on a priority of six to ten years, one to five years, within one year, and urgent and have been estimated as follows:

Capital Works Costs and Timeframes

Time Frame	Capital Cost
< 1 year	\$10,907,500.00
1 – 5 years	\$4,122,500.00
6 – 10 years	\$5,031,000.00
TOTAL	\$20,061,000.00

It should be noted that these costs include recommended replacement costs for structures in need.

Taking into consideration the structures calculated BCI's, several structures have been identified for replacement or rehabilitation. Within the next year, three (3) structures have been identified as requiring rehabilitation and six (6) structures have been identified for replacement. Within the next 1 to 5 years, three (3) structures have been identified as requiring rehabilitation and four (4) structures have been identified for replacement.

The roadside safety needs include a general allowance for guide rail and/or end treatments at all bridge locations as required. The total estimated cost for roadside safety is **\$1,058,000.00**.

It should be noted that all of the aforementioned estimated costs throughout this summary and the report do not include property acquisition costs, utility relocation costs or engineering fees associated with road work beyond the wingwalls, unless specifically identified within the individual OSIM forms. All costs are also exclusive of HST.

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1.0 Introduction

R.J. Burnside & Associates Limited (Burnside) has been engaged by the Municipality of South Bruce to undertake the inspection of 45 road bridge and culvert structures over the span of 3.0 m. It should be noted that Structure 1010 (Adam Street Structure), previously not inspected in 2020 due to access restrictions, was inspected in 2022 and structures 1022, 1023, and 1024 have been added to the Structure Inventory as requested by the Municipality. The inspections have been completed in accordance with the Ministry of Transportation - Ontario Structure Inspection Manual (OSIM). Inspection of the Municipality's bridges and culverts are required every two years as per Ontario Regulation 104/97 which states:

“The structural integrity, safety and condition of every bridge shall be determined through the performance of at least one inspection in every second calendar year under the direction of a professional engineer and in accordance with the Ontario Structure Inspection Manual.”

These inspections assess the condition of the structure and identify any additional studies or repairs required. A map showing the location of all structures has been provided in Appendix C.

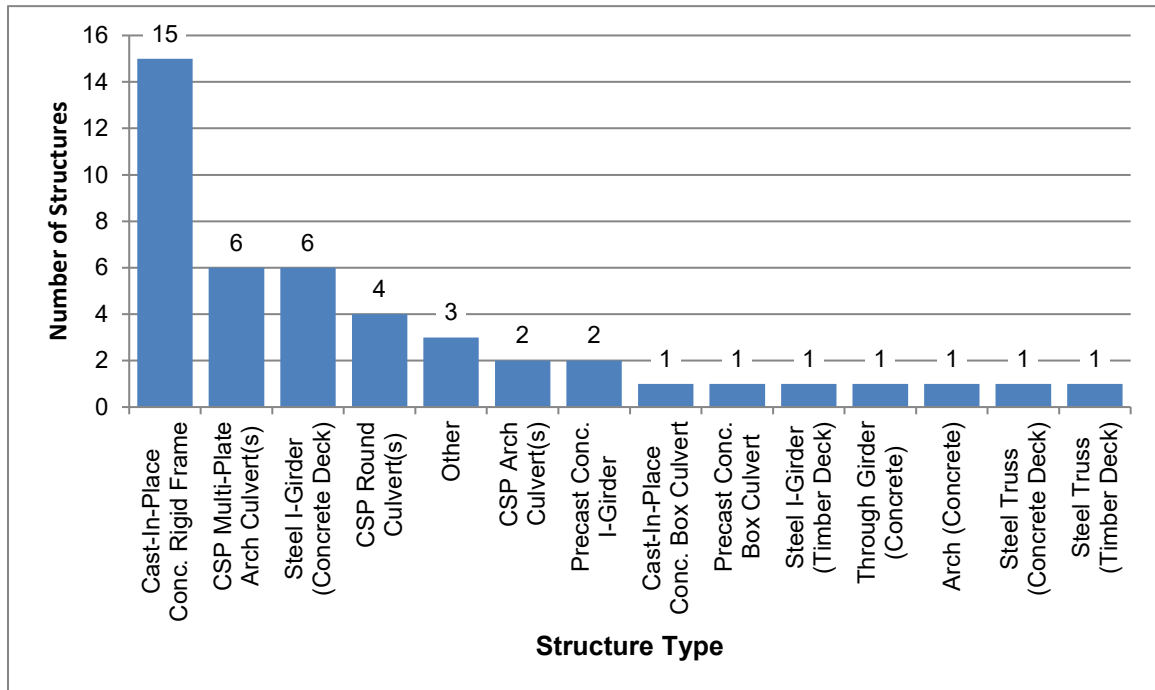
Burnside staff conducted a detailed element-by-element visual assessment of each bridge/culvert in order to identify any material defects, performance deficiencies and maintenance needs on a structure-by-structure basis. All data collected has been documented on the OSIM forms and provided in digital format in Appendix D. In addition, a brief written overview has been provided to clarify the OSIM data.

2.0 Inspection Observations and Recommendations

The following observations and recommendations were made during our recent inspection of the Municipality's structures. These inspections, along with a review of the previous reports have contributed to the recommendations provided.

The Municipality of South Bruce has an inventory of 45 structures, which is comprised of a variety of structure types. Figure 1 below summarizes the number and types of structures within the inventory.

Figure 1 - Types of Structures



Depending on the condition of each structure, some level of remedial action is usually required. The recommendations for remedial work are provided in three classifications, routine maintenance, additional investigations, and repair, rehabilitation, or replacement.

2.1 Routine Maintenance

Routine maintenance needs often require minimal effort to extend the service life of the structure. In most cases, routine maintenance can be undertaken by Municipality staff or locally contracted out. It is desirable to ensure that all maintenance needs identified at each structure be completed within the calendar year of receiving this Report.

Common structure defects were noted, to varying degrees, at most of the structures inspected. These common defects include:

- Minor erosion of slopes on culvert embankments and adjacent to bridge wingwalls.
- Excessive sand/granular material on deck surface due to winter maintenance or vehicle tracking.
- Clogged deck drains or lack of drainage.
- Erosion of stream banks at the water level.
- Debris collection and heavy vegetation at culvert and bridge openings.
- Lack of, damaged or non-code conforming guide rail.
- Minor asphalt defects (potholes, cracking).
- Lack of or missing hazard warning signs.

These general defects can be addressed within the Municipality's routine maintenance program and these issues can be added to the Municipality's in-house road and structure inspection routine.

Routine bridge sweeping, washing of decks, drains, joints, bearing seat areas and girders will improve a structures service life. Removal or trimming of vegetation and addressing minor erosion concerns regularly will pre-empt more serious issues.

The total estimated value of the work to be completed by the Municipality is approximately **\$97,000.00**. We recommend that a general allowance to complete the works described above be included in the Municipality's annual road maintenance budget.

A summary of maintenance needs is provided in Appendix B, along with estimated costs to complete the work.

2.2 Additional Studies/Investigations

As per the OSIM, additional investigations or surveys may be required to further assess the condition of certain elements that may not be fully determined by a visual inspection. In many cases, where a major rehabilitation of a structure is required or planned, the completion of additional studies or investigations will assist in developing appropriate rehabilitation programs. Studies or investigations may also be required where performance deficiencies are suspected. Typical investigations that may be required include:

- Deck condition surveys.
- Structure evaluations (Load Capacity).
- Monitoring of deformations, settlements, and movement.
- Monitoring crack widths.

A summary of the additional investigations recommended for the Municipality are summarized in Table 2 below:

Table 2 - Additional Investigations

Structure No./Name	Additional Investigation	Reasoning	Estimated Cost
0001	Structure Evaluation	Determine if the structure can accommodate the additional fill loading.	\$5,000.00
0003	Monitoring of Deformations, Settlements and Movements, Monitoring Crack Widths	Monitor deformations, bolt hole cracking and cusping during future biennial inspections to determine if actively progressing. If actively progressing, consider more frequent monitoring.	\$0.00
0008	Load Limit Evaluation	Determine the extent of strength reduction given the vintage and condition of the structure.	\$15,000.00
0010	Monitoring of Deformations, Settlements and Movements	Monitor approach slab settlement during future biennial inspections to determine if actively progressing.	\$0.00
0020	Monitoring of Deformations, Settlements and Movements	Monitor deformations and cusping during future biennial inspections to determine if actively progressing.	\$0.00
0021	Monitoring of Deformations, Settlements and Movements	Due to severe disintegration of concrete throughout the structure, it is recommended the Municipality monitor this structure closely and consider a 5-tonne load limit until replacement is a feasible option.	\$0.00
1002	Monitoring of Deformations, Settlements and Movements	Monitor deformations during future biennial inspections to determine if actively progressing.	\$0.00
1009	Monitoring of Deformations, Settlements and Movements	Monitor movement of gabion baskets during future biennial inspections to determine if actively progressing and unstable.	\$0.00
1011	Feasibility Study	Compare lining and grouting versus replacing the structure.	\$10,000.00
1016	Detailed Deck Condition Survey	Determine the extents of deck top rehabilitation work.	\$10,000.00
1020	Monitoring of Deformations, Settlements and Movements	Monitor cusping and reverse curvature during future biennial inspections to ensure structure stability.	\$0.00
1024	Load Limit Evaluation	Determine the current load carrying capacity.	\$5,000.00
Total			\$45,000.00

A summary of recommended studies and costs is also included in Appendix B.

2.3 Roadside Safety

During our inspections, Burnside makes note of the condition and effectiveness of roadside safety measures on the approaches to the structures. Where no roadside safety systems are present, Burnside has a responsibility to identify that there should be consideration given to installing roadside safety systems, i.e., guide rail and end treatments.

Roadside safety system requirements are set out in the MTO - Roadside Safety Manual which is a guideline provided to be used as a risk assessment tool in establishing the need, type, and extent of roadside safety measures.

As is discussed in more detail in the Manual, risk management is critical in assessing the need for roadside safety installations. At some structures, and on some roadways, the installation of guide rail systems may be seen as more of a hazard than not having a system. This may be a result of a reduction in road platform width, the ability to remove snow effectively, and the space available to place and anchor end treatments. Section 4.2.2.1 from the MTO - Roadside Design Manual states *that guide rail systems must be offset a minimum of 4.25 m from the roadway centerline, to provide clearance to snowplowing operations*. In addition, local use of a roadway by farm equipment and the location of driveway and field entrances around structures should also be considered in determining the need and effectiveness of guide rail systems.

In consideration of the above, costs to install guide rail on narrow Municipality roads with a platform width of 8.0 m or narrower have not been included in this report under the rehabilitation plan, unless bridge/road widening to 8.5 m or wider has been recommended as part of the rehabilitation plan. Installation of steel beam guide rail for replacement options is included within the replacement cost estimate.

For the purpose of this Report, where a high level review indicated that guide rail or guiderail components would be required (apparent substandard length of need, substandard end treatments, rigid barriers on the structure, small clear zone between the edge of road and edge of structure, etc.) a general allowance for a typical guide rail system installation has been provided, however, site specific and detailed assessments of need at each structure is not included in this Report. Where the need for a guiderail system was not evident based on high level review, an allowance for an investigation into the need for guiderail was provided. The total estimated cost relating to guide rail installation or investigation is **\$1,058,000.00**

Where recommendations have been made for installation or corrective measures, Burnside has identified that the work is to be completed within 1-5 years. However, as each site has unique characteristics relating to the requirements of guiderail, Burnside also recommends that a further investigation and risk analysis of each of the identified sites be completed by the Municipality within one year to classify the structures as high,

medium, or low priority for guide rail installation or improvements. The study may also outline a timeline for guide rail upgrades based on annual guide rail budget.

2.3.1 Pedestrian and Inspector Safety

During inspections, Burnside makes note of the condition and effectiveness of the pedestrian barricades installed at bridges and culverts. MTO Bulletin, BO2020-03 Guards on Structures, was issued on April 7, 2020, and provides recommendations for the installation of guards on culvert ends and retaining walls for the safety of the public and inspectors.

The bulletin recommends that where an area is accessible to the public and an exposed height of greater than 0.6 m is present, a guard meeting the Ontario Building Code requirements shall be installed to protect the public from fall hazards. Additionally, in areas not accessible to the public and where exposed heights greater than 2.4 m are present, a guard shall be installed on culvert ends, or on top of retaining walls to protect inspectors from fall hazards.

It is further noted in the bulletin that a fall hazard risk assessment is to be completed and the need for guards determined by the MTO, or the Owner as appropriate. Installation of guards is recommended to be included as part of any major capital program, and in unique situations may be completed as a standalone installation if warranted.

Burnside has identified locations that could be considered high risk for pedestrians where the lack of guards, or poor condition of existing guards exist. Costs for replacement / installation of guards have been included in the recommended work programs.

2.4 Repair, Rehabilitation or Replacement

Recommended repair, rehabilitation or replacement work is provided on the OSIM form for each bridge and culvert. The recommended work is indicated for each element and outlines the priority and estimated construction cost. The priorities for the specified rehabilitation or replacement plans are typically identified on the OSIM forms as six to ten years, one to five years, within one year, and urgent.

The costs associated with the recommended work are based on the measured quantities of fair and poor element conditions and unit costs for similar and recent works. In many instances, where only minor works are required, the costs for mobilization, site access and or waterway control items (as required) are difficult to assess and may skew the costs of small-scale works. This work is often best completed by grouping similar efforts together.

For repair programs that require a number of prolonged on-site activities, we have assigned a variable general cost that may range from \$20,000.00 to \$100,000.00, to address some of the mobilization, insurance, bonding and related costs of being on-site.

Where the recommended work is the replacement of the structure, these general costs are assumed to be included in the overall replacement cost.

Construction cost estimates do not include property acquisition, utilities relocation or support, or engineering fees associated for the works beyond the structure limits, unless specifically identified within the individual OSIM forms.

The total estimated cost for the capital works for all 45 structures within the Municipality, (including rehabilitation/repair and replacement costs) has been estimated as follows:

Table 3 - Capital Works Costs and Timeframes

Time Frame	Capital Cost
< 1 year	\$10,907,500.00
1 – 5 years	\$4,122,500.00
6 – 10 years	\$5,031,000.00
TOTAL	\$20,061,000.00

The total, 10-year estimated capital costs, which includes the above as well as all other associated costs including maintenance, additional investigations, and roadside protection costs, is \$21,261,000.00. It should be noted that all costs are based on 2022 prices and do not account for inflation. A summary of the capital works needs can be found in Appendix B.

2.5 Load Postings and Recommendations

Load postings may be recommended for structures based on age, condition, noted performance deficiencies or based on the findings of a structural evaluation. A summary of the current and proposed load postings for the Municipality's inventory, as well as the reasoning for the posting, is provided in Table 4 below.

Table 4 - Load Postings and Recommendations

Bridge Name	Load Posting (tonnes)		Reasoning
	Current	Proposed	
0007	11	Closure	Structure closure recommended until Municipality can budget for replacement.
0008	None	18	Load limit should be applied given the vintage and condition of the structure. Determine the extent of strength reduction due to the corrosion noted on the structural steel.
0013	3	3	Maintain previously posted load limit unless otherwise determined it can be removed.
0015	16	16	Maintain previously posted load limit unless otherwise determined it can be removed.
0016	11/21/30	5	The load posting should be reduced given the actively progressing severe corrosion noted on the key structural elements.
0019	16	16	Maintain previously posted load limit unless otherwise determined it can be removed.
0021	11	5	The load posting should be reduced given the continued deterioration of key structural elements.
1003	5	5	Maintain previously posted load limit unless otherwise determined it can be removed.
1024	None	5	Load limit should be applied given the overall condition of the structure.

3.0 Bridge Condition Index

The Bridge Condition Index (BCI) for each structure has been determined based on the Ministry of Transportation Ontario (MTO) methodology followed in the MTO Document, MTO Bridge Condition index and Overall Measure of Bridge Condition, July 2009.

A new structure would have a BCI value of 100 and the value will decline over time. Monitoring the rate of decline in the BCI and comparing this with an anticipated rate of decline will provide the Municipality with valuable, long-term planning and asset management information. The reduction in BCI, in theory, is a function of many factors, including traffic volume, truck use, use of de-icing chemicals, exposure to the elements and the type of structure. Each bridge will decline at its own rate, but it is reasonable to expect that the decline begins slowly and accelerates as the structure gets older.

In addition, determining an individual BCI value at any point in time will allow the Municipality to make estimates of expected remaining service life and or establish target BCI criteria for major rehabilitations or replacements.

The Canadian Highway Bridge Design Code has a target service life of approximately 75 years, but it is recognized that maintenance, repair, and rehabilitations will be required along the way to reach or exceed this target.

As indicated, the BCI for a structure can range from 0 to 100 and a municipal bridge and culvert infrastructure can be organized into several ranges.

Good – BCI Range 70 to 100

A bridge with a BCI greater than 70 is generally considered to be in good to excellent condition, and repair or rehabilitation work is not usually required within the next five years. Routine maintenance, such as sweeping, cleaning, and washing are still recommended.

Fair – BCI Range 50 to 70

A bridge with a BCI between 50 and 70 is generally considered to be in good to fair condition. Repair or rehabilitation work recommended is ideally scheduled to be completed within the next five years. This is the ideal time to schedule major bridge repairs for larger and/or critical structures from an economic perspective. The most effective improvement in a structure's service life can be achieved by completing repairs while in this range.

Poor – BCI Less than 50

A bridge with a BCI rating of less than 50 is generally considered poor with lower numbers representing structures nearing the end of their service life. The repair or rehabilitation of these structures is ideally best scheduled to be completed within approximately one year. However, if it is determined that the replacement of the structure would be a more viable, practical, or economical solution than repairing the structure, the structure can be identified for continued monitoring and scheduled for replacement within a one-to-ten-year range. The lower the BCI the more of a priority, within the one-to-ten-year range, the replacement becomes.

4.0 Structure Inventory Trends

Based on the biennial inspection of each structure, the Bridge Condition Index (BCI) is calculated for each structure. The Bridge Condition Index Distribution graph, shown in Figure 2 below, provides a summary of the current state of the Municipality's structures, and Figure 3 shows the historical trend of the state of the structures over past inspections where BCI information was available.

Figure 2 - Bridge Condition Index Distribution (2022)

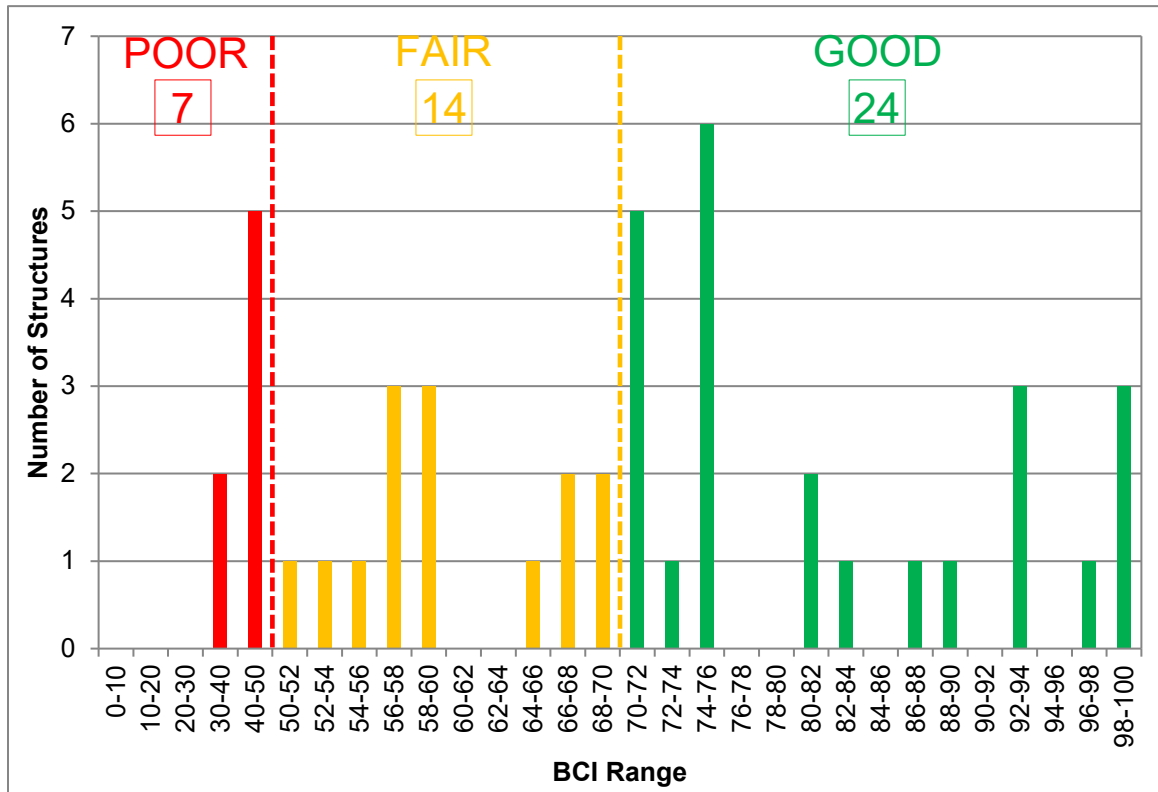
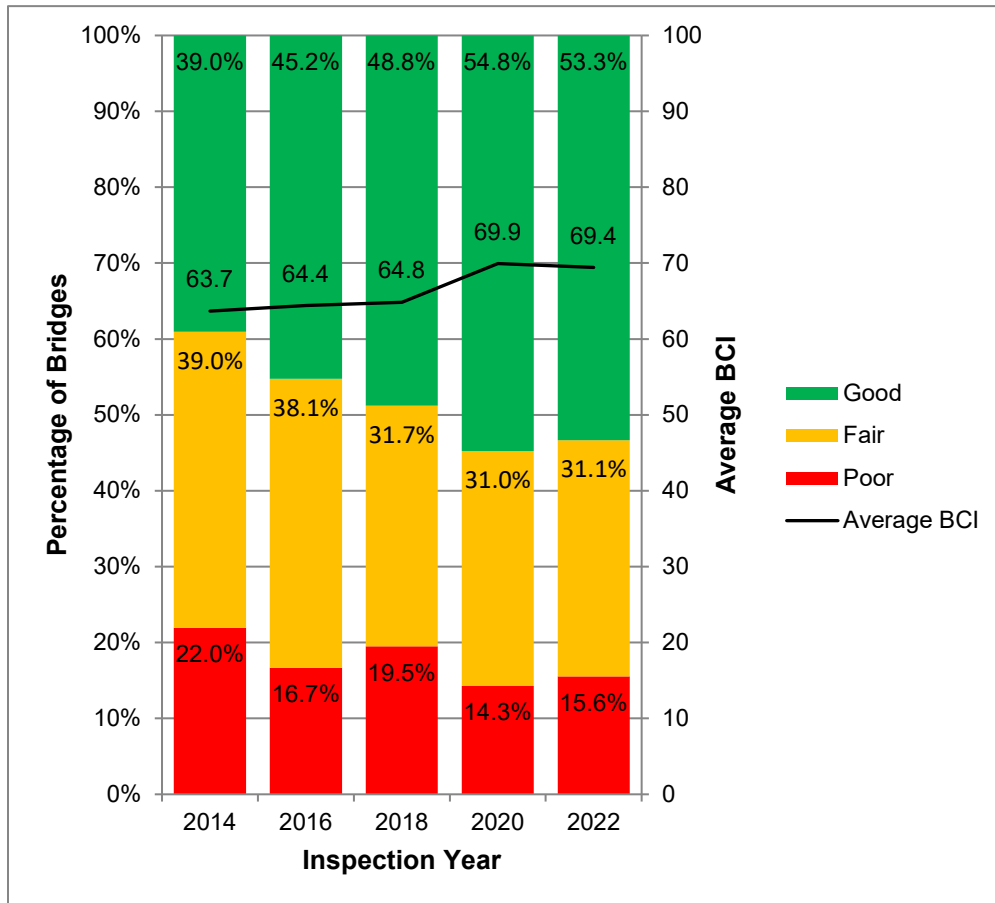


Figure 3 - Bridge Condition Index Historical Trend



Currently, only approximately 53.3% of the Municipality’s structures are within the “good” range, with 31.1% of the structures classified as “fair” and 15.6% classified as “poor”, as illustrated in Figure 3 above. Of interest, the MTO has established a goal of maintaining 85% of their structures in “good” condition (BCI \geq 70) by addressing rehabilitations and replacements as necessary. Burnside recognizes that the above goal was not established by the Municipality, but it is noted that, based on the current state of the inspected structures, the Municipality is showing adequate management of their bridge assets when compared to the MTO’s established goal.

The trend in Figure 3 identifies that the overall average BCI of the Township’s inventory has essentially remained flat over the last 2 years primarily, and this is due to additional structures in poor condition being added to the 2022 Structure Inventory offsetting the replacements that were recently completed. It is acknowledged that the Municipality had completed the following capital works projects since the 2020 inspections:

- Structure No. 1013 (Concession 10) - Replaced in 2020
- Structure No. 0025 (Concession 10) - Replaced in 2020
- Structure No. 1022 (Sideroad 15 N) - Replaced 2022

Projects currently in the design or construction stages include:

- Structure No. 1010 (Adam Street)
- Structure No. 0002 (Concession 2)
- Structure No. 1019 (Sideroad 35)
- Structure No. 0015 (Concession 12)

Continued maintenance and completion of rehabilitative or replacement works as recommended in this report will help to continue this trend of overall improvement of the Municipality's bridge assets.

The MTO has also developed theoretical deterioration curves which can be used as a backdrop to estimate the remaining service life of a structure before replacement, or to establish a time frame for future rehabilitations.

For the purposes of this report, culverts and bridges less than 4.5 m in span are assumed not to have a rehabilitation cycle. These structures will be monitored and planned for replacement when their BCI drops below a lower limit of 40. However, even though our recommendation is to replace a structure, the costs to repair identified defects are included on the OSIM forms should the Municipality wish to repair these structures.

For structures with spans greater than 4.5 m, it has been assumed that a structure will be rehabilitated once during its lifetime. The rehabilitations are scheduled when the structures reach a target BCI of 60. However, for certain larger, more significant bridges, rehabilitation options may still be viable for BCI's lower than 60, but these will be considered on a site-by-site basis.

The estimated time until replacement or rehabilitation is required has been provided and the costs for all works required in the next ten years are identified.

5.0 Prioritization and Recommended Work

As an initial measure for prioritizing any required work, the structures have been ranked using their BCI values. A summary of the structures, in ascending order of BCI, along with their associated preliminary construction costs has been included in Appendix B. Two separate summary tables have been created to identify replacement and rehabilitation priority structures.

It should be noted that although the BCI is a good measure of the overall condition of the bridge, and therefore relative construction need, other factors are often considered when programming and prioritizing bridge work. Other factors that may be considered include:

- Traffic volume and number of trucks that regularly use the road.
- Load capacity restrictions at the site.

- Geometric restrictions (alignment or width).
- Pedestrian or cycling requirements.
- History of accidents or traffic conflicts.
- History of flooding or ice problems.
- Area growth and development.
- In conjunction with already planned road improvements.

The prioritized capital works plan and associated construction costs can be used for estimating future capital budgets. The budgets and rehabilitation work plans have been provided for the Municipality’s highest priority structures. The structures provided below have been identified as requiring rehabilitation work or replacement in the next five years. The structures have been identified for rehabilitation or replacement based on their condition during the latest completed inspection.

Table 5 - Top Priority Structures (Based on BCI Rating)

Structure No./Name	Road Name	Recommended Work	Estimated Construction Cost
0009	Sideroad 25N	Replace (currently decommissioned)	\$1,872,500.00
1024	Concession Rd C	Replace	\$517,500.00
0015	Concession 12	Replace	\$1,430,500.00
0021	Sideroad 1A	Replace	\$741,500.00
0007	Sideroad 25N	Closure	N/A
0002	Concession 2	Replace	\$716,500.00
1019	Sideroad 35	Replace	\$656,500.00
0013	Concession 12	Replace	\$596,500.00
0017	Concession 4	Rehabilitation	\$463,000.00
0001	Concession 2	Replace	\$1,016,500.00
0016	Concession 14	Replace	\$2,973,000.00
1011	Concession 10	Rehabilitation	\$479,000.00
0008	Concession 8	Rehabilitation	\$912,000.00
0003	Concession 4	Rehabilitation	\$335,000.00
Total			\$12,710,000.00

The structures in the 5-year Capital Plan shown below in Table 6 have been recommended for rehabilitation or replacement based on their condition during the latest completed inspection, but also take into account additional factors through recent discussions with Municipality, such as traffic volume roads, scheduled reconstruction projects, load limitations, close proximity of priority structures, etc.

Table 6 - 5-Year Capital Plan

Year	Design and Planning (Engineering)		Capital Works (Construction)		Total Annual Budget
	Structure No.	Cost	Structure No.	Cost	
2023	0015 (Replacement 'Shovel Ready' Design)	\$90,000	0002 (Replacement)	\$592,000	\$734,000
	1019 (Replacement)	\$20,000			
	0003 (Repair)	\$2,000			
	0007 (Closure)	-	0003 (Repair)	\$30,000	
2024	0017 (Rehabilitation)	\$40,000	1019 (Replacement)	\$650,000	\$690,000
2025	0016 (Rehabilitation)	\$65,000	0017 (Rehabilitation)	\$350,000	\$415,000
2026	-		0015 (Replacement)	\$1,324,500	\$1,324,500
2027	1024 (Replacement of Superstructure)	\$40,000	0016 (Rehabilitation)	\$957,000	\$997,000
2028	-	-	1024 (Replacement of Superstructure)	\$482,500	\$482,500
Total (Engineering + Construction)					\$4,643,000

Note: The Municipality has requested the design of Structure 0021 Replacement be put on hold for the time being, and therefore this structure has been omitted from the 5-Year Capital Plan. In addition, at the request of the Municipality, Structure 0009 which is currently decommissioned (closed to through traffic) has also been omitted from the 5-Year Plan.

6.0 Summary

The 2022 OSIM inspections were carried out by Burnside on behalf of the Municipality of South Bruce to identify the current condition of all the structures within the Municipality's inventory. The Summary Reports provided in Appendix A summarize the maintenance needs, additional investigations, and capital works requirements for each structure. The capital works for each structure has been given a priority of six to ten years, one to five years, within one year and urgent, based on the current BCI.

We trust the summary report provides all the information that you require at this time. If you have any questions or comments, please do not hesitate to contact us.



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Appendix A

Summary Reports

1.1 Structure No. 0001 (MTO No. 2-238)

2022 BCI: 56.2

<u>Structure Name:</u>	Structure No. 0001 (O'Malley Bridge)		
<u>Road Name:</u>	Concession 2		
<u>Location:</u>	Lot 7, Concession 2/3, Culross Survey		
<u>Structure Type:</u>	Cast-In-Place Conc. Rigid Frame		
<u>Number of Spans:</u>	1	<u>Span Lengths:</u>	5.5 (6.1 skew span) m
<u>Overall Structure Width:</u>	9.2 m	<u>Roadway Width:</u>	6.7 m
<u>Year of Construction:</u>	1930	<u>Current Load Limit:</u>	N/A



Recommendation: Structure replacement is recommended within 4 years.

Justification:

Structure No. 0001 is generally in fair to poor condition with large areas of unsound concrete noted throughout and a considerable amount of additional fill placed over the deck (300-400 mm) that the structure may not have been intended to carry. There is evidence of a previous rehabilitation to the structure, but the date is unknown. Due to road profile adjustment requirements associated with additional fill on the deck and given a previous rehabilitation has been completed, it is recommended that the Municipality forgo an additional rehabilitation and replace the structure. Due to the condition of the deck and wingwalls, replacement is recommended within approximately 4 years. Alternatively, the Municipality may wish to complete a study into the economical feasibility of repairing the structure versus replacing it to determine the best course of action. If a rehabilitation is elected, the above noted repairs should be completed within the next year. A structure evaluation should be considered to determine if the bridge can accommodate the additional fill loading. Consideration should also be given to replacing the steel beam guide rail system to help protect oncoming traffic.

Maintenance Need	Element and Comments	Estimated Cost
Erosion Control	Repair eroded embankments and place rock protection	\$2,500.00
Rout and Seal	Rout and seal cracks in wearing surface	\$1,000.00
Maintenance Needs Total		\$3,500.00

Additional Investigations	Priority	Estimated Cost
Structure Evaluation,	Normal	\$5,000.00

Roadside Protection Repairs	Priority	Estimated Cost
Replace Guide Rail, end treatments and structure connections	1 to 5 Years	\$95,000.00

Rehabilitation/Repair Required	Priority	Estimated Cost
Type A concrete repairs to deck top, curbs,	Within 1 year	\$5,000.00
Type B concrete repairs to soffit,	Within 1 year	\$31,000.00
Type C concrete repairs to abutment walls, wingwalls,	Within 1 year	\$35,000.00
Waterproof and pave	Within 1 year	\$25,000.00
Add slope stabilization	Within 1 year	\$10,000.00
General Items - Insurance, Mobilization, Access etc.	Within 1 year	\$125,000.00
Rehabilitation Cost Subtotal		\$231,000.00

Estimate Value of Replacement Structure	\$750,000.00
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Associated Work	Priority	Estimated Cost
Approaches -		\$0.00
Detours -		\$0.00
Traffic Control -	Within 1 year	\$15,000.00
Utilities -		\$0.00
Right of Way -		\$0.00
Environmental -		\$0.00
Other -		\$0.00
Total Associated Work Cost		\$15,000.00

Total Capital Works Costs			
Cost		Rehabilitation	Replacement
Subtotal:		\$246,000.00	\$765,000.00
Roadside Protection:		\$95,000.00	\$95,000.00
Staging:		N/A	\$0.00
Environmental Assessment		N/A	\$2,500.00
Contingencies:	10%	\$25,000.00	\$77,000.00
Engineering Design:	10% of first \$1M + 5% of cost above \$1M	\$25,000.00	\$77,000.00
Total Capital Work Cost		\$391,000.00	\$1,016,500.00

1.2 Structure No. 0002 (MTO No. 2-335)

2022 BCI: 46.5

<u>Structure Name:</u>	Structure No. 0002 (Falconer Bridge)		
<u>Road Name:</u>	Concession 2		
<u>Location:</u>	Lot 28, Concession 2/3, Culross Survey		
<u>Structure Type:</u>	Cast-In-Place Conc. Rigid Frame		
<u>Number of Spans:</u>	1	<u>Span Lengths:</u>	5.8 (6.15 skew span) m
<u>Overall Structure Width:</u>	7.8 m	<u>Roadway Width:</u>	6.7 m
<u>Year of Construction:</u>	1940	<u>Current Load Limit:</u>	N/A



Recommendation: Structure replacement is recommended as soon as possible.

Justification:

Structure No. 0002, which has evidence of previous rehabilitation work, is generally in poor condition with signs of further deterioration since the 2018 inspection. This structure is scheduled for replacement in 2023.

Maintenance Need	Element and Comments	Estimated Cost
		\$0.00
		\$0.00
Maintenance Needs Total		\$0.00

Additional Investigations	Priority	Estimated Cost
	Normal	\$0.00

Roadside Protection Repairs	Priority	Estimated Cost
	1 to 5 Years	\$0.00

Rehabilitation/Repair Required	Priority	Estimated Cost
	N/A	\$0.00
	N/A	\$0.00
	N/A	\$0.00
	N/A	\$0.00
	N/A	\$0.00
Rehabilitation Cost Subtotal		\$0.00

Estimate Value of Replacement Structure	\$500,000.00
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Associated Work	Priority	Estimated Cost
Approaches -		\$0.00
Detours -		\$0.00
Traffic Control -	Within 1 year	\$15,000.00
Utilities -		\$0.00
Right of Way -		\$0.00
Environmental -		\$0.00
Other -		\$0.00
Total Associated Work Cost		\$15,000.00

Total Capital Works Costs			
Cost		Rehabilitation	Replacement
Subtotal:		N/A	\$515,000.00
Roadside Protection:		N/A	\$95,000.00
Staging:		N/A	\$0.00
Environmental Assessment		N/A	\$2,500.00
Contingencies:	10%	N/A	\$52,000.00
Engineering Design:	10% of first \$1M + 5% of cost above \$1M	N/A	\$52,000.00
Total Capital Work Cost		N/A	\$716,500.00

1.3 Structure No. 0003 (MTO No. 2-337)

2022 BCI:

66.3

<u>Structure Name:</u>	Structure No. 0003 (Lorenz Bridge)		
<u>Road Name:</u>	Concession 4		
<u>Location:</u>	Lot 6, Concession 4/5, Culross Survey		
<u>Structure Type:</u>	CSP Multi-Plate Arch Culvert(s)		
<u>Number of Spans:</u>	2	<u>Span Lengths:</u>	5.5 m
<u>Overall Structure Width:</u>	23.2 m	<u>Roadway Width:</u>	7.4 m
<u>Year of Construction:</u>	1984	<u>Current Load Limit:</u>	N/A



Recommendation: Minor Rehabilitation is recommended within 1 years.

Justification:

Structure No. 0003 is made up of twin-cell CSP arch culverts which generally appear to be in fair condition and were noted to have bolt hole cracking within the east barrel due to the improper bolting pattern used. Consideration should be given to repairing the bolt hole cracking as soon as possible to prevent further deterioration to the barrel by welding rebar across the cracks or spraying shotcrete beams across the cracked areas. The bolt hole cracking and minor deformation in the west culvert should be monitored closely during future biennial inspections, as these deficiencies affect the structural capacity of the culvert. If the deformation becomes greater than 10% of the culvert diameter, consideration should be given to establishing a monitoring program. In the interim, consideration should also be given to installing a guide rail barrier system over the culverts to help protect oncoming vehicular traffic.

Maintenance Need	Element and Comments	Estimated Cost
Bridge Cleaning	Remove overgrown vegetation around culverts	\$1,500.00
Maintenance Needs Total		\$1,500.00

Additional Investigations	Priority	Estimated Cost
Monitoring of Deformations, Settlements and Movements, Monitoring Crack Widths,	Normal	\$0.00

Roadside Protection Repairs	Priority	Estimated Cost
Replace Guide Rail, end treatments	1 to 5 Years	\$95,000.00

Rehabilitation/Repair Required	Priority	Estimated Cost
Repair bolt hole cracking (shotcrete beam / welded steel reinforcing)	Within 1 year	\$75,000.00
General Items - Insurance, Mobilization, Access etc.	Within 1 year	\$125,000.00
Rehabilitation Cost Subtotal		\$200,000.00

Estimate Value of Replacement Structure	\$1,100,000.00
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Associated Work	Priority	Estimated Cost
Approaches -		\$0.00
Detours -		\$0.00
Traffic Control -		\$0.00
Utilities -		\$0.00
Right of Way -		\$0.00
Environmental -		\$0.00
Other -		\$0.00
Total Associated Work Cost		\$0.00

Total Capital Works Costs			
Cost		Rehabilitation	Replacement
Subtotal:		\$200,000.00	\$1,100,000.00
Roadside Protection:		\$95,000.00	\$95,000.00
Staging:		N/A	\$0.00
Environmental Assessment		N/A	\$2,500.00
Contingencies:	10%	\$20,000.00	\$110,000.00
Engineering Design:	10% of first \$1M + 5% of cost above \$1M	\$20,000.00	\$105,000.00
Total Capital Work Cost		\$335,000.00	\$1,412,500.00

1.4 Structure No. 0004 (MTO No. 2-336)

2022 BCI: 74.6

<u>Structure Name:</u>	Structure No. 0004 (Kennedy Bridge)		
<u>Road Name:</u>	Concession 4		
<u>Location:</u>	Lot 12, Concession 4/5, Culross Survey		
<u>Structure Type:</u>	CSP Arch Culvert(s)		
<u>Number of Spans:</u>	1	<u>Span Lengths:</u>	6 m
<u>Overall Structure Width:</u>	24 m	<u>Roadway Width:</u>	7.1 m
<u>Year of Construction:</u>	1982	<u>Current Load Limit:</u>	N/A



Recommendation: No Capital Works is estimated to be required within the next 10 years.

Justification:

Structure No. 0004 generally appears to be in good condition showing no major signs of deterioration outside of typical surface corrosion. Improper bolting patterns are present on the structure which are prone to bolt hole cracking in the areas of concentrated stress at the tighter radius plates; however, no cracks were noted at the time of inspection. These areas, as well as the minor plate cusping on the top of the culvert should be closely monitored during future inspections. If the plate cusping deformation becomes greater than 10 mm, consideration should be given to establishing a monitoring program. Based on the current BCI, replacement should be scheduled in approximately 17-18 years if the BCI continues to drop at a rate matching the projected deterioration curves typical of this structure type. In the interim, consideration should be given to installing a proper guide rail barrier system over the structure to help protect oncoming vehicular traffic.

Maintenance Need	Element and Comments	Estimated Cost
Bridge Cleaning	Remove overgrown vegetation around culvert	\$1,000.00
Hazard Signs	Replace hazard warning signs at structure	\$1,000.00
Maintenance Needs Total		\$2,000.00

Additional Investigations	Priority	Estimated Cost
	Normal	\$0.00

Roadside Protection Repairs	Priority	Estimated Cost
Replace Guide Rail, end treatments	1 to 5 Years	\$95,000.00

Rehabilitation/Repair Required	Priority	Estimated Cost
	N/A	\$0.00
	N/A	\$0.00
	N/A	\$0.00
	N/A	\$0.00
	N/A	\$0.00
Rehabilitation Cost Subtotal		\$0.00

Estimate Value of Replacement Structure	\$650,000.00
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Associated Work	Priority	Estimated Cost
Approaches -		\$0.00
Detours -		\$0.00
Traffic Control -	N/A	\$15,000.00
Utilities -		\$0.00
Right of Way -		\$0.00
Environmental -		\$0.00
Other -		\$0.00
Total Associated Work Cost		\$15,000.00

Total Capital Works Costs			
Cost		Rehabilitation	Replacement
Subtotal:		N/A	\$665,000.00
Roadside Protection:		N/A	\$95,000.00
Staging:		N/A	\$0.00
Environmental Assessment		N/A	\$2,500.00
Contingencies:	10%	N/A	\$67,000.00
Engineering Design:	10% of first \$1M + 5% of cost above \$1M	N/A	\$67,000.00
Total Capital Work Cost		N/A	\$896,500.00

1.5 Structure No. 0005 (MTO No. 2-340)

2022 BCI:

70

<u>Structure Name:</u>	Structure No. 0005		
<u>Road Name:</u>	Sideroad 5A		
<u>Location:</u>	Lot 5/6 Concession 2, Culross Survey		
<u>Structure Type:</u>	Cast-In-Place Conc. Rigid Frame		
<u>Number of Spans:</u>	1	<u>Span Lengths:</u>	7.35 m
<u>Overall Structure Width:</u>	8.1 m	<u>Roadway Width:</u>	4.5 m
<u>Year of Construction:</u>	1950	<u>Current Load Limit:</u>	N/A



Recommendation: Minor Rehabilitation is recommended within 10 years.

Justification:

Structure No. 0005 is a concrete rigid frame structure that is over 65 years old but generally appears to be in good to fair condition with localized concrete deficiencies noted. This structure is an ideal candidate for future rehabilitation work as the BCI approaches 60, which is estimated to occur in approximately 10 years time based on typical degradation curves for this structure type. Rehabilitation work consisting of concrete repairs, installation of guiderail, and waterproofing and paving is recommended.

Maintenance Need	Element and Comments	Estimated Cost
Bridge Cleaning	Remove vegetation along curbs and trees in close proximity to structure	\$2,500.00
Hazard Signs	Install hazard warning signs at structure	\$1,000.00
Maintenance Needs Total		\$3,500.00

Additional Investigations	Priority	Estimated Cost
	Normal	\$0.00

Roadside Protection Repairs	Priority	Estimated Cost
Narrow Structure, install guide rail during rehab/replacement	1 to 5 Years	\$0.00

Rehabilitation/Repair Required	Priority	Estimated Cost
Type A concrete repairs to end post, posts, deck top, curbs,	6 to 10 years	\$10,000.00
Type B concrete repairs to soffit,	6 to 10 years	\$25,000.00
Type C concrete repairs to abutment walls, wingwalls,	6 to 10 years	\$2,000.00
Waterproof and pave	6 to 10 years	\$30,000.00
Install guide rail	6 to 10 years	\$95,000.00
General Items - Insurance, Mobilization, Access etc.	6 to 10 years	\$125,000.00
Rehabilitation Cost Subtotal		\$287,000.00

Estimate Value of Replacement Structure	\$750,000.00
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Associated Work	Priority	Estimated Cost
Approaches -		\$0.00
Detours -		\$0.00
Traffic Control -	6 to 10 Years	\$15,000.00
Utilities -		\$0.00
Right of Way -		\$0.00
Environmental -		\$0.00
Other -		\$0.00
Total Associated Work Cost		\$15,000.00

Total Capital Works Costs			
Cost		Rehabilitation	Replacement
Subtotal:		\$302,000.00	\$765,000.00
Roadside Protection:		\$0.00	\$95,000.00
Staging:		N/A	\$0.00
Environmental Assessment		N/A	\$2,500.00
Contingencies:	10%	\$31,000.00	\$77,000.00
Engineering Design:	10% of first \$1M + 5% of cost above \$1M	\$31,000.00	\$77,000.00
Total Capital Work Cost		\$364,000.00	\$1,016,500.00

1.6 Structure No. 0006 (MTO No. 2-338)

2022 BCI:

73.1

<u>Structure Name:</u>	Structure No. 0006 (Martin Bridge)		
<u>Road Name:</u>	Sideroad 5A		
<u>Location:</u>	Lot 5/6, Concession 3, Culross Survey		
<u>Structure Type:</u>	Cast-In-Place Conc. Rigid Frame		
<u>Number of Spans:</u>	1	<u>Span Lengths:</u>	12.15 m
<u>Overall Structure Width:</u>	8.35 m	<u>Roadway Width:</u>	5.5 m
<u>Year of Construction:</u>	1962	<u>Current Load Limit:</u>	N/A



Recommendation: No Capital Works estimated to be required within 10 years. Future structure rehabilitation should be considered.

Justification:

Structure No. 0006 generally appears to be in good condition showing only very localized concrete deficiencies. The joint in the barriers were sealed in 2016, however; the Styrofoam seals are holding water and contributing to localized spalling in the barriers. Based on the current BCI, this structure should be scheduled for rehabilitation work in approximately 13 years based on typical deterioration rates for this structure type. However, the BCI should be monitored in future biennial inspections and the years to rehabilitation can be adjusted accordingly. During the rehabilitation it is recommended to remove the fill from above the bridge and waterproof and pave the structure to help extend the service life of the bridge. It is also recommended that the barrier be replaced with a current code conforming system. In the interim, consideration should be given to installing approach guide rail as soon as possible to help protect oncoming vehicular traffic from the exposed concrete barrier ends.

Maintenance Need	Element and Comments	Estimated Cost
Bridge Cleaning	Remove vegetation growing along shoulders	\$1,000.00
Erosion Control	Install rock protection along wingwalls	\$2,500.00
Hazard Signs	Install hazard warning signs on posts at structure	\$1,000.00
Other	Replace Styrofoam joint sealants in barriers with caulking	\$1,000.00
Maintenance Needs Total		\$5,500.00

Additional Investigations	Priority	Estimated Cost
	Normal	\$0.00

Roadside Protection Repairs	Priority	Estimated Cost
Install Guide Rail, end treatments and structure connections	1 to 5 Years	\$95,000.00

Rehabilitation/Repair Required	Priority	Estimated Cost
	N/A	\$0.00
	N/A	\$0.00
	N/A	\$0.00
	N/A	\$0.00
	N/A	\$0.00
Rehabilitation Cost Subtotal		\$0.00

Estimate Value of Replacement Structure	\$1,200,000.00
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Associated Work	Priority	Estimated Cost
Approaches -		\$0.00
Detours -		\$0.00
Traffic Control -	N/A	\$15,000.00
Utilities -		\$0.00
Right of Way -		\$0.00
Environmental -		\$0.00
Other -		\$0.00
Total Associated Work Cost		\$15,000.00

Total Capital Works Costs			
Cost		Rehabilitation	Replacement
Subtotal:		N/A	\$1,215,000.00
Roadside Protection:		N/A	\$95,000.00
Staging:		N/A	\$0.00
Environmental Assessment		N/A	\$2,500.00
Contingencies:	10%	N/A	\$122,000.00
Engineering Design:	10% of first \$1M + 5% of cost above \$1M	N/A	\$111,000.00
Total Capital Work Cost		N/A	\$1,545,500.00

1.7 Structure No. 0007 (MTO No. 2-309)

2022 BCI: 46.1

<u>Structure Name:</u>	Structure No. 0007 (Green Bridge)		
<u>Road Name:</u>	Sideroad 25N		
<u>Location:</u>	Lot 25/26, Concession 7, Culross Survey		
<u>Structure Type:</u>	Through Girder (Concrete)		
<u>Number of Spans:</u>	2	<u>Span Lengths:</u>	12, 12 m
<u>Overall Structure Width:</u>	6 m	<u>Roadway Width:</u>	4.8 m
<u>Year of Construction:</u>	1910	<u>Current Load Limit:</u>	11 tonnes



Recommendation: Closure of the structure is recommended

Justification:

Structure No. 0007 is over 105 years old and generally in poor condition with severe concrete deterioration. A detailed deck condition survey was completed in 2015/2016 and determined that rehabilitating the existing concrete is not a feasible option. Therefore, given the vintage, type of the structure (single load path) and the amount of poor concrete observed in the key structural elements, replacement should be scheduled as soon as possible with a full two lane structure. It is recommended that this structure be closed until sufficient budget can be allocated for replacement.

Maintenance Need	Element and Comments	Estimated Cost
		\$0.00
		\$0.00
Maintenance Needs Total		\$0.00

Additional Investigations	Priority	Estimated Cost
	Normal	\$0.00

Roadside Protection Repairs	Priority	Estimated Cost
	1 to 5 Years	\$0.00

Rehabilitation/Repair Required	Priority	Estimated Cost
	N/A	\$0.00
	N/A	\$0.00
	N/A	\$0.00
	N/A	\$0.00
	N/A	\$0.00
Rehabilitation Cost Subtotal		\$0.00

Estimate Value of Replacement Structure	\$1,700,000.00
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Associated Work	Priority	Estimated Cost
Approaches -		\$0.00
Detours -		\$0.00
Traffic Control -	Within 1 year	\$15,000.00
Utilities -		\$0.00
Right of Way -		\$0.00
Environmental -		\$0.00
Other -		\$0.00
Total Associated Work Cost		\$15,000.00

Total Capital Works Costs			
Cost		Rehabilitation	Replacement
Subtotal:		N/A	\$1,715,000.00
Roadside Protection:		N/A	\$95,000.00
Staging:		N/A	\$0.00
Environmental Assessment		N/A	\$2,500.00
Contingencies:	10%	N/A	\$172,000.00
Engineering Design:	10% of first \$1M + 5% of cost above \$1M	N/A	\$136,000.00
Total Capital Work Cost		N/A	\$2,120,500.00

1.8 Structure No. 0008 (MTO No. 2-301)

2022 BCI:

64

<u>Structure Name:</u>	Structure No. 8 (McPherson Bridge)		
<u>Road Name:</u>	Concession 8		
<u>Location:</u>	Lot 28, Concession 8/9, Culross Survey		
<u>Structure Type:</u>	Steel Truss (Concrete Deck)		
<u>Number of Spans:</u>	1	<u>Span Lengths:</u>	31.5 m
<u>Overall Structure Width:</u>	6.55 m	<u>Roadway Width:</u>	5.2 m
<u>Year of Construction:</u>	1940	<u>Current Load Limit:</u>	N/A



Recommendation: Major Rehabilitation is recommended within 4 years.

Justification:

Structure No. 0008 is over 75 years old, with evidence of a previous major rehabilitation to the structure. Generally, the bridge appears to be in fair condition with signs of corrosion and areas of localized minor to moderate section loss to the structural steel members. Typically, a bridge of this nature would be rehabilitated for a second time when the BCI approaches 60 and often replaced when the BCI reaches 40. Given the relatively high cost of replacement, the Municipality may wish to complete a second major rehabilitation in approximately 4 years when the BCI reaches 60. Replacement would most likely be required in approximately 14 years if no rehabilitation work is completed. Given the vintage of the structure and the corrosion noted, a load limit evaluation may be completed prior to the rehabilitation. If a load limit evaluation is not completed, we would recommend a single load limit of 18 tonnes be placed on this structure.

Maintenance Need	Element and Comments	Estimated Cost
Bridge Cleaning	Sweep deck, flush joints & clean brg. seats	\$2,500.00
Deck Joint Repair	Replace missing bolts in armouring	\$500.00
Maintenance Needs Total		\$3,000.00

Additional Investigations	Priority	Estimated Cost
Structure Evaluation,	Normal	\$15,000.00

Roadside Protection Repairs	Priority	Estimated Cost
Narrow Structure, install guide rail during rehab/replacement	1 to 5 Years	\$0.00

Rehabilitation/Repair Required	Priority	Estimated Cost
Type A concrete repairs to curbs,	1 to 5 years	\$5,000.00
Type B concrete repairs to soffit,	1 to 5 years	\$5,000.00
Type C concrete repairs to abutment walls, wingwalls,	1 to 5 years	\$25,000.00
Sandblast and painting required to structural steel	1 to 5 years	\$185,000.00
Steel repairs	1 to 5 years	\$200,000.00
Replace bearings	1 to 5 years	\$80,000.00
Install guide rail	1 to 5 years	\$95,000.00
General Items - Insurance, Mobilization, Access etc.	1 to 5 years	\$150,000.00
Rehabilitation Cost Subtotal		\$745,000.00

Estimate Value of Replacement Structure	\$2,600,000.00
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Associated Work	Priority	Estimated Cost
Approaches -		\$0.00
Detours -		\$0.00
Traffic Control -	1 to 5 Years	\$15,000.00
Utilities -		\$0.00
Right of Way -		\$0.00
Environmental -		\$0.00
Other -		\$0.00
Total Associated Work Cost		\$15,000.00

Total Capital Works Costs			
Cost		Rehabilitation	Replacement
Subtotal:		\$760,000.00	\$2,615,000.00
Roadside Protection:		\$0.00	\$95,000.00
Staging:		N/A	\$0.00
Environmental Assessment		N/A	\$50,000.00
Contingencies:	10%	\$76,000.00	\$262,000.00
Engineering Design:	10% of first \$1M + 5% of cost above \$1M	\$76,000.00	\$181,000.00
Total Capital Work Cost		\$912,000.00	\$3,203,000.00

1.9 Structure No. 0009 (MTO No. 2-302)

2022 BCI: 34.3

<u>Structure Name:</u>	Structure No. 0009 (Leahy Bridge)		
<u>Road Name:</u>	Sideroad 25N		
<u>Location:</u>	Lot 25/26, Concession 10, Culross Survey		
<u>Structure Type:</u>	Other - Abutments Only		
<u>Number of Spans:</u>	1	<u>Span Lengths:</u>	23.7 m
<u>Overall Structure Width:</u>	5.55 m	<u>Roadway Width:</u>	5.55 m
<u>Year of Construction:</u>	1920	<u>Current Load Limit:</u>	N/A



Recommendation: Closure of the structure is recommended

Justification:

Structure No. 0009 was hit by a Municipal snowplow in 2013 and has since been closed to traffic. The superstructure has been removed and only the original abutments remain currently. The abutments have large areas of unsound concrete noted by hammer tapping but appear stable at this time. No further action is recommended at this point in time.

Maintenance Need	Element and Comments	Estimated Cost
		\$0.00
		\$0.00
Maintenance Needs Total		\$0.00

Additional Investigations	Priority	Estimated Cost
	Normal	\$0.00

Roadside Protection Repairs	Priority	Estimated Cost
	1 to 5 Years	\$0.00

Rehabilitation/Repair Required	Priority	Estimated Cost
	N/A	\$0.00
	N/A	\$0.00
	N/A	\$0.00
	N/A	\$0.00
	N/A	\$0.00
Rehabilitation Cost Subtotal		\$0.00

Estimate Value of Replacement Structure	\$1,500,000.00
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Associated Work	Priority	Estimated Cost
Approaches -		\$0.00
Detours -		\$0.00
Traffic Control -		\$0.00
Utilities -		\$0.00
Right of Way -		\$0.00
Environmental -		\$0.00
Other -		\$0.00
Total Associated Work Cost		\$0.00

Total Capital Works Costs			
Cost		Rehabilitation	Replacement
Subtotal:		N/A	\$1,500,000.00
Roadside Protection:		N/A	\$95,000.00
Staging:		N/A	\$0.00
Environmental Assessment		N/A	\$2,500.00
Contingencies:	10%	N/A	\$150,000.00
Engineering Design:	10% of first \$1M + 5% of cost above \$1M	N/A	\$125,000.00
Total Capital Work Cost		N/A	\$1,872,500.00

1.10 Structure No. 0010 (MTO No. 2-303)

2022 BCI: 87.6

<u>Structure Name:</u>	Structure No. 0010 (Concession 10 Bridge)		
<u>Road Name:</u>	Concession 10		
<u>Location:</u>	Lot 23, Concession 10/11, Culross Survey		
<u>Structure Type:</u>	Precast Concrete I-Girder		
<u>Number of Spans:</u>	1	<u>Span Lengths:</u>	27.3 m
<u>Overall Structure Width:</u>	10.5 m	<u>Roadway Width:</u>	8.6 m
<u>Year of Construction:</u>	2009	<u>Current Load Limit:</u>	N/A



Recommendation: Minor Rehabilitation is recommended within 2 years.

Justification:

Structure No. 0010 was constructed in 2009 and is generally in excellent condition; however, the approach slabs have experienced significant settlement, which was likely caused by substandard compaction efforts during construction. This settlement does not appear to be actively progressing when compared to previous inspection measurements, but it presents a rough riding surface for traffic. The settlement should continue to be monitored during future biennial inspections and the Municipality may wish to complete the repairs if the settlement is no longer actively progressing. Anticipated repairs would include removing the curbs, milling, and padding the asphalt and replacing the curbs. Alternatively, jacking of the slab using a polyurethane epoxy injection could also be completed. In addition, consideration should be given to repairing the guide rail end treatments as it appears they were installed incorrectly during construction.

Maintenance Need	Element and Comments	Estimated Cost
Handrail Maintenance	Replace missing bolts for post to railing connection	\$500.00
Hazard Signs	Install hazard warning signs at structure	\$1,000.00
Other	Remove exposed filter cloth along abutments	\$250.00
Maintenance Needs Total		\$1,750.00

Additional Investigations	Priority	Estimated Cost
Monitoring of Deformations, Settlements and Movements,	Normal	\$0.00

Roadside Protection Repairs	Priority	Estimated Cost
Repair Guide Rail End Treatments	1 to 5 Years	\$5,000.00

Rehabilitation/Repair Required	Priority	Estimated Cost
Repair settled approaches and curbs	1 to 5 years	\$25,000.00
General Items - Insurance, Mobilization, Access etc.	1 to 5 years	\$15,000.00
Rehabilitation Cost Subtotal		\$40,000.00

Estimate Value of Replacement Structure	\$1,800,000.00
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Associated Work	Priority	Estimated Cost
Approaches -		\$0.00
Detours -		\$0.00
Traffic Control -	1 to 5 Years	\$15,000.00
Utilities -		\$0.00
Right of Way -		\$0.00
Environmental -		\$0.00
Other -		\$0.00
Total Associated Work Cost		\$15,000.00

Total Capital Works Costs			
Cost		Rehabilitation	Replacement
Subtotal:		\$55,000.00	\$1,815,000.00
Roadside Protection:		\$5,000.00	\$95,000.00
Staging:		N/A	\$0.00
Environmental Assessment		N/A	\$2,500.00
Contingencies:	10%	\$6,000.00	\$182,000.00
Engineering Design:	10% of first \$1M + 5% of cost above \$1M	\$2,500.00	\$141,000.00
Total Capital Work Cost		\$68,500.00	\$2,235,500.00

1.11 Structure No. 0011 (MTO No. 2-308)

2022 BCI:

97.3

<u>Structure Name:</u>	Structure No. 0011 (Donaldson Bridge)		
<u>Road Name:</u>	Concession 10		
<u>Location:</u>	Lot 11, Concession 10/11, Culross Survey		
<u>Structure Type:</u>	Steel I-Girder (Concrete Deck)		
<u>Number of Spans:</u>	1	<u>Span Lengths:</u>	16.55 m
<u>Overall Structure Width:</u>	9.2 m	<u>Roadway Width:</u>	8.5 m
<u>Year of Construction:</u>	2018	<u>Current Load Limit:</u>	N/A



Recommendation: No Capital Works estimated to be required within 10 years. Future structure rehabilitation should be considered.

Justification:

Structure No. 0011 is a concrete deck on steel I-girder structure which was recently constructed in 2018 and is in excellent condition. The new substructure was constructed using perched spread footings behind the existing substructure. The existing substructure remains in place to act as a retaining wall and scour protection but does not support the new structure.

Maintenance Need	Element and Comments	Estimated Cost
		\$0.00
		\$0.00
Maintenance Needs Total		\$0.00

Additional Investigations	Priority	Estimated Cost
	Normal	\$0.00

Roadside Protection Repairs	Priority	Estimated Cost
	1 to 5 Years	\$0.00

Rehabilitation/Repair Required	Priority	Estimated Cost
	N/A	\$0.00
	N/A	\$0.00
	N/A	\$0.00
	N/A	\$0.00
	N/A	\$0.00
Rehabilitation Cost Subtotal		\$0.00

Estimate Value of Replacement Structure	\$1,400,000.00
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Associated Work	Priority	Estimated Cost
Approaches -		\$0.00
Detours -		\$0.00
Traffic Control -		\$0.00
Utilities -		\$0.00
Right of Way -		\$0.00
Environmental -		\$0.00
Other -		\$0.00
Total Associated Work Cost		\$0.00

Total Capital Works Costs			
Cost		Rehabilitation	Replacement
Subtotal:		N/A	\$1,400,000.00
Roadside Protection:		N/A	\$95,000.00
Staging:		N/A	\$0.00
Environmental Assessment		N/A	\$2,500.00
Contingencies:	10%	N/A	\$140,000.00
Engineering Design:	10% of first \$1M + 5% of cost above \$1M	N/A	\$120,000.00
Total Capital Work Cost		N/A	\$1,757,500.00

1.12 Structure No. 0012 (MTO No. 2-317)

2022 BCI:

74.1

<u>Structure Name:</u>	Structure No. 0012 (Fischer Bridge)		
<u>Road Name:</u>	Concession 10		
<u>Location:</u>	Lot 5, Concession 10/11, Culross Survey		
<u>Structure Type:</u>	CSP Multi-Plate Arch Culvert(s)		
<u>Number of Spans:</u>	1	<u>Span Lengths:</u>	5.4 m
<u>Overall Structure Width:</u>	26 m	<u>Roadway Width:</u>	7.9 m
<u>Year of Construction:</u>	1990	<u>Current Load Limit:</u>	N/A



Recommendation: No Capital Works is estimated to be required within the next 10 years.

Justification:

Structure No. 0012 is a CSP multi-plate arch culvert which appears to be in good condition overall. Based on the current BCI, replacement is anticipated to be required in approximately 24 years if the BCI continues at a rate matching the typical deterioration curve used for this structure type. However, the degradation rate being experienced appears to be lower than typical curves and therefore the structure may outlast the estimated service life remaining, and the timeline for replacement may be adjusted to suit. In the interim, consideration should be given to replacing the guide rail system with a steel beam guide rail system.

Maintenance Need	Element and Comments	Estimated Cost
Bridge Cleaning	Clean Deck Wearing Surface,	\$1,000.00
Other	Replace rotted posts	\$1,000.00
Maintenance Needs Total		\$2,000.00

Additional Investigations	Priority	Estimated Cost
	Normal	\$0.00

Roadside Protection Repairs	Priority	Estimated Cost
Replace guide rail system and install end treatments	1 to 5 Years	\$95,000.00

Rehabilitation/Repair Required	Priority	Estimated Cost
	N/A	\$0.00
	N/A	\$0.00
	N/A	\$0.00
	N/A	\$0.00
	N/A	\$0.00
Rehabilitation Cost Subtotal		\$0.00

Estimate Value of Replacement Structure	\$650,000.00
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Associated Work	Priority	Estimated Cost
Approaches -		\$0.00
Detours -		\$0.00
Traffic Control -		\$0.00
Utilities -		\$0.00
Right of Way -		\$0.00
Environmental -		\$0.00
Other -		\$0.00
Total Associated Work Cost		\$0.00

Total Capital Works Costs			
Cost		Rehabilitation	Replacement
Subtotal:		N/A	\$650,000.00
Roadside Protection:		N/A	\$95,000.00
Staging:		N/A	\$0.00
Environmental Assessment		N/A	\$2,500.00
Contingencies:	10%	N/A	\$65,000.00
Engineering Design:	10% of first \$1M + 5% of cost above \$1M	N/A	\$65,000.00
Total Capital Work Cost		N/A	\$877,500.00

1.13 Structure No. 13

2022 BCI: **50.7**

<u>Structure Name:</u>	Structure No. 0013 (McGlenn Lake Bridge [Sinkhole Bridge])		
<u>Road Name:</u>	Concession 12		
<u>Location:</u>	Lot 30, Concession 12/13, Culross Survey		
<u>Structure Type:</u>	Other - Timber Deck		
<u>Number of Spans:</u>	1	<u>Span Lengths:</u>	12.8 m
<u>Overall Structure Width:</u>	3.75 m	<u>Roadway Width:</u>	3.75 m
<u>Year of Construction:</u>	1991	<u>Current Load Limit:</u>	3 tonnes



Recommendation: Forgo rehabilitation and replace structure within 5 years.

Justification:

Structure No. 0013 is a narrow, timber structure located on a low traffic road with a 3-tonne load limit. During all past inspections, the inspection of this structure has been limited due to the water elevation being above the soffit elevation. However, it does appear that the abutment is rotating and may be unstable. Also, given the environment and the fluctuating water levels that expose the main load carrying members to intermittent wet conditions, it is anticipated that the timber elements may be experiencing increased deterioration rates. Based on the site conditions, a rehabilitation is not considered economically feasible, and the Municipality should consider replacing this structure within the next 5 years. It is anticipated that the replacement structure will be at a higher elevation and require road profile adjustments. Replacement cost for a single lane structure is estimated to be approximately \$596,500, which does not include the associated road work. In the interim, the Municipality should complete maintenance work, including the repair of the failed timber curbs and embankment erosion. The stability of the structure should be monitored during future biennial inspections until replacement can occur.

Maintenance Need	Element and Comments	Estimated Cost
Erosion Control	Place rock protection on embankments	\$2,000.00
Other	Remove exposed nails	\$500.00
Other	Remove failed timber fascia boards	\$500.00
Other	Install timber curbs	\$2,500.00
Maintenance Needs Total		\$5,500.00

Additional Investigations	Priority	Estimated Cost
	Normal	\$0.00

Roadside Protection Repairs	Priority	Estimated Cost
Narrow Structure, install guide rail during rehab/replacement	1 to 5 Years	\$0.00

Rehabilitation/Repair Required	Priority	Estimated Cost
	N/A	\$0.00
	N/A	\$0.00
	N/A	\$0.00
	N/A	\$0.00
	N/A	\$0.00
Rehabilitation Cost Subtotal		\$0.00

Estimate Value of Replacement Structure	\$400,000.00
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Associated Work	Priority	Estimated Cost
Approaches -		\$0.00
Detours -		\$0.00
Traffic Control -	1 to 5 Years	\$15,000.00
Utilities -		\$0.00
Right of Way -		\$0.00
Environmental -		\$0.00
Other -		\$0.00
Total Associated Work Cost		\$15,000.00

Total Capital Works Costs		
Cost		
Subtotal:		\$415,000.00
Roadside Protection:		\$95,000.00
Staging:		\$0.00
Environmental Assessment		\$2,500.00
Contingencies:	10%	\$42,000.00
Engineering Design:	10% of first \$1M + 5% of cost above \$1M	\$42,000.00
Total Capital Work Cost		\$596,500.00

1.14 Structure No. 0014 (MTO No. 2-304)

2022 BCI: 74.4

<u>Structure Name:</u>	Structure No. 0014 (Dobson Bridge)		
<u>Road Name:</u>	Concession 12		
<u>Location:</u>	Lot 21, Concession 12/13, Culross Survey		
<u>Structure Type:</u>	Precast Concrete I-Girder		
<u>Number of Spans:</u>	1	<u>Span Lengths:</u>	23.7 m
<u>Overall Structure Width:</u>	9.3 m	<u>Roadway Width:</u>	7.6 m
<u>Year of Construction:</u>	1982	<u>Current Load Limit:</u>	N/A



Recommendation: No Capital Works estimated to be required within 10 years. Future structure rehabilitation should be considered.

Justification:

Structure No. 0014, which was built in 1982, appears to be in sound condition with only localized deterioration which does not appear to have significantly increased since the 2020 inspection. However, localized concrete repairs and work to prevent further exposure to salt laden water is recommended to be completed as the BCI approaches 60, which is estimated to occur within approximately 14 years. In the meantime, the maintenance work listed above can be carried out to help reduce deterioration rates. Consideration should be given to replacing the current guide rail system with a code conforming guide rail system.

Maintenance Need	Element and Comments	Estimated Cost
Bridge Cleaning	Remove vegetation along shoulders, flush joints, clean bearing seats	\$3,500.00
Erosion Control	repair NW washout and install rock protection	\$2,500.00
Other	Remove formwork left in place	\$500.00
Other	Replace joint sealants	\$5,000.00
Maintenance Needs Total		\$11,500.00

Additional Investigations	Priority	Estimated Cost
	Normal	\$0.00

Roadside Protection Repairs	Priority	Estimated Cost
Replace Guide Rail, end treatments and structure connections	1 to 5 Years	\$95,000.00

Rehabilitation/Repair Required	Priority	Estimated Cost
	N/A	\$0.00
	N/A	\$0.00
	N/A	\$0.00
	N/A	\$0.00
	N/A	\$0.00
Rehabilitation Cost Subtotal		\$0.00

Estimate Value of Replacement Structure	\$1,500,000.00
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Associated Work	Priority	Estimated Cost
Approaches -		\$0.00
Detours -		\$0.00
Traffic Control -	N/A	\$15,000.00
Utilities -		\$0.00
Right of Way -		\$0.00
Environmental -		\$0.00
Other -		\$0.00
Total Associated Work Cost		\$15,000.00

Total Capital Works Costs			
Cost		Rehabilitation	Replacement
Subtotal:		N/A	\$1,515,000.00
Roadside Protection:		N/A	\$95,000.00
Staging:		N/A	\$0.00
Environmental Assessment		N/A	\$2,500.00
Contingencies:	10%	N/A	\$152,000.00
Engineering Design:	10% of first \$1M + 5% of cost above \$1M	N/A	\$126,000.00
Total Capital Work Cost		N/A	\$1,890,500.00

1.15 Structure No. 0015 (MTO No. 2-307)

2022 BCI:

44.9

<u>Structure Name:</u>	Structure No. 0015		
<u>Road Name:</u>	Concession 12		
<u>Location:</u>	Lot 14, Concession 12, East of Bruce Road 4		
<u>Structure Type:</u>	Cast-In-Place Conc. Rigid Frame		
<u>Number of Spans:</u>	1	<u>Span Lengths:</u>	12.1 m
<u>Overall Structure Width:</u>	7.1 m	<u>Roadway Width:</u>	6.3 m
<u>Year of Construction:</u>	1950	<u>Current Load Limit:</u>	16 tonnes



Recommendation: Structure replacement is recommended as soon as possible.

Justification:

Structure No. 0015 generally appears to be in poor condition and is demonstrating signs of moisture penetration and severe concrete deterioration. A detailed Deck Condition Survey carried out in 2015 revealed approximately 300 mm of saturated granular material above the deck top. Core samples of the deck confirmed high chloride ion content at that time. Although a rehabilitation may have been considered a viable option with the addition of cathodic protection at that time, degradation of the structure has accelerated, and significantly more deteriorated concrete was noted during the 2020 inspection compared to 2016. The blocks recently placed by the Municipality pose a significant safety hazard to oncoming vehicular traffic. As such, it is recommended that replacement of this structure occur as soon as possible.

Maintenance Need	Element and Comments	Estimated Cost
Bridge Cleaning	Clean wearing surface and curbs	\$1,000.00
Maintenance Needs Total		\$1,000.00

Additional Investigations	Priority	Estimated Cost
	Normal	\$0.00

Roadside Protection Repairs	Priority	Estimated Cost
Install Guide Rail, end treatments and structure connections	1 to 5 Years	\$95,000.00

Rehabilitation/Repair Required	Priority	Estimated Cost
	N/A	\$0.00
	N/A	\$0.00
	N/A	\$0.00
	N/A	\$0.00
	N/A	\$0.00
Rehabilitation Cost Subtotal		\$0.00

Estimate Value of Replacement Structure	\$1,100,000.00
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Associated Work	Priority	Estimated Cost
Approaches -		\$0.00
Detours -		\$0.00
Traffic Control -	Within 1 year	\$15,000.00
Utilities -		\$0.00
Right of Way -		\$0.00
Environmental -		\$0.00
Other -		\$0.00
Total Associated Work Cost		\$15,000.00

Total Capital Works Costs			
Cost		Rehabilitation	Replacement
Subtotal:		N/A	\$1,115,000.00
Roadside Protection:		N/A	\$95,000.00
Staging:		N/A	\$0.00
Environmental Assessment		N/A	\$2,500.00
Contingencies:	10%	N/A	\$112,000.00
Engineering Design:	10% of first \$1M + 5% of cost above \$1M	N/A	\$106,000.00
Total Capital Work Cost		N/A	\$1,430,500.00

1.16 Structure No. 0016 (MTO No. 2-305)**2022 BCI:****57.3**

<u>Structure Name:</u>	Structure No. 0016 (Bannerman Bridge)		
<u>Road Name:</u>	Concession 14		
<u>Location:</u>	Lot 22, Concession 14/15, Culross Survey		
<u>Structure Type:</u>	Steel Truss (Timber Deck)		
<u>Number of Spans:</u>	1	<u>Span Lengths:</u>	25 m
<u>Overall Structure Width:</u>	5.55 m	<u>Roadway Width:</u>	4.7 m
<u>Year of Construction:</u>	1939	<u>Current Load Limit:</u>	11,21,30 tonnes



Recommendation: Structure replacement is recommended as soon as possible.

Justification:

Structure No. 0016 is a steel through truss structure that is over 75 years old and is generally in fair to poor condition overall but is demonstrating signs of very severe section loss and accelerating corrosion since the 2016 and 2018 inspections, specifically on the steel floor beams and stringers. Five of the most severely corroded/perforated stringers were replaced in 2019 in order for the bridge to remain open until further capital works can be completed. Given the progression of corrosion and section loss throughout the steel members, a single load posting of 5 tonnes should be implemented until capital works are complete. Capital works should be planned for as soon as possible. Because this structure likely has heritage value due to its age and structure type, the Municipality may wish to analyze the option of a major rehabilitation as an alternative to replacement. Rehabilitation work would be extensive and would include replacement of the floor beams, stringers and timber decking and repair or replacement of localized members of the main truss system, as well as abutment repairs. However, even after rehabilitation, the structure may still require a load posting of 20/33/41 tonnes (based on the 2016 Structural Evaluation) and the service life of the structure would only be extended by a maximum of 30 years. Additionally, the narrow driving platform and road alignment issues on the approaches would not be addressed in a rehabilitation and therefore the Municipality may find it more economically efficient in the long term to complete a full structure replacement at this time. The load posting should be reduced, and the structure should be monitored until capital works can occur.

Maintenance Need	Element and Comments	Estimated Cost
Bridge Cleaning	Sweep deck, flush joints, and clean bearing seats	\$2,500.00
Bearing Maintenance	Replace missing bolt on bearing	\$1,000.00
Hazard Signs	Install narrow structure signs	\$500.00
Maintenance Needs Total		\$4,000.00

Additional Investigations	Priority	Estimated Cost
	Normal	\$0.00

Roadside Protection Repairs	Priority	Estimated Cost
Narrow Structure, install guiderail during rehab/replacement	1 to 5 Years	\$0.00

Rehabilitation/Repair Required	Priority	Estimated Cost
Replace timber decking	Urgent	\$45,000.00
Type C conc. repairs to abut. walls, ballast walls, wingwalls,	Urgent	\$25,000.00
Sandblasting and painting required to Structural Steel (Full length),	Urgent	\$150,000.00
Steel repairs/replacement to top and bottom chords, verticals/diagonals	Urgent	\$50,000.00
Replace stringers and floor beams	Urgent	\$200,000.00
Replace bearings	Urgent	\$65,000.00
Reconstruct approaches	Urgent	\$25,000.00
Install guide rail	Urgent	\$95,000.00
General Items - Insurance, Mobilization, Access etc.	Urgent	\$200,000.00
Rehabilitation Cost Subtotal		\$855,000.00

Estimate Value of Replacement Structure	\$2,400,000.00
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Associated Work	Priority	Estimated Cost
Approaches -		\$0.00
Detours -		\$0.00
Traffic Control -	Within 1 year	\$15,000.00
Utilities -		\$0.00
Total Associated Work Cost		\$15,000.00

Total Capital Works Costs			
Cost		Rehabilitation	Replacement
Subtotal:		\$870,000.00	\$2,415,000.00
Roadside Protection:		\$0.00	\$95,000.00
Staging:		N/A	\$0.00
Environmental Assessment		N/A	\$50,000.00
Contingencies:	10%	\$87,000.00	\$242,000.00
Engineering Design:	10% of first \$1M + 5% of cost above \$1M	\$87,000.00	\$171,000.00
Total Capital Work Cost		\$1,044,000.00	\$2,973,000.00

1.17 Structure No. 17

2022 BCI:

53.5

<u>Structure Name:</u>	Structure No. 0017		
<u>Road Name:</u>	Concession 4		
<u>Location:</u>	Lot 27, Concession 4/5		
<u>Structure Type:</u>	Cast-In-Place Conc. Rigid Frame		
<u>Number of Spans:</u>	1	<u>Span Lengths:</u>	6 m
<u>Overall Structure Width:</u>	7 m	<u>Roadway Width:</u>	6 m
<u>Year of Construction:</u>	Unknown	<u>Current Load Limit:</u>	N/A



Recommendation: Minor Rehabilitation is recommended as soon as possible.

Justification:

Structure No. 0017 generally appears to be in fair to poor condition with signs of concrete deterioration and moisture penetration which has continued since 2018. There is evidence of previous concrete patch repair work, however these repairs are deteriorating and no longer functioning as intended. The structure may not have been designed to carry the additional dead load of the 0.7 m fill over the structure, which may be contributing to the structure's deterioration. It is recommended that the Municipality complete an additional rehabilitation as soon as possible to help extend the service life of this structure. Concrete repairs, waterproofing and paving, installation of guide rail, and slope stabilization should be included in the proposed rehabilitation.

Maintenance Need	Element and Comments	Estimated Cost
Bridge Cleaning	Remove trees growing in close proximity to structure	\$1,500.00
Maintenance Needs Total		\$1,500.00

Additional Investigations	Priority	Estimated Cost
	Normal	\$0.00

Roadside Protection Repairs	Priority	Estimated Cost
Narrow Structure, install guide rail during rehab/replacement	1 to 5 Years	\$0.00

Rehabilitation/Repair Required	Priority	Estimated Cost
Type A concrete repairs to deck top,	Within 1 year	\$15,000.00
Type B concrete repairs to soffit,	Within 1 year	\$50,000.00
Type C concrete repairs to abutment walls, wingwalls,	Within 1 year	\$35,000.00
Waterproof and pave	Within 1 year	\$40,000.00
Installation of guide rail	Within 1 year	\$95,000.00
Add slope stabilization	Within 1 year	\$10,000.00
General Items - Insurance, Mobilization, Access etc.	Within 1 year	\$125,000.00
Rehabilitation Cost Subtotal		\$370,000.00

Estimate Value of Replacement Structure	\$650,000.00
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Associated Work	Priority	Estimated Cost
Approaches -		\$0.00
Detours -		\$0.00
Traffic Control -	Within 1 year	\$15,000.00
Utilities -		\$0.00
Right of Way -		\$0.00
Environmental -		\$0.00
Other -		\$0.00
Total Associated Work Cost		\$15,000.00

Total Capital Works Costs		
Cost		
Subtotal:		
	\$385,000.00	\$665,000.00
Roadside Protection:	\$0.00	\$95,000.00
Staging:	N/A	\$0.00
Environmental Assessment	N/A	\$2,500.00
Contingencies:	10%	\$39,000.00
Engineering Design:	10% of first \$1M + 5% of cost above \$1M	\$39,000.00
	Total Capital Work Cost	\$463,000.00
		\$896,500.00

1.18 Structure No. 19

2022 BCI:

66.7

<u>Structure Name:</u>	Structure No. 0019		
<u>Road Name:</u>	Sideroad 18		
<u>Location:</u>	Lot 18/19, Concession 14, Culross Survey		
<u>Structure Type:</u>	Cast-In-Place Conc. Rigid Frame		
<u>Number of Spans:</u>	1	<u>Span Lengths:</u>	12.5 m
<u>Overall Structure Width:</u>	7.1 m	<u>Roadway Width:</u>	6.4 m
<u>Year of Construction:</u>	1945	<u>Current Load Limit:</u>	16 tonnes



Recommendation: Minor Rehabilitation is recommended within 7 years.

Justification:

Structure No. 0019 generally appears to be in good condition with the exception of the barrier system. The bridge currently has a 16-tonne load limit posting, which the Municipality may wish to review further if this posting is required based on the observed condition of the structure. Based on the current BCI, it is recommended that rehabilitation work be scheduled within approximately 7 years. The structure may not have been designed to carry the additional dead load of the 0.4 m fill over the structure. Removing the fill over the structure and waterproofing and paving will help extend the service life of the structure. Installing a steel beam guide rail system during a rehabilitation or replacement is also recommended to help protect oncoming traffic.

Maintenance Need	Element and Comments	Estimated Cost
Bridge Cleaning	Remove vegetation along curbs	\$1,000.00
Erosion Control	Repair NE and SW erosion	\$2,500.00
Hazard Signs	Install hazard warning signs at structure	\$1,000.00
Maintenance Needs Total		\$4,500.00

Additional Investigations	Priority	Estimated Cost
	Normal	\$0.00

Roadside Protection Repairs	Priority	Estimated Cost
Narrow Structure, install guide rail during rehab/replacement	1 to 5 Years	\$0.00

Rehabilitation/Repair Required	Priority	Estimated Cost
Type A concrete repairs to posts, deck top, curbs,	6 to 10 years	\$7,000.00
Type B concrete repairs to soffit,	6 to 10 years	\$11,000.00
Type C concrete repairs to wingwalls,	6 to 10 years	\$5,000.00
Waterproof and pave	6 to 10 years	\$30,000.00
Replace deck drains	6 to 10 years	\$10,000.00
Install guide rail	6 to 10 years	\$95,000.00
Add slope stabilization	6 to 10 years	\$10,000.00
General Items - Insurance, Mobilization, Access etc.	6 to 10 years	\$125,000.00
Rehabilitation Cost Subtotal		\$293,000.00

Estimate Value of Replacement Structure	\$850,000.00
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Associated Work	Priority	Estimated Cost
Approaches -		\$0.00
Detours -		\$0.00
Traffic Control -	6 to 10 Years	\$15,000.00
Utilities -		\$0.00
Right of Way -		\$0.00
Environmental -		\$0.00
Total Associated Work Cost		\$15,000.00

Total Capital Works Costs			
Cost		Rehabilitation	Replacement
Subtotal:		\$308,000.00	\$865,000.00
Roadside Protection:		\$0.00	\$95,000.00
Staging:		N/A	\$0.00
Environmental Assessment		N/A	\$2,500.00
Contingencies:	10%	\$31,000.00	\$87,000.00
Engineering Design:	10% of first \$1M + 5% of cost above \$1M	\$31,000.00	\$87,000.00
Total Capital Work Cost		\$370,000.00	\$1,136,500.00

1.19 Structure No. 20

2022 BCI:

74.6

<u>Structure Name:</u>	Structure No. 0020		
<u>Road Name:</u>	Concession 2		
<u>Location:</u>	Lot 11, Concession 2, Culross Survey		
<u>Structure Type:</u>	CSP Multi-Plate Arch Culvert(s)		
<u>Number of Spans:</u>	1	<u>Span Lengths:</u>	3.9 m
<u>Overall Structure Width:</u>	21.7 m	<u>Roadway Width:</u>	7 m
<u>Year of Construction:</u>	1974	<u>Current Load Limit:</u>	N/A



Recommendation: No Capital Works is estimated to be required within the next 10 years.

Justification:

Structure No. 0020 is a CSP multi-plate arch culvert that appears to be in good condition overall with some minor cusping noted and a slightly sagged profile through the barrel. Based on the current BCI, replacement is anticipated to be required in approximately 25 years if the BCI trend continues at a rate matching the typical deterioration curve used for this structure type. The minor deformation in the top of the culvert should continue to be monitored closely during future biennial inspections. If the deformation becomes greater than 10% of the culvert diameter, consideration should be given to establishing a monitoring program. The Municipality may wish to investigate if desirable clear zone requirements are met at this structure location or if a guide rail barrier system is required.

Maintenance Need	Element and Comments	Estimated Cost
Bridge Cleaning	Clear debris/vegetation from watercourse	\$2,500.00
Erosion Control	Install rock protection at the inlet/outlet	\$2,500.00
Maintenance Needs Total		\$5,000.00

Additional Investigations	Priority	Estimated Cost
Monitoring of Deformations, Settlements and Movements,	Normal	\$0.00

Roadside Protection Repairs	Priority	Estimated Cost
Investigate need for Guide Rail	1 to 5 Years	\$1,000.00

Rehabilitation/Repair Required	Priority	Estimated Cost
	N/A	\$0.00
	N/A	\$0.00
	N/A	\$0.00
	N/A	\$0.00
	N/A	\$0.00
Rehabilitation Cost Subtotal		\$0.00

Estimate Value of Replacement Structure	\$500,000.00
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Associated Work	Priority	Estimated Cost
Approaches -		\$0.00
Detours -		\$0.00
Traffic Control -		\$0.00
Utilities -		\$0.00
Right of Way -		\$0.00
Environmental -		\$0.00
Other -		\$0.00
Total Associated Work Cost		\$0.00

Total Capital Works Costs			
Cost		Rehabilitation	Replacement
Subtotal:		N/A	\$500,000.00
Roadside Protection:		N/A	\$95,000.00
Staging:		N/A	\$0.00
Environmental Assessment		N/A	\$2,500.00
Contingencies:	10%	N/A	\$50,000.00
Engineering Design:	10% of first \$1M + 5% of cost above \$1M	N/A	\$50,000.00
Total Capital Work Cost		N/A	\$697,500.00

1.20 Structure No. 21

2022 BCI:

46.1

<u>Structure Name:</u>	Structure No. 0021		
<u>Road Name:</u>	Sideroad 1A		
<u>Location:</u>	Lot 1, Concession 2, Culross Survey		
<u>Structure Type:</u>	Cast-In-Place Conc. Rigid Frame		
<u>Number of Spans:</u>	1	<u>Span Lengths:</u>	5.55 (6.5 skew span) m
<u>Overall Structure Width:</u>	11 m	<u>Roadway Width:</u>	4.5 m
<u>Year of Construction:</u>	Unknown	<u>Current Load Limit:</u>	11 tonnes



Recommendation: Forgo rehabilitation and replace structure within 3 years.

Justification:

Structure No. 0021 is generally in poor condition with severe disintegration of concrete throughout. Given the vast amount of poor concrete observed, the high rehabilitation costs, and the small span, rehabilitating this structure is not recommended and replacement of the structure should be considered as the BCI approaches 40, in approximately 3 years. It is recommended the Municipality monitor this structure closely and consider reducing the load posting to 5-tonnes until replacement is a viable option.

Maintenance Need	Element and Comments	Estimated Cost
Bridge Cleaning	Remove brush blocking hazard warning signs and outlet	\$1,500.00
Hazard Signs	Replace non code confirming weight restriction signs	\$1,000.00
Maintenance Needs Total		\$2,500.00

Additional Investigations	Priority	Estimated Cost
Monitoring of Deformations, Settlements and Movements,	Normal	\$0.00

Roadside Protection Repairs	Priority	Estimated Cost
Narrow Structure, install guide rail during rehab/replacement	1 to 5 Years	\$0.00

Rehabilitation/Repair Required	Priority	Estimated Cost
	N/A	\$0.00
	N/A	\$0.00
	N/A	\$0.00
	N/A	\$0.00
	N/A	\$0.00
Rehabilitation Cost Subtotal		\$0.00

Estimate Value of Replacement Structure	\$600,000.00
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Associated Work	Priority	Estimated Cost
Approaches -		\$0.00
Detours -		\$0.00
Traffic Control -	1 to 5 Years	\$15,000.00
Utilities -		\$0.00
Right of Way -		\$0.00
Environmental -		\$0.00
Other -		\$0.00
Total Associated Work Cost		\$15,000.00

Total Capital Works Costs		
Cost		
Subtotal:		N/A
Roadside Protection:		\$615,000.00
Staging:		N/A
Environmental Assessment		\$95,000.00
Contingencies:	10%	N/A
Engineering Design:	10% of first \$1M + 5% of cost above \$1M	\$62,000.00
Total Capital Work Cost		\$836,500.00

1.21 Structure No. 22

2022 BCI:

80.7

<u>Structure Name:</u>	Structure No. 0022		
<u>Road Name:</u>	Turnberry-Culross Townline		
<u>Location:</u>	Lot 1, Concession 1, Culcross Survey		
<u>Structure Type:</u>	CSP Multi-Plate Arch Culvert(s)		
<u>Number of Spans:</u>	1	<u>Span Lengths:</u>	3.7 m
<u>Overall Structure Width:</u>	17 m	<u>Roadway Width:</u>	8 m
<u>Year of Construction:</u>	Unknown	<u>Current Load Limit:</u>	N/A



Recommendation: No Capital Works is estimated to be required within the next 10 years.

Justification:

Structure No. 0022 generally appears to be in good condition and appears to have been installed within the last 20+/- years. Based on the current BCI, replacement is anticipated in approximately 31 years if the BCI continues to drop at a rate matching the projected deterioration curve used for this structure type; however, the BCI can continue to be monitored during future inspections and the years to replacement adjusted accordingly. The Municipality may wish to investigate if a barrier system is required at this location, but it appears the slopes are recoverable, and a guide rail system may not be warranted if the culvert ends are beyond the desirable clear zone.

Maintenance Need	Element and Comments	Estimated Cost
Hazard Signs	Repair leaning signs and replace other two signs	\$750.00
Maintenance Needs Total		\$750.00

Additional Investigations	Priority	Estimated Cost
	Normal	\$0.00

Roadside Protection Repairs	Priority	Estimated Cost
Investigate need for Guide Rail	1 to 5 Years	\$1,000.00

Rehabilitation/Repair Required	Priority	Estimated Cost
	N/A	\$0.00
	N/A	\$0.00
	N/A	\$0.00
	N/A	\$0.00
	N/A	\$0.00
Rehabilitation Cost Subtotal		\$0.00

Estimate Value of Replacement Structure	\$450,000.00
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Associated Work	Priority	Estimated Cost
Approaches -		\$0.00
Detours -		\$0.00
Traffic Control -	N/A	\$15,000.00
Utilities -		\$0.00
Right of Way -		\$0.00
Environmental -		\$0.00
Other -		\$0.00
Total Associated Work Cost		\$15,000.00

Total Capital Works Costs		
Cost		
	Rehabilitation	Replacement
Subtotal:	N/A	\$465,000.00
Roadside Protection:	N/A	\$95,000.00
Staging:	N/A	\$0.00
Environmental Assessment	N/A	\$2,500.00
Contingencies:	10%	\$47,000.00
Engineering Design:	10% of first \$1M + 5% of cost above \$1M	\$47,000.00
Total Capital Work Cost		\$656,500.00

1.22 Structure No. 23

2022 BCI:

71.9

<u>Structure Name:</u>	Structure No. 0023		
<u>Road Name:</u>	Sideroad 5A		
<u>Location:</u>	0.7km South of Concession 2 (0.1km South of Structure 0005), Conc. II, Lot 5/6		
<u>Structure Type:</u>	CSP Round Culvert(s)		
<u>Number of Spans:</u>	2	<u>Span Lengths:</u>	1.9, 1.9 m
<u>Overall Structure Width:</u>	11.2 m	<u>Roadway Width:</u>	5 m
<u>Year of Construction:</u>	Unknown	<u>Current Load Limit:</u>	N/A



Recommendation: No Capital Works is estimated to be required within the next 10 years.

Justification:

Structure No. 0023 is made up of twin-cell CSP culverts which appear to be in good condition overall, however, the culverts are nearly 50% filled with silt and consideration should be given to cleaning out the culvert to improve the hydraulic conveyance. Based on the current BCI, replacement is estimated to be required within approximately 22 years if the BCI continues at a rate matching the typical deterioration curve used for this structure type. In the interim, the Municipality should consider investigating whether the desirable clear zone is provided at this site, or whether a guide rail barrier system should be installed to help protect oncoming vehicular traffic given the steep slopes present.

Maintenance Need	Element and Comments	Estimated Cost
Bridge Cleaning	Remove vegetation blocking hazard warning signs	\$1,000.00
Erosion Control	Install rock protection on embankments	\$1,000.00
Other	Remove sediment buildup from culvert (pending approval from conservation authority)	\$5,000.00
Maintenance Needs Total		\$7,000.00

Additional Investigations	Priority	Estimated Cost
	Normal	\$0.00

Roadside Protection Repairs	Priority	Estimated Cost
Investigate need for Guide Rail	1 to 5 Years	\$1,000.00

Rehabilitation/Repair Required	Priority	Estimated Cost
	N/A	\$0.00
	N/A	\$0.00
	N/A	\$0.00
	N/A	\$0.00
	N/A	\$0.00
Rehabilitation Cost Subtotal		\$0.00

Estimate Value of Replacement Structure	\$400,000.00
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Associated Work	Priority	Estimated Cost
Approaches -		\$0.00
Detours -		\$0.00
Traffic Control -		\$0.00
Utilities -		\$0.00
Right of Way -		\$0.00
Environmental -		\$0.00
Other -		\$0.00
Total Associated Work Cost		\$0.00

Total Capital Works Costs		
Cost		
Subtotal:		\$400,000.00
Roadside Protection:		\$95,000.00
Staging:		\$0.00
Environmental Assessment		\$2,500.00
Contingencies:	10%	\$40,000.00
Engineering Design:	10% of first \$1M + 5% of cost above \$1M	\$40,000.00
Total Capital Work Cost		\$577,500.00

1.23 Structure No. 24

2022 BCI:

57.1

<u>Structure Name:</u>	Structure No. 0024		
<u>Road Name:</u>	Concession 8		
<u>Location:</u>	Lot 28, Concession 8/9, Culross Survey, approximately 0.1km W of Structure 0008		
<u>Structure Type:</u>	Cast-In-Place Conc. Rigid Frame		
<u>Number of Spans:</u>	1	<u>Span Lengths:</u>	6.2 m
<u>Overall Structure Width:</u>	7.5 m	<u>Roadway Width:</u>	5.5 m
<u>Year of Construction:</u>	Unknown	<u>Current Load Limit:</u>	N/A



Recommendation: Forgo rehabilitation and replace structure within 9 years.

Justification:

Structure No. 0024 generally appears to be in fair to poor condition with concrete deterioration throughout but most severe on the fascia. The bridge has approximately 0.5 m fill over the deck which may be contributing to the moisture damage noted. Based on the BCI, rehabilitation work would typically be recommended for this structure, however, given the limited clearance and relatively high cost of repairs versus replacement, replacement of the structure may be more economically efficient in the long term. The Municipality has confirmed that even with the low flow through the structure, this bridge is required as a flood relief structure. Based on the current BCI, replacement/ removal should be considered within 9 years.

Maintenance Need	Element and Comments	Estimated Cost
Bridge Cleaning	Remove overgrown vegetation along curbs	\$1,000.00
Erosion Control	Install rock protection on embankments	\$2,500.00
Hazard Signs	Replace hazard warning signs at structure	\$1,000.00
Wearing Surface	Patch cracked asphalt areas	\$5,000.00
Maintenance Needs Total		\$9,500.00

Additional Investigations	Priority	Estimated Cost
	Normal	\$0.00

Roadside Protection Repairs	Priority	Estimated Cost
Narrow Structure, install guide rail during rehab/replacement	1 to 5 Years	\$0.00

Rehabilitation/Repair Required	Priority	Estimated Cost
Type A concrete repairs to deck top, curbs,	N/A	\$10,000.00
Type B concrete repairs to soffit,	N/A	\$40,000.00
Type C concrete repairs to abutment walls, wingwalls,	N/A	\$20,000.00
Waterproof and pave	N/A	\$25,000.00
Install guide rail	N/A	\$95,000.00
Add slope stabilization	N/A	\$10,000.00
General Items - Insurance, Mobilization, Access etc.	N/A	\$125,000.00
Rehabilitation Cost Subtotal		\$325,000.00

Estimate Value of Replacement Structure	\$1,000,000.00
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Associated Work	Priority	Estimated Cost
Approaches -		\$0.00
Detours -		\$0.00
Traffic Control -	6 to 10 years	\$15,000.00
Utilities -		\$0.00
Right of Way -		\$0.00
Environmental -		\$0.00
Total Associated Work Cost		\$15,000.00

Total Capital Works Costs			
Cost		Rehabilitation	Replacement
Subtotal:		\$340,000.00	\$1,015,000.00
Roadside Protection:		\$0.00	\$95,000.00
Staging:		N/A	\$0.00
Environmental Assessment		N/A	\$2,500.00
Contingencies:	10%	\$34,000.00	\$102,000.00
Engineering Design:	10% of first \$1M + 5% of cost above \$1M	\$34,000.00	\$101,000.00
Total Capital Work Cost		\$408,000.00	\$1,315,500.00

1.24 Structure No. 25

2022 BCI:

100

<u>Structure Name:</u>	Structure No. 0025		
<u>Road Name:</u>	Concession 10		
<u>Location:</u>	0.5km West of Bruce Road 4, Conc. XII/XIII, Lot 17		
<u>Structure Type:</u>	CSP Round Culvert(s)		
<u>Number of Spans:</u>	1	<u>Span Lengths:</u>	3 m
<u>Overall Structure Width:</u>	18 m	<u>Roadway Width:</u>	6 m
<u>Year of Construction:</u>	2020	<u>Current Load Limit:</u>	N/A



Recommendation: No Capital Works is estimated to be required within the next 10 years.

Justification:

Structure No. 0025 was recently constructed in 2020, by the Municipality's own forces, and is generally in excellent condition. The replacement cost estimate is based on the Municipality tendering the future replacement works; however, if the Municipality were to complete the future replacement using their own forces, the estimated replacement cost would be reduced.

Maintenance Need	Element and Comments	Estimated Cost
Hazard Signs	Install hazard warning signs at structure	\$1,000.00
Maintenance Needs Total		\$1,000.00

Additional Investigations	Priority	Estimated Cost
	Normal	\$0.00

Roadside Protection Repairs	Priority	Estimated Cost
Narrow Structure, install guide rail during rehab/replacement	1 to 5 Years	\$0.00

Rehabilitation/Repair Required	Priority	Estimated Cost
	N/A	\$0.00
	N/A	\$0.00
	N/A	\$0.00
	N/A	\$0.00
	N/A	\$0.00
Rehabilitation Cost Subtotal		\$0.00

Estimate Value of Replacement Structure	\$350,000.00
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Associated Work	Priority	Estimated Cost
Approaches -		\$0.00
Detours -		\$0.00
Traffic Control -		\$0.00
Utilities -		\$0.00
Right of Way -		\$0.00
Environmental -		\$0.00
Other -		\$0.00
Total Associated Work Cost		\$0.00

Total Capital Works Costs			
Cost		Rehabilitation	Replacement
Subtotal:		N/A	\$350,000.00
Roadside Protection:		N/A	\$95,000.00
Staging:		N/A	\$0.00
Environmental Assessment		N/A	\$2,500.00
Contingencies:	10%	N/A	\$35,000.00
Engineering Design:	10% of first \$1M + 5% of cost above \$1M	N/A	\$35,000.00
Total Capital Work Cost		N/A	\$517,500.00

1.25 Structure No. 1001 (MTO No. 002-0319)

2022 BCI: 69.6

<u>Structure Name:</u>	Structure No. 1001		
<u>Road Name:</u>	Concession 14		
<u>Location:</u>	Lot 11, Concession 14/15, Carrick Survey		
<u>Structure Type:</u>	Steel I-Girder (Concrete Deck)		
<u>Number of Spans:</u>	1	<u>Span Lengths:</u>	8.7 m
<u>Overall Structure Width:</u>	9.4 m	<u>Roadway Width:</u>	8.7 m
<u>Year of Construction:</u>	1940	<u>Current Load Limit:</u>	N/A



Recommendation: No Capital Works is estimated to be required within the next 10 years.

Justification:

Structure No. 1001 generally appears to be in good condition with the exception of the previous water damage caused by the road salt/water leaking through the expansion joints in the barriers which were sealed after the 2014 inspection. The structure appears to have been previously rehabilitated and therefore the next capital works planned for the structure should be a replacement. Based on typical deterioration curves for rehabilitated structures, it is estimated that replacement will be required in approximately 20 years.

Maintenance Need	Element and Comments	Estimated Cost
Bridge Cleaning	Clean bearing seats	\$1,500.00
Maintenance Needs Total		\$1,500.00

Additional Investigations	Priority	Estimated Cost
	Normal	\$0.00

Roadside Protection Repairs	Priority	Estimated Cost
Replace Guide Rail, end treatments and structure connections	1 to 5 Years	\$95,000.00

Rehabilitation/Repair Required	Priority	Estimated Cost
	N/A	\$0.00
	N/A	\$0.00
	N/A	\$0.00
	N/A	\$0.00
	N/A	\$0.00
Rehabilitation Cost Subtotal		\$0.00

Estimate Value of Replacement Structure	\$900,000.00
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Associated Work	Priority	Estimated Cost
Approaches -		\$0.00
Detours -		\$0.00
Traffic Control -	N/A	\$15,000.00
Utilities - Relocate Utility Mounted to Fascia	N/A	\$15,000.00
Right of Way -		\$0.00
Environmental -		\$0.00
Other -		\$0.00
Total Associated Work Cost		\$30,000.00

Total Capital Works Costs			
Cost		Rehabilitation	Replacement
Subtotal:		N/A	\$930,000.00
Roadside Protection:		N/A	\$95,000.00
Staging:		N/A	\$0.00
Environmental Assessment		N/A	\$2,500.00
Contingencies:	10%	N/A	\$93,000.00
Engineering Design:	10% of first \$1M + 5% of cost above \$1M	N/A	\$93,000.00
Total Capital Work Cost		N/A	\$1,213,500.00

1.26 Structure No. 1002 (MTO No. 002-0320)

2022 BCI:

75

<u>Structure Name:</u>	Structure No. 1002 (12th Concession Bridge)		
<u>Road Name:</u>	Concession 12		
<u>Location:</u>	Lot 11, Concession 12/13, East of Highway 9		
<u>Structure Type:</u>	CSP Multi-Plate Arch Culvert(s)		
<u>Number of Spans:</u>	2	<u>Span Lengths:</u>	4.7, 4.7 m
<u>Overall Structure Width:</u>	21.1 m	<u>Roadway Width:</u>	7 m
<u>Year of Construction:</u>	1970	<u>Current Load Limit:</u>	N/A



Recommendation: No Capital Works is estimated to be required within the next 10 years.

Justification:

Structure No. 1002 is made up of twin-cell CSP culverts and generally appears to be in good condition. Based on the current BCI, replacement should be scheduled in approximately 25 years if the BCI continues to drop at a rate matching the typical deterioration curve used for this structure type. The minor deformation in the top of the east and west culvert should be monitored closely during future biennial inspections. If the deformations become greater than 10% of the culvert diameter, consideration should be given to establishing a monitoring program. The Municipality should also investigate whether the desirable clear zone is met at this site or if installation of a SBGR barrier system is warranted to help protect oncoming vehicular traffic.

Maintenance Need	Element and Comments	Estimated Cost
Bridge Cleaning	Remove fallen trees from inlet	\$1,000.00
Erosion Control	Install rock protection at inlet/outlet	\$2,500.00
Maintenance Needs Total		\$3,500.00

Additional Investigations	Priority	Estimated Cost
Monitoring of Deformations, Settlements and Movements,	Normal	\$0.00

Roadside Protection Repairs	Priority	Estimated Cost
Investigate need for Guide Rail	1 to 5 Years	\$1,000.00

Rehabilitation/Repair Required	Priority	Estimated Cost
	N/A	\$0.00
	N/A	\$0.00
	N/A	\$0.00
	N/A	\$0.00
	N/A	\$0.00
Rehabilitation Cost Subtotal		\$0.00

Estimate Value of Replacement Structure	\$900,000.00
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Associated Work	Priority	Estimated Cost
Approaches -		\$0.00
Detours -		\$0.00
Traffic Control -	N/A	\$15,000.00
Utilities -		\$0.00
Right of Way -		\$0.00
Environmental -		\$0.00
Other -		\$0.00
Total Associated Work Cost		\$15,000.00

Total Capital Works Costs			
Cost		Rehabilitation	Replacement
Subtotal:		N/A	\$915,000.00
Roadside Protection:		N/A	\$95,000.00
Staging:		N/A	\$0.00
Environmental Assessment		N/A	\$2,500.00
Contingencies:	10%	N/A	\$92,000.00
Engineering Design:	10% of first \$1M + 5% of cost above \$1M	N/A	\$92,000.00
Total Capital Work Cost		N/A	\$1,196,500.00

1.27 Structure No. 1003 (MTO No. 002-322)

2022 BCI:

58.1

<u>Structure Name:</u>	Structure No. 1003		
<u>Road Name:</u>	Concession 12		
<u>Location:</u>	Lot 31, Concession 12/13, Carrick Survey, Just East of Sideroad 30		
<u>Structure Type:</u>	Steel I-Girder (Concrete Deck)		
<u>Number of Spans:</u>	1	<u>Span Lengths:</u>	7.8 m
<u>Overall Structure Width:</u>	7.4 m	<u>Roadway Width:</u>	6 m
<u>Year of Construction:</u>	1940	<u>Current Load Limit:</u>	5 tonnes



Recommendation: Forgo rehabilitation and replace structure within 8 years.

Justification:

Structure No. 1003, which is estimated to have been constructed around 1940 has been previously rehabilitated and currently appears to be in generally fair condition overall. The structure is demonstrating continual signs of moisture penetration through the leaking expansion joints which is contributing to the damage of the girder ends and original abutments/ballast walls. The bridge's BCI has fallen from 63 to 58.1 since the 2014 inspection, which is mostly due to progression of corrosion noted on the girders. The structure has a load posting that may not allow for a large emergency vehicle to pass safely across the bridge. Given this load posting, the previous rehabilitation, and the relatively high cost associated with an additional rehabilitation, replacement of the structure is recommended as the BCI approaches 40, which is anticipated in approximately 8 years based on typical deterioration rates.

Maintenance Need	Element and Comments	Estimated Cost
Bridge Cleaning	Clean bearing seats	\$2,500.00
Erosion Control	Install scour protection	\$1,000.00
Maintenance Needs Total		\$3,500.00

Additional Investigations	Priority	Estimated Cost
	Normal	\$0.00

Roadside Protection Repairs	Priority	Estimated Cost
Narrow Structure, install guide rail during rehab/replacement	1 to 5 Years	\$0.00

Rehabilitation/Repair Required	Priority	Estimated Cost
	N/A	\$0.00
	N/A	\$0.00
	N/A	\$0.00
	N/A	\$0.00
	N/A	\$0.00
Rehabilitation Cost Subtotal		\$0.00

Estimate Value of Replacement Structure	\$900,000.00
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Associated Work	Priority	Estimated Cost
Approaches -		\$0.00
Detours -		\$0.00
Traffic Control -	6 to 10 years	\$15,000.00
Utilities -		\$0.00
Right of Way -		\$0.00
Environmental -		\$0.00
Other -		\$0.00
Total Associated Work Cost		\$15,000.00

Total Capital Works Costs			
Cost		Rehabilitation	Replacement
Subtotal:		N/A	\$915,000.00
Roadside Protection:		N/A	\$95,000.00
Staging:		N/A	\$0.00
Environmental Assessment		N/A	\$2,500.00
Contingencies:	10%	N/A	\$92,000.00
Engineering Design:	10% of first \$1M + 5% of cost above \$1M	N/A	\$92,000.00
Total Capital Work Cost		N/A	\$1,196,500.00

1.28 Structure No. 1006 (MTO No. 002-0324)

2022 BCI:

93.3

<u>Structure Name:</u>	Structure No. 1006		
<u>Road Name:</u>	Sideroad 30N		
<u>Location:</u>	Lot 30, Concession 8, Carrick Survey		
<u>Structure Type:</u>	Steel I-Girder (Timber Deck)		
<u>Number of Spans:</u>	1	<u>Span Lengths:</u>	9.1 m
<u>Overall Structure Width:</u>	5.6 m	<u>Roadway Width:</u>	4.3 m
<u>Year of Construction:</u>	1944	<u>Current Load Limit:</u>	N/A



Recommendation: No Capital Works is estimated to be required within the next 10 years.

Justification:

Structure No. 1006 had a superstructure replacement in 2019 and is generally in excellent condition overall. Only routine maintenance work is recommended at this point in time. It is typically only economical to complete one (1) rehabilitation for a bridge of this size and therefore the next capital works for this structure should be replacement when the condition warrants.

Maintenance Need	Element and Comments	Estimated Cost
Deck Joint Repair	Replace caulking at deck ends	\$0.00
Maintenance Needs Total		\$0.00

Additional Investigations	Priority	Estimated Cost
	Normal	\$0.00

Roadside Protection Repairs	Priority	Estimated Cost
Tighten end treatment cables	1 to 5 Years	\$500.00

Rehabilitation/Repair Required	Priority	Estimated Cost
	N/A	\$0.00
	N/A	\$0.00
	N/A	\$0.00
	N/A	\$0.00
	N/A	\$0.00
Rehabilitation Cost Subtotal		\$0.00

Estimate Value of Replacement Structure	\$900,000.00
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Associated Work	Priority	Estimated Cost
Approaches -		\$0.00
Detours -		\$0.00
Traffic Control -		\$0.00
Utilities -		\$0.00
Right of Way -		\$0.00
Environmental -		\$0.00
Other -		\$0.00
Total Associated Work Cost		\$0.00

Total Capital Works Costs		
Cost		
Subtotal:		N/A \$900,000.00
Roadside Protection:		N/A \$95,000.00
Staging:		N/A \$0.00
Environmental Assessment		N/A \$2,500.00
Contingencies:	10%	N/A \$90,000.00
Engineering Design:	10% of first \$1M + 5% of cost above \$1M	N/A \$90,000.00
Total Capital Work Cost		N/A \$1,177,500.00

1.29 Structure No. 1007 (MTO No. 002-0325)

2022 BCI: 81.7

<u>Structure Name:</u>	Structure No. 1007 (Sawmill Bridge)		
<u>Road Name:</u>	Concession 6		
<u>Location:</u>	Lot 26, Concession 6/7, Carrick Survey, East of Sideroad 25		
<u>Structure Type:</u>	Cast-In-Place Conc. Rigid Frame		
<u>Number of Spans:</u>	1	<u>Span Lengths:</u>	12 m
<u>Overall Structure Width:</u>	10.3 m	<u>Roadway Width:</u>	7.3 m
<u>Year of Construction:</u>	2007	<u>Current Load Limit:</u>	N/A



Recommendation: No Capital Works estimated to be required within 10 years. Future structure rehabilitation should be considered.

Justification:

Structure No. 1007 is a concrete rigid frame which was constructed in 2007 and appears to be in excellent to good condition with only minor maintenance work recommended at this point in time. Based on the structure size, and type, rehabilitation work to help extend the service life of the structure is typically required as the structure degrades over time and should be planned for in approximately 19 years based on typical deterioration rates used for this structure type. Consideration should be given to replacing the current guide rail system with a code conforming guide rail system.

Maintenance Need	Element and Comments	Estimated Cost
Bridge Cleaning	Remove vegetation in close proximity to structure	\$1,000.00
Maintenance Needs Total		\$1,000.00

Additional Investigations	Priority	Estimated Cost
	Normal	\$0.00

Roadside Protection Repairs	Priority	Estimated Cost
Replace Guide Rail, end treatments and structure connections	1 to 5 Years	\$95,000.00

Rehabilitation/Repair Required	Priority	Estimated Cost
	N/A	\$0.00
	N/A	\$0.00
	N/A	\$0.00
	N/A	\$0.00
	N/A	\$0.00
Rehabilitation Cost Subtotal		\$0.00

Estimate Value of Replacement Structure	\$900,000.00
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Associated Work	Priority	Estimated Cost
Approaches -		\$0.00
Detours -		\$0.00
Traffic Control -		\$0.00
Utilities -		\$0.00
Right of Way -		\$0.00
Environmental -		\$0.00
Other -		\$0.00
Total Associated Work Cost		\$0.00

Total Capital Works Costs			
Cost		Rehabilitation	Replacement
Subtotal:		N/A	\$900,000.00
Roadside Protection:		N/A	\$95,000.00
Staging:		N/A	\$0.00
Environmental Assessment		N/A	\$2,500.00
Contingencies:	10%	N/A	\$90,000.00
Engineering Design:	10% of first \$1M + 5% of cost above \$1M	N/A	\$90,000.00
Total Capital Work Cost		N/A	\$1,177,500.00

1.30 Structure No. 1008

2022 BCI:

83.4

<u>Structure Name:</u>	Structure No. 1008		
<u>Road Name:</u>	Sideroad 25N		
<u>Location:</u>	lot 25/26, Concession 6, Carrick Survey		
<u>Structure Type:</u>	Steel I-Girder (Concrete Deck)		
<u>Number of Spans:</u>	1	<u>Span Lengths:</u>	8.6 m
<u>Overall Structure Width:</u>	9.2 m	<u>Roadway Width:</u>	4.3 m
<u>Year of Construction:</u>	2010	<u>Current Load Limit:</u>	N/A



Recommendation: No Capital Works estimated to be required within 10 years. Future structure rehabilitation should be considered.

Justification:

Structure No. 1008 was constructed in 2010 and is generally in excellent condition. Only minor maintenance work is recommended at this point in time, including installing hazard warning signs at the end of the guide rail to conform to modern standards. Consideration should be given to waterproofing and paving the structure to help reduce exposure of the concrete deck to salt laden water and to help extend the service life of the structure.

Maintenance Need	Element and Comments	Estimated Cost
Handrail Maintenance	Replace missing bolt	\$250.00
Hazard Signs	Install hazard warning signs at structure	\$1,000.00
Other	Provide additional conduit for exposed utility ends	\$1,000.00
Maintenance Needs Total		\$2,250.00

Additional Investigations	Priority	Estimated Cost
	Normal	\$0.00

Roadside Protection Repairs	Priority	Estimated Cost
Tighten loose end treatment cables	1 to 5 Years	\$500.00

Rehabilitation/Repair Required	Priority	Estimated Cost
Waterproof and Pave deck	1 to 5 years	\$30,000.00
Rehabilitation Cost Subtotal		\$30,000.00

Estimate Value of Replacement Structure	\$700,000.00
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Associated Work	Priority	Estimated Cost
Approaches -		\$0.00
Detours -		\$0.00
Traffic Control -		\$0.00
Utilities -		\$0.00
Right of Way -		\$0.00
Environmental -		\$0.00
Other -		\$0.00
Total Associated Work Cost		\$0.00

Total Capital Works Costs		
Cost		
	Rehabilitation	Replacement
Subtotal:	\$30,000.00	\$700,000.00
Roadside Protection:	\$500.00	\$95,000.00
Staging:	N/A	\$0.00
Environmental Assessment	N/A	\$2,500.00
Contingencies:	10%	\$3,000.00
Engineering Design:	10% of first \$1M + 5% of cost above \$1M	\$2,500.00
		\$70,000.00
Total Capital Work Cost		\$36,000.00
		\$937,500.00

1.31 Structure No. 1009 (MTO No. 002-0410)

2022 BCI:

74.8

<u>Structure Name:</u>	Structure No. 1009		
<u>Road Name:</u>	Council Road		
<u>Location:</u>	Lot 28, Concession "A", Carrick Survey, Just East of CR12		
<u>Structure Type:</u>	Cast-In-Place Conc. Box Culvert		
<u>Number of Spans:</u>	1	<u>Span Lengths:</u>	6 m
<u>Overall Structure Width:</u>	18.9 m	<u>Roadway Width:</u>	9.1 m
<u>Year of Construction:</u>	1988	<u>Current Load Limit:</u>	N/A



Recommendation: No Capital Works estimated to be required within 10 years. Future structure rehabilitation should be considered.

Justification:

Structure No. 1009 was constructed in 1988 and appears to be in good condition showing no signs of further deterioration since the 2020 inspection. No repairs are recommended at this time. Based on the structure type, rehabilitations are not typically economical, and the structure should be planned for future replacement when condition warrants (20+ years). In the interim, the signs of movement in the gabion stone retaining walls should continue to be monitored during future biennial inspections. Consideration should be given to investigating the need for a guide rail system to help protect oncoming traffic.

Maintenance Need	Element and Comments	Estimated Cost
Bridge Cleaning	Clean Curbs,	\$1,000.00
Maintenance Needs Total		\$1,000.00

Additional Investigations	Priority	Estimated Cost
Monitoring of Deformations, Settlements and Movements,	Normal	\$0.00
	Urgent	\$0.00

Roadside Protection Repairs	Priority	Estimated Cost
Investigate need for Guide Rail	1 to 5 Years	\$1,000.00

Rehabilitation/Repair Required	Priority	Estimated Cost
	N/A	\$0.00
	N/A	\$0.00
	N/A	\$0.00
	N/A	\$0.00
	N/A	\$0.00
Rehabilitation Cost Subtotal		\$0.00

Estimate Value of Replacement Structure	\$700,000.00
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Associated Work	Priority	Estimated Cost
Approaches -		\$0.00
Detours -		\$0.00
Traffic Control -		\$0.00
Utilities -		\$0.00
Right of Way -		\$0.00
Environmental -		\$0.00
Other -		\$0.00
Total Associated Work Cost		\$0.00

Total Capital Works Costs			
Cost		Rehabilitation	Replacement
Subtotal:		N/A	\$700,000.00
Roadside Protection:		N/A	\$95,000.00
Staging:		N/A	\$0.00
Environmental Assessment		N/A	\$2,500.00
Contingencies:	10%	N/A	\$70,000.00
Engineering Design:	10% of first \$1M + 5% of cost above \$1M	N/A	\$70,000.00
Total Capital Work Cost		N/A	\$937,500.00

1.32 Structure No. 1010**2022 BCI:****55.5**

<u>Structure Name:</u>	Structure No. 1010		
<u>Road Name:</u>	Adam Street		
<u>Location:</u>	Adam Street, Mildmay, Carrick Survey		
<u>Structure Type:</u>	Other - Dam Structure		
<u>Number of Spans:</u>	2	<u>Span Lengths:</u>	2.7, 2.7 m
<u>Overall Structure Width:</u>	7.2 m	<u>Roadway Width:</u>	5 m
<u>Year of Construction:</u>	1935	<u>Current Load Limit:</u>	N/A



Recommendation: Closure of the structure is recommended

Justification:

Structure No. 1010 is currently closed to through traffic and generally appears to be in fair to poor condition, demonstrating signs of water ingress and concrete deterioration. The existing concrete retaining walls are in poor condition and appear unstable. A limited inspection of the dam structure was completed October 19, 2016, as the property owner would not grant access to the structure at the time of inspection. The OSIM comments and condition are based on the previous April 17, 2015, inspection which was completed as part of the dam monitoring program carried out by the Municipality of South Bruce. Monitoring of the dam took place from July 2014 to April 2015, and it was determined that no significant or continuous movement was observed during this time to warrant monitoring the dam structure further. The structure has since been removed and is currently under construction (2022 / 2023).

Maintenance Need	Element and Comments	Estimated Cost
		\$0.00
		\$0.00
Maintenance Needs Total		\$0.00

Additional Investigations	Priority	Estimated Cost
Monitoring of Deformations, Settlements and Movements,	Normal	\$0.00
	Urgent	\$0.00

Roadside Protection Repairs	Priority	Estimated Cost
	1 to 5 Years	\$0.00

Rehabilitation/Repair Required	Priority	Estimated Cost
	N/A	\$0.00
	N/A	\$0.00
	N/A	\$0.00
	N/A	\$0.00
	N/A	\$0.00
Rehabilitation Cost Subtotal		\$0.00

Estimate Value of Replacement Structure	\$650,000.00
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Associated Work	Priority	Estimated Cost
Approaches -		\$0.00
Detours -		\$0.00
Traffic Control -		\$0.00
Utilities -		\$0.00
Right of Way -		\$0.00
Environmental -		\$0.00
Other -		\$0.00
Total Associated Work Cost		\$0.00

Total Capital Works Costs			
Cost		Rehabilitation	Replacement
Subtotal:		N/A	\$650,000.00
Roadside Protection:		N/A	\$95,000.00
Staging:		N/A	\$0.00
Environmental Assessment		N/A	\$2,500.00
Contingencies:	10%	N/A	\$65,000.00
Engineering Design:	10% of first \$1M + 5% of cost above \$1M	N/A	\$65,000.00
Total Capital Work Cost		N/A	\$877,500.00

1.33 Structure No. 1011

<u>Structure Name:</u>	Structure No. 1011		
<u>Road Name:</u>	Concession 10		
<u>Location:</u>	Lot 31, Concession 10, East of Sideroad 30		
<u>Structure Type:</u>	Arch (Concrete)		
<u>Number of Spans:</u>	1	<u>Span Lengths:</u>	7.2 m
<u>Overall Structure Width:</u>	15.5 m	<u>Roadway Width:</u>	7.6 m
<u>Year of Construction:</u>	Unknown	<u>Current Load Limit:</u>	N/A



Recommendation: Major Rehabilitation is recommended as soon as possible.

Justification:

Structure No. 1011 is a concrete arch structure that generally appears to be in fair condition with signs of moisture penetration throughout the culvert barrel. Given the requirement for large excavations to complete waterproofing of the structure to prevent further moisture penetration, it is likely more feasible to provide a lining and grouting option. As such, a feasibility study has been recommended to compare lining and grouting versus replacing the structure and to confirm whether the reduced opening area caused by lining would be acceptable from a hydraulics standpoint. If re-lining is to occur, it is recommended that this work be completed as soon as possible, before deterioration reaches a point where replacement may be the only feasible option. If no rehabilitation work is completed, it is estimated that replacement will be required within 10 years based on the typical deterioration rates used for this structure type.

Maintenance Need	Element and Comments	Estimated Cost
		\$0.00
		\$0.00
Maintenance Needs Total		\$0.00

Additional Investigations	Priority	Estimated Cost
Structure Evaluation,	Normal	\$10,000.00

Roadside Protection Repairs	Priority	Estimated Cost
Replace Guide Rail, end treatments and structure connections	1 to 5 Years	\$95,000.00

Rehabilitation/Repair Required	Priority	Estimated Cost
CSP Liner & Grouting	Within 1 year	\$150,000.00
Widen Footing for Liner	Within 1 year	\$30,000.00
General Items - Insurance, Mobilization, Access etc.	Within 1 year	\$125,000.00
Rehabilitation Cost Subtotal		\$305,000.00

Estimate Value of Replacement Structure	\$800,000.00
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Associated Work	Priority	Estimated Cost
Approaches -		\$0.00
Detours -		\$0.00
Traffic Control -	Within 1 year	\$15,000.00
Utilities -		\$0.00
Right of Way -		\$0.00
Environmental -		\$0.00
Other -		\$0.00
Total Associated Work Cost		\$15,000.00

Total Capital Works Costs			
Cost		Rehabilitation	Replacement
Subtotal:		\$320,000.00	\$815,000.00
Roadside Protection:		\$95,000.00	\$95,000.00
Staging:		N/A	\$0.00
Environmental Assessment		N/A	\$2,500.00
Contingencies:	10%	\$32,000.00	\$82,000.00
Engineering Design:	10% of first \$1M + 5% of cost above \$1M	\$32,000.00	\$82,000.00
Total Capital Work Cost		\$479,000.00	\$1,076,500.00

1.34 Structure No. 1012

2022 BCI:

69

<u>Structure Name:</u>	Structure No. 1012		
<u>Road Name:</u>	Concession 10		
<u>Location:</u>	Lot 12, Concession 10		
<u>Structure Type:</u>	Cast-In-Place Conc. Rigid Frame		
<u>Number of Spans:</u>	1	<u>Span Lengths:</u>	11.7 m
<u>Overall Structure Width:</u>	10.4 m	<u>Roadway Width:</u>	9.2 m
<u>Year of Construction:</u>	Unknown	<u>Current Load Limit:</u>	N/A



Recommendation: Major Rehabilitation is recommended within 9 years.

Justification:

Structure No. 1012 is a concrete rigid frame that generally appears to be in good to fair condition but is demonstrating signs of moisture penetration through the exposed concrete deck. Based on the current BCI and structure type, this structure is a good candidate for future rehabilitation work which should be scheduled in approximately 9 years based on typical deterioration rates. Concrete repairs, installation of rock protection, and waterproofing and paving the exposed deck will help extend the service life of the structure. Consideration should be given to replacing the current guide rail system with a code conforming guide rail system.

Maintenance Need	Element and Comments	Estimated Cost
Hazard Signs	Replace hazard warning signs at structure	\$1,000.00
Maintenance Needs Total		\$1,000.00

Additional Investigations	Priority	Estimated Cost
	Normal	\$0.00

Roadside Protection Repairs	Priority	Estimated Cost
Replace Guide Rail, end treatments and structure connections	1 to 5 Years	\$95,000.00

Rehabilitation/Repair Required	Priority	Estimated Cost
Type A concrete repairs to deck top, curbs,	6 to 10 years	\$10,000.00
Type B concrete repairs to soffit,	6 to 10 years	\$40,000.00
Type C concrete repairs to abutment walls, wingwalls,	6 to 10 years	\$10,000.00
Install Rock Protection	6 to 10 years	\$10,000.00
Waterproof and pave	6 to 10 years	\$35,000.00
General Items - Insurance, Mobilization, Access etc.	6 to 10 years	\$125,000.00
Rehabilitation Cost Subtotal		\$230,000.00

Estimate Value of Replacement Structure	\$1,100,000.00
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Associated Work	Priority	Estimated Cost
Approaches -		\$0.00
Detours -		\$0.00
Traffic Control -	6 to 10 Years	\$15,000.00
Utilities -		\$0.00
Right of Way -		\$0.00
Environmental -		\$0.00
Other -		\$0.00
Total Associated Work Cost		\$15,000.00

Total Capital Works Costs			
Cost		Rehabilitation	Replacement
Subtotal:		\$245,000.00	\$1,115,000.00
Roadside Protection:		\$95,000.00	\$95,000.00
Staging:		N/A	\$0.00
Environmental Assessment		N/A	\$2,500.00
Contingencies:	10%	\$25,000.00	\$112,000.00
Engineering Design:	10% of first \$1M + 5% of cost above \$1M	\$25,000.00	\$106,000.00
Total Capital Work Cost		\$390,000.00	\$1,430,500.00

1.35 Structure No. 1013

2022 BCI:

100

<u>Structure Name:</u>	Structure No. 1013		
<u>Road Name:</u>	Concession 10		
<u>Location:</u>	Lot 15, Concession 10		
<u>Structure Type:</u>	CSP Round Culvert(s)		
<u>Number of Spans:</u>	1	<u>Span Lengths:</u>	3.3 m
<u>Overall Structure Width:</u>	25.9 m	<u>Roadway Width:</u>	8.4 m
<u>Year of Construction:</u>	2020	<u>Current Load Limit:</u>	N/A



Recommendation: No Capital Works is estimated to be required within the next 10 years.

Justification:

Structure No. 1013 was recently constructed in 2020, by the Municipality’s own forces, and is generally in excellent condition. Consideration should be given to reviewing the 3-cable guide rail to determine if it is suitable for this culvert location based on the magnitude of deflection that can occur with such a system. The replacement cost estimate is based on the Municipality tendering the future replacement works; however, if the Municipality were to complete the future replacement using their own forces, the estimated replacement cost would be reduced.

Maintenance Need	Element and Comments	Estimated Cost
Hazard Signs	Install hazard warning signs at structure	\$1,000.00
Maintenance Needs Total		\$1,000.00

Additional Investigations	Priority	Estimated Cost
	Normal	\$0.00

Roadside Protection Repairs	Priority	Estimated Cost
	1 to 5 Years	\$0.00

Rehabilitation/Repair Required	Priority	Estimated Cost
	N/A	\$0.00
	N/A	\$0.00
	N/A	\$0.00
	N/A	\$0.00
	N/A	\$0.00
Rehabilitation Cost Subtotal		\$0.00

Estimate Value of Replacement Structure	\$400,000.00
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Associated Work	Priority	Estimated Cost
Approaches -		\$0.00
Detours -		\$0.00
Traffic Control -		\$0.00
Utilities -		\$0.00
Right of Way -		\$0.00
Environmental -		\$0.00
Other -		\$0.00
Total Associated Work Cost		\$0.00

Total Capital Works Costs		
Cost		
	Rehabilitation	Replacement
Subtotal:	N/A	\$400,000.00
Roadside Protection:	N/A	\$95,000.00
Staging:	N/A	\$0.00
Environmental Assessment	N/A	\$2,500.00
Contingencies:	10%	\$40,000.00
Engineering Design:	10% of first \$1M + 5% of cost above \$1M	\$40,000.00
Total Capital Work Cost		\$577,500.00

1.36 Structure No. 1014

2022 BCI:

93.6

<u>Structure Name:</u>	Structure No. 1014		
<u>Road Name:</u>	Huron Bruce Townline		
<u>Location:</u>	Lot 1, Concession 1		
<u>Structure Type:</u>	Precast Concrete Box Culvert		
<u>Number of Spans:</u>	1	<u>Span Lengths:</u>	5 m
<u>Overall Structure Width:</u>	17.07 m	<u>Roadway Width:</u>	8.5 m
<u>Year of Construction:</u>	2016	<u>Current Load Limit:</u>	N/A



Recommendation: No Capital Works estimated to be required within 10 years. Future structure rehabilitation should be considered.

Justification:

Structure No. 1014 was replaced in 2016 and is in excellent condition. No capital work is recommended at this time; however, the Municipality should complete routine maintenance on this structure, including cleaning of the wearing surface and exposed concrete as part of their annual maintenance program.

Maintenance Need	Element and Comments	Estimated Cost
		\$0.00
		\$0.00
Maintenance Needs Total		\$0.00

Additional Investigations	Priority	Estimated Cost
	Normal	\$0.00

Roadside Protection Repairs	Priority	Estimated Cost
	1 to 5 Years	\$0.00

Rehabilitation/Repair Required	Priority	Estimated Cost
	N/A	\$0.00
	N/A	\$0.00
	N/A	\$0.00
	N/A	\$0.00
	N/A	\$0.00
Rehabilitation Cost Subtotal		\$0.00

Estimate Value of Replacement Structure	\$600,000.00
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Associated Work	Priority	Estimated Cost
Approaches -		\$0.00
Detours -		\$0.00
Traffic Control -		\$0.00
Utilities -		\$0.00
Right of Way -		\$0.00
Environmental -		\$0.00
Other -		\$0.00
Total Associated Work Cost		\$0.00

Total Capital Works Costs			
Cost		Rehabilitation	Replacement
Subtotal:		N/A	\$600,000.00
Roadside Protection:		N/A	\$95,000.00
Staging:		N/A	\$0.00
Environmental Assessment		N/A	\$2,500.00
Contingencies:	10%	N/A	\$60,000.00
Engineering Design:	10% of first \$1M + 5% of cost above \$1M	N/A	\$60,000.00
Total Capital Work Cost		N/A	\$817,500.00

1.37 Structure No. 1016

2022 BCI:

71.9

<u>Structure Name:</u>	Structure No. 1016		
<u>Road Name:</u>	Highway 9		
<u>Location:</u>	Just east of Structure 1015 on Highway 9		
<u>Structure Type:</u>	Cast-In-Place Conc. Rigid Frame		
<u>Number of Spans:</u>	2	<u>Span Lengths:</u>	6.75, 6.75 m
<u>Overall Structure Width:</u>	18.9 m	<u>Roadway Width:</u>	13.5 m
<u>Year of Construction:</u>	Unknown	<u>Current Load Limit:</u>	N/A



Recommendation: No Capital Works estimated to be required within 10 years. Future structure rehabilitation should be considered.

Justification:

Structure No. 1016 generally appears to be in good condition but is demonstrating signs of potential moisture penetration through the concrete deck, based on efflorescence-stained cracking in the soffit. Given the size and the amount of traffic using this structure, this structure is an ideal candidate for future rehabilitation work. Based on typical deterioration rates for this structure type, a rehabilitation is estimated to be required in approximately 12 years, when the BCI reaches 60. It is recommended that a detailed deck condition survey be completed prior to the rehabilitation to confirm levels of chloride content in the deck slab and to confirm extent of repairs required. Rehabilitation work will help extend the service life of the structure, but if it is not completed, it is estimated the structure will need to be replaced in approximately 22 years based on typical deterioration rates.

Maintenance Need	Element and Comments	Estimated Cost
Bridge Cleaning	Clean Deck Drainage,	\$1,000.00
Rout and Seal	Rout and seal cracks in wearing surface	\$2,500.00
Maintenance Needs Total		\$3,500.00

Additional Investigations	Priority	Estimated Cost
Detailed Deck Condition Survey,	Normal	\$10,000.00

Roadside Protection Repairs	Priority	Estimated Cost
Tighten end treatment cables	1 to 5 Years	\$500.00

Rehabilitation/Repair Required	Priority	Estimated Cost
	N/A	\$0.00
	N/A	\$0.00
	N/A	\$0.00
	N/A	\$0.00
	N/A	\$0.00
Rehabilitation Cost Subtotal		\$0.00

Estimate Value of Replacement Structure	\$1,600,000.00
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Associated Work	Priority	Estimated Cost
Approaches -		\$0.00
Detours -		\$0.00
Traffic Control -	N/A	\$15,000.00
Utilities -		\$0.00
Right of Way -		\$0.00
Environmental -		\$0.00
Other -		\$0.00
Total Associated Work Cost		\$15,000.00

Total Capital Works Costs			
Cost		Rehabilitation	Replacement
Subtotal:		N/A	\$1,615,000.00
Roadside Protection:		N/A	\$95,000.00
Staging:		\$75,000.00	\$175,000.00
Environmental Assessment		N/A	\$2,500.00
Contingencies:	10%	N/A	\$162,000.00
Engineering Design:	10% of first \$1M + 5% of cost above \$1M	N/A	\$131,000.00
Total Capital Work Cost		N/A	\$2,180,500.00

1.38 Structure No. 1017

2022 BCI:

89.9

<u>Structure Name:</u>	Structure No. 1017		
<u>Road Name:</u>	Sideroad 15N		
<u>Location:</u>	0.25km South of Concession 10		
<u>Structure Type:</u>	CSP Arch Culvert(s)		
<u>Number of Spans:</u>	1	<u>Span Lengths:</u>	3.325 m
<u>Overall Structure Width:</u>	16.3 m	<u>Roadway Width:</u>	6.8 m
<u>Year of Construction:</u>	2018	<u>Current Load Limit:</u>	N/A



Recommendation: No Capital Works is estimated to be required within the next 10 years.

Justification:

Structure No. 1017 was recently replaced by the Municipality using their own forces in 2018 and is currently in excellent condition; however, some gaps were noted at joints. The gaps are currently filled with an expandable sealant but deterioration of this material in the future could lead to loss of the culvert backfill material. The replacement cost estimate is based on the Municipality completing the future replacement work; however, if a Contractor is to be procured, the costs for replacement will likely be higher than noted.

Maintenance Need	Element and Comments	Estimated Cost
		\$0.00
		\$0.00
Maintenance Needs Total		\$0.00

Additional Investigations	Priority	Estimated Cost
	Normal	\$0.00

Roadside Protection Repairs	Priority	Estimated Cost
Narrow Structure, install guide rail during rehab/replacement	1 to 5 Years	\$0.00

Rehabilitation/Repair Required	Priority	Estimated Cost
	N/A	\$0.00
	N/A	\$0.00
	N/A	\$0.00
	N/A	\$0.00
	N/A	\$0.00
Rehabilitation Cost Subtotal		\$0.00

Estimate Value of Replacement Structure	\$350,000.00
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Associated Work	Priority	Estimated Cost
Approaches -		\$0.00
Detours -		\$0.00
Traffic Control -		\$0.00
Utilities -		\$0.00
Right of Way -		\$0.00
Environmental -		\$0.00
Other -		\$0.00
Total Associated Work Cost		\$0.00

Total Capital Works Costs			
Cost		Rehabilitation	Replacement
Subtotal:		N/A	\$350,000.00
Roadside Protection:		N/A	\$95,000.00
Staging:		N/A	\$0.00
Environmental Assessment		N/A	\$2,500.00
Contingencies:	10%	N/A	\$35,000.00
Engineering Design:	10% of first \$1M + 5% of cost above \$1M	N/A	\$35,000.00
Total Capital Work Cost		N/A	\$517,500.00

1.39 Structure No. 1018

2022 BCI:

71.3

<u>Structure Name:</u>	Structure No. 1018		
<u>Road Name:</u>	Sideroad 30		
<u>Location:</u>	0.1km south of Highway 9, Lot 30/31, Conc. D		
<u>Structure Type:</u>	Cast-In-Place Conc. Rigid Frame		
<u>Number of Spans:</u>	1	<u>Span Lengths:</u>	5.45 m
<u>Overall Structure Width:</u>	7.6 m	<u>Roadway Width:</u>	7 m
<u>Year of Construction:</u>	1929	<u>Current Load Limit:</u>	N/A



Recommendation: Forgo rehabilitation and replace structure in future (replacement timeline estimated to exceed 10 years).

Justification:

Structure No. 1018 is generally in good condition, however, there are cracks and delamination's present in the soffit which indicate the possible presence of chloride and moisture penetration through the deck. Consideration should be given to removing the fill, repairing concrete, installing a barrier system, waterproofing, and paving the bridge to help prevent further chloride and moisture penetration and extend the overall service life of the structure. However, given the small size of the structure, and narrow platform width, it is likely more economically efficient to consider forgoing a rehabilitation and replace the bridge as the BCI approaches 40. Based on the current BCI and typical deterioration rates, it is anticipated that replacement would be required in approximately 21 years, but the deterioration rate can be monitored during future inspections and the timeline adjusted accordingly.

Maintenance Need	Element and Comments	Estimated Cost
Other	Remove fallen post and wire fence collecting debris at inlet	\$500.00
Maintenance Needs Total		\$500.00

Additional Investigations	Priority	Estimated Cost
	Normal	\$0.00

Roadside Protection Repairs	Priority	Estimated Cost
Narrow Structure, install guide rail during rehab/replacement	1 to 5 Years	\$0.00

Rehabilitation/Repair Required	Priority	Estimated Cost
Type A concrete repairs to deck top, curbs,	N/A	\$5,000.00
Type B concrete repairs to soffit,	N/A	\$10,000.00
Type C concrete repairs to abutment walls, wingwalls,	N/A	\$5,000.00
Waterproof and pave	N/A	\$25,000.00
Install guide rail	N/A	\$95,000.00
General Items - Insurance, Mobilization, Access etc.	N/A	\$125,000.00
Rehabilitation Cost Subtotal		\$265,000.00

Estimate Value of Replacement Structure	\$550,000.00
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Associated Work	Priority	Estimated Cost
Approaches -		\$0.00
Detours -		\$0.00
Traffic Control -	N/A	\$15,000.00
Utilities -		\$0.00
Right of Way -		\$0.00
Environmental -		\$0.00
Other -		\$0.00
Total Associated Work Cost		\$15,000.00

Total Capital Works Costs		
Cost		
	Rehabilitation	Replacement
Subtotal:	\$280,000.00	\$565,000.00
Roadside Protection:	\$0.00	\$95,000.00
Staging:	N/A	\$0.00
Environmental Assessment	N/A	\$2,500.00
Contingencies:	10%	\$28,000.00
Engineering Design:	10% of first \$1M + 5% of cost above \$1M	\$28,000.00
		\$57,000.00
Total Capital Work Cost		\$336,000.00
		\$776,500.00

1.40 Structure No. 1019

2022 BCI:

49.3

<u>Structure Name:</u>	Structure No. 1019		
<u>Road Name:</u>	Sideroad 35		
<u>Location:</u>	0.04km south of Highway 9, Lot 35/36, Conc. D		
<u>Structure Type:</u>	Cast-In-Place Conc. Rigid Frame		
<u>Number of Spans:</u>	1	<u>Span Lengths:</u>	4.9 m
<u>Overall Structure Width:</u>	7.4 m	<u>Roadway Width:</u>	6.8 m
<u>Year of Construction:</u>	1937	<u>Current Load Limit:</u>	N/A



Recommendation: Structure replacement is recommended within 2 years.

Justification:

Structure No. 1019 is in generally poor condition with severe concrete disintegration and unsound concrete noted throughout the curbs, exterior soffit and wingwalls. The Municipality has tentatively scheduled the replacement of this structure for 2023, pending budget approval.

Maintenance Need	Element and Comments	Estimated Cost
		\$0.00
		\$0.00
Maintenance Needs Total		\$0.00

Additional Investigations	Priority	Estimated Cost
	Normal	\$0.00

Roadside Protection Repairs	Priority	Estimated Cost
	1 to 5 Years	\$0.00

Rehabilitation/Repair Required	Priority	Estimated Cost
	N/A	\$0.00
	N/A	\$0.00
	N/A	\$0.00
	N/A	\$0.00
	N/A	\$0.00
Rehabilitation Cost Subtotal		\$0.00

Estimate Value of Replacement Structure	\$450,000.00
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Associated Work	Priority	Estimated Cost
Approaches -		\$0.00
Detours -		\$0.00
Traffic Control -	1 to 5 Years	\$15,000.00
Utilities -		\$0.00
Right of Way -		\$0.00
Environmental -		\$0.00
Other -		\$0.00
Total Associated Work Cost		\$15,000.00

Total Capital Works Costs			
Cost		Rehabilitation	Replacement
Subtotal:		N/A	\$465,000.00
Roadside Protection:		N/A	\$95,000.00
Staging:		N/A	\$0.00
Environmental Assessment		N/A	\$2,500.00
Contingencies:	10%	N/A	\$47,000.00
Engineering Design:	10% of first \$1M + 5% of cost above \$1M	N/A	\$47,000.00
Total Capital Work Cost		N/A	\$656,500.00

1.41 Structure No. 1020**2022 BCI:**

59.3

<u>Structure Name:</u>	Structure No. 1020		
<u>Road Name:</u>	Field Road (Sideroad 25S)		
<u>Location:</u>	0.3km Northwest of Sideroad 45, Lot 23/24, Conc. II		
<u>Structure Type:</u>	CSP Multi-Plate Arch Culvert(s)		
<u>Number of Spans:</u>	1	<u>Span Lengths:</u>	2.7 m
<u>Overall Structure Width:</u>	18.5 m	<u>Roadway Width:</u>	7 m
<u>Year of Construction:</u>	Unknown	<u>Current Load Limit:</u>	N/A



Recommendation: Structure replacement is recommended within 10 years.

Justification:

Structure No. 1020 is a multi-plate CSP with a span less than 3 m. The structure was added to the bridge inspection list in 2014 as deformations were observed throughout the culvert. The overall physical condition of the culvert is good with no significant surface corrosion; however, cusping is present over approximately 5.5 m of the culvert length, which has a negative affect on the overall BCI rating of the structure. The length and magnitude of the cusping has been monitored since 2014 and has not increased but should continue to be monitored during biennial inspections. Based on the current BCI and typical deterioration curves, the remaining service life of the structure is approximately 10 years. It is likely however that this structure will outperform this timeframe given that the cusping is not actively progressing and considering that the structure is not deteriorating at typical rates for the current BCI. In the interim, the Municipality should consider investigating the need for guiderail at this location.

Maintenance Need	Element and Comments	Estimated Cost
		\$0.00
		\$0.00
Maintenance Needs Total		\$0.00

Additional Investigations	Priority	Estimated Cost
Monitoring of Deformations, Settlements and Movements,	Normal	\$0.00

Roadside Protection Repairs	Priority	Estimated Cost
Investigate need for Guide Rail	1 to 5 Years	\$1,000.00

Rehabilitation/Repair Required	Priority	Estimated Cost
	N/A	\$0.00
	N/A	\$0.00
	N/A	\$0.00
	N/A	\$0.00
	N/A	\$0.00
Rehabilitation Cost Subtotal		\$0.00

Estimate Value of Replacement Structure	\$350,000.00
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Associated Work	Priority	Estimated Cost
Approaches -		\$0.00
Detours -		\$0.00
Traffic Control -		\$0.00
Utilities -		\$0.00
Right of Way -		\$0.00
Environmental -		\$0.00
Other -		\$0.00
Total Associated Work Cost		\$0.00

Total Capital Works Costs			
Cost		Rehabilitation	Replacement
Subtotal:		N/A	\$350,000.00
Roadside Protection:		N/A	\$95,000.00
Staging:		N/A	\$0.00
Environmental Assessment		N/A	\$2,500.00
Contingencies:	10%	N/A	\$35,000.00
Engineering Design:	10% of first \$1M + 5% of cost above \$1M	N/A	\$35,000.00
Total Capital Work Cost		N/A	\$517,500.00

1.42 Structure No. 1021

2022 BCI:

93.1

<u>Structure Name:</u>	Structure No. 1021		
<u>Road Name:</u>	Concession 12 E		
<u>Location:</u>	On border of Township of Carrick and Township of Normanby, Lot 54, Conc. XII/XIII		
<u>Structure Type:</u>	Steel I-Girder (Concrete Deck)		
<u>Number of Spans:</u>	1	<u>Span Lengths:</u>	17.85 (19m skew span) m
<u>Overall Structure Width:</u>	10.5 m	<u>Roadway Width:</u>	9 m
<u>Year of Construction:</u>	2016	<u>Current Load Limit:</u>	N/A



Recommendation: No Capital Works estimated to be required within 10 years. Future structure rehabilitation should be considered.

Justification:

Structure No. 1021 was replaced in 2016 and is in excellent condition. Although only minor deficiencies were noted, portions of element quantities have been gradually transferred from excellent to good condition based on age and level of exposure to account for typical aging as outlined in the OSIM Manual. Routine maintenance should be completed to help maximize the lifespan of the structure.

Maintenance Need	Element and Comments	Estimated Cost
Other	Remove silt fence	\$250.00
Maintenance Needs Total		\$250.00

Additional Investigations	Priority	Estimated Cost
	Normal	\$0.00

Roadside Protection Repairs	Priority	Estimated Cost
Tighten loose end treatment cables	1 to 5 Years	\$500.00

Rehabilitation/Repair Required	Priority	Estimated Cost
	N/A	\$0.00
	N/A	\$0.00
	N/A	\$0.00
	N/A	\$0.00
	N/A	\$0.00
Rehabilitation Cost Subtotal		\$0.00

Estimate Value of Replacement Structure	\$1,700,000.00
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Associated Work	Priority	Estimated Cost
Approaches -		\$0.00
Detours -		\$0.00
Traffic Control -	N/A	\$15,000.00
Utilities -		\$0.00
Right of Way -		\$0.00
Environmental -		\$0.00
Other -		\$0.00
Total Associated Work Cost		\$15,000.00

Total Capital Works Costs		
Cost		
Subtotal:		N/A
Roadside Protection:		\$1,715,000.00
Staging:		N/A
Environmental Assessment		\$95,000.00
Contingencies:	10%	N/A
Engineering Design:	10% of first \$1M + 5% of cost above \$1M	\$172,000.00
		N/A
Total Capital Work Cost		\$2,120,500.00

1.43 Structure No. 1022

2022 BCI:

100

<u>Structure Name:</u>	1022		
<u>Road Name:</u>	Sideroad 15N		
<u>Location:</u>	600m North of Concession Rd 10		
<u>Structure Type:</u>	CSP Round Culvert(s)		
<u>Number of Spans:</u>	2	<u>Span Lengths:</u>	1.6, 1.6 m
<u>Overall Structure Width:</u>	16 m	<u>Roadway Width:</u>	6 m
<u>Year of Construction:</u>	2022	<u>Current Load Limit:</u>	N/A



Recommendation: No Capital Works is estimated to be required within the next 10 years.

Justification:

Structure No. 1022 was replaced in 2022 by Municipality staff and is generally in excellent condition. Routine maintenance is recommended to help prolong the service life of this structure.

Maintenance Need	Element and Comments	Estimated Cost
		\$0.00
		\$0.00
Maintenance Needs Total		\$0.00

Additional Investigations	Priority	Estimated Cost
	Normal	\$0.00

Roadside Protection Repairs	Priority	Estimated Cost
	1 to 5 Years	\$0.00

Rehabilitation/Repair Required	Priority	Estimated Cost
	N/A	\$0.00
	N/A	\$0.00
	N/A	\$0.00
	N/A	\$0.00
	N/A	\$0.00
Rehabilitation Cost Subtotal		\$0.00

Estimate Value of Replacement Structure	\$350,000.00
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Associated Work	Priority	Estimated Cost
Approaches -		\$0.00
Detours -		\$0.00
Traffic Control -		\$0.00
Utilities -		\$0.00
Right of Way -		\$0.00
Environmental -		\$0.00
Other -		\$0.00
Total Associated Work Cost		\$0.00

Total Capital Works Costs			
Cost		Rehabilitation	Replacement
Subtotal:		N/A	\$350,000.00
Roadside Protection:		N/A	\$95,000.00
Staging:		N/A	\$0.00
Environmental Assessment		N/A	\$2,500.00
Contingencies:	10%	N/A	\$35,000.00
Engineering Design:	10% of first \$1M + 5% of cost above \$1M	N/A	\$35,000.00
Total Capital Work Cost		N/A	\$517,500.00

1.44 Structure No. 1023

2022 BCI:

71.5

<u>Structure Name:</u>	1023		
<u>Road Name:</u>	Sideroad 15N		
<u>Location:</u>	500m North of Concession Rd 10		
<u>Structure Type:</u>	Cast-In-Place Conc. Rigid Frame		
<u>Number of Spans:</u>	1	<u>Span Lengths:</u>	2.4 m
<u>Overall Structure Width:</u>	8.5 m	<u>Roadway Width:</u>	4.5 m
<u>Year of Construction:</u>	1942	<u>Current Load Limit:</u>	N/A



Recommendation: No Capital Works is estimated to be required within the next 10 years.

Justification:

Structure No. 1023 is generally in good condition with only minor defects noted. Due to the span of less than 4.5 m, a rehabilitation is not recommended, and replacement of the structure should be considered as the BCI approaches 40, in approximately 22 years. Routine maintenance is recommended to help prolong the service life of the structure.

Maintenance Need	Element and Comments	Estimated Cost
Bridge Cleaning	Remove overgrown vegetation in close proximity to structure	\$1,500.00
Maintenance Needs Total		\$1,500.00

Additional Investigations	Priority	Estimated Cost
	Normal	\$0.00

Roadside Protection Repairs	Priority	Estimated Cost
Narrow Structure, install guide rail during rehab/replacement	1 to 5 Years	\$0.00

Rehabilitation/Repair Required	Priority	Estimated Cost
	N/A	\$0.00
	N/A	\$0.00
	N/A	\$0.00
	N/A	\$0.00
	N/A	\$0.00
Rehabilitation Cost Subtotal		\$0.00

Estimate Value of Replacement Structure	\$350,000.00
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Associated Work	Priority	Estimated Cost
Approaches -		\$0.00
Detours -		\$0.00
Traffic Control -		\$0.00
Utilities -		\$0.00
Right of Way -		\$0.00
Environmental -		\$0.00
Other -		\$0.00
Total Associated Work Cost		\$0.00

Total Capital Works Costs			
Cost		Rehabilitation	Replacement
Subtotal:		N/A	\$350,000.00
Roadside Protection:		N/A	\$95,000.00
Staging:		N/A	\$0.00
Environmental Assessment		N/A	\$2,500.00
Contingencies:	10%	N/A	\$35,000.00
Engineering Design:	10% of first \$1M + 5% of cost above \$1M	N/A	\$35,000.00
Total Capital Work Cost		N/A	\$517,500.00

1.45 Structure No. 1024

2022 BCI:

36.8

<u>Structure Name:</u>	1024		
<u>Road Name:</u>	Concession Rd C		
<u>Location:</u>	400m West of Sideroad 41		
<u>Structure Type:</u>	Steel I-Girder (Concrete Deck)		
<u>Number of Spans:</u>	1	<u>Span Lengths:</u>	4.6 m
<u>Overall Structure Width:</u>	4.1 m	<u>Roadway Width:</u>	3.8 m
<u>Year of Construction:</u>	Unknown	<u>Current Load Limit:</u>	N/A



Recommendation: Structure replacement is recommended as soon as possible.

Justification:

Structure No. 1024 is generally in poor condition with severe disintegration of the concrete and severe section loss of the structural steel throughout. Based on the BCI, replacement of the structure is recommended as soon as possible. The replacement costs reflect a prefabricated single lane structure on spread footings behind the existing abutments. It is recommended during the design phase to review the option of raising approach grades and installing an additional overflow CSP to the south given the flooding history at this site. In the interim, the Municipality should consider completing a structure evaluation to determine the current load carrying capacity. It is recommended the Municipality place a 5-tonne load limit on this structure if a Structural Evaluation is not completed and monitor this structure closely or consider closing the structure until replacement is a feasible option.

Maintenance Need	Element and Comments	Estimated Cost
		\$0.00
		\$0.00
Maintenance Needs Total		\$0.00

Additional Investigations	Priority	Estimated Cost
Structure Evaluation,	Normal	\$5,000.00

Roadside Protection Repairs	Priority	Estimated Cost
	1 to 5 Years	\$0.00

Rehabilitation/Repair Required	Priority	Estimated Cost
	N/A	\$0.00
	N/A	\$0.00
	N/A	\$0.00
	N/A	\$0.00
	N/A	\$0.00
Rehabilitation Cost Subtotal		\$0.00

Estimate Value of Replacement Structure	\$350,000.00
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Associated Work	Priority	Estimated Cost
Approaches -		\$0.00
Detours -		\$0.00
Traffic Control -		\$0.00
Utilities -		\$0.00
Right of Way -		\$0.00
Environmental -		\$0.00
Other -		\$0.00
Total Associated Work Cost		\$0.00

Total Capital Works Costs			
Cost		Rehabilitation	Replacement
Subtotal:		N/A	\$350,000.00
Roadside Protection:		N/A	\$95,000.00
Staging:		N/A	\$0.00
Environmental Assessment		N/A	\$2,500.00
Contingencies:	10%	N/A	\$35,000.00
Engineering Design:	10% of first \$1M + 5% of cost above \$1M	N/A	\$35,000.00
Total Capital Work Cost		N/A	\$517,500.00



BURNSIDE

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Appendix B

Structure Inventory and Cost Summaries

MUNICIPALITY OF SOUTH BRUCE - STRUCTURE INVENTORY

Structure No.	Inspect. Year	Road Name	Location	Structure Type	Span(s) (m)	Width (m)	Deck Area (m2)	Deterioration Curve	BCI
0001	2022	Concession 2	Lot 7, Concession 2/3, Culross Survey	Cast-In-Place Conc. Rigid Frame	5.5 (6.1m skew span)	9.2	64.4	BR-1	56.17
0002	2022	Concession 2	Lot 28, Concession 2/3, Culross Survey	Cast-In-Place Conc. Rigid Frame	5.8 (6.15 skew span)	7.8	53.04	BR-1	46.47
0003	2022	Concession 4	Lot 6, Concession 4/5, Culross Survey	CSP Multi-Plate Arch Culvert(s)	5,5	23.2	292.3	CS	66.34
0004	2022	Concession 4	Lot 12, Concession 4/5, Culross Survey	CSP Arch Culvert(s)	6	24	144	CS	74.60
0005	2022	Sideroad 5A	Lot 5/6 Concession 2, Culross Survey	Cast-In-Place Conc. Rigid Frame	7.35	8.1	63.99	BR-1	69.98
0006	2022	Sideroad 5A	Lot 5/6, Concession 3, Culross Survey	Cast-In-Place Conc. Rigid Frame	12.15	8.35	110.22	BR-1	73.07
0007	2022	Sideroad 25N	Lot 25/26, Concession 7, Culross Survey	Through Girder (Concrete)	12, 12	6	161.4	BR-2	46.11
0008	2022	Concession 8	Lot 28, Concession 8/9, Culross Survey	Steel Truss (Concrete Deck)	31.5	6.55	220.08	BR-2	64.00
0009	2022	Sideroad 25N	Lot 25/26, Concession 10, Culross Survey	Other - Abutments Only	23.7	5.55	138.195	BR-2	34.27
0010	2022	Concession 10	Lot 23, Concession 10/11, Culross Survey	Precast Concrete I-Girder	27.3	10.5	297.15	BR-2	87.65
0011	2022	Concession 10	Lot 11, Concession 10/11, Culross Survey	Steel I-Girder (Concrete Deck)	16.55	9.2	173.42	BR-1	97.29
0012	2022	Concession 10	Lot 5, Concession 10/11, Culross Survey	CSP Multi-Plate Arch Culvert(s)	5.4	26	140.4	CS	74.06
0013	2022	Concession 12	Lot 30, Concession 12/13, Culross Survey	Other - Timber Deck	12.8	3.75	48.75	BR-1	50.68
0014	2022	Concession 12	Lot 21, Concession 12/13, Culross Survey	Precast Concrete I-Girder	23.7	9.3	231.57	BR-2	74.38
0015	2022	Concession 12	Lot 14, Concession 12, East of Bruce Road 4	Cast-In-Place Conc. Rigid Frame	12.1	7.1	91.59	BR-1	44.91
0016	2022	Concession 14	Lot 22, Concession 14/15, Culross Survey	Steel Truss (Timber Deck)	25	5.55	150.405	BR-2	57.29
0017	2022	Concession 4	Lot 27, Concession 4/5	Cast-In-Place Conc. Rigid Frame	6	7	47.6	BR-1	53.48
0019	2022	Sideroad 18	Lot 18/19, Concession 14, Culross Survey	Cast-In-Place Conc. Rigid Frame	12.5	7.1	94.43	BR-1	66.68
0020	2022	Concession 2	Lot 11, Concession 2, Culross Survey	CSP Multi-Plate Arch Culvert(s)	3.9	21.7	84.63	CS	74.59
0021	2022	Sideroad 1A	Lot 1, Concession 2, Culross Survey	Cast-In-Place Conc. Rigid Frame	5.55 (6.5 skew span)	11	72.6	BR-1	46.11
0022	2022	Turnberry-Culross Townline	Lot 1, Concession 1, Culross Survey	CSP Multi-Plate Arch Culvert(s)	3.7	17	62.9	CS	80.68
0023	2022	Sideroad 5A	0.7km South of Concession 2 (0.1km South of Structure 0005), Conc. II, Lot 5/6	CSP Round Culvert(s)	1.9, 1.9	11.2	43.68	CS	71.85
0024	2022	Concession 8	Lot 28, Concession 8/9, Culross Survey, Approximately 0.1km W of Structure 0008	Cast-In-Place Conc. Rigid Frame	6.2	7.5	54	BR-1	57.05
0025	2022	Concession 10	0.5km West of Bruce Road 4, Conc. XII/XIII, Lot 17	CSP Round Culvert(s)	3	18	54	CS	100.00
1001	2022	Concession 14	Lot 11, Concession 14/15, Carrick Survey	Steel I-Girder (Concrete Deck)	8.7	9.4	92.12	BR-1	69.62
1002	2022	Concession 12	Lot 11, Concession 12/13, East of Highway 9	CSP Multi-Plate Arch Culvert(s)	4.7, 4.7	21.1	225.77	CS	75.00
1003	2022	Concession 12	Lot 31, Concession 12/13, Carrick Survey, Just East of Sideroad 30	Steel I-Girder (Concrete Deck)	7.8	7.4	72.52	BR-1	58.06
1006	2022	Sideroad 30N	Lot 30, Concession 8, Carrick Survey	Steel I-Girder (Timber Deck)	9.1	5.6	56.56	BR-1	93.25
1007	2022	Concession 6	Lot 26, Concession 6/7, Carrick Survey, East of Sideroad 25	Cast-In-Place Conc. Rigid Frame	12	10.3	135.96	BR-1	81.67
1008	2022	Sideroad 25N	lot 25/26, Concession 6, Carrick Survey	Steel I-Girder (Concrete Deck)	8.6	9.2	87.4	BR-1	83.45
1009	2022	Council Road	Lot 28, Concession "A", Carrick Survey, Just East of CR12	Cast-In-Place Conc. Box Culvert	6	18.9	128.52	CC	74.83
1010	2022	Adam Street	Adam Street, Mildmay, Carrick Survey	Other - Dam Structure	2.7, 2.7	7.2	50.4	BR	55.54
1011	2022	Concession 10	Lot 31, Concession 10, East of Sideroad 30	Arch (Concrete)	7.2	15.5	111.6	BR-1	58.99
1012	2022	Concession 10	Lot 12, Concession 10	Cast-In-Place Conc. Rigid Frame	11.7	10.4	130	BR-1	69.02
1013	2022	Concession 10	Lot 15, Concession 10	CSP Round Culvert(s)	3.3	25.9	85.47	CS	99.98
1014	2022	Huron Bruce Townline	Lot 1, Concession 1	Precast Concrete Box Culvert	5	17.07	97.47	BR	93.57
1016	2022	Highway 9	Just east of Structure 1015 on Highway 9	Cast-In-Place Conc. Rigid Frame	6.75, 6.75	18.9	279.72	BR-1	71.87
1017	2022	Sideroad 15N	0.25km South of Concession 10	CSP Arch Culvert(s)	3.325	16.3	54.2	BR	89.88
1018	2022	Sideroad 30	0.1km south of Highway 9, Lot 30/31, Conc. D	Cast-In-Place Conc. Rigid Frame	5.45	7.6	42.35	BR-1	71.30
1019	2022	Sideroad 35	0.04km south of Highway 9, Lot 35/36, Conc. D	Cast-In-Place Conc. Rigid Frame	4.9	7.4	37.4	BR	49.31
1020	2022	Field Road (Sideroad 25S)	0.3km Northwest of Sideroad 45, Lot 23/24, Conc. II	CSP Multi-Plate Arch Culvert(s)	2.7	18.5	49.95	CS	59.30
1021	2022	Concession 12 E	On border of Township of Carrick and Township of Normanby, Lot 54, Conc. XII/XIII	Steel I-Girder (Concrete Deck)	17.85 (19m skew span)	10.5	234.15	BR-1	93.14
1022	2022	Sideroad 15N	600m North of Concession Rd 10	CSP Round Culvert(s)	1.6, 1.6	16	86.4	CS	100.00
1023	2022	Sideroad 15N	500m North of Concession Rd 10	Cast-In-Place Conc. Rigid Frame	2.4	8.5	25.5	BR	71.46
1024	2022	Concession Rd C	400m West of Sideroad 41	Steel I-Girder (Concrete Deck)	4.6	4.1	20.09	BR-1	36.76

MUNICIPALITY OF SOUTH BRUCE - REHABILITATION CAPITAL WORKS

Structure No.	Inspect. Year	Road Name	Deterioration Curve	BCI	Years to Rehab	Years to Replace	Total Cost of Rehabilitation	Total Cost of Replacement	Recommended Work	Maintenance Needs	Additional Investigations	Roadside Protection	Structure Repair/ Replacement	Associated Work	Staging	Environmental Assessment	Contingency	Engineering Design	Capital Works Within 1 year	Capital Works 1 - 5 Years	Capital Works 6 - 10 Years	10-Year Capital Works Cost
0017	2022	Concession 4	BR-1	53.48	0.00	6.74	\$ 463,000.00	\$ 896,500.00	Rehabilitate	\$ 1,500.00	\$ -	\$ -	\$ 370,000.00	\$ 15,000.00	N/A	\$ -	\$ 39,000.00	\$ 39,000.00	\$ 463,000.00	\$ -	\$ -	\$ 463,000.00
1011	2022	Concession 10	BR-1	58.99	0.00	9.50	\$ 479,000.00	\$ 1,076,500.00	Rehabilitate	\$ -	\$ 10,000.00	\$ 95,000.00	\$ 305,000.00	\$ 15,000.00	N/A	\$ -	\$ 32,000.00	\$ 32,000.00	\$ 479,000.00	\$ -	\$ -	\$ 479,000.00
0003	2022	Concession 4	CS	66.34	1.00	13.17	\$ 335,000.00	\$ 1,412,500.00	Rehabilitate	\$ 1,500.00	\$ -	\$ 95,000.00	\$ 200,000.00	\$ -	N/A	\$ -	\$ 20,000.00	\$ 20,000.00	\$ 335,000.00	\$ -	\$ -	\$ 335,000.00
0010	2022	Concession 10	BR-2	87.65	2.00	34.15	\$ 68,500.00	\$ 2,235,500.00	Rehabilitate	\$ 1,750.00	\$ -	\$ 5,000.00	\$ 40,000.00	\$ 15,000.00	N/A	\$ -	\$ 6,000.00	\$ 2,500.00	\$ -	\$ 68,500.00	\$ -	\$ 68,500.00
0008	2022	Concession 8	BR-2	64.00	4.00	14.00	\$ 912,000.00	\$ 3,203,000.00	Rehabilitate	\$ 3,000.00	\$ 15,000.00	\$ -	\$ 745,000.00	\$ 15,000.00	N/A	\$ -	\$ 76,000.00	\$ 76,000.00	\$ -	\$ 912,000.00	\$ -	\$ 912,000.00
0019	2022	Sideroad 18	BR-1	66.68	6.68	16.68	\$ 370,000.00	\$ 1,136,500.00	Rehabilitate	\$ 4,500.00	\$ -	\$ -	\$ 293,000.00	\$ 15,000.00	N/A	\$ -	\$ 31,000.00	\$ 31,000.00	\$ -	\$ -	\$ 370,000.00	\$ 370,000.00
1012	2022	Concession 10	BR-1	69.02	9.02	19.02	\$ 390,000.00	\$ 1,430,500.00	Rehabilitate	\$ 1,000.00	\$ -	\$ 95,000.00	\$ 230,000.00	\$ 15,000.00	N/A	\$ -	\$ 25,000.00	\$ 25,000.00	\$ -	\$ -	\$ 390,000.00	\$ 390,000.00
0005	2022	Sideroad 5A	BR-1	69.98	9.98	19.98	\$ 364,000.00	\$ 1,016,500.00	Rehabilitate	\$ 3,500.00	\$ -	\$ -	\$ 287,000.00	\$ 15,000.00	N/A	\$ -	\$ 31,000.00	\$ 31,000.00	\$ -	\$ -	\$ 364,000.00	\$ 364,000.00
1016	2022	Highway 9	BR-1	71.87	11.87	21.87	N/A	\$ 2,180,500.00	Rehabilitate	\$ 3,500.00	\$ 10,000.00	\$ 500.00	\$ -	\$ 15,000.00	\$ 75,000.00	\$ -	N/A	N/A	\$ -	\$ -	\$ -	\$ -
0006	2022	Sideroad 5A	BR-1	73.07	13.07	23.07	N/A	\$ 1,545,500.00	Rehabilitate	\$ 5,500.00	\$ -	\$ 95,000.00	\$ -	\$ 15,000.00	N/A	\$ -	N/A	N/A	\$ -	\$ -	\$ -	\$ -
0014	2022	Concession 12	BR-2	74.38	14.38	24.38	N/A	\$ 1,890,500.00	Rehabilitate	\$ 11,500.00	\$ -	\$ 95,000.00	\$ -	\$ 15,000.00	N/A	\$ -	N/A	N/A	\$ -	\$ -	\$ -	\$ -
1007	2022	Concession 6	BR-1	81.67	19.17	29.17	N/A	\$ 1,177,500.00	Rehabilitate	\$ 1,000.00	\$ -	\$ 95,000.00	\$ -	\$ -	N/A	\$ -	N/A	N/A	\$ -	\$ -	\$ -	\$ -
1008	2022	Sideroad 25N	BR-1	83.45	19.45	29.45	\$ 36,000.00	\$ 937,500.00	Rehabilitate	\$ 2,250.00	\$ -	\$ 500.00	\$ 30,000.00	\$ -	N/A	\$ -	\$ 3,000.00	\$ 2,500.00	\$ -	\$ 36,000.00	\$ -	\$ 36,000.00
1021	2022	Concession 12 E	BR-1	93.14	28.14	38.14	N/A	\$ 2,120,500.00	Rehabilitate	\$ 250.00	\$ -	\$ 500.00	\$ -	\$ 15,000.00	N/A	\$ -	N/A	N/A	\$ -	\$ -	\$ -	\$ -
0011	2022	Concession 10	BR-1	97.29	32.29	42.29	N/A	\$ 1,757,500.00	Rehabilitate	\$ -	\$ -	\$ -	\$ -	\$ -	N/A	\$ -	N/A	N/A	\$ -	\$ -	\$ -	\$ -
1009	2022	Council Road	CC	74.83	N/A	19.83	N/A	\$ 937,500.00	Rehabilitate	\$ 1,000.00	\$ -	\$ 1,000.00	\$ -	\$ -	N/A	\$ -	N/A	N/A	\$ -	\$ -	\$ -	\$ -
1014	2022	Huron Bruce Townline	BR	93.57	N/A	38.57	N/A	\$ 817,500.00	Rehabilitate	\$ -	\$ -	\$ -	\$ -	\$ -	N/A	\$ -	N/A	N/A	\$ -	\$ -	\$ -	\$ -
Sub Totals										\$ 41,750.00	\$ 35,000.00	\$ 577,500.00	\$ 2,500,000.00	\$ 165,000.00	\$ 75,000.00	\$ -	\$ 263,000.00	\$ 259,000.00	\$ 1,277,000.00	\$ 1,016,500.00	\$ 1,124,000.00	\$ 3,417,500.00

MUNICIPALITY OF SOUTH BRUCE - REPLACEMENT CAPITAL WORKS

Structure No.	Inspect. Year	Road Name	Deterioration Curve	BCI	Years to Rehab	Years to Replace	Total Cost of Rehabilitation	Total Cost of Replacement	Recommended Work	Maintenance Needs	Additional Investigations	Roadside Protection	Structure Repair/ Replacement	Associated Work	Staging	Environmental Assessment	Contingency	Engineering Design	Capital Works Within 1 year	Capital Works 1 - 5 Years	Capital Works 6 - 10 Years	10-Year Capital Works Cost
0002	2022	Concession 2	BR-1	46.47	0.00	0.00	N/A	\$ 716,500.00	Replace	\$ -	\$ -	\$ 95,000.00	\$ 500,000.00	\$ 15,000.00	\$ -	\$ 2,500.00	\$ 52,000.00	\$ 52,000.00	\$ 716,500.00	\$ -	\$ -	\$ 716,500.00
0007	2022	Sideroad 25N	BR-2	46.11	0.00	0.00	N/A	\$ 2,120,500.00	Replace	\$ -	\$ -	\$ 95,000.00	\$ 1,700,000.00	\$ 15,000.00	\$ -	\$ 2,500.00	\$ 172,000.00	\$ 136,000.00	\$ 2,120,500.00	\$ -	\$ -	\$ 2,120,500.00
0009	2022	Sideroad 25N	BR-2	34.27	0.00	0.00	N/A	\$ 1,872,500.00	Replace	\$ -	\$ -	\$ 95,000.00	\$ 1,500,000.00	\$ -	\$ -	\$ 2,500.00	\$ 150,000.00	\$ 125,000.00	\$ 1,872,500.00	\$ -	\$ -	\$ 1,872,500.00
0015	2022	Concession 12	BR-1	44.91	0.00	0.00	N/A	\$ 1,430,500.00	Replace	\$ 1,000.00	\$ -	\$ 95,000.00	\$ 1,100,000.00	\$ 15,000.00	\$ -	\$ 2,500.00	\$ 112,000.00	\$ 106,000.00	\$ 1,430,500.00	\$ -	\$ -	\$ 1,430,500.00
0016	2022	Concession 14	BR-2	57.29	0.00	0.00	\$ 1,044,000.00	\$ 2,973,000.00	Replace	\$ 4,000.00	\$ -	\$ 95,000.00	\$ 2,400,000.00	\$ 15,000.00	\$ -	\$ 50,000.00	\$ 242,000.00	\$ 171,000.00	\$ 2,973,000.00	\$ -	\$ -	\$ 2,973,000.00
1024	2022	Concession Rd C	BR-1	36.76	0.00	0.00	N/A	\$ 517,500.00	Replace	\$ -	\$ 5,000.00	\$ 95,000.00	\$ 350,000.00	\$ -	\$ -	\$ 2,500.00	\$ 35,000.00	\$ 35,000.00	\$ 517,500.00	\$ -	\$ -	\$ 517,500.00
1019	2022	Sideroad 35	BR	49.31	N/A	2.00	N/A	\$ 656,500.00	Replace	\$ -	\$ -	\$ 95,000.00	\$ 450,000.00	\$ 15,000.00	\$ -	\$ 2,500.00	\$ 47,000.00	\$ 47,000.00	\$ -	\$ 656,500.00	\$ -	\$ 656,500.00
0021	2022	Sideroad 1A	BR-1	46.11	0.00	3.06	N/A	\$ 836,500.00	Replace	\$ 2,500.00	\$ -	\$ 95,000.00	\$ 600,000.00	\$ 15,000.00	\$ -	\$ 2,500.00	\$ 62,000.00	\$ 62,000.00	\$ -	\$ 836,500.00	\$ -	\$ 836,500.00
0001	2022	Concession 2	BR-1	56.17	N/A	4.00	\$ 391,000.00	\$ 1,016,500.00	Replace	\$ 3,500.00	\$ 5,000.00	\$ 95,000.00	\$ 750,000.00	\$ 15,000.00	\$ -	\$ 2,500.00	\$ 77,000.00	\$ 77,000.00	\$ -	\$ 1,016,500.00	\$ -	\$ 1,016,500.00
0013	2022	Concession 12	BR-1	50.68	0.00	5.34	N/A	\$ 596,500.00	Replace	\$ 5,500.00	\$ -	\$ 95,000.00	\$ 400,000.00	\$ 15,000.00	\$ -	\$ 2,500.00	\$ 42,000.00	\$ 42,000.00	\$ -	\$ 596,500.00	\$ -	\$ 596,500.00
1010	2022	Adam Street	BR	55.54	N/A	7.77	N/A	\$ 877,500.00	Replace	\$ -	\$ -	\$ 95,000.00	\$ 650,000.00	\$ -	\$ -	\$ 2,500.00	\$ 65,000.00	\$ 65,000.00	\$ -	\$ -	\$ 877,500.00	\$ 877,500.00
1003	2022	Concession 12	BR-1	58.06	0.00	8.00	N/A	\$ 1,196,500.00	Replace	\$ 3,500.00	\$ -	\$ 95,000.00	\$ 900,000.00	\$ 15,000.00	\$ -	\$ 2,500.00	\$ 92,000.00	\$ 92,000.00	\$ -	\$ -	\$ 1,196,500.00	\$ 1,196,500.00
0024	2022	Concession 8	BR-1	57.05	0.00	8.53	\$ 408,000.00	\$ 1,016,500.00	Replace	\$ 9,500.00	\$ -	\$ 95,000.00	\$ 750,000.00	\$ 15,000.00	\$ -	\$ 2,500.00	\$ 77,000.00	\$ 77,000.00	\$ -	\$ -	\$ 1,016,500.00	\$ 1,016,500.00
1020	2022	Field Road (Sideroad 25S)	CS	59.30	N/A	9.65	N/A	\$ 517,500.00	Replace	\$ -	\$ -	\$ 95,000.00	\$ 350,000.00	\$ -	\$ -	\$ 2,500.00	\$ 35,000.00	\$ 35,000.00	\$ -	\$ -	\$ 517,500.00	\$ 517,500.00
1001	2022	Concession 14	BR-1	69.62	N/A	16.81	N/A	\$ 1,213,500.00	Replace	\$ 1,500.00	\$ -	\$ 95,000.00	\$ 900,000.00	\$ 30,000.00	\$ -	\$ 2,500.00	\$ 93,000.00	\$ 93,000.00	\$ -	\$ -	\$ -	\$ -
0004	2022	Concession 4	CS	74.60	N/A	17.56	N/A	\$ 896,500.00	Replace	\$ 2,000.00	\$ -	\$ 95,000.00	\$ 650,000.00	\$ 15,000.00	\$ -	\$ 2,500.00	\$ 67,000.00	\$ 67,000.00	\$ -	\$ -	\$ -	\$ -
1018	2022	Sideroad 30	BR-1	71.30	11.30	21.30	\$ 336,000.00	\$ 776,500.00	Replace	\$ 500.00	\$ -	\$ 95,000.00	\$ 550,000.00	\$ 15,000.00	\$ -	\$ 2,500.00	\$ 57,000.00	\$ 57,000.00	\$ -	\$ -	\$ -	\$ -
1023	2022	Sideroad 15N	BR	71.46	N/A	21.46	N/A	\$ 517,500.00	Replace	\$ 1,500.00	\$ -	\$ 95,000.00	\$ 350,000.00	\$ -	\$ -	\$ 2,500.00	\$ 35,000.00	\$ 35,000.00	\$ -	\$ -	\$ -	\$ -
0023	2022	Sideroad 5A	CS	71.85	N/A	21.85	N/A	\$ 577,500.00	Replace	\$ 7,000.00	\$ -	\$ 95,000.00	\$ 400,000.00	\$ -	\$ -	\$ 2,500.00	\$ 40,000.00	\$ 40,000.00	\$ -	\$ -	\$ -	\$ -
0012	2022	Concession 10	CS	74.06	N/A	24.06	N/A	\$ 877,500.00	Replace	\$ 2,000.00	\$ -	\$ 95,000.00	\$ 650,000.00	\$ -	\$ -	\$ 2,500.00	\$ 65,000.00	\$ 65,000.00	\$ -	\$ -	\$ -	\$ -
0020	2022	Concession 2	CS	74.59	N/A	24.59	N/A	\$ 697,500.00	Replace	\$ 5,000.00	\$ -	\$ 95,000.00	\$ 500,000.00	\$ -	\$ -	\$ 2,500.00	\$ 50,000.00	\$ 50,000.00	\$ -	\$ -	\$ -	\$ -
1002	2022	Concession 12	CS	75.00	N/A	25.00	N/A	\$ 1,196,500.00	Replace	\$ 3,500.00	\$ -	\$ 95,000.00	\$ 900,000.00	\$ 15,000.00	\$ -	\$ 2,500.00	\$ 92,000.00	\$ 92,000.00	\$ -	\$ -	\$ -	\$ -
0022	2022	Tumberry-Culross Townline	CS	80.68	N/A	30.68	N/A	\$ 656,500.00	Replace	\$ 750.00	\$ -	\$ 95,000.00	\$ 450,000.00	\$ 15,000.00	\$ -	\$ 2,500.00	\$ 47,000.00	\$ 47,000.00	\$ -	\$ -	\$ -	\$ -
1017	2022	Sideroad 15N	BR	89.88	N/A	35.44	N/A	\$ 517,500.00	Replace	\$ -	\$ -	\$ 95,000.00	\$ 350,000.00	\$ -	\$ -	\$ 2,500.00	\$ 35,000.00	\$ 35,000.00	\$ -	\$ -	\$ -	\$ -
1006	2022	Sideroad 30N	BR-1	93.25	N/A	40.58	N/A	\$ 1,177,500.00	Replace	\$ -	\$ -	\$ 95,000.00	\$ 900,000.00	\$ -	\$ -	\$ 2,500.00	\$ 90,000.00	\$ 90,000.00	\$ -	\$ -	\$ -	\$ -
1013	2022	Concession 10	CS	99.98	N/A	44.98	N/A	\$ 577,500.00	Replace	\$ 1,000.00	\$ -	\$ 95,000.00	\$ 400,000.00	\$ -	\$ -	\$ 2,500.00	\$ 40,000.00	\$ 40,000.00	\$ -	\$ -	\$ -	\$ -
0025	2022	Concession 10	CS	100.00	N/A	45.00	N/A	\$ 517,500.00	Replace	\$ 1,000.00	\$ -	\$ 95,000.00	\$ 350,000.00	\$ -	\$ -	\$ 2,500.00	\$ 35,000.00	\$ 35,000.00	\$ -	\$ -	\$ -	\$ -
1022	2022	Sideroad 15N	CS	100.00	N/A	45.00	N/A	\$ 517,500.00	Replace	\$ -	\$ -	\$ 95,000.00	\$ 350,000.00	\$ -	\$ -	\$ 2,500.00	\$ 35,000.00	\$ 35,000.00	\$ -	\$ -	\$ -	\$ -
Sub Totals										\$ 55,250.00	\$ 10,000.00	\$ 2,660,000.00	\$ 20,100,000.00	\$ 240,000.00	\$ -	\$ 117,500.00	\$ 2,041,000.00	\$ 1,903,000.00	\$ 9,630,500.00	\$ 3,106,000.00	\$ 3,608,000.00	\$ 16,344,500.00

MUNICIPALITY OF SOUTH BRUCE - ADDITIONAL INVESTIGATIONS REQUIRED

Priority	Structure Name	Road Name	Additional Investigations Required	Estimated Cost
Normal	0001	Concession 2	Structure Evaluation,	\$5,000
Normal	0003	Concession 4	Monitoring of Deformations, Settlements and Movements, Mon	\$0
Normal	0008	Concession 8	Structure Evaluation,	\$15,000
Normal	0010	Concession 10	Monitoring of Deformations, Settlements and Movements,	\$0
Normal	0020	Concession 2	Monitoring of Deformations, Settlements and Movements,	\$0
Normal	0021	Sideroad 1A	Monitoring of Deformations, Settlements and Movements,	\$0
Normal	1002	Concession 12	Monitoring of Deformations, Settlements and Movements,	\$0
Normal	1009	Council Road	Monitoring of Deformations, Settlements and Movements,	\$0
Normal	1011	Concession 10	Other,	\$10,000
Normal	1016	Highway 9	Detailed Deck Condition Survey,	\$10,000
Normal	1020	Field Road (Sideroad 25S)	Monitoring of Deformations, Settlements and Movements,	\$0
Normal	1024	Concession Rd C	Structure Evaluation,	\$5,000
Total				\$45,000.00

MUNICIPALITY OF SOUTH BRUCE - MAINTENANCE NEEDS

Structure Name	Road Name	Maintenance Need	Estimated Maintenance Costs
0001	Concession 2	Repair eroded embankments and place rock protection; Rout and seal cracks in wearing surface	\$3,500.00
0003	Concession 4	Remove overgrown vegetation around culverts	\$1,500.00
0004	Concession 4	Remove overgrown vegetation around culvert; Replace hazard warning signs at structure	\$2,000.00
0005	Sideroad 5A	Remove vegetation along curbs and trees in close proximity to structure; Install hazard warning signs at structure	\$3,500.00
0006	Sideroad 5A	Remove vegetation growing along shoulders; Install rock protection along wingwalls; Install hazard warning signs on posts at structure; Replace styrofoam joint sealants in barriers with caulking	\$5,500.00
0008	Concession 8	Sweep wearing surface, flush joints, and clean bearing seats; Replace missing bolts in armouring	\$3,000.00
0010	Concession 10	Replace missing bolts for post to railing connection; Install hazard warning signs at structure; Remove exposed filter cloth along abutments	\$1,750.00
0012	Concession 10	Clean Deck Wearing Surface; Replace rotted posts	\$2,000.00
0013	Concession 12	Place rock protection on embankments; Remove exposed nails; Remove failed timber fascia boards; Install timber curbs	\$5,500.00
0014	Concession 12	Remove vegetation along shoulders, flush joints, clean bearing seats; repair NW washout and install rock protection; Remove formwork left in place; Replace joint sealants	\$11,500.00
0015	Concession 12	Clean wearing surface and curbs	\$1,000.00
0016	Concession 14	Swweep deck, flush joints, and clean bearing seats; Replace missing bolt on bearing; Install narrow structure signs	\$4,000.00
0017	Concession 4	Remove trees growing in close proximity to structure	\$1,500.00
0019	Sideroad 18	Remove vegetation along curbs; Repair NE and SW erosion; Install hazard warning signs at structure	\$4,500.00
0020	Concession 2	Clear debris/vegetation from watercourse; Install rock protection at the inlet/outlet	\$5,000.00
0021	Sideroad 1A	Remove brush blocking hazard warning signs and outlet; Replace non code confirming weight restriction signs	\$2,500.00
0022	Turnberry-Culross Townline	Repair leaning signs and replace other two signs	\$750.00
0023	Sideroad 5A	Remove vegetation blocking hazard warning signs; Install rock protection on embankments; Remove sediment buildup from culvert (pending approval form conservation authority)	\$7,000.00
0024	Concession 8	Remove overgrown vegetation along curbs; Install rock protection on embankments; Replace hazard warning signs at structure; Patch cracked asphalt areas	\$9,500.00
0025	Concession 10	Install hazard warning signs at structure	\$1,000.00
1001	Concession 14	Clean bearing seats	\$1,500.00
1002	Concession 12	Remove fallen trees from inlet; Install rock protection at inlet/outlet	\$3,500.00
1003	Concession 12	Clean bearing seats; Install scour protection	\$3,500.00
1006	Sideroad 30N	Replace caulking at deck ends	\$0.00
1007	Concession 6	Remove vegetation in close proximity to structure	\$1,000.00
1008	Sideroad 25N	Replace missing bolt; Install hazard warning signs at structure; Provide additional conduit for exposed utility ends	\$2,250.00
1009	Council Road	Clean Curbs	\$1,000.00
1012	Concession 10	Replace hazard warning signs at structure	\$1,000.00
1013	Concession 10	Install hazard warning signs at structure	\$1,000.00
1016	Highway 9	Clean Deck Drainage; Rout and seal cracks in wearing surface	\$3,500.00
1018	Sideroad 30	Remove fallen post and wire fence collecting debris at inlet	\$500.00
1021	Concession 12 E	Remove silt fence	\$250.00
1023	Sideroad 15N	Remove overgrown vegetation in close proximity to structure	\$1,500.00
Total			\$97,000.00

MUNICIPALITY OF SOUTH BRUCE - CURRENT ROADSIDE SAFETY NEEDS

Structure Name	Road Name	Roadside Safety Need	Estimated Cost
0001	Concession 2	Replace Guide Rail, end treatments and structure connections	\$95,000.00
0003	Concession 4	Replace Guide Rail, end treatments	\$95,000.00
0004	Concession 4	Replace Guide Rail, end treatments	\$95,000.00
0005	Sideroad 5A	Narrow Structure, install guide rail during rehab/replacement	\$0.00
0006	Sideroad 5A	Install Guide Rail, end treatments and structure connections	\$95,000.00
0008	Concession 8	Narrow Structure, install guide rail during rehab/replacement	\$0.00
0010	Concession 10	Repair Guide Rail End Treatments	\$5,000.00
0012	Concession 10	Replace guide rail system and install end treatments	\$95,000.00
0013	Concession 12	Narrow Structure, install guide rail during rehab/replacement	\$0.00
0014	Concession 12	Replace Guide Rail, end treatments and structure connections	\$95,000.00
0015	Concession 12	Install Guide Rail, end treatments and structure connections	\$95,000.00
0016	Concession 14	Narrow Structure, install guide rail during rehab/replacement	\$0.00
0017	Concession 4	Narrow Structure, install guide rail during rehab/replacement	\$0.00
0019	Sideroad 18	Narrow Structure, install guide rail during rehab/replacement	\$0.00
0020	Concession 2	Investigate need for Guide Rail	\$1,000.00
0021	Sideroad 1A	Narrow Structure, install guide rail during rehab/replacement	\$0.00
0022	Turnberry-Culross Townline	Investigate need for Guide Rail	\$1,000.00
0023	Sideroad 5A	Investigate need for Guide Rail	\$1,000.00
0024	Concession 8	Narrow Structure, install guide rail during rehab/replacement	\$0.00
0025	Concession 10	Narrow Structure, install guide rail during rehab/replacement	\$0.00
1001	Concession 14	Replace Guide Rail, end treatments and structure connections	\$95,000.00
1002	Concession 12	Investigate need for Guide Rail	\$1,000.00
1003	Concession 12	Narrow Structure, install guide rail during rehab/replacement	\$0.00
1006	Sideroad 30N	Tighten end treatment cables	\$500.00
1007	Concession 6	Replace Guide Rail, end treatments and structure connections	\$95,000.00
1008	Sideroad 25N	Tighten loose end treatment cables	\$500.00
1009	Council Road	Investigate need for Guide Rail	\$1,000.00
1011	Concession 10	Replace Guide Rail, end treatments and structure connections	\$95,000.00
1012	Concession 10	Replace Guide Rail, end treatments and structure connections	\$95,000.00
1016	Highway 9	Tighten end treatment cables	\$500.00
1017	Sideroad 15N	Narrow Structure, install guide rail during rehab/replacement	\$0.00
1018	Sideroad 30	Narrow Structure, install guide rail during rehab/replacement	\$0.00
1020	Field Road (Sideroad 25S)	Investigate need for Guide Rail	\$1,000.00
1021	Concession 12 E	Tighten loose end treatment cables	\$500.00
1023	Sideroad 15N	Narrow Structure, install guide rail during rehab/replacement	\$0.00
Total			\$1,058,000.00

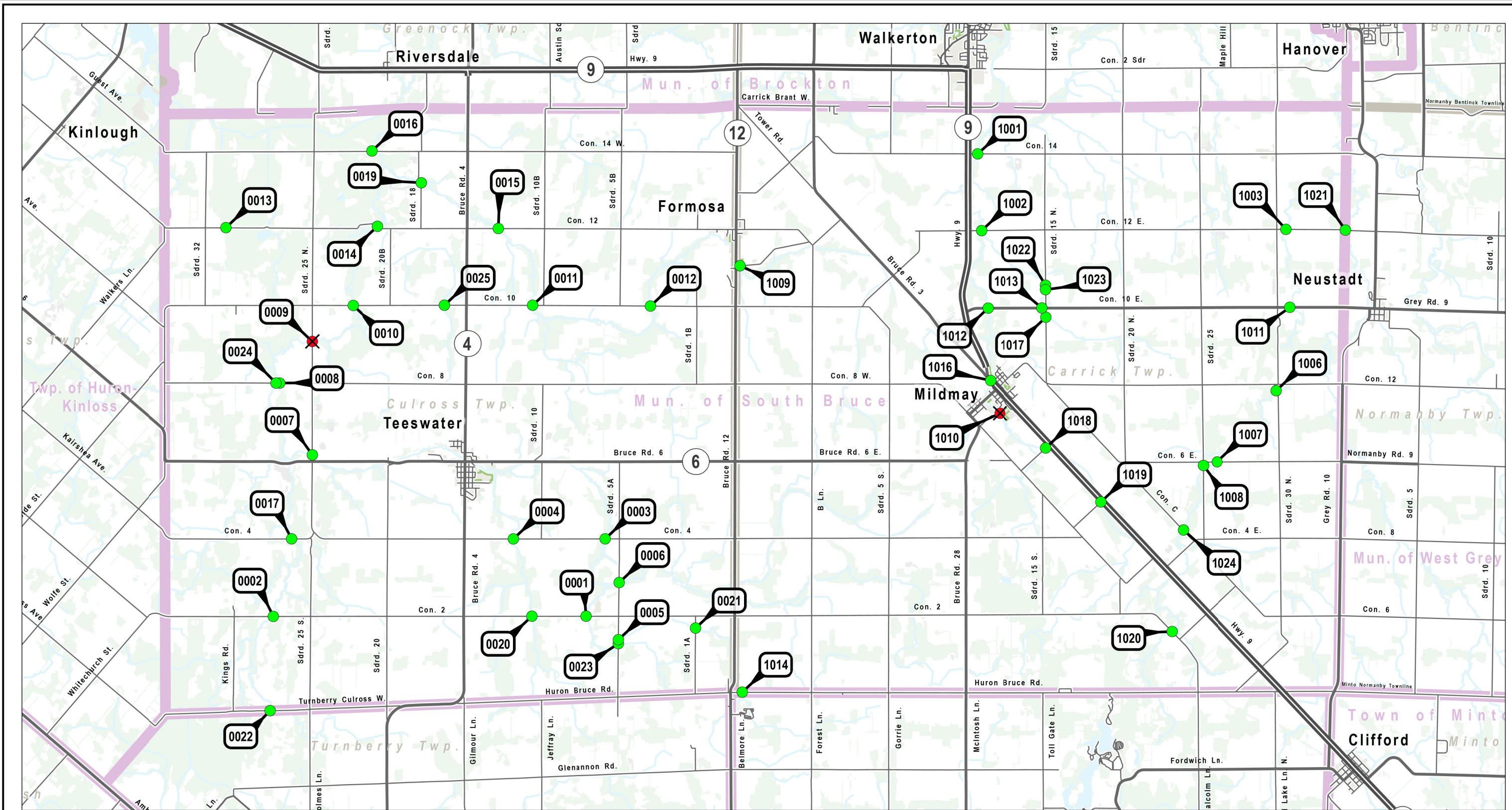


BURNSIDE

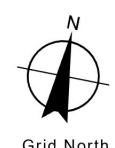
[THE DIFFERENCE IS OUR PEOPLE]

Appendix C

Structure Location Map



Datum: North American 1983 CSRS
 Coord. System: NAD 1983 CSRS Ontario MNR
 Projection: Lambert Conformal Conic
 Central Meridian: 85°0'0.00"W
 False Easting: 930,000m False Northing: 6,430,000m
 Page Orientation: -14° Scale Factor: 0.00000



Grid North

- Closed Structure Location
- Structure Location

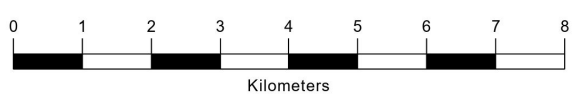


Figure Title
OSIM INSPECTIONS 2022
 STRUCTURE LOCATIONS
 FORMER TOWNSHIPS OF
 CARRICK AND CULROSS

Client
MUNICIPALITY OF SOUTH BRUCE

Drawn	Checked	Date	Figure No.
PS	CK	2022/12/16	1
Scale	Project No.		
H 1:100,000		300042391.2022	



BURNSIDE

[THE DIFFERENCE IS OUR PEOPLE]

Appendix D

Photo Summary Sheets

042391: Structure 1: Concession Rd 2



UTM Coordinates (WGS84)	17-480898m.E 4868560m.N
Ownership	Municipality of South Bruce
Structure Type	Municipal Structure
Inspectors	Brody Still, Clayton Watters

1. 1: Approach Guide Rail (South West)

Photo



2. 1: Deck Wearing Surface (Overtop of structure)

Photo



3. 1: Wingwalls (Quadrant of structure)

Photo



4. 1: Soffit - Thick Slab - Ext (South)

Photo



5. 1: Soffit - Thick Slab - Int (Underside of structure)

Photo



6. 1: Abutment Walls (South)

Photo



042391: Structure 2: Concession Rd 2



UTM Coordinates (WGS84)	17-472755m.E 4866973m.N
Ownership	Municipality of South Bruce
Structure Type	Municipal Structure
Inspectors	Brody Still, Clayton Watters

1. 2: Approach Guide Rail (Quadrant of structure)

Photo



2. 2: Approach Wearing Surface (West)

Photo



3. 2: Deck Wearing Surface (Overtop of structure)

Photo



4. 2: Soffit - Thick Slab - Int (Underside of structure)

Photo



5. 2: Abutment Walls (East)

Photo



042391: Structure 3: Concession Rd 4



UTM Coordinates (WGS84) | 17-481005m.E 4870671m.N

Ownership | Municipality of South Bruce

Structure Type | Municipal Structure

Inspectors | Brody Still, Clayton Watters

1. 3: Approach Wearing Surface (North East)

Photo



2. 3: Deck Wearing Surface (Overtop of structure)

Photo



5. 3: Outlet (North)

Photo



6. 3: Inlet (South)

Photo



5. 3: Barrels (Through structure)

Photo



6. 3: Barrels (Through structure)

Photo



042391: Structure 4: Concession Rd 4



UTM Coordinates (WGS84)	17-478608m.E 4870204m.N
Ownership	Municipality of South Bruce
Structure Type	Municipal Structure
Inspectors	Brody Still, Clayton Watters

1. 4: Signs (North East)

Photo



2. 4: Deck Wearing Surface (Overtop of structure)

Photo



3. 4: Barrels (Through structure)

Photo



4. 4: Inlet (South)

Photo



5. 4: Outlet (North)

Photo



042391: Structure 5: Sideroad 5A



UTM Coordinates (WGS84) | 17-481860m.E 4868111m.N

Ownership | Municipality of South Bruce

Structure Type | Municipal Structure

Inspectors | Brody Still, Clayton Watters

1. 5: Deck Wearing Surface (Overtop of structure)

Photo



2. 5: Barrier/Parapet Walls Interior (West)

Photo



3. 5: Wingwalls (Quadrant of structure)

Photo



4. 5: Soffit - Thick Slab - Ext (East)

Photo



5. 5: Abutment Walls (South)

Photo



6. 5: Soffit - Thick Slab - Int (Underside of structure)

Photo



7. 5: Soffit - Thick Slab - Int (Underside of structure)

Photo



042391: Structure 6: Sideroad 5A



UTM Coordinates (WGS84)	17-481589m.E 4869603m.N
Ownership	Municipality of South Bruce
Structure Type	Municipal Structure
Inspectors	Brody Still, Clayton Watters

1. 6: Approach Wearing Surface (North)

Photo



2. 6: Deck Wearing Surface (Overtop of structure)

Photo



3. 6: Barrier/Parapet Walls Interior (East)

Photo



4. 6: Barrier/Parapet Walls Exterior (East)

Photo



5. 6: Wingwalls (Quadrant of structure)

Photo



6. 6: Soffit - Thick Slab - Ext (East)

Photo



7. 6: Soffit - Thick Slab - Int (Underside of structure)

Photo



8. 6: Abutment Walls (North)

Photo



042391: Structure 7: Sideroad 25 N



UTM Coordinates (WGS84) | 17-472951m.E 4871377m.N

Ownership | Municipality of South Bruce

Structure Type | Municipal Structure

Inspectors | Brody Still, Clayton Watters

1. 7: Deck Wearing Surface (Overtop of structure)

Photo



2. 7: Barrier/Parapet Walls Interior (East)

Photo



3. 7: Barrier/Parapet Walls Exterior (East)

Photo



4. 7: Shaft / Bents (center of structure)

Photo



5. 7: Soffit - Thick Slab - Ext (West)

Photo



6. 7: Soffit - Thick Slab - Int (Underside of structure)

Photo



7. 7: Shaft / Bents (Center of structure)

Photo



8. 7: Abutment Walls (North)

Photo



042391: Structure 8: Concession Rd 8



UTM Coordinates (WGS84)	17-471740m.E 4873082m.N
Ownership	Municipality of South Bruce
Structure Type	Municipal Structure
Inspectors	Brody Still, Clayton Watters

1. 8: Approach Guide Rail (South West)

Photo



2. 8: Deck Wearing Surface (Overtop of structure)

Photo



3. 8: Verticals / Diagonals (North)

Photo



4. 8: Connections (South)

Photo



5. 8: Floor Beams (Underside of Structure)

Photo



042391: Structure 10: Concession Rd 10



UTM Coordinates (WGS84)	17-473262m.E 4875473m.N
Ownership	Municipality of South Bruce
Structure Type	Municipal Structure
Inspectors	Brody Still, Clayton Watters

1. 10: Approach Guide Rail (Quadrant of structure)

Photo



2. 10: Approach Wearing Surface (East)

Photo



3. 10: Deck Wearing Surface (Overtop of structure)

Photo



4. 10: Deck Drainage (south)

Photo



5. 10: Curbs (North)

Photo



6. 10: Barrier/Parapet Walls Interior (South)

Photo



7. 10: Hand Railings (South)

Photo



8. 10: Girders - Ends (Underside of structure)

Photo



9. 10: Girders - Middle (Underside of structure)

Photo



042391: Structure 11: Concession Rd 10



UTM Coordinates (WGS84)	17-477928m.E 4876387m.N
Ownership	Municipality of South Bruce
Structure Type	Municipal Structure
Inspectors	Brody Still, Clayton Watters

1. 11: Signs (South West)

Photo



2. 11: Approach Wearing Surface (East)

Photo



3. 11: Approach Guide Rail (North East)

Photo



4. 11: Deck Wearing Surface (Overtop of Structure)

Photo



5. 11: Barrier/Parapet Walls Interior (South)

Photo



6. 11: Wingwalls (South East)

Photo



7. 11: Girders - Ends (West)

Photo



8. 11: A. Bearings (West)

Photo



9. 11: Girders - Middle (Underside of structure)

Photo



10. 11: Abutment Walls (West)

Photo



11. 11: Diaphragms - End (Underside of structure)

Photo



12. 11: Soffit - Thick Slab - Int (Underside of structure)

Photo



042391: Structure 12: Concession Rd 10



UTM Coordinates (WGS84)	17-481006m.E 4876964m.N
Ownership	Municipality of South Bruce
Structure Type	Municipal Structure
Inspectors	Brody Still, Clayton Watters

1. 12: Approach Wearing Surface (East)

Photo



2. 12: Deck Wearing Surface (Overtop of structure)

Photo



3. 12: Inlet (North)

Photo



4. 12: Barrels (Interior of structure)

Photo



5. 12: Outlet (South)

Photo



042391: Structure 13: Concession Rd 12

UTM Coordinates (WGS84)	17-469552m.E 4876858m.N
Ownership	Municipality of South Bruce
Structure Type	Municipal Structure
Inspectors	Brody Still, Clayton Watters

1. 13: Deck Top (Overtop of structure)

Photo



042391: Structure 14: Concession Rd 12



UTM Coordinates (WGS84)	17-473501m.E 4877661m.N
Ownership	Municipality of South Bruce
Structure Type	Municipal Structure
Inspectors	Brody Still, Clayton Watters

1. 14: Approach Wearing Surface (East)

Photo



2. 14: Approach Guide Rail (North West)

Photo



3. 14: Deck Wearing Surface (Overtop of structure)

Photo



4. 14: undefined (Ends of deck wearing surface)

Photo



5. 14: Barrier/Parapet Walls Interior (North)

Photo



6. 14: Deck Drainage (Quadrant of deck)

Photo



7. 14: Wingwalls (Quadrant of structure)

Photo



8. 14: Soffit - Thick Slab - Int (Underside of structure)

Photo



9. 14: Girders - Middle (Underside of structure)

Photo



042391: Structure 15: Concession Rd 12



UTM Coordinates (WGS84)	17-476647m.E 4878212m.N
Ownership	Municipality of South Bruce
Structure Type	Municipal Structure
Inspectors	Brody Still, Clayton Watters

1. 15: Signs (North West)

Photo



2. 15: Posts (North)

Photo



3. 15: Railing System (North)

Photo



4. 15: Posts (North)

Photo



5. 15: Deck Wearing Surface (Overtop of structure)

Photo



6. 15: Curbs (South)

Photo



7. 15: Wingwalls (South East)

Photo



8. 15: Soffit - Thick Slab - Ext (South)

Photo



9. 15: Abutment Walls (East)

Photo



10. 15: Soffit - Thick Slab - Int (Underside of structure)

Photo



11. 15: Soffit - Thick Slab - Int (Underside of structure)

Photo



042391: Structure 16: Concession Rd 14 W



UTM Coordinates (WGS84)	17-472975m.E 4879595m.N
Ownership	Municipality of South Bruce
Structure Type	Municipal Structure
Inspectors	Brody Still, Clayton Watters

1. 16: Deck Top (Overtop of structure)

Photo



2. 16: Verticals / Diagonals (South)

Photo



3. 16: Approach Guide Rail (South East)

Photo



4. 16: Connections (South)

Photo



5. 16: Abutment Walls (East)

Photo



6. 16: Soffit - Thin Slab - Int (Underside of structure)

Photo



7. 16: Floor Beams (Underside of structure)

Photo



042391: Structure 17: Concession Rd 4



UTM Coordinates (WGS84) | 17-472837m.E 4869084m.N

Ownership | Municipality of South Bruce

Structure Type | Municipal Structure

Inspectors | Brody Still, Clayton Watters

1. 17: Deck Wearing Surface (Overtop of structure)

Photo



2. 17: Approach Guide Rail (Quadrant of structure)

Photo



3. 17: Approach Wearing Surface (East)

Photo



4. 17: Wingwalls (Quadrant of structure)

Photo



5. 17: Soffit - Thick Slab - Ext (South)

Photo



6. 17: Abutment Walls (East)

Photo



7. 17: Soffit - Thick Slab - Int (Underside of structure)

Photo



042391: Structure 19: Sideroad 18



UTM Coordinates (WGS84)	17-474418m.E 4879017m.N
Ownership	Municipality of South Bruce
Structure Type	Municipal Structure
Inspectors	Brody Still, Clayton Watters

1. 19: Deck Wearing Surface (Overtop of structure)

Photo



2. 19: Signs (South East)

Photo



3. 19: End Post (South West)

Photo



4. 19: Railing System (West)

Photo



5. 19: Railing System (West)

Photo



6. 19: Wingwalls (Quadrant of structure)

Photo



7. 19: Soffit - Thick Slab - Ext (East)

Photo



8. 19: Soffit - Thick Slab - Int (Underside of structure)

Photo



9. 19: Abutment Walls (North)

Photo

-

10. 19: Abutment Walls (North)

Photo



042391: Structure 20: Concession Rd 2



UTM Coordinates (WGS84) | 17-479480m.E 4868284m.N

Ownership | Municipality of South Bruce

Structure Type | Municipal Structure

Inspectors | Brody Still, Clayton Watters

2. 20: Signs (Quadrant of structure)

Photo



3. 20: Deck Wearing Surface (Overtop of structure)

Photo



3. 20: Outlet (South)

Photo



5. 20: Barrels (Through structure)

Photo



5. 20: Inlet (North)

Photo



042391: Structure 21: Sideroad 1A



UTM Coordinates (WGS84)	17-483809m.E 4868804m.N
Ownership	Municipality of South Bruce
Structure Type	Municipal Structure
Inspectors	Brody Still, Clayton Watters

1. 21: Deck Wearing Surface (Overtop of structure)

Photo



2. 21: Soffit - Thick Slab - Ext (East)

Photo



3. 21: Soffit - Thick Slab - Int (Underside of structure)

Photo



4. 21: Soffit - Thick Slab - Int (Underside of structure)

Photo



5. 21: Abutment Walls (North)

Photo



6. 21: Wingwalls (Quadrant of structure)

Photo



042391: Structure 22: Turnberry Culross Rd W



UTM Coordinates (WGS84)	17-473148m.E 4864501m.N
Ownership	Municipality of South Bruce
Structure Type	Municipal Structure
Inspectors	Brody Still, Clayton Watters

1. 22: Deck Wearing Surface (Overtop of structure)

Photo



2. 22: Inlet (North)

Photo



3. 22: Wall (Quadrant of structure)

Photo



4. 22: Barrels (Through structure)

Photo



5. 22: Outlet (South)

Photo



042391: Structure 23: Sideroad 5A



UTM Coordinates (WGS84)	17-481877m.E 4868009m.N
Ownership	Municipality of South Bruce
Structure Type	Municipal Structure
Inspectors	Brody Still, Clayton Watters

1. 23: Barrels (Through structure)

Photo



2. 23: Barrels (Through structure)

Photo



3. 23: Inlet (East)

Photo



4. 23: Outlet (West)

Photo



5. 23: Signs (Quadrant of structure)

Photo



042391: Structure 24: Concession Rd 8



UTM Coordinates (WGS84) | 17-471642m.E 4873063m.N

Ownership | Municipality of South Bruce

Structure Type | Municipal Structure

Inspectors | Brody Still, Clayton Watters

1. 24: Approach Wearing Surface (West)

Photo



2. 24: Deck Wearing Surface (Overtop of structure)

Photo



3. 24: Wingwalls (North West)

Photo



4. 24: Soffit - Thick Slab - Ext (South)

Photo



5. 24: Soffit - Thick Slab - Int (Underside of Structure)

Photo



6. 24: Abutment Walls (East)

Photo



042391: Structure 25: Concession Rd 10



UTM Coordinates (WGS84)	17-475637m.E 4875942m.N
Ownership	Municipality of South Bruce
Structure Type	Municipal Structure
Inspectors	Brody Still, Clayton Watters

1. 25: Inlet (North)

Photo



2. 25: Outlet (South)

Photo



3. 25: Barrels (Through structure)

Photo



4. 25: Deck Wearing Surface (Overtop of structure)

Photo



042391: Structure 1001: Concession Rd 14



UTM Coordinates (WGS84)	17-488761m.E 4882584m.N
Ownership	Municipality of South Bruce
Structure Type	Municipal Structure
Inspectors	Brody Still, Clayton Watters

1. 1001: Approach Guide Rail (North East)

Photo



2. 1001: Deck Wearing Surface (Overtop of structure)

Photo



3. 1001: Girders - Middle (West)

Photo



4. 1001: Abutment Walls (East)

Photo



5. 1001: Barrier/Parapet Walls Exterior (North)

Photo



6. 1001: Wingwalls (All quadrants)

Photo



042391: Structure 1002: Concession Rd 12 E



UTM Coordinates (WGS84)	17-489251m.E 4880604m.N
Ownership	Municipality of South Bruce
Structure Type	Municipal Structure
Inspectors	Brody Still, Clayton Watters

1. 1002: Signs (North East)

Photo



2. 1002: Deck Wearing Surface (Overtop of structure)

Photo



3. 1002: Barrels (Interior of east culvert)

Photo



4. 1002: Barrels (West)

Photo



5. 1002: Inlet (South)

Photo



6. 1002: Outlet (North)

Photo



042391: Structure 1003: Concession Rd 12 E



UTM Coordinates (WGS84) | 17-497170m.E 4882176m.N

Ownership | Municipality of South Bruce

Structure Type | Municipal Structure

Inspectors | Brody Still, Clayton Watters

1. 1003: Approach Guide Rail (North)

Photo



2. 1003: Approach Wearing Surface (South West)

Photo



3. 1003: Wingwalls (North West)

Photo



4. 1003: Abutment Walls (East)

Photo



5. 1003: Abutment Walls (West)

Photo



6. 1003: A. Bearings (West)

Photo



042391: Structure 1006: Sideroad 30 N



UTM Coordinates (WGS84) | 17-497732m.E 4877922m.N

Ownership | Municipality of South Bruce

Structure Type | Municipal Structure

Inspectors | Brody Still, Clayton Watters

1. 1006: Approach Wearing Surface (North)

Photo



2. 1006: Approach Guide Rail (South West)

Photo



3. 1006: Approach Guide Rail (South East)

Photo

-

4. 1006: Deck Wearing Surface (Overtop of structure)

Photo



5. 1006: Abutment Walls (North East)

Photo





6. 1006: Wingwalls (Each quadrant)

Photo



7. 1006: Abutment Walls (North)

Photo





8. 1006: Soffit - Thin Slab - Int (Underside of structure)

Photo



042391: Structure 1007: Concession Rd 6 E



UTM Coordinates (WGS84)	17-496550m.E 4875772m.N
Ownership	Municipality of South Bruce
Structure Type	Municipal Structure
Inspectors	Brody Still, Clayton Watters

1. 1007: Approach Guide Rail (North East)

Photo



2. 1007: Approach Wearing Surface (East)

Photo



3. 1007: Deck Wearing Surface (Overtop of structure)

Photo



4. 1007: Deck Drainage (Quadrants)

Photo



5. 1007: Railing System (North)

Photo



6. 1007: Curbs (North)

Photo



7. 1007: Soffit - Thick Slab - Ext (South)

Photo



8. 1007: Abutment Walls (East)

Photo



9. 1007: Soffit - Thick Slab - Int (Underside of structure)

Photo



042391: Structure 1008: Sideroad 25



UTM Coordinates (WGS84)	17-496210m.E 4875607m.N
Ownership	Municipality of South Bruce
Structure Type	Municipal Structure
Inspectors	Brody Still, Clayton Watters

1. 1008: Approach Guide Rail (South East)

Photo



2. 1008: Deck Wearing Surface (Overtop of structure)

Photo



3. 1008: Curbs (East)

Photo



4. 1008: Railing System (East)

Photo



5. 1008: Wingwalls (North East)

Photo



6. 1008: Barrier/Parapet Walls Exterior (East)

Photo



7. 1008: Girders - Ends (East)

Photo



8. 1008: Abutment Walls (West)

Photo



9. 1008: Soffit - Thick Slab - Int (Underside of structure)

Photo



042391: Structure 1009: Council Rd



UTM Coordinates (WGS84)	17-483128m.E 4878466m.N
Ownership	Municipality of South Bruce
Structure Type	Municipal Structure
Inspectors	Brody Still, Clayton Watters

1. 1009: Deck Wearing Surface (Overtop of structure)

Photo



2. 1009: Railing System (North)

Photo



3. 1009: undefined (North East)

Photo



4. 1009: Inlet (South)

Photo



5. 1009: Outlet (North)

Photo



042391: Structure 1011: Concession Rd 10 E



UTM Coordinates (WGS84) | 17-497668m.E 4880163m.N

Ownership | Municipality of South Bruce

Structure Type | Municipal Structure

Inspectors | Brody Still, Clayton Watters

1. 1011: Deck Wearing Surface (Overtop of structure)

Photo



2. 1011: Railing System (South)

Photo



3. 1011: Inlet (South)

Photo



4. 1011: Barrels (Interior of structure)

Photo



5. 1011: Outlet (North)

Photo



042391: Structure 1012: Concession Rd 10 E



UTM Coordinates (WGS84)	17-489811m.E 4878616m.N
Ownership	Municipality of South Bruce
Structure Type	Municipal Structure
Inspectors	Brody Still, Clayton Watters

1. 1012: Approach Guide Rail (North West)

Photo



2. 1012: Approach Wearing Surface (West)

Photo



3. 1012: Approach Wearing Surface (West)

Photo



4. 1012: Deck Wearing Surface (Overtop of structure)

Photo



5. 1012: Railing System (South)

Photo



6. 1012: Curbs (Post connection)

Photo



7. 1012: Wingwalls (North West)

Photo



8. 1012: Deck Drainage (East)

Photo



9. 1012: Soffit - Thick Slab - Ext (East)

Photo



10. 1012: Soffit - Thick Slab - Int (Underside of structure)

Photo



11. 1012: Abutment Walls (West)

Photo



042391: Structure 1013: Concession Rd 10 E



UTM Coordinates (WGS84) | 17-491219m.E 4878894m.N

Ownership | Municipality of South Bruce

Structure Type | Municipal Structure

Inspectors | Brody Still, Clayton Watters

1. 1013: Approach Wearing Surface (East)

Photo



2. 1013: Deck Wearing Surface (Overtop of structure)

Photo



3. 1013: Outlet (South)

Photo



4. 1013: Barrels (Interior of structure)

Photo



5. 1013: Barrels (Through structure)

Photo



6. 1013: Barrels (Through structure)

Photo



7. 1013: Barrels (Through structure)

Photo



042391: Structure 1014: Huron Bruce Rd



UTM Coordinates (WGS84)	17-485346m.E 4867370m.N
Ownership	Municipality of South Bruce
Structure Type	Municipal Structure
Inspectors	Brody Still, Clayton Watters

1. 1014: Approach Guide Rail (South West)

Photo



2. 1014: Approach Wearing Surface (East)

Photo



3. 1014: Deck Wearing Surface (Overtop of structure)

Photo



4. 1014: Barrels (Through structure)

Photo



5. 1014: Barrels (Through structure)

Photo



042391: Structure 1016: Elora St



UTM Coordinates (WGS84)	17-490245m.E 4876745m.N
Ownership	Municipality of South Bruce
Structure Type	Municipal Structure
Inspectors	Brody Still, Clayton Watters

1. 1016: Approach Wearing Surface (North)

Photo



2. 1016: Approach Wearing Surface (North)

Photo



3. 1016: Curbs (South)

Photo



4. 1016: Approach Guide Rail (South West)

Photo



5. 1016: Curbs (West)

Photo



6. 1016: Railing System (East)

Photo



7. 1016: Deck Wearing Surface (Overtop of structure)

Photo



8. 1016: Deck Wearing Surface (Overtop of structure)

Photo



9. 1016: Wingwalls (North East)

Photo



10. 1016: Soffit - Thick Slab - Ext (East)

Photo



11. 1016: Wingwalls (North East)

Photo



12. 1016: Soffit - Thick Slab - Int (Underside of structure)

Photo



13. 1016: Abutment Walls (North)

Photo



14. 1016: undefined (North)

Photo



042391: Structure 1017: Sideroad 15 N



UTM Coordinates (WGS84)	17-491370m.E 4878673m.N
Ownership	Municipality of South Bruce
Structure Type	Municipal Structure
Inspectors	Brody Still, Clayton Watters

1. 1017: Deck Wearing Surface (Overtop of structure)

Photo



2. 1017: Signs (North East)

Photo



3. 1017: Inlet (West)

Photo



4. 1017: Outlet (East)

Photo



5. 1017: Barrels (Through structure)

Photo



042391: Structure 1018: Sideroad 30



UTM Coordinates (WGS84)	17-492025m.E 4875266m.N
Ownership	Municipality of South Bruce
Structure Type	Municipal Structure
Inspectors	Brody Still, Clayton Watters

1. 1018: Deck Wearing Surface (Overtop of structure)

Photo



2. 1018: Curbs (South West)

Photo



3. 1018: Signs (All quadrants)

Photo



4. 1018: Soffit - Thick Slab - Ext (West)

Photo



5. 1018: Soffit - Thick Slab - Int (Underside of structure)

Photo



6. 1018: Abutment Walls (North)

Photo



042391: Structure 1019: Sideroad 35



UTM Coordinates (WGS84) | 17-493731m.E 4874140m.N

Ownership | Municipality of South Bruce

Structure Type | Municipal Structure

Inspectors | Brody Still, Clayton Watters

1. 1019: Signs (North West)

Photo



2. 1019: Approach Wearing Surface (West)

Photo



3. 1019: Deck Wearing Surface (Overtop of structure)

Photo



4. 1019: Curbs (North)

Photo



5. 1019: Soffit - Thick Slab - Ext (West)

Photo



6. 1019: Wingwalls (North West)

Photo



7. 1019: Abutment Walls (South)

Photo



8. 1019: Soffit - Thick Slab - Int (Underside of structure)

Photo



042391: Structure 1020: Field Rd



UTM Coordinates (WGS84)	17-496236m.E 4871124m.N
Ownership	Municipality of South Bruce
Structure Type	Municipal Structure
Inspectors	Brody Still, Clayton Watters

1. 1020: Signs (All quadrants)

Photo



2. 1020: Deck Wearing Surface (Overtop of structure)

Photo



3. 1020: Inlet (North)

Photo



4. 1020: Barrels (Interior of structure)

Photo



5. 1020: Outlet (South)

Photo



042391: Structure 1021: Concession Rd 12 E



UTM Coordinates (WGS84)	17-498723m.E 4882456m.N
Ownership	Municipality of South Bruce
Structure Type	Municipal Structure
Inspectors	Brody Still, Clayton Watters

1. 1021: Approach Guide Rail (South East)

Photo



2. 1021: Deck Wearing Surface (Overtop of structure)

Photo



3. 1021: Curbs (North)

Photo



4. 1021: Seals / Sealants (Overtop of structure)

Photo



5. 1021: Wingwalls (South West)

Photo



6. 1021: Girders - Ends (South West)

Photo



7. 1021: Girders - Middle (Underside of structure)

Photo



8. 1021: Soffit - Thin Slab - Int (Underside of structure)

Photo



9. 1021: Diaphragms - Middle (Underside of structure)

Photo



10. 1021: Abutment Walls (East)

Photo



11. 1021: A. Bearings (West)

Photo



042391: Structure 1022: Sideroad 15 N



UTM Coordinates (WGS84)	17-491199m.E 4879504m.N
Ownership	Municipality of South Bruce
Structure Type	Municipal Structure
Inspectors	Brody Still, Clayton Watters

1. 1022: Signs (Quadrant of structure)

Photo



2. 1022: Barrels (South)

Photo



3. 1022: Barrels (North)

Photo



042391: Structure 1023: Sideroad 15 N



UTM Coordinates (WGS84)	17-491222m.E 4879391m.N
Ownership	Municipality of South Bruce
Structure Type	Municipal Structure
Inspectors	Brody Still, Clayton Watters

1. 1023: Deck Wearing Surface (Overtop of structure)

Photo



2. 1023: Signs (Quadrant of structure)

Photo



3. 1023: Barrels (Interior)

Photo



4. 1023: Inlet (West)

Photo



042391: Structure 1024: Concession Rd Ctr



UTM Coordinates (WGS84) | 17-496018m.E 4873825m.N

Ownership | Municipality of South Bruce

Structure Type | Municipal Structure

Inspectors | Brody Still, Clayton Watters

1. 1024: Signs (Quadrant of structure)

Photo



2. 1024: Railing System (South West)

Photo



3. 1024: Deck Wearing Surface (Overtop of structure)

Photo



4. 1024: Wingwalls (Quadrant of structure)

Photo



5. 1024: Abutment Walls (North West)

Photo



6. 1024: Girders - Middle (Underside of deck)

Photo



7. 1024: Soffit - Thin Slab - Int (Underside of deck)

Photo



8. 1024: Girders - Ends (Underside of deck)

Photo





BURNSIDE

[THE DIFFERENCE IS OUR PEOPLE]

Appendix E

OSIM Forms and Photos

(provided on USB)