
MUNICIPALITY OF MIDDLESEX CENTRE

STRUCTURES INSPECTION AND ASSESSMENT

2023



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2023

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MUNICIPALITY OF MIDDLESEX CENTRE 2023 STRUCTURES INSPECTION AND ASSESSMENT

1.0 INTRODUCTION

Bridges are an important and sometimes expensive component within a road network system. The purpose of a bridge needs assessment is to not only identify safety concerns and structural deficiencies, but to help prioritize improvements in an effort to minimize the costs to maintain the bridges. Bridges are defined as structures with a span of 3.0 meters or more. In the case of barrel culverts, the span is measured on the normal to the stream. BMROSS completed inspections of 152 structures in the Municipality of Middlesex Centre, which includes the addition of 24 structures since the 2021 inspections. Of the 152 structures reviewed, 51 are bridges, 99 are culverts and 2 are retaining walls. Of the 99 culverts, 27 have a total span between 2.0 m and 3.0 m, and 1 has a span less than 2.0 m (1.8 m).

This report includes a summary of our observations, some general recommendations, and a suggested priority list of the needs to help maintain the bridges within the Municipality.

The same numbering convention used in previous reports was used to reference the structures. Appendices A and B list an inventory of the structures reviewed, while Appendix C contains a map showing locations of the structures. The inspection reports have been updated to include the additional information recommended within the 2018 Ontario Structural Inspection Manual (OSIM) and a copy of the reports have been provided in a separately bound booklet.

2.0 SCOPE OF THE WORK

This study is to help the Municipality prioritize the structural improvements, address identified safety concerns in a cost-effective way and help predict future costs. It is understood that some of this information will be incorporated into an overall asset management plan by the Municipality.

In general, the assessment process is divided into the following major components:

1. Prepare an updated inventory of the bridges using information supplied by the Municipality or obtained from previous inspections.
2. The inspections are completed in general accordance with the Ontario Structural Inspection Manual (OSIM) procedures. This includes a review the bridges looking for safety or structural deficiencies, taking measurements and assigning condition ratings of the key

- bridge elements to develop a Bridge Condition Index (BCI) as per the OSIM. Photographs were taken of all sites and of some defects to better illustrate the condition of the bridges.
3. Develop a probable cost estimate to address the recommended maintenance tasks and structural rehabilitation recommendations identified for each structure. These are divided into tasks required in less than 1 year, 1 to 5 years, 6 to 10 years, and 11 to 20 years. These costs are included on the OSIM forms.
 4. Identify a list of recommended additional investigation work, if warranted, to further evaluate the condition of the structures.
 5. Incorporate the information gathered into a needs report that provides general comments about the condition of the structures, provides a priority list of the recommended needs and maintenance work with probable cost estimates.

Note, although a projection of future needs up to 20 years in the future is provided, the Municipality is still required to have bi-annual inspections completed under the direction of a Professional Engineer as other safety concerns may develop overtime or the integrity of the structures may deteriorate quicker than anticipated.

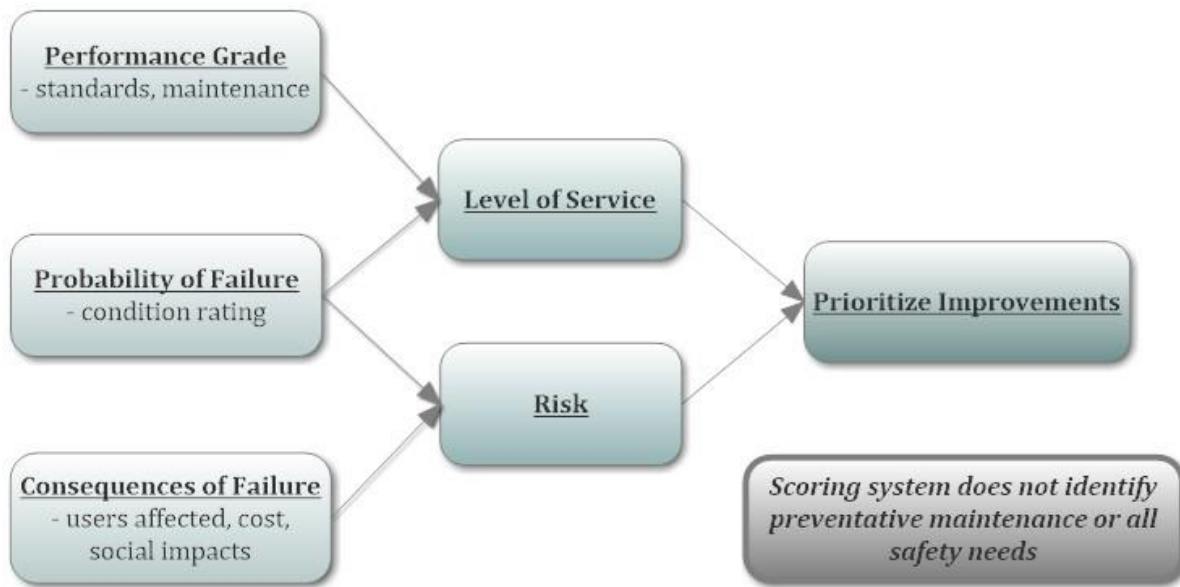
The site inspections were done between February 10 to July 19, 2023. The structures were reviewed by Nic Gowing, P. Eng. The report and recommended priority list were reviewed by Ken Logtenberg, P. Eng. and Nic Gowing, P. Eng.

3.0 METHODOLOGY TO PRIORITIZE IMPROVEMENTS

When prioritizing the recommended capital improvements for a Bridge Needs Assessment or an Asset Management Plan for other municipal assets, we believe there are generally three key factors that should be taken into consideration; the probability of failure, the consequence of failure and the performance grade. While these factors can include many components, the **probability of failure** factor is generally represented by the condition rating or age of an asset. The **consequence of failure** is a score based on the number of users affected if the asset cannot be used safely or other social impacts and the cost of the asset. The **performance grade** should incorporate the relative maintenance requirements of the asset and a comparison of how the asset was built versus the appropriate design standard for that particular asset. In a simplified way these components were used, as illustrated in Figure 1, to develop a theoretical **priority score** for the improvements.

BMROSS has developed a scoring system to help prioritize the improvement needs as per the relationship shown in Figure 1 and as a starting point, we are using two parameters to assign a score for the performance grade. For this study, the width of the bridge or culvert and the presence or lack of a load limit was used to calculate a performance grade for each road section. If the Municipality desires, in the future, other characteristics could be used to further refine this scoring system. If the width of the structure was, in our opinion, appropriate for a two-lane road a score of 1 was applied. If the width was somewhat narrow to accommodate two lanes of traffic, a score of 3 was applied and if the bridge was only suitable for a single lane of traffic, a score of 5 was applied. Similarly, the good score of 1 was assigned if the structure does not have a load limit and a score of 5 was assigned if there is a current or pending load limit. The average of the structure width and load limit score was used in the evaluation.

Figure 1
Relationship between Data Collected and Calculated Theoretical Priority Scores



The BCI value calculated as per the OSIM format was used to determine the probability of failure score. Structures with BCI scores below 40 were assigned a score of 5 and structures with a BCI scores above 85 were assigned scores of 1. Between those values the score changes by one unit as the BCI score increases by 15 points. Meanwhile, the consequence of failure value has been calculated based on the assumed or supplied traffic volumes on each road section. A score of 1 means it has an average annual daily traffic value of less than 50 and a road with greater than a 1000 vehicles per day would have a score of 5. A table showing how the scores were assigned is provided in Appendix D and the respective scores for the bridges is provided in D-1.

The scores assigned for the three key factors were added together as illustrated in the figure to determine the theoretical level of service score, risk score and priority for improvement score for each asset. Although these are just relative numbers, municipalities may choose to define a targeted average level of service or risk value for their bridges system using these values. They can also monitor and track these average scores over time for future comparison purposes. The theoretical priority score for each asset is the combined score of the level of service factor and the risk factor. Defining the desired level of service or acceptable levels of risk are beyond the scope of this study, so only the priority score has been presented and used.

The theoretical priority scoring system has been used as a guide to help prioritize improvement work on the assets however there are other factors that should be taken into account when prioritizing the road improvements. Factors including preventative maintenance activities, scheduling tasks to coincide with integrated assets within the same area, addressing specific safety concerns, financial and timing restraints and other activities taking place within the vicinity must be considered by Municipality staff. It is impossible to take into account all of these other factors in a simplified scoring system. For this reason, the theoretical score of highest priorities established on an individual asset basis is only used as a guide and the priority list provided in this report is, in the opinion of the inspecting engineer, the best sequence to incorporate the identified

preventative maintenance and the specific safety concerns. Note, as the condition of the structures may deteriorate differently than anticipated overtime and we are not aware of the other activities taking place in your Municipality or other financial obligations of the Municipality, adjustments to the sequence of the improvements may need to be made overtime by the Municipality.

4.0 GENERAL COMMENTS

4.1 Load Limits

At the time of the inspections, no structures were posted with load limits.

Following discussions with municipal staff regarding unidentified additional structures within the Municipality, a load limit of 5 tonnes was recommended and subsequently implemented for structure C-572 on Ivan Drive.

4.2 Guiderail

Recommendations to replace bridge railings or guiderails on the approaches to bridges has only been included for a few structures in the list of improvements but may also be warranted at other locations not included in the list. Provincial regulations dictate that guiderail is to be installed where warranted in conformance with the *Roadside Safety Manual* of the Ministry of Transportation. The warrants include the need for steel beam guiderail on the approaches to all bridges that have railings. It will also include the need for cable guiderail for most culverts with fill as all of these represent roadside hazards.

Most municipalities find that the guiderail needs are overwhelming in cost and the addition of guiderail to existing structures is usually left until the structure is replaced or rehabilitated. Regardless, the regulations apply to all roadside hazards for all public roads. Consideration should especially be given to structures on roads that are now paved where most of their service life has been as a gravel road. The change to hard surface tends to increase the volume and the velocity of traffic, which increases the probability and consequence of an errant vehicle at any bridge site. Generally, an additional \$45,000 + HST should be budgeted for the minimum standard length of new steel beam guiderail, channel, and end treatments.

Consideration should also be given to sites of poor horizontal alignment or steep fills. The budget figures given do not include the cost of approach guiderail except where listed.

4.3 Single Lane Bridges

Structures that have widths less than 6.0 m between curbs or railings should be posted as single lane crossings. The deficient width means that repairs to these structures should be given a lower priority with a view to replacing the bridges at the end of their service life rather than extending their service life.

4.4 Waterproofing

In the 1970's, the MTO had a policy of leaving concrete bridge decks exposed so that the deterioration could be monitored. Experience has shown that this visibility has not been worth the deterioration caused by de-icing salts. It is generally now recommended that all concrete decks on paved roads be protected with waterproofing and paving. In the MTO's Structural Financial Analysis Manual, they suggest that the service life of the waterproofing is 30 years.

At the time of rehabilitation, the deck can be inspected and repaired, if necessary. Some bridges may not be able to accommodate the extra weight of the pavement and an engineer should be consulted before adding new pavement on a bridge deck.

4.5 Routine Maintenance

Bridges require periodic maintenance by staff or contractors. Beam bridges and trusses require bearing seats to be cleaned about once every 2 to 5 years, depending on the site. Expansion joint seals should be cleaned by pressure washer annually; usually in the spring or early summer.

Open footing culverts should be reviewed for erosion of the footings and rip rap should be placed to prevent failure by undermining. Brush and logs should be cleared from under structures or at entrances. Debris jams can cause failure of the entire structure by wash-out during flood events.

Where obvious maintenance needs were identified they were included in the list of maintenance needs table. Some of these are also listed within the list of repairs on the OSIM reports. It has been assumed that this work will be completed by municipal staff; therefore, no engineering costs have been included in the cost estimate for this work.

At several structures, the existing approach shoulders are loose, steep, built up or washing out. Additionally, material at the wingtips is severely eroded to the point that the asphalt/approach slabs are being undermined. The Municipality should routinely review the condition of the above noted elements and place riprap or compacted granular material as required.

4.6 Footing Struts for Open Footing Culverts

Cracks between the top slab and the top of the abutment wall at articulated frame concrete culverts can indicate that the abutment walls are rotating due to inward movement of the footings. This behavior is more concerning at structures where the concrete footings are exposed due to scour or drain lowering. Where both the cracking and the drain lowering exist, we have typically recommended that concrete footing struts be installed between the footings to resist their inward motion. Based on our observations no existing structures currently required footings struts. If erosion in front of the footings is identified early enough, placement of rip rap along the front of the footings can help prevent the bottom of the footings from shifting inward and the need for more elaborate repairs such as placement of struts.

4.7 Corrugated Steel Pipe Arch Structures

Within the Municipality, there are a few multi-plate corrugated steel pipe arched (CSPA) culverts. It has been identified that when assembled incorrectly and with inadequate compaction, cracking

often occurs along the spring line of this type of structures. If cracks are identified over the spring-line of these culverts, the condition of the culverts with cracking will be monitored to determine if the crack expands over the length of the structure from one inspection to the next. Unless there are other problems with the culvert or the crack is already affecting the structural integrity of the culvert, a decision when to replace the structure will be determined based on how quickly the crack is expanding.

A few CSP structures have minimal, to no embedment. The structures may be undermined over time reducing their life span. For these structures, rehabilitation includes placement of riprap at the ends of the culvert. Depending on the existing condition, concrete grout may need to be placed in the eroded void where the stream bed elevation is significantly lower than the invert of the culvert.

4.8 Coating System on Bridge Components

Some structural components such as steel girders or metal railings have a coating system to protect the member from the elements. Coating systems can deteriorate overtime; therefore, methods to shelter the components from the exposure to the elements should be implemented when possible. Sometimes the coating system has to be repaired or replaced, and it is usually more cost effective to do this work before the condition of the structural element starts to deteriorate. When scheduling the needs, these factors should be taken into consideration.

The coating system for deck drains on multiple structures have deteriorated to the point that severe corrosion and section loss is occurring. Girders or the soffit of structures may deteriorate at an accelerated rate where deck drains do not extend past these elements. Structures where deck drain sleeves or extension are recommended, without significant other capital work, include B-121, B-144, B-302, B-521, B-523, B-536, and B-538. It may possible to be group these into one contract where the drains are sleeved or extended.

4.9 Cost-Reducing Strategies

The Municipality may benefit from implementing methods and strategies to reduce costs when considering projects for design and construction. These include but are not limited to grouping similar projects together under a common design and/or construction contract; pre-purchasing or direct-sourcing materials from suppliers; providing materials and services such as excess soil disposal sites, material hauling services, and granular material supplied from pits owned by the Municipality; and completing lower complexity repairs and smaller replacements by Municipal staff (i.e. riprap placement, shoulder and road grading, tree and vegetation removal, caulking barrier and curb gaps, parapet handrail repairs, guiderail repairs, culvert replacements).

It is difficult to provide an accurate quantitative assessment of anticipated cost savings for the strategies noted above as there are numerous factors to consider and many are unique to each Municipality. However, recent projects BMROSS has been involved with would indicate grouping design and construction of similar types of projects together may reduce costs by up to 10% by way of economies of scale. Pre-purchasing materials or providing hauling services or granular material would eliminate Contractor labour and overhead profit margins on those items, potentially reducing costs specifically related to those items by up to 15%. Completing work by municipal staff would also eliminate Contractor labour and overhead profit margins and may reduce project costs by up to 35%. Note, the cost reduction estimates listed do not reflect the

additional administration time and labour required from Municipal staff to provide materials or services, or complete projects as outlined above.

The cost reduction estimates provided above are only reflective of similar past design and construction contracts BMROSS staff have experience with and may not be suitable when budgeting to complete repair or replacement work. However, some of these potential cost savings possibilities may be a result of current economic conditions within the construction industry and the cost effectiveness of the chosen suppliers.

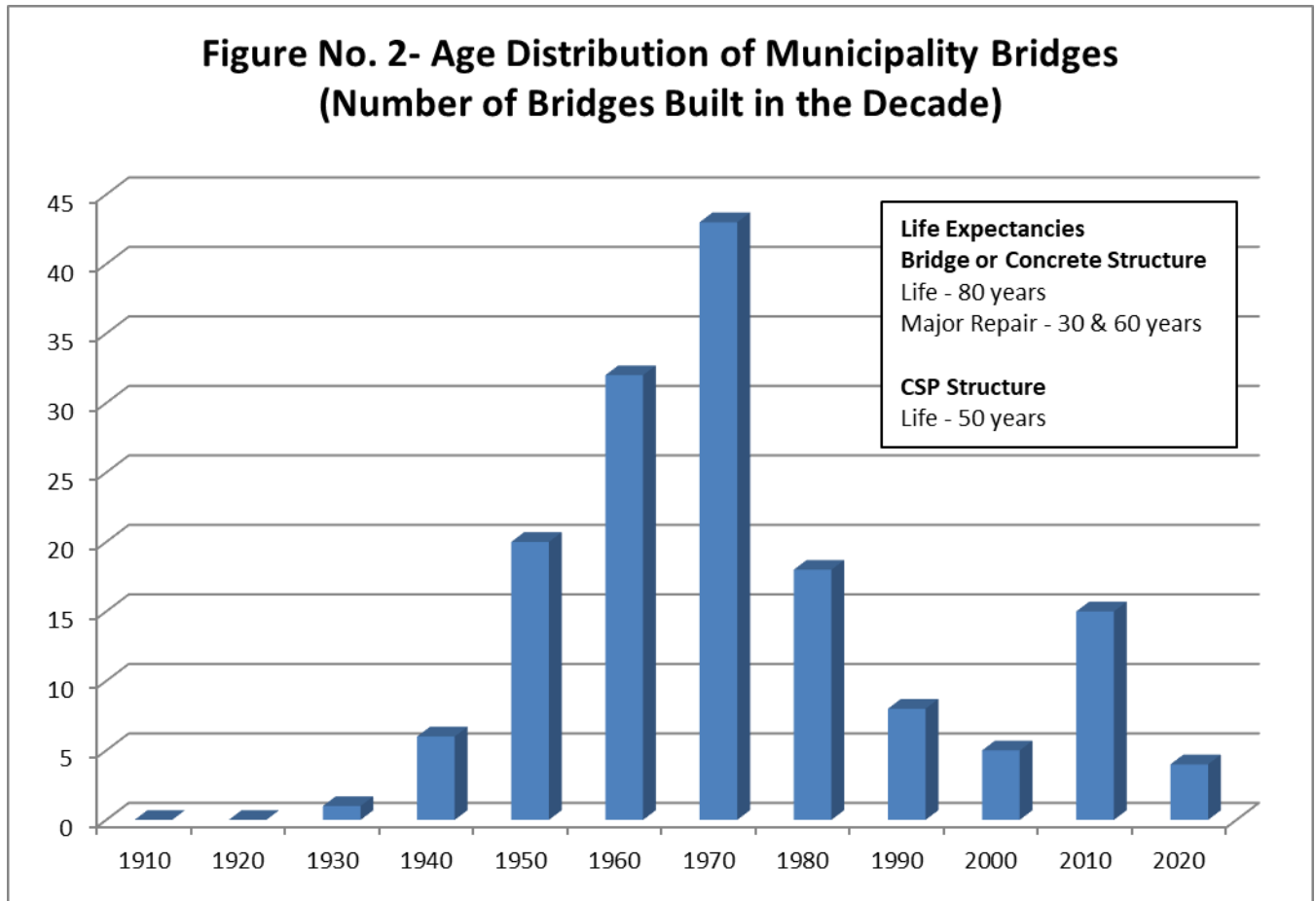
5.0 SUMMARY BRIDGE DATA COLLECTED

5.1 Age of Bridges

The Ontario Ministry of Transportation's *Structural Financial Manual* from 1993 suggests that the average service life of a bridge in Ontario is about 50 years. Other references and the new Bridge Code suggest bridges should provide a service life of 75 years. It is our opinion that rural bridges in this part of Ontario can be expected to provide a service life of about 80 years or more if properly maintained and repaired. That said, with some structures it may be determined that by doing a life cycle cost comparison it is more cost effective to perform repairs and extend the life of the bridge beyond 80 years. The Municipality has 152 structures. If we assume a life expectancy of 80 years, on average, the Municipality should be replacing between 9 to 10 structures in any five-year period to avoid a concentrated replacement program in the future. Figure No. 2 shows an age distribution of the bridges in the Municipality using the assumed year-built information provided, or when it was not provided, the year built estimated by BMROSS was used.

When reviewing the assumed year built for the structures, it appears that 26 structures have been built in the last 35 years, which equates to between 5 to 6 structures in a five-year period. Where practical, we have provided recommendations how to repair the bridges; however, it may be in the Municipality's longer-term interest to replace these with new structures or modify them to bring them up to current standards instead of repairing the existing because the structure is too narrow or otherwise sub-standard and they are on busy roads.

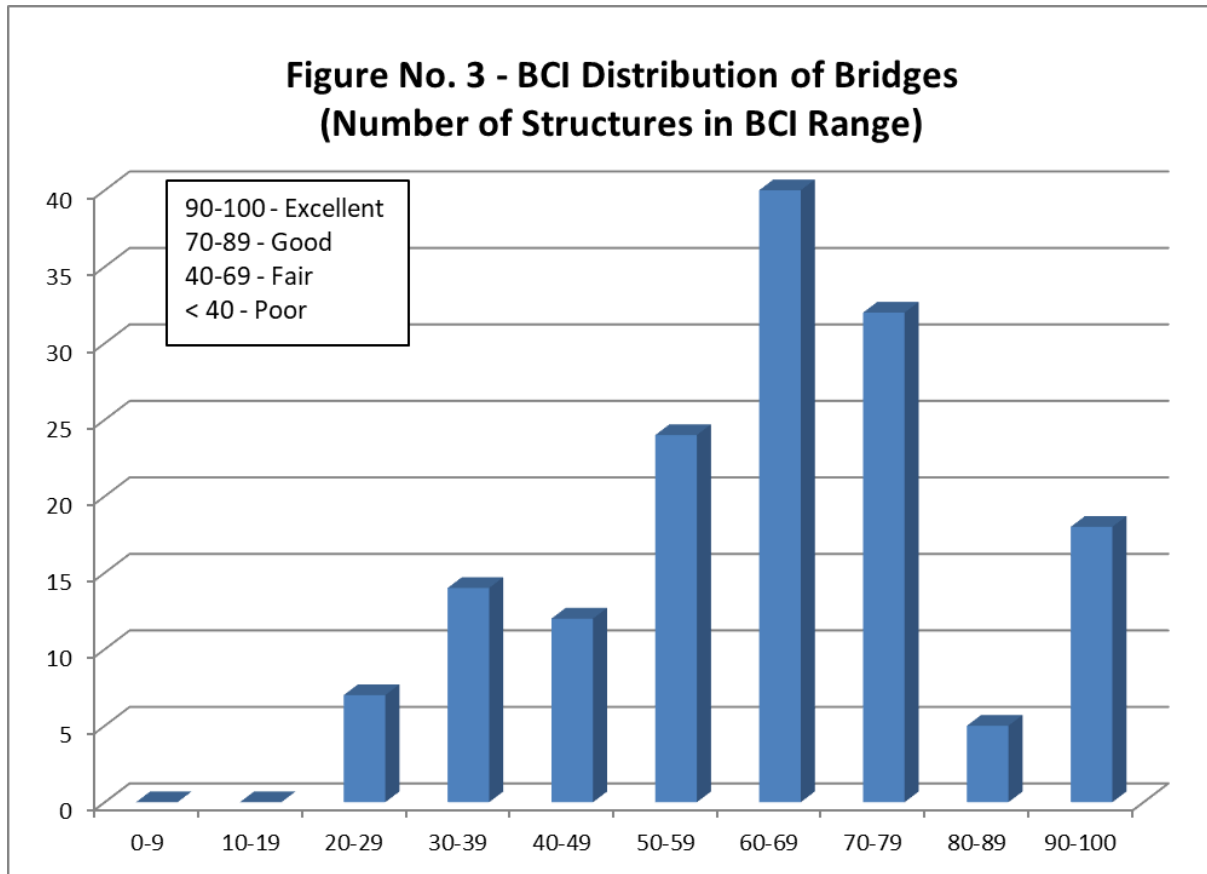
Fifteen (15) structures have been recommended for full replacement within the next five years (excluding 2023 projects), while three other structures require repairs that will likely extend the life of those structures to their 80-year service life. We have listed a few additional structures for replacement in the 6 to 10 and 11 to 20 year timelines primarily because they are narrow and nearing the end of their service life, even though they potentially could be repaired to extend their service life. If the Municipality cannot budget to replace them at this time, or complete all the repairs identified, it may be necessary to consider closures or completion of some repairs to temporarily extend the life of the bridges.



5.2 Bridge Condition Index

Figure 3 provides a breakdown of the Bridge Condition Index (BCI) range for the Municipality's bridges. The Ontario Ministry of Transportation's Bridge Condition Index information from 2009 indicates that the BCI is a measure of the overall structural condition of the bridge. The score is developed with a weighted average of the condition ratings for the individual components assessed. Generally, a structure with a BCI greater than 90 is in excellent condition, 70 to 89 good condition, 40 to 69 is in fair condition and below 40 the structure is in poor condition. Currently, 21 of the Municipality's 152 structures have a rating of below 40. The 2023 average BCI value for all the structures is 62.9. The 2021 average BCI value was calculated at 64.8. The 2023 average BCI value for all bridge structures is 67.5. The 2023 average BCI value for all the culvert structures with total spans greater than 3.0 m is 64.4, and with total spans less than 3.0 m is 50.3. The 2023 average BCI value for the retaining wall structures is 67.5

Based on a projection of the recommended work being completed It is anticipated that completing the 1-5 year recommended work as outlined in Section 6.0 will allow the Municipality to achieve an average BCI of approximately 70 at the end of that time period. In order to maintain an average BCI of 70 beyond the 1-5 year period, it is recommended to complete maintenance work as soon as it is identified, and continue to follow prescribed repair and replacement programs similar to those outlined in this report.



6.0 RECOMMENDED WORK

A list of recommended repairs and structure replacement type improvements has been assembled in Tables 1, 2, and 3. Table 1 includes, in order, the higher priority tasks recommended for completion within the next 5 years and Table 2 has tasks recommended for completion in the 6 to 10 year period. Table 3 includes the tasks recommended for completion within the 11 to 20 year period. The needs have been prioritized using the method explained in Section 3 and the opinion of the Engineer. Occasionally where specific circumstances arise, structures that have a lower theoretical priority score may be moved ahead to complete preventative maintenance work or for other reasons not incorporated in the scoring system. Structures with a higher calculated theoretical priority score should generally be replaced or rehabilitated sooner. The priority list provided is only a recommended sequence for the noted repairs based solely on the visual inspection completed. Ultimately, the decision on the order of completion of work should be made by the Municipality.

Table 1 includes expected years for replacements or rehabilitations for each of the structures listed. Structures with similar needs and/or are in close proximity have been grouped together and could possibly be completed under the same contract. It should be noted that there are 4 projects listed for construction in 2023, as these projects have been awarded prior to issuing this report. The probable costs for these projects have been provided by the Municipality and are reflective of the construction tender prices received and do not include engineering costs. These projects have been excluded from the 1-5 year total and the average costs per year, as it has been assumed budgets for these projects have been previously approved.

Tables 2 and 3 list structures in priority and alpha numeric order. It should be noted that these structures will continue to deteriorate at different rates. These structures should be monitored during future inspections and the time frame adjusted as required.

While reviewing the list of needs for the bridges there appears to be a relatively high number of repair needs identified in the next 1 to 5 years. Implementation of these repairs, in many instances, represents preventative maintenance work that should help extend the life of these more expensive structures. In some instances, we are recommending repairs to help restore the integrity of the guiderails on the approaches and address safety concerns.

Another influence on the priority list may be the Municipality's schedule for road reconstruction and resurfacing. Priority may be shifted to those structures on roads scheduled to be resurfaced to allow for deck patching, waterproofing or other repairs that are best done ahead of road resurfacing.

Please note that the probable cost of repairs has been calculated based on 2023 construction costs. Appropriate inflation factors should be applied for other years. The costs in Table 1 and Table 2 include engineering, design, administration, and a 10% to 20% contingency. It is becoming increasingly difficult to provide a budget price for projects as the industry demand fluctuates. It is recommended that an updated estimate be obtained when the preliminary designs are prepared. As mentioned previously, efficiency can usually be gained by grouping like projects together to keep costs down. When creating probable costs for replacements and rehabilitations, assumptions were made including species at risk at site, full road closure, or replacement expected to match existing structure (unless specified otherwise).

To complete all the repair and replacement work recommended within the next 5 years would cost on average about \$2,075,200 per year (\$10,376,000 total), within the 6 to 10 year period would be about \$2,247,600 per year (\$11,238,000 total), and within the 11 to 20 year period would be about \$284,600 per year (\$2,846,000 total). These totals do not include the maintenance work that we have assumed can be completed by municipal staff. If the above noted amounts are more than available within the municipal budget, it may be possible to address some of the short fall with money from grants, addressing the safety concerns with temporary repairs instead of replacements, by delaying the work, or by implementing methods discussed under Section 4.9 of this report. If the work is delayed, it is possible additional load limits or lower load limits will be recommended in the future or bridge closures may become necessary.

To aid in long-term budgeting we have included repairs and replacements which have been identified for the 6 to 10 year period in Table 2 and for the 11 to 20 year period in Table 3. It should be noted it is expected that quantities for repairs will increase over time, and the extent of deterioration should be re-evaluated with future bridge inspections and when the preliminary designs are prepared. It may be determined then that the condition of the structure has deteriorated more or less than anticipated and the recommended method of repair will have to be changed.

A list of recommended maintenance work is provided in Table 4. Completion of these tasks should be a very cost-effective way to delay the need for capital improvements to these structures. With some of the maintenance work, such as cleaning out deck drains and bearing seat locations, that work should be done annually. Staff should monitor for a build-up of debris at culvert inlets and remove when time permits to avoid the risk of flooding. With other maintenance work, such

as placement of rip rap to prevent erosion, it is hoped that completion of that will be adequate to address the concerns for many years. We generally recommend the work identified be completed within the next couple of years.

The cost estimates provided for maintenance work were based on 2023 construction costs of similar works. An allowance for engineering has not been included. As it has generally been assumed these tasks can be completed by Municipal staff, these cost estimates are not likely to reflect the actual costs incurred by the Municipality to complete the work.

Table 1
Suggested Priority List of Repair and Replacement Needs
1 to 5 Year Period

Site Number	Road Name	Recommended Improvement	BCI	Anticipated Construction Year	Theoretical Priority Score	Probable Cost
C-558*	Fernhill Drive	Replace structure	24	2023	12	\$340,922.86
B-314*	Westminster Drive	Replace guiderail, re-galvanize parapet rails, patch repair soffit, girders and diaphragms, replace joint seals	70	2023	9	\$308,610.34
B-505*	Vanneck Road	Patch and seal centreline, replace drains, waterproof and pave	56	2023	12	\$169,784.33
B-301*	Carriage Road	Patch repair abutments and wingwalls, replace guiderail, jack and replace bearings, patch girders and diaphragms, patch deck top and edges, extend drains, convert to -semi-integral, patch barriers, waterproof and pave	59	2023	12	\$583,826.33
B-108	Medway Road	Replace guiderail, convert to semi-integral, patch repair deck, waterproof and pave	66	2024	12	\$681,000
B-530	Coldstream Road	Replace seals with expansion joints, jack and repair girder ends and bearing pedestals, replace bearings, replace deck drains, remove framing on diaphragms, patch deck, waterproof and pave	63	2024	11	\$644,000
C-580	New Ontario Road	Replace structure	34	2024	13	\$252,000
C-563	Lamont Drive	Replace structure	20	2024	12	\$449,000
B-120	Nine Mile Road	Replace guiderail, convert to semi-integral, replace curbs and railings, raise and extend drains, patch repair deck, waterproof and pave	57	2024	10	\$816,000
C-156	Thirteen Mile Road	Replace structure	28	2024	12	\$368,000
C-572	Ivan Drive	Replace structure	26	2024	14	\$286,000
C-155	Clarke Road	Replace structure	33	2025	14	\$365,000
C-153	Sixteen Mile Road	Replace structure	22	2025	12	\$409,000
C-575	McEwen Drive	Replace structure	32	2025	12	\$264,000
C-131	Adelaide Street	Replace guiderail end treatments, patch repair concrete, place riprap	53	2025	15	\$142,000
C-111	Thirteen Mile Road	Patch repair culvert and headwalls	57	2025	9	\$59,000
C-556	Fernhill Drive	Replace structure	41	2026	10	\$439,000

Site Number	Road Name	Recommended Improvement	BCI	Anticipated Construction Year	Theoretical Priority Score	Probable Cost
C-560	Poplar Hill Road	Replace structure	42	2026	10	\$389,000
C-567	McEwen Drive	Replace structure	44	2026	10	\$262,000
B-140	Fourteen Mile Road	Mill, patch repair and overlay deck, waterproof and pave	62	2026	9	\$284,000
B-523	Bear Creek Road	Replace drains, replace damaged railing post and missing nut	66	2026	10	\$30,000
C-133	Clarke Road	Replace guiderail	63	2026	9	\$79,000
C-317	Southdel Drive	Patch repair culvert ends or replace structure	28	2026	14	\$125,000
B-115	Eight Mile Road	Replace guiderail at east end	69	2026	11	\$34,000
C-568	Gold Creek Drive	Replace structure	34	2026	12	\$261,000
B-528	Oxbow Drive	Replace drains, replace seals with expansion joints, patch deck, waterproof and pave	72	2027	10	\$333,000
C-161	Sixteen Mile Road	Replace structure	27	2027	12	\$261,000
C-506	McEwan Drive	Replace guiderail	69	2027	9	\$64,000
B-536	Amiens Road	Replace drains, patch soffit around drains, patch repair curbs	68	2027	11	\$46,000
C-315	Southdel Drive	Lower water and inspect	68	2027	9	\$3,000
B-113	Eight Mile Road	Replace expansion joints, widen shoulders, waterproof and pave	71	2027	7	\$254,000
C-138	Clarke Road	Patch repair cutoff wall	52	2027	12	\$19,000
B-118	Nine Mile Road	Replace guiderail	64	2027	11	\$61,000
B-521	Ivan Drive	Replace drains	67	2027	10	\$28,000
C-117	Prospect Hill Road	Reconstruct slope and place riprap, remove tree, correct channel	56	2027	12	\$20,000
B-144	Sixteen Mile Road	Replace or sleeve drains	70	2027	6	\$28,000
B-130	Twelve Mile Road	Replace or sleeve drains, waterproof and pave	71	2027	7	\$101,000
B-302	Brigham Road	Repair guiderail, extend drains	52	2027	13	\$42,000
B-121	Ten Mile Road	Replace drains	73	2027	7	\$19,000
C-520	Ivan Drive	Install guiderail	51	2027	12	\$100,000
B-529	Oxbow Drive	Convert to semi-integral, patch repair deck, jack and replace bearings, replace curbs and barriers, construct approach slabs, replace drains, waterproof and pave	66	2028	12	\$1,288,000
C-102	Thirteen Mile Road	Replace structure	38	2028	15	\$340,000

Site Number	Road Name	Recommended Improvement	BCI	Anticipated Construction Year	Theoretical Priority Score	Probable Cost
C-119	Nine Mile Road	Replace guiderail, expose deck edges and place sub-drain	67	2028	10	\$67,000
C-571	Ivan Drive	Replace structure	37	2028	12	\$323,000
C-578	Fernhill Drive	Replace structure	38	2028	12	\$341,000
					Total*	\$10,376,000
					Average (5 Year)*	\$2,075,200

*Total costs and average costs for the 1-5 year recommended work exclude projects scheduled for 2023 construction, as it has been assumed budgets for the specified work have been approved prior to issuing this report, and project scopes may not align with updates made to the individual structure reports. These costs are reflective of the construction tender prices received and do not include engineering costs.

Table 2
Suggested List of Repair and Replacement Needs
6 to 10 Year Period

Site Number	Road Name	Recommended Improvement	BCI	Theoretical Priority Score	Probable Cost
B-122	Ten Mile Road	Convert to semi-integral, replace railings and curbs, waterproof and pave	69	9	\$756,000
B-132	Ilderton Road	Replace structure	61	11	\$1,353,000
B-134	Thirteen Mile Road	Patch repair deck edges, soffit, abutments and wingwalls, place riprap	54	12	\$150,000
B-139	Fourteen Mile Road	Replace curbs and railings, patch repair deck and soffit, replace drains, place riprap, waterproof and pave	50	11	\$353,000
B-303	Brigham Road	Patch repair deck and curbs, waterproof and pave	64	10	\$146,000
B-308	Little Church Drive	Replace curbs and barriers, replace drains, mill and overlay deck, waterproof and pave	56	9	\$287,000
B-312	Cook Road	Replace structure	35	13	\$585,000
B-502	Fernhill Drive	Replace drains, mill and overlay deck	64	9	\$174,000
B-512	Amiens Road	Convert to semi-integral, replace barriers and curbs, patch repair pier, patch repair soffit and diaphragms, replace drains, waterproof and pave	67	12	\$1,498,000
B-517	Coldstream Road	Replace barriers and curbs, patch repair soffit, mill and overlay deck, waterproof and pave	63	11	\$334,000
B-519	Ilderton Road	Replace drains, patch repair soffit, replace joint seals	70	10	\$142,000
B-526	Vanneck Road	Convert to semi-integral, replace curbs and railings, patch repair deck, waterproof and pave	66	12	\$813,000
B-535	Old River Road	Replace decorative end posts, replace guiderail, re-caulk gaps in parapets and curbs	65	12	\$109,000
B-537	Oxbow Drive	Convert to semi-integral, replace barriers and curbs, raise and extend drains, patch girders, jack and replace bearings, patch repair deck, waterproof and pave	66	12	\$1,063,000
B-538	Fernhill Drive	Replace drains	50	11	\$35,000
C-137	Thirteen Mile Road	Patch repair SW corner	54	12	\$21,000
C-157	Hyde Park Road	Replace structure	34	17	\$394,000
C-159	Sixteen Mile Road	Replace structure	38	12	\$390,000
C-162	Thirteen Mile Road	Replace structure	40	11	\$297,000
C-547	Oxbow Drive	Replace structure, pave	50	14	\$451,000

Site Number	Road Name	Recommended Improvement	BCI	Theoretical Priority Score	Probable Cost
C-551	Greystead Road	Replace structure	61	9	\$430,000
C-554	Greystead Drive	Replace structure	36	13	\$423,000
C-559	Vanneck Road	Replace middle section, waterproof	42	14	\$327,000
C-566	Quaker Lane	Replace structure	57	8	\$324,000
C-581	Coldstream Road	Replace structure	52	12	\$383,000
				Total	\$11,238,000
				Average (5 Year)	\$2,247,600

Table 3
List of Anticipated Repair and Replacement Needs
11 to 20 Year Period

Site Number	Road Name	Recommended Improvement	BCI	Theoretical Priority Score	Probable Cost
B-142	Fifteen Mile Road	Replace curbs and barriers	71	9	\$280,000
B-145	Adelaide Street	Replace barriers and guiderail, waterproof and pave	68	12	\$400,000
C-149	Mill Lane	Replace structure	54	10	\$801,000
C-532	Oxbow Drive	Replace structure, pave	60	12	\$396,000
C-541	Coldstream Road	Replace structure, pave	47	14	\$572,000
C-545	Coldstream Road	Replace structure, pave	39	15	\$397,000
				Total	\$2,846,000
				Average (10 Year)	\$284,600

Table 4
Suggested List of Maintenance Needs

Site Number	Road Name	Recommended Improvement	BCI	Probable Cost
B-113	Eight Mile Road	Clear vegetation, re-caulk gaps in curbs and barriers	71	\$10,000
B-118	Nine Mile Road	Re-caulk gaps in barrier walls	64	\$4,000
B-123	Ten Mile Road	Remove gravel in front of curbs	75	\$2,000
B-128	Wonderland Road	Rout and seal asphalt at deck ends and approach slab ends, place riprap	96	\$8,000
B-135	Adelaide Street	Place riprap up to wingtips.	73	\$6,000
B-308	Little Church Drive	Place riprap up to wingtips.	56	\$8,000
B-502	Fernhill Drive	Place riprap up to wingtips, investigate downstream for damming/debris	64	\$10,000
B-510	Greystead Drive	Clean out drains, place riprap in front of east abutment and up to wingtips	77	\$15,000
B-519	Ilderton Road	Clean out expansion joints and check for leakage, clean off bearing seats, place riprap up to wingtips and at eroded areas	70	\$20,000
B-521	Ivan Drive	Place riprap in front of abutments and up to wingtips	67	\$18,000
B-522	Vanneck Road	Apply concrete sealer/hardener to inside face of barriers	68	\$5,000
B-523	Bear Creek Road	Place riprap	66	\$8,000
B-524	Gold Creek Drive	Re-set rotated spacer blocks on guiderail	70	\$2,000
B-528	Oxbow Drive	Regrade shoulders, place riprap up to wingtips	72	\$10,000
B-531	Coldstream Road	Place riprap in washout and extend down slope, regrade shoulders	70	\$10,000
B-536	Amiens Road	Regrade shoulders	68	\$3,000
C-103	Fourteen Mile Road	Tighten loose guiderail cables	81	\$2,000
C-109	Twelve Mile Road	Place riprap at corners, place roadway markers to identify culvert location	57	\$5,000
C-110	Thirteen Mile Road	Tighten and re-attach guiderail cables	91	\$2,000
C-125	Twelve Mile Road	Tighten loose guiderail cables, place riprap along footings	94	\$8,000
C-133	Clarke Road	Correct channel, place riprap to prevent further scour	63	\$10,000
C-148	Sixteen Mile Road	Place riprap all 4 corners	66	\$5,000
C-152	Eight Mile Road	Place riprap all 4 corners, repair subdrain	72	\$8,000
C-154	Nine Mile Road	Remove trees, repair subdrain	64	\$4,000
C-159	Sixteen Mile Road	Investigate buried drain and catch basin	38	\$2,000
C-309	Little Church Drive	Place riprap in front of wingwalls	54	\$6,000
C-310	Woodhull Road	Remove debris from end of culvert	40	\$1,000
C-311	Westdel Bourne	Place riprap	99	\$1,000

Site Number	Road Name	Recommended Improvement	BCI	Probable Cost
C-501	Fernhill Drive	Place riprap all 4 corners	71	\$6,000
C-506	McEwan Drive	Remove debris	69	\$1,000
C-508	McEwan Drive	Place large riprap at side slopes	57	\$10,000
C-513	Duncrief Road	Remove sediment build-up at inlet of north barrel	40	\$3,000
C-516	Hedly Drive	Place riprap along footings	64	\$8,000
C-520	Ivan Drive	Replace damaged CSP section, restore roadway	51	\$85,000
C-525	Gold Creek Drive	Reconnect and tighten guiderail cables	83	\$3,000
C-540	New Ontario Road	Remove trees from east end, place riprap along footings	57	\$8,000
C-543	McEwan Drive	Place riprap on side slopes and extend into culvert	60	\$6,000
C-544	Ivan Drive	Place riprap all 4 corners	75	\$6,000
C-545	Coldstream Road	Place riprap along footings	39	\$8,000
C-555	McEwen Drive	Place riprap along footings	64	\$8,000
C-562	Amiens Road	Pace riprap at inlet and outlet	62	\$8,000
C-565	Wood Road	Place riprap	97	\$6,000
C-573	Poplar Hill Road	Remove trees	100	\$1,000
C-576	Poplar Hill Road	Pace riprap at inlet and outlet	40	\$8,000
C-577	Vanneck Road	Place riprap up side slopes	100	\$8,000
W-318	Harris Road	Remove vegetation in front and grade shoulder.	63	\$2,000
W-574	Old River Road	Remove large diameter trees above wall.	72	\$8,000
			Total	\$386,000

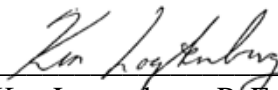
7.0 FURTHER INSPECTIONS

Provincial regulations require all bridges with spans greater than 3.0 m to be reviewed every two years under the supervision of a Professional Engineer. As a minimum, it is proposed that all structures be reviewed in 2025 with a letter outlining any new safety concerns. In 2027, a more detailed review and an updated assessment of the replacement and rehabilitation needs should be completed to replace this report.

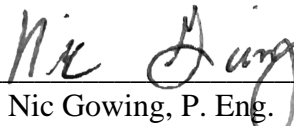
All of which is respectfully submitted.



B. M. ROSS AND ASSOCIATES LIMITED

Per 
Ken Logtenberg, P. Eng.



Per 
Nic Gowing, P. Eng.

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APPENDIX A

**BRIDGE INVENTORY SUMMARY BY
STRUCTURE NUMBER**

Municipality of Middlesex Centre - Bridge Inventory Summary by Site Number

Site Number	Structure Type	Structure Name	Road Name	Structure Location	Total Span Length (m)	Year Built	BCI	Probable Cost of 1-5 Year Recommended Work	Probable Cost of 6-10 Year Recommended Work	Probable Cost of 11-20 Year Recommended Work	Priority Score
B-107	Rigid Frame, Vertical Legs	McLean Bridge	Denfield Road	0.8 km North of Sunningdale Road	15.4	1977	75	\$0	\$0	\$0	7
B-108	Box Beams of Girders	Ferguson Bridge	Medway Road	0.9 km East of Denfield Road	14.7	1988	66	\$681,000	\$0	\$0	12
B-113	Box Beams of Girders	Oxbow-Keays Bridge	Eight Mile Road	0.7 km East of Denfield Road	15.5	1972	71	\$254,000	\$0	\$0	7
B-114	Rigid Frame, Vertical Legs	Connor Bridge (West)	Eight Mile Road	1.2 km East of Hwy. #4	13.7	1951	74	\$0	\$0	\$0	9
B-115	Rigid Frame, Vertical Legs	Connor Bridge (East)	Eight Mile Road	1.3 km East of Hwy. #4	25.8	1980	69	\$34,000	\$0	\$0	11
B-118	Rigid Frame, Vertical Legs	Loft Bridge	Nine Mile Road	0.5 km East of Hyde Park Road	13.1	1981	64	\$61,000	\$0	\$0	11
B-120	Box Beams of Girders	Moir Bridge	Nine Mile Road	1.2 km East of Adelaide Street	20.8	1979	57	\$816,000	\$0	\$0	10
B-121	Rigid Frame, Vertical Legs	Sandborn Bridge	Ten Mile Road	1.2 km East of Highbury Ave	10.7	1961	73	\$19,000	\$0	\$0	7
B-122	I-beam of Girders	Needham Bridge	Ten Mile Road	1.3 km East of Adelaide Street	20.7	1968	69	\$0	\$756,000	\$0	9
B-123	Rigid Frame, Vertical Legs	Carmichael Bridge	Ten Mile Road	0.5 km East of Hwy.#4	15.4	1975	75	\$0	\$0	\$0	7
B-124	Box Beams of Girders	Oxbow Creek Bridge	Ten Mile Road	0.6 km East of Hyde Park Road	11.8	1959	81	\$0	\$0	\$0	7
B-128	Rigid Frame, Vertical Legs	Filson Bridge	Wonderland Road	Ilderton at Twelve Mile Road	12.2	2011	96	\$0	\$0	\$0	8
B-129	Rigid Frame, Vertical Legs	Rosser Bridge	Twelve Mile Road	0.1 km West of Hwy. #4	15.3	1986	72	\$0	\$0	\$0	7
B-130	Rigid Frame, Vertical Legs	Ward Bridge	Twelve Mile Road	0.4 km West of Adelaide Street	13.8	1961	71	\$101,000	\$0	\$0	7
B-132	Rigid Frame, Vertical Legs	Smibert Bridge	Ilderton Road	1.2 km East of Clarke Road	15.4	1954	61	\$0	\$1,353,000	\$0	11
B-134	Rigid Frame, Vertical Legs	Risdon Bridge	Thirteen Mile Road	0.8 km E of Highbury Ave	12.1	1957	54	\$0	\$150,000	\$0	12
B-135	Rigid Frame, Vertical Legs	Vanderloo Bridge	Adelaide Street	0.8 km North of Twelve Mile Road	13.2	1982	73	\$0	\$0	\$0	10
B-136	Box Beams of Girders	White Bridge	Thirteen Mile Road	0.8 km East of Hwy. #4	15.2	1976	73	\$0	\$0	\$0	8
B-139	Rigid Frame, Vertical Legs	O'Neil Bridge	Fourteen Mile Road	0.3 km West of Clarke Road	15.3	1960	50	\$0	\$353,000	\$0	11
B-140	Rigid Frame, Vertical Legs	Morrow Bridge	Fourteen Mile Road	1.5 km East of Hwy #4	15.8	1970	62	\$284,000	\$0	\$0	9
B-142	Rigid Frame, Vertical Legs	Hack Bridge	Fifteen Mile Road	0.2 km West of Adelaide Street	14.7	1969	71	\$0	\$0	\$280,000	9
B-144	Rigid Frame, Vertical Legs	Stewart Bridge	Sixteen Mile Road	0.2 km East of Adelaide Street	9.5	1967	70	\$28,000	\$0	\$0	6
B-145	Rigid Frame, Vertical Legs	Rudd Bridge	Adelaide Street	0.3 km South of Sixteen Mile Road	9.9	1987	68	\$0	\$0	\$400,000	12
B-146	Box Beams of Girders	Stanley Bridge	Sixteen Mile Road	0.5 km East of Hwy. #4	11.9	1958	75	\$0	\$0	\$0	7
B-301	I-beam of Girders	Bridge No. 1	Carriage Road	1.6k m South of Elviage Drive	21.7	1978	59	\$936,000	\$0	\$0	12
B-302	Box Beams of Girders	Mumford Bridge	Brigham Road	0.6 km North of Longwoods Road	20	1956	52	\$42,000	\$0	\$0	13
B-303	Rigid Frame, Vertical Legs	Faulds Bridge	Brigham Road	1.7 km South of Longwoods Road	9.2	1970	64	\$0	\$146,000	\$0	10
B-306	Rigid Frame, Vertical Legs	Heatley Bridge	Heatley Drive	0.6 km West of Springer Road	9.5	2016	97	\$0	\$0	\$0	4
B-308	Rigid Frame, Vertical Legs	Baker Bridge	Little Church Drive	0.5 km West of Westde! Bourne	10.7	1968	56	\$0	\$287,000	\$0	9
B-312	Rigid Frame, Vertical Legs	Cook Road Bridge	Cook Road	0.5 km South of Decker Drive	6.5	1950 est	35	\$0	\$585,000	\$0	13
B-314	I-beam or Girders	Giles Bridge	Westminster Drive	1km SW of Carriage Road	114.8	1970	70	\$335,000	\$0	\$0	9
B-502	Rigid Frame, Vertical Legs	County Bridge No. 116	Fernhill Drive	0.3 km West of Nairn Road	12.5	1968	64	\$0	\$174,000	\$0	9
B-505	Rigid Frame, Vertical Legs		Vanneck Road	0.2 km North of McEwen Drive	15.6	1963	56	\$163,000	\$0	\$0	12
B-507	Rigid Frame, Vertical Legs		Bear Creek Road	0.6 km South of Fernhill Drive	10.6	2009	88	\$0	\$0	\$0	5
B-510	Rigid Frame, Vertical Legs	Bridge No. 32	Greystead Drive	0.9 km West of New Ontario Road	9.2	1970	77	\$0	\$0	\$0	7
B-512	I-beam of Girders		Amiens Road	0.3 km North of Ilderton Road	31.7	1965	67	\$0	\$1,498,000	\$0	12
B-517	Rigid Frame, Vertical Legs	Bridge No. 53	Coldstream Road	0.1 km North of Ilderton Road	15.4	1974	63	\$0	\$334,000	\$0	11
B-519	I-beam of Girders	Wark Bridge	Ilderton Road	0.2 km East of Amiens Road	32.9	1965	70	\$0	\$142,000	\$0	10
B-521	Rigid Frame, Vertical Legs	Caverhill Bridge	Ivan Drive	0.2 km East of Bear Creek Drive	13.9	1967	67	\$28,000	\$0	\$0	10
B-522	Rigid Frame, Vertical Legs	Bridge No. 66	Vanneck Road	0.5 km South of Ilderton Road	10.7	1987	68	\$0	\$0	\$0	12
B-523	Rigid Frame, Vertical Legs	Bear Creek Bridge	Bear Creek Road	0.1 km South of Ivan Drive	13.9	1962	66	\$30,000	\$0	\$0	10
B-524	Rigid Frame, Vertical Legs	Bridge No. 82	Gold Creek Drive	0.9 km East of Komoka Road	9.1	1971	70	\$0	\$0	\$0	7
B-526	Box Beams of Girders		Vanneck Road	0.9 km North of County Road 22	16.2	1974	66	\$0	\$813,000	\$0	12
B-528	I-beam of Girders	Edwards Bridge	Oxbow Drive	0.1 km West of Nairn Road	20.7	1966	72	\$333,000	\$0	\$0	10
B-529	I-beam of Girders		Oxbow Drive	0.9 km West of Nairn Road	20.6	1960 est.	66	\$1,288,000	\$0	\$0	12
B-530	I-beam of Girders		Coldstream Road	0.6 km South of Melrose Drive	20.7	1959	63	\$644,000	\$0	\$0	11
B-531	Rigid Frame, Vertical Legs	Bridge No. 31	Coldstream Road	0.5 km South of Oxbow Drive	15.3	1986	70	\$0	\$0	\$0	10
B-535	Rigid Frame, Vertical Legs	Bridge No. 35	Old River Road	0.2 km East of Glendon Road	14.8	1978	65	\$0	\$109,000	\$0	12
B-536	Rigid Frame, Vertical Legs		Amiens Road	0.8 km North of Gold Creek Drive	11.7	1969	68	\$46,000	\$0	\$0	11
B-537	I-beam of Girders	Robinson Bridge	Oxbow Drive	1.0 km West of Coldstream Road	21.5	1954	66	\$0	\$1,063,000	\$0	12
B-538	Rigid Frame, Vertical Legs		Fernhill Drive	0.2 km West of Bear Creek Road	10.67	1962	50	\$0	\$35,000	\$0	11

Municipality of Middlesex Centre - Bridge Inventory Summary by Site Number

Site Number	Structure Type	Structure Name	Road Name	Structure Location	Total Span Length (m)	Year Built	BCI	Probable Cost of 1-5 Year Recommended Work	Probable Cost of 6-10 Year Recommended Work	Probable Cost of 11-20 Year Recommended Work	Priority Score
C-101	Rectangular Culvert		Denfield Road	0.5 km North of Sunningdale Road	3.7	2018	100	\$0	\$0	\$0	5
C-102	Rectangular Culvert		Thirteen Mile Road	0.7 km West of Wonderland Road	3.7	1945 est.	38	\$340,000	\$0	\$0	15
C-103	Rectangular Culvert		Fourteen Mile Road	0.4 km East of Highbury	3	2006	81	\$0	\$0	\$0	7
C-106	Rectangular Culvert	Vanneck Road Culvert	Vanneck Road	0.01 km South of Thirteen Mile Road	3	1999	75	\$0	\$0	\$0	10
C-109	Rectangular Culvert	Patrick - Twelve Mile Culvert	Twelve Mile Road	1.1 km East of Wonderland Road	3	1960 est.	57	\$0	\$0	\$0	9
C-110	Rectangular Culvert	Hasket Bridge	Thirteen Mile Road	0.5 km East of Wonderland Road	4	2013	91	\$0	\$0	\$0	6
C-111	Rectangular Culvert	Risdon Drain Culvert	Thirteen Mile Road	0.5 km West of Prospect Hill Road	3.2	1958	57	\$59,000	\$0	\$0	9
C-117	Rectangular Culvert	Schroeder Bridge	Prospect Hill Road	0.1 km North of Eight Mile Road	6.1	1967	56	\$20,000	\$0	\$0	12
C-119	Rectangular Culvert	McFarlane Bridge	Nine Mile Road	1.1 km East of Hwy. #4	12.4	1969	67	\$67,000	\$0	\$0	10
C-125	CSP Arch Culvert	Sharpe Culvert	Twelve Mile Road	0.5 km East of Denfield Road	4.5	2016	94	\$0	\$0	\$0	5
C-126	Rectangular Culvert	Schaum Bridge	Wonderland Road	0.05 km North of Twelve Mile Road	7.7	1964	71	\$0	\$0	\$0	10
C-127	Rectangular Culvert	Kennedy Bridge	Twelve Mile Road	0.1 km East of Wonderland Road	6.3	1996	75	\$0	\$0	\$0	7
C-131	Rectangular Culvert	Sleight Bridge	Adelaide Street	0.8 km North of Illdertton Road	15.2	1973	53	\$142,000	\$0	\$0	15
C-133	Rectangular Culvert	Marshall Bridge	Clarke Road	0.1 km North of Plover Mills Road	8.8	1974	63	\$79,000	\$0	\$0	9
C-137	Rectangular Culvert	Buddo Bridge	Thirteen Mile Road	0.2 km West of Wonderland Road	7.1	1967	54	\$0	\$21,000	\$0	12
C-138	CSP Arch Culvert	Bilyea Bridge	Clarke Road	0.2 km North of Fourteen Mile Road	8	1983	52	\$19,000	\$0	\$0	12
C-141	Rectangular Culvert	Southgate Bridge	Fourteen Mile Road	0.5 km West of Wonderland Road	6.2	1965	64	\$0	\$0	\$0	9
C-143	Rectangular Culvert	Fitzgerald-Fifteen Mile Culvert	Fifteen Mile Road	0.9 km East of Clarke Road	6.1	1965 est.	50	\$0	\$0	\$0	11
C-147	Rectangular Culvert	Roberts Bridge	Hyde Park Road	0.1 km South of Sixteen Mile Road	3.65	2021	100	\$0	\$0	\$0	8
C-148	Rectangular Culvert	Seeley Bridge	Sixteen Mile Road	0.01 km West of Denfield Road	7.6	1964	66	\$0	\$0	\$0	9
C-149	CSP Ellipse Culvert	Mill Lane Bridge	Mill Lane	0.8 km North of Fifteen Mile Road	11	1978	54	\$0	\$0	\$801,000	10
C-150	CSP Arch Culvert	Fitzgerald-Sixteen Mile Culvert	Sixteen Mile Road	0.8 km East of Clarke Road	4.7	2016	94	\$0	\$0	\$0	4
C-151	Rectangular Culvert		Sixteen Mile Road	1.1 km West of Hyde Park Road	7.6	1965 est.	72	\$0	\$0	\$0	7
C-152	Rectangular Culvert		Eight Mile Road	0.4 km West of Hyde Park Road	3	1970 est.	72	\$0	\$0	\$0	6
C-153	Rectangular Culvert		Sixteen Mile Road	1.2 km East of Wonderland Road	3	1940 est	22	\$409,000	\$0	\$0	12
C-154	Rectangular Culvert		Nine Mile Road	0.6 km West of Prospect Hill Road	5.5	1970 est.	64	\$0	\$0	\$0	8
C-155	CSP Arch Culvert		Clarke Road	0.1 km South of 10 Mile Road	3.05	1960 est	33	\$365,000	\$0	\$0	14
C-156	Rectangular Culvert		Thirteen Mile Road	1.0 km West of Prospect Hill Road	2.75	1940 est	28	\$368,000	\$0	\$0	12
C-157	Rectangular Culvert		Hyde Park Road	0.4 km North of 16 Mile Road	2.9	1950 est	34	\$0	\$394,000	\$0	17
C-158	Rectangular Culvert		Sixteen Mile Road	1.0 km East of Hyde Park Road	3	1991 est.	75	\$0	\$0	\$0	6
C-159	Rectangular Culvert		Sixteen Mile Road	1.0 km West of Wonderland Road North	2.75	1940 est	38	\$0	\$390,000	\$0	12
C-160	CSP Arch Culvert		Twelve Mile Road	1.0 km West of Hyde Park Road	3.3	1970 est.	68	\$0	\$0	\$0	8
C-161	Rectangular Culvert		Sixteen Mile Road	0.25 km East of Prospect Hill Road	2.4	1955 est.	27	\$261,000	\$0	\$0	12
C-162	Rectangular Culvert		Thirteen Mile Road	20m East of Highbury Avenue North	2.9	1955 est.	40	\$0	\$297,000	\$0	11
C-163	CSP Arch Culvert		Sixteen Mile Road	50m East of Hyde Park Road	2.4	1980 est	71	\$0	\$0	\$0	6
C-164	CSP Arch Culvert		Thirteen Mile Road	50m East of Vanneck Road	2.7	1970 est.	47	\$0	\$0	\$0	11
C-165	CSP Arch Culvert		Nine Mile Road	0.9 km West of Wonderland Road	2.4	2018 est.	100	\$0	\$0	\$0	5
C-304	Rectangular Culvert		Sharon Drive	0.4 km East of Woodhull Road	5.7	1970	62	\$0	\$0	\$0	12
C-305	Rectangular Culvert	Sharon Creek Bridge	Woodhull Road	0.2 km North of Sharon Drive	7.6	1963	64	\$0	\$0	\$0	11
C-307	CSP Round Culvert	Bells Road Culvert	Bells Road	0.3 km South of Littlewood Drive	3.2	2004	72	\$0	\$0	\$0	7
C-309	Rectangular Culvert		Little Church Drive	0.5 km West of Woodhull Road	5.6	1960 est.	54	\$0	\$0	\$0	11
C-310	CSP Round Culvert	Conc. 4 Bridge	Woodhull Road	0.6 km North of Southdel Drive	4.6	1995	40	\$0	\$0	\$0	11
C-311	Rectangular Culvert		Westdel Bourne	0.3 km North of Littlewood Drive	4.5	2017	99	\$0	\$0	\$0	6
C-313	Rectangular Culvert		Westdel Bourne	0.4 km North of Little Church Drive	3.6	2017	99	\$0	\$0	\$0	5
C-315	CSP Arch Culvert		Southdel Drive	0.6 km West of Bodkin Road	3.9	1970 est.	68	\$3,000	\$0	\$0	9
C-316	Rectangular Culvert		Sharon Drive	0.2 km East of Brigham Road	3	1958	56	\$0	\$0	\$0	10
C-317	Rectangular Culvert		Southdel Drive	0.5 km East of Bodkin Road	2.7	1955 est.	28	\$125,000	\$0	\$0	14
C-501	Rectangular Culvert	Bridge No.3	Fernhill Drive	0.8 km West of Coldstream Road	3.7	1979	71	\$0	\$0	\$0	7
C-506	Rectangular Culvert	Bridge No. 5	McEwan Drive	0.9 km East of Bear Creek Drive	9.1	1980 est.	69	\$64,000	\$0	\$0	9
C-508	CSP Arch Culvert		McEwan Drive	1.1 km West of Nairn Road	7	1980 est.	57	\$0	\$0	\$0	9
C-509	CSP Arch Culvert		Greystead Drive	1.1 km West of Nairn Road	4.2	1980 est.	68	\$0	\$0	\$0	9

Municipality of Middlesex Centre - Bridge Inventory Summary by Site Number

Site Number	Structure Type	Structure Name	Road Name	Structure Location	Total Span Length (m)	Year Built	BCI	Probable Cost of 1-5 Year Recommended Work	Probable Cost of 6-10 Year Recommended Work	Probable Cost of 11-20 Year Recommended Work	Priority Score
C-511	Rectangular Culvert		Charton Drive	0.8 km East of Bear Creek Road	5.8	2014	94	\$0	\$0	\$0	5
C-513	CSP Ellipse Culvert		Duncrief Road	0.7 km North of Hedly Drive	6.4	1970 est.	40	\$0	\$0	\$0	10
C-514	CSP Arch Culvert	Culvert No. 14	Duncrief Road	0.2 km South of Charlton Drive	4.6	1970 est.	36	\$0	\$0	\$0	12
C-515	CSP Arch Culvert		Hedly Drive	0.8 km East of Bear Creek Road	6	1970 est.	38	\$0	\$0	\$0	13
C-516	Rectangular Culvert	Culvert No. 49	Hedly Drive	1.0 km West of New Ontario Road	6.4	1967	64	\$0	\$0	\$0	10
C-520	CSP Round Culvert		Ivan Drive	0.5 km West of Bear Creek Drive	6.6	2017	51	\$100,000	\$0	\$0	12
C-525	Rectangular Culvert		Gold Creek Drive	0.7 km East of Amiens Road	11.8	2006	83	\$0	\$0	\$0	7
C-527	CSP Arch Culvert	Taylor Drain Culvert Concession 6-7	Sinclair Drive	0.7 km West of Bear Creek Road	3.2	2017	95	\$0	\$0	\$0	5
C-532	CSP Arch Culvert	Bridge No. 85	Oxbow Drive	0.2 km West of Vanneck Road	4.4	1970 est.	60	\$0	\$0	\$396,000	12
C-533	Rectangular Culvert		New Ontario Road	0.5 km North of Hedly Drive	4.3	2021	100	\$0	\$0	\$0	7
C-534	CSP Arch Culvert		Fernhill Road	0.3 km East of Poplar Hill Road	3.6	1970 est.	40	\$0	\$0	\$0	11
C-540	Rectangular Culvert	Bridge No. 36	New Ontario Road	0.6 km North of Graystead Drive	3.1	1968	57	\$0	\$0	\$0	11
C-541	Rectangular Culvert		Coldstream Road	0.4 km S of Lamont Drive	5.2	1950 est.	47	\$0	\$0	\$572,000	14
C-542	CSP Arch Culvert		Lamont Drive	0.7 km East of Coldstream Road	3.7	2018	93	\$0	\$0	\$0	5
C-543	CSP Arch Culvert		McEwan Drive	0.4 km West of Nairn Road	5.4	1999	60	\$0	\$0	\$0	9
C-544	Rectangular Culvert		Ivan Drive	0.2 km East of Coldstream Road	4.5	1975 est.	75	\$0	\$0	\$0	7
C-545	CSP Arch Culvert		Coldstream Road	0.4 km North of Ivan Drive	3.5	1975 est.	39	\$0	\$0	\$397,000	15
C-547	Rectangular Culvert		Oxbow Drive	0.9 km East of Amiens Road	3.7	1945 est.	50	\$0	\$451,000	\$0	14
C-549	CSP Arch Culvert		McEwen Drive	1.5 km West of Nairn Road	2.8	1980 est.	64	\$0	\$0	\$0	9
C-551	Rectangular Culvert		Greystead Road	0.2 km West of Nairn Road	3.1	1939	61	\$0	\$430,000	\$0	9
C-553	Rectangular Culvert		McEwen Drive	0.7 km West of New Ontario Road	3.1	2012	90	\$0	\$0	\$0	5
C-554	CSP Arch Culvert		Greystead Drive	0.6 km West of New Ontario Road	2.8	1970 est.	36	\$0	\$423,000	\$0	13
C-555	Rectangular Culvert		McEwen Drive	0.3 km West of Coldstream Road	3.7	1980 est.	64	\$0	\$0	\$0	9
C-556	Rectangular Culvert		Fernhill Drive	1.1 km East of Bear Creek Road	3.33	1960 est.	41	\$439,000	\$0	\$0	10
C-557	CSP Round Culvert		Fernhill Drive	100m West of Siddall Road	10.8	2000 est.	86	\$0	\$0	\$0	4
C-558	CSP Arch Culvert		Fernhill Drive	1.0 km East of Wood Road	3.75	1970 est.	24	\$429,000	\$0	\$0	12
C-559	Rectangular Culvert		Vanneck Road	75m North of Fernhill Drive	2.76	1950 est.	42	\$0	\$327,000	\$0	14
C-560	CSP Arch Culvert		Poplar Hill Road	0.25 km North of McEwen Drive	2.62	1970 est.	42	\$389,000	\$0	\$0	10
C-561	Rectangular Culvert		Ilderton Road	0.7 km West of Egremont Drive	2.38	1990 est.	75	\$0	\$0	\$0	10
C-562	CSP Arch Culvert		Amiens Road	0.6 km North of Sinclair Drive	4.31	1970 est.	62	\$0	\$0	\$0	12
C-563	Rectangular Culvert		Lamont Drive	0.8 km East of Nairn Road	3	1940 est.	20	\$449,000	\$0	\$0	12
C-564	Rectangular Culvert		Bear Creek Road	0.5 km South of Sinclair Drive	3.66	1980 est.	72	\$0	\$0	\$0	6
C-565	CSP Round Culvert		Wood Road	0.2 km North of McEwen Drive	3.2	2015 est.	97	\$0	\$0	\$0	4
C-566	CSP Arch Culvert		Quaker Lane (Coldstream)	0.65 km Northeast of Ilderton Road	2.8	1980 est.	57	\$0	\$324,000	\$0	8
C-567	CSP Arch Culvert		McEwen Drive	0.75 km West of Poplar Hill Road	2.7	1970 est.	44	\$262,000	\$0	\$0	10
C-568	Rectangular Culvert		Gold Creek Drive	1.25 km Southwest of Egremont Drive	2.7	1955 est.	34	\$261,000	\$0	\$0	12
C-569	CSP Arch Culvert		Greystead Drive	1.0 km West of Poplar Hill Road	2.3	1975 est.	68	\$0	\$0	\$0	8
C-570	CSP Arch Culvert		Greystead Drive	0.2 km East of New Ontario Road	2.6	1970 est.	40	\$0	\$0	\$0	10
C-571	CSP Arch Culvert		Ivan Drive	0.35 km West of Komoka Road	2.6	1975 est.	37	\$323,000	\$0	\$0	12
C-572	Rectangular Culvert		Ivan Drive	0.5 km East of Coldstream Road	2.4	1950 est.	26	\$286,000	\$0	\$0	14
C-573	Round Culvert		Poplar Hill Road	0.25 km North of Zavits Drive	2.8	2020	100	\$0	\$0	\$0	6
C-575	Arch Culvert		McEwen Drive	0.1 km West of Poplar Hill Road	2.4	1970 est.	32	\$264,000	\$0	\$0	12
C-576	CSP Round Culvert		Poplar Hill Road	0.3 km South of Fernhill Drive	2.6	1980 est.	40	\$0	\$0	\$0	13
C-577	CSP Round Culvert		Vanneck Road	67m South of Nine Mile Road	2.7	2021 est.	100	\$0	\$0	\$0	8
C-578	CSP Arch Culvert		Fernhill Drive	1.4 km East of Nairn Road	3	1970 est.	38	\$341,000	\$0	\$0	12
C-579	CSP Arch Culvert		Coldstream Road	0.2 km South of Greystead Road	2.4	1975 est.	72	\$0	\$0	\$0	6
C-580	Rectangular Culvert		New Ontario Road	0.1 km North of Greystead Road	1.8	1955 est.	34	\$252,000	\$0	\$0	13
C-581	CSP Ellipse Culvert		Coldstream Road	0.5 km South of Lamont Drive	2.9	1975 est.	52	\$0	\$383,000	\$0	12
W-318	Retaining Wall		Harris Road	0.5 km West of Carriage Road	0	1990 est.	63	\$0	\$0	\$0	8
W-574	Retaining Wall		Old River Road	Adjacent to B-535	0	1990 est.	72	\$0	\$0	\$0	6

APPENDIX B

**BRIDGE INVENTORY SUMMARY BY
BCI NUMBER**

Municipality of Middlesex Centre - Bridge Inventory Summary by Bridge Condition Index (BCI)

Site Number	Structure Type	Structure Name	Road Name	Structure Location	Total Span Length (m)	Year Built	BCI	Probable Cost of 1-5 Year Recommended Work	Probable Cost of 6-10 Year Recommended Work	Probable Cost of 11-20 Year Recommended Work	Priority Score
C-563	Rectangular Culvert		Lamont Drive	0.8 km East of Nairn Road	3	1940 est.	20	\$449,000	\$0	\$0	12
C-153	Rectangular Culvert		Sixteen Mile Road	1.2 km East of Wonderland Road	3	1940 est	22	\$409,000	\$0	\$0	12
C-558	CSP Arch Culvert		Fernhill Drive	1.0 km East of Wood Road	3.75	1970 est.	24	\$429,000	\$0	\$0	12
C-572	Rectangular Culvert		Ivan Drive	0.5 km East of Coldstream Road	2.4	1950 est.	26	\$286,000	\$0	\$0	14
C-161	Rectangular Culvert		Sixteen Mile Road	0.25 km East of Prospect Hill Road	2.4	1955 est.	27	\$261,000	\$0	\$0	12
C-156	Rectangular Culvert		Thirteen Mile Road	1.0 km West of Prospect Hill Road	2.75	1940 est	28	\$368,000	\$0	\$0	12
C-317	Rectangular Culvert		Southdel Drive	0.5 km East of Bodkin Road	2.7	1955 est.	28	\$125,000	\$0	\$0	14
C-575	Arch Culvert		McEwen Drive	0.1 km West of Poplar Hill Road	2.4	1970 est.	32	\$264,000	\$0	\$0	12
C-155	CSP Arch Culvert		Clarke Road	0.1 km South of 10 Mile Road	3.05	1960 est	33	\$365,000	\$0	\$0	14
C-157	Rectangular Culvert		Hyde Park Road	0.4 km North of 16 Mile Road	2.9	1950 est	34	\$0	\$394,000	\$0	17
C-568	Rectangular Culvert		Gold Creek Drive	1.25 km Southwest of Egremont Drive	2.7	1955 est.	34	\$261,000	\$0	\$0	12
C-580	Rectangular Culvert		New Ontario Road	0.1 km North of Greystead Road	1.8	1955 est.	34	\$252,000	\$0	\$0	13
B-312	Rigid Frame, Vertical Legs	Cook Road Bridge	Cook Road	0.5 km South of Decker Drive	6.5	1950 est	35	\$0	\$585,000	\$0	13
C-514	CSP Arch Culvert	Culvert No. 14	Duncrief Road	0.2 km South of Charlton Drive	4.6	1970 est.	36	\$0	\$0	\$0	12
C-554	CSP Arch Culvert		Greystead Drive	0.6 km West of New Ontario Road	2.8	1970 est.	36	\$0	\$423,000	\$0	13
C-571	CSP Arch Culvert		Ivan Drive	0.35 km West of Komoka Road	2.6	1975 est.	37	\$323,000	\$0	\$0	12
C-102	Rectangular Culvert		Thirteen Mile Road	0.7 km West of Wonderland Road	3.7	1945 est.	38	\$340,000	\$0	\$0	15
C-159	Rectangular Culvert		Sixteen Mile Road	1.0 km West of Wonderland Road North	2.75	1940 est	38	\$0	\$390,000	\$0	12
C-515	CSP Arch Culvert		Hedly Drive	0.8 km East of Bear Creek Road	6	1970 est	38	\$0	\$0	\$0	13
C-578	CSP Arch Culvert		Fernhill Drive	1.4 km East of Nairn Road	3	1970 est.	38	\$341,000	\$0	\$0	12
C-545	CSP Arch Culvert		Coldstream Road	0.4 km North of Ivan Drive	3.5	1975 est.	39	\$0	\$0	\$397,000	15
C-162	Rectangular Culvert		Thirteen Mile Road	20m East of Highbury Avenue North	2.9	1955 est.	40	\$0	\$297,000	\$0	11
C-310	CSP Round Culvert	Conc. 4 Bridge	Woodhull Road	0.6 km North of Southdel Drive	4.6	1995	40	\$0	\$0	\$0	11
C-513	CSP Ellipse Culvert		Duncrief Road	0.7 km North of Hedly Drive	6.4	1970 est.	40	\$0	\$0	\$0	10
C-534	CSP Arch Culvert		Fernhill Road	0.3 km East of Poplar Hill Road	3.6	1970 est.	40	\$0	\$0	\$0	11
C-570	CSP Arch Culvert		Greystead Drive	0.2 km East of New Ontario Road	2.6	1970 est.	40	\$0	\$0	\$0	10
C-576	CSP Round Culvert		Poplar Hill Road	0.3 km South of Fernhill Drive	2.6	1980 est.	40	\$0	\$0	\$0	13
C-556	Rectangular Culvert		Fernhill Drive	1.1 km East of Bear Creek Road	3.33	1960 est.	41	\$439,000	\$0	\$0	10
C-559	Rectangular Culvert		Vanneck Road	75m North of Fernhill Drive	2.76	1950 est.	42	\$0	\$327,000	\$0	14
C-560	CSP Arch Culvert		Poplar Hill Road	0.25 km North of McEwen Drive	2.62	1970 est.	42	\$389,000	\$0	\$0	10
C-567	CSP Arch Culvert		McEwen Drive	0.75 km West of Poplar Hill Road	2.7	1970 est.	44	\$262,000	\$0	\$0	10
C-164	CSP Arch Culvert		Thirteen Mile Road	50m East of Vanneck Road	2.7	1970 est.	47	\$0	\$0	\$0	11
C-541	Rectangular Culvert		Coldstream Road	0.4 km S of Lamont Drive	5.2	1950 est.	47	\$0	\$0	\$572,000	14
B-139	Rigid Frame, Vertical Legs	O'Neil Bridge	Fourteen Mile Road	0.3 km West of Clarke Road	15.3	1960	50	\$0	\$353,000	\$0	11
B-538	Rigid Frame, Vertical Legs		Fernhill Drive	0.2 km West of Bear Creek Road	10.67	1962	50	\$0	\$35,000	\$0	11
C-143	Rectangular Culvert	Fitzgerald-Fifteen Mile Culvert	Fifteen Mile Road	0.9 km East of Clarke Road	6.1	1965 est.	50	\$0	\$0	\$0	11
C-547	Rectangular Culvert		Oxbow Drive	0.9 km East of Amiens Road	3.7	1945 est.	50	\$0	\$451,000	\$0	14
C-520	CSP Round Culvert		Ivan Drive	0.5 km West of Bear Creek Drive	6.6	2017	51	\$100,000	\$0	\$0	12
B-302	Box Beams of Girders	Mumford Bridge	Brigham Road	0.6 km North of Longwoods Road	20	1956	52	\$42,000	\$0	\$0	13
C-138	CSP Arch Culvert	Bilyea Bridge	Clarke Road	0.2 km North of Fourteen Mile Road	8	1983	52	\$19,000	\$0	\$0	12
C-581	CSP Ellipse Culvert		Coldstream Road	0.5 km South of Lamont Drive	2.9	1975 est.	52	\$0	\$383,000	\$0	12
C-131	Rectangular Culvert	Sleight Bridge	Adelaide Street	0.8 km North of Illderton Road	15.2	1973	53	\$142,000	\$0	\$0	15
B-134	Rigid Frame, Vertical Legs	Risdon Bridge	Thirteen Mile Road	0.8 km E of Highbury Ave	12.1	1957	54	\$0	\$150,000	\$0	12
C-137	Rectangular Culvert	Buddo Bridge	Thirteen Mile Road	0.2 km West of Wonderland Road	7.1	1967	54	\$0	\$21,000	\$0	12
C-149	CSP Ellipse Culvert	Mill Lane Bridge	Mill Lane	0.8 km North of Fifteen Mile Road	11	1978	54	\$0	\$0	\$801,000	10
C-309	Rectangular Culvert		Little Church Drive	0.5 km West of Woodhull Road	5.6	1960 est.	54	\$0	\$0	\$0	11
B-308	Rigid Frame, Vertical Legs	Baker Bridge	Little Church Drive	0.5 km West of Westdel Bourne	10.7	1968	56	\$0	\$287,000	\$0	9
B-505	Rigid Frame, Vertical Legs		Vanneck Road	0.2 km North of McEwen Drive	15.6	1963	56	\$163,000	\$0	\$0	12
C-117	Rectangular Culvert	Schroeder Bridge	Prospect Hill Road	0.1 km North of Eight Mile Road	6.1	1967	56	\$20,000	\$0	\$0	12
C-316	Rectangular Culvert		Sharon Drive	0.2 km East of Brigham Road	3	1958	56	\$0	\$0	\$0	10
B-120	Box Beams of Girders	Moir Bridge	Nine Mile Road	1.2 km East of Adelaide Street	20.8	1979	57	\$816,000	\$0	\$0	10

Municipality of Middlesex Centre - Bridge Inventory Summary by Bridge Condition Index (BCI)

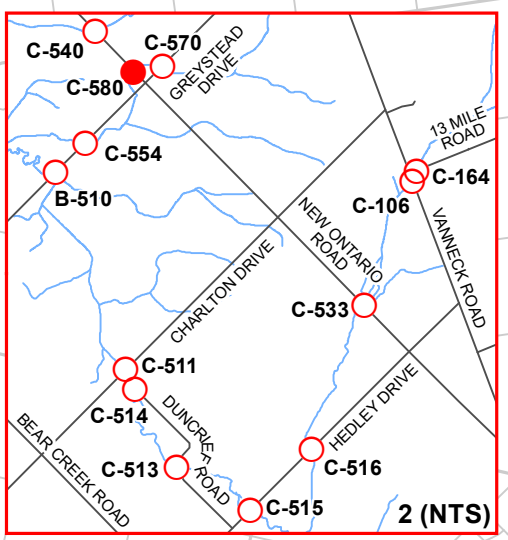
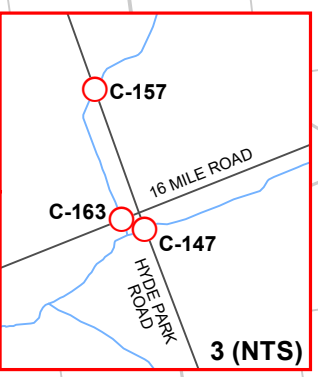
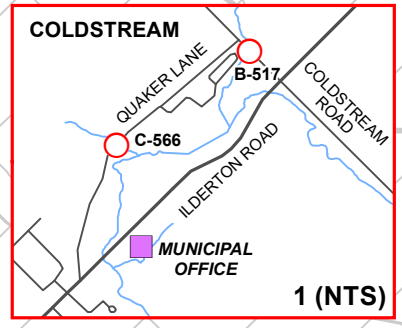
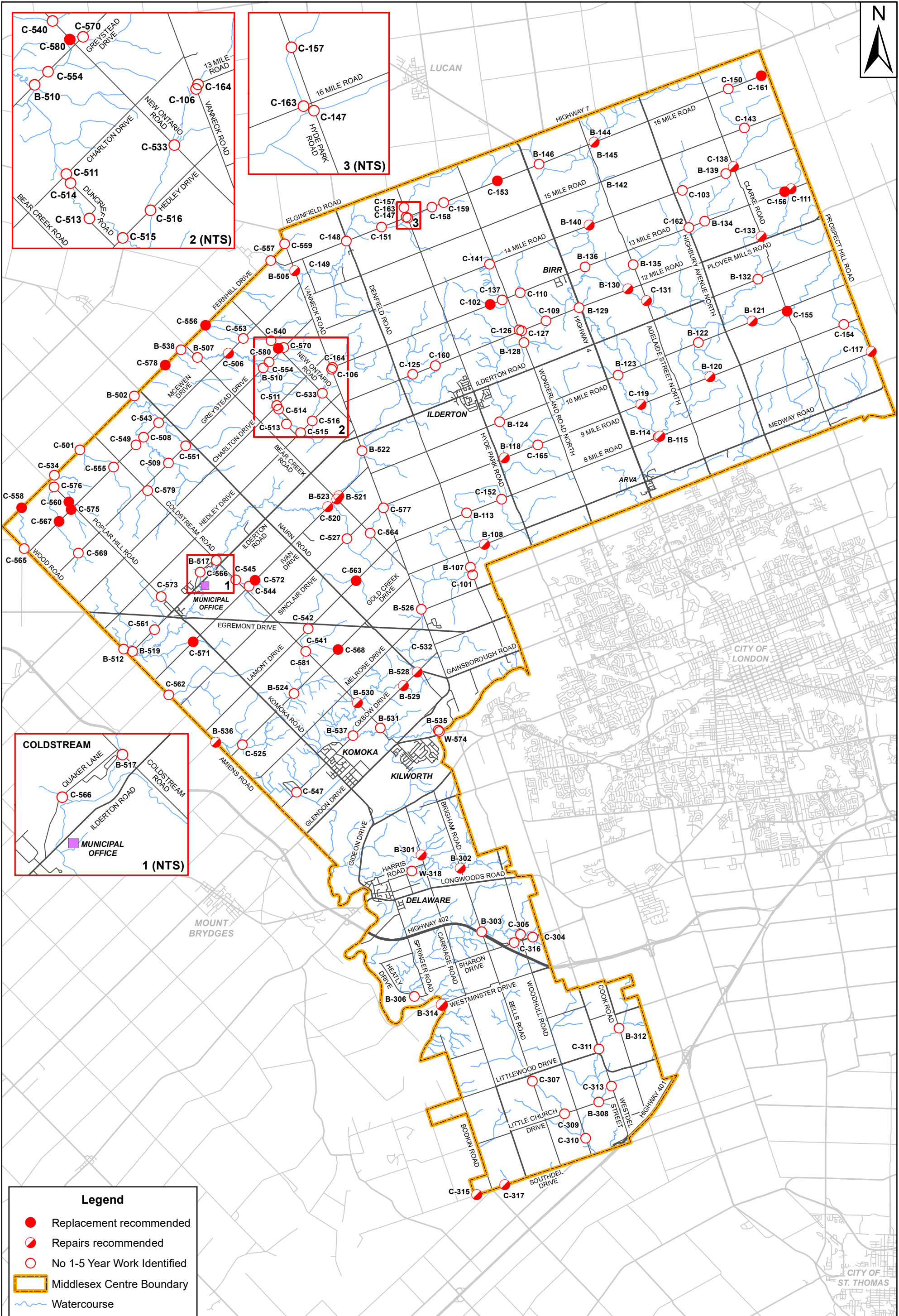
Site Number	Structure Type	Structure Name	Road Name	Structure Location	Total Span Length (m)	Year Built	BCI	Probable Cost of 1-5 Year Recommended Work	Probable Cost of 6-10 Year Recommended Work	Probable Cost of 11-20 Year Recommended Work	Priority Score
C-109	Rectangular Culvert	Patrick - Twelve Mile Culvert	Twelve Mile Road	1.1 km East of Wonderland Road	3	1960 est.	57	\$0	\$0	\$0	9
C-111	Rectangular Culvert	Risdon Drain Culvert	Thirteen Mile Road	0.5 km West of Prospect Hill Road	3.2	1958	57	\$59,000	\$0	\$0	9
C-508	CSP Arch Culvert		McEwan Drive	1.1 km West of Nairn Road	7	1980 est.	57	\$0	\$0	\$0	9
C-540	Rectangular Culvert	Bridge No. 36	New Ontario Road	0.6 km North of Graystead Drive	3.1	1968	57	\$0	\$0	\$0	11
C-566	CSP Arch Culvert		Quaker Lane (Coldstream)	0.65 km Northeast of Ilderton Road	2.8	1980 est.	57	\$0	\$324,000	\$0	8
B-301	I-beam of Girders	Bridge No. 1	Carriage Road	1.6k m South of Elviage Drive	21.7	1978	59	\$936,000	\$0	\$0	12
C-532	CSP Arch Culvert	Bridge No. 85	Oxbow Drive	0.2 km West of Vanneck Road	4.4	1970 est.	60	\$0	\$0	\$396,000	12
C-543	CSP Arch Culvert		McEwan Drive	0.4 km West of Nairn Road	5.4	1999	60	\$0	\$0	\$0	9
B-132	Rigid Frame, Vertical Legs	Smibert Bridge	Ilderton Road	1.2 km East of Clarke Road	15.4	1954	61	\$0	\$1,353,000	\$0	11
C-551	Rectangular Culvert		Greystead Road	0.2 km West of Nairn Road	3.1	1939	61	\$0	\$430,000	\$0	9
B-140	Rigid Frame, Vertical Legs	Morrow Bridge	Fourteen Mile Road	1.5 km East of Hwy #4	15.8	1970	62	\$284,000	\$0	\$0	9
C-304	Rectangular Culvert		Sharon Drive	0.4 km East of Woodhull Road	5.7	1970	62	\$0	\$0	\$0	12
C-562	CSP Arch Culvert		Amiens Road	0.6 km North of Sinclair Drive	4.31	1970 est.	62	\$0	\$0	\$0	12
B-517	Rigid Frame, Vertical Legs	Bridge No. 53	Coldstream Road	0.1 km North of Ilderton Road	15.4	1974	63	\$0	\$334,000	\$0	11
B-530	I-beam of Girders		Coldstream Road	0.6 km South of Melrose Drive	20.7	1959	63	\$644,000	\$0	\$0	11
C-133	Rectangular Culvert	Marshall Bridge	Clarke Road	0.1 km North of Plover Mills Road	8.8	1974	63	\$79,000	\$0	\$0	9
W-318	Retaining Wall		Harris Road	0.5 km West of Carriage Road	0	1990 est.	63	\$0	\$0	\$0	8
B-118	Rigid Frame, Vertical Legs	Loft Bridge	Nine Mile Road	0.5 km East of Hyde Park Road	13.1	1981	64	\$61,000	\$0	\$0	11
B-303	Rigid Frame, Vertical Legs	Faulds Bridge	Brigham Road	1.7 km South of Longwoods Road	9.2	1970	64	\$0	\$146,000	\$0	10
B-502	Rigid Frame, Vertical Legs	County Bridge No. 116	Fernhill Drive	0.3 km West of Nairn Road	12.5	1968	64	\$0	\$174,000	\$0	9
C-141	Rectangular Culvert	Southgate Bridge	Fourteen Mile Road	0.5 km West of Wonderland Road	6.2	1965	64	\$0	\$0	\$0	9
C-154	Rectangular Culvert		Nine Mile Road	0.6 km West of Prospect Hill Road	5.5	1970 est.	64	\$0	\$0	\$0	8
C-305	Rectangular Culvert	Sharon Creek Bridge	Woodhull Road	0.2 km North of Sharon Drive	7.6	1963	64	\$0	\$0	\$0	11
C-516	Rectangular Culvert	Culvert No. 49	Hedly Drive	1.0 km West of New Ontario Road	6.4	1967	64	\$0	\$0	\$0	10
C-549	CSP Arch Culvert		McEwen Drive	1.5 km West of Nairn Road	2.8	1980 est.	64	\$0	\$0	\$0	9
C-555	Rectangular Culvert		McEwen Drive	0.3 km West of Coldstream Road	3.7	1980 est.	64	\$0	\$0	\$0	9
B-535	Rigid Frame, Vertical Legs	Bridge No. 35	Old River Road	0.2 km East of Glendon Road	14.8	1978	65	\$0	\$109,000	\$0	12
B-108	Box Beams of Girders	Ferguson Bridge	Medway Road	0.9 km East of Denfield Road	14.7	1988	66	\$681,000	\$0	\$0	12
B-523	Rigid Frame, Vertical Legs	Bear Creek Bridge	Bear Creek Road	0.1 km South of Ivan Drive	13.9	1962	66	\$30,000	\$0	\$0	10
B-526	Box Beams of Girders		Vanneck Road	0.9 km North of County Road 22	16.2	1974	66	\$0	\$813,000	\$0	12
B-529	I-beam of Girders		Oxbow Drive	0.9 km West of Nairn Road	20.6	1960 est.	66	\$1,288,000	\$0	\$0	12
B-537	I-beam of Girders	Robinson Bridge	Oxbow Drive	1.0 km West of Coldstream Road	21.5	1954	66	\$0	\$1,063,000	\$0	12
C-148	Rectangular Culvert	Seeley Bridge	Sixteen Mile Road	0.01 km West of Denfield Road	7.6	1964	66	\$0	\$0	\$0	9
B-512	I-beam of Girders		Amiens Road	0.3 km North of Ilderton Road	31.7	1965	67	\$0	\$1,498,000	\$0	12
B-521	Rigid Frame, Vertical Legs	Caverhill Bridge	Ivan Drive	0.2 km East of Bear Creek Drive	13.9	1967	67	\$28,000	\$0	\$0	10
C-119	Rectangular Culvert	McFarlane Bridge	Nine Mile Road	1.1 km East of Hwy. #4	12.4	1969	67	\$67,000	\$0	\$0	10
B-145	Rigid Frame, Vertical Legs	Rudd Bridge	Adelaide Street	0.3 km South of Sixteen Mile Road	9.9	1987	68	\$0	\$0	\$400,000	12
B-522	Rigid Frame, Vertical Legs	Bridge No. 66	Vanneck Road	0.5 km South of Ilderton Road	10.7	1987	68	\$0	\$0	\$0	12
B-536	Rigid Frame, Vertical Legs		Amiens Road	0.8 km North of Gold Creek Drive	11.7	1969	68	\$46,000	\$0	\$0	11
C-160	CSP Arch Culvert		Twelve Mile Road	1.0 km West of Hyde Park Road	3.3	1970 est.	68	\$0	\$0	\$0	8
C-315	CSP Arch Culvert		Southdel Drive	0.6 km West of Bodkin Road	3.9	1970 est.	68	\$3,000	\$0	\$0	9
C-509	CSP Arch Culvert		Greystead Drive	1.1 km West of Nairn Road	4.2	1980 est.	68	\$0	\$0	\$0	9
C-569	CSP Arch Culvert		Greystead Drive	1.0 km West of Poplar Hill Road	2.3	1975 est.	68	\$0	\$0	\$0	8
B-115	Rigid Frame, Vertical Legs	Connor Bridge (East)	Eight Mile Road	1.3 km East of Hwy. #4	25.8	1980	69	\$34,000	\$0	\$0	11
B-122	I-beam of Girders	Needham Bridge	Ten Mile Road	1.3 km East of Adelaide Street	20.7	1968	69	\$0	\$756,000	\$0	9
C-506	Rectangular Culvert	Bridge No. 5	McEwan Drive	0.9 km East of Bear Creek Drive	9.1	1980 est.	69	\$64,000	\$0	\$0	9
B-144	Rigid Frame, Vertical Legs	Stewart Bridge	Sixteen Mile Road	0.2 km East of Adelaide Street	9.5	1967	70	\$28,000	\$0	\$0	6
B-314	I-beam or Girders	Giles Bridge	Westminster Drive	1km SW of Carriage Road	114.8	1970	70	\$335,000	\$0	\$0	9
B-519	I-beam of Girders	Wark Bridge	Ilderton Road	0.2 km East of Amiens Road	32.9	1965	70	\$0	\$142,000	\$0	10
B-524	Rigid Frame, Vertical Legs	Bridge No. 82	Gold Creek Drive	0.9 km East of Komoka Road	9.1	1971	70	\$0	\$0	\$0	7
B-531	Rigid Frame, Vertical Legs	Bridge No. 31	Coldstream Road	0.5 km South of Oxbow Drive	15.3	1986	70	\$0	\$0	\$0	10

Municipality of Middlesex Centre - Bridge Inventory Summary by Bridge Condition Index (BCI)

Site Number	Structure Type	Structure Name	Road Name	Structure Location	Total Span Length (m)	Year Built	BCI	Probable Cost of 1-5 Year Recommended Work	Probable Cost of 6-10 Year Recommended Work	Probable Cost of 11-20 Year Recommended Work	Priority Score
B-113	Box Beams of Girders	Oxbow-Keays Bridge	Eight Mile Road	0.7 km East of Denfield Road	15.5	1972	71	\$254,000	\$0	\$0	7
B-130	Rigid Frame, Vertical Legs	Ward Bridge	Twelve Mile Road	0.4 km West of Adelaide Street	13.8	1961	71	\$101,000	\$0	\$0	7
B-142	Rigid Frame, Vertical Legs	Hack Bridge	Fifteen Mile Road	0.2 km West of Adelaide Street	14.7	1969	71	\$0	\$0	\$280,000	9
C-126	Rectangular Culvert	Schaum Bridge	Wonderland Road	0.05 km North of Twelve Mile Road	7.7	1964	71	\$0	\$0	\$0	10
C-163	CSP Arch Culvert		Sixteen Mile Road	50m East of Hyde Park Road	2.4	1980 est.	71	\$0	\$0	\$0	6
C-501	Rectangular Culvert	Bridge No.3	Fernhill Drive	0.8 km West of Coldstream Road	3.7	1979	71	\$0	\$0	\$0	7
B-129	Rigid Frame, Vertical Legs	Rosser Bridge	Twelve Mile Road	0.1 km West of Hwy. #4	15.3	1986	72	\$0	\$0	\$0	7
B-528	I-beam of Girders	Edwards Bridge	Oxbow Drive	0.1 km West of Nairn Road	20.7	1966	72	\$333,000	\$0	\$0	10
C-151	Rectangular Culvert		Sixteen Mile Road	1.1 km West of Hyde Park Road	7.6	1965 est.	72	\$0	\$0	\$0	7
C-152	Rectangular Culvert		Eight Mile Road	0.4 km West of Hyde Park Road	3	1970 est.	72	\$0	\$0	\$0	6
C-307	CSP Round Culvert	Bells Road Culvert	Bells Road	0.3 km South of Littlewood Drive	3.2	2004	72	\$0	\$0	\$0	7
C-564	Rectangular Culvert		Bear Creek Road	0.5 km South of Sinclair Drive	3.66	1980 est.	72	\$0	\$0	\$0	6
C-579	CSP Arch Culvert		Coldstream Road	0.2 km South of Greystead Road	2.4	1975 est.	72	\$0	\$0	\$0	6
W-574	Retaining Wall		Old River Road	Adjacent to B-535	0	1990 est.	72	\$0	\$0	\$0	6
B-121	Rigid Frame, Vertical Legs	Sandborn Bridge	Ten Mile Road	1.2 km East of Highbury Ave	10.7	1961	73	\$19,000	\$0	\$0	7
B-135	Rigid Frame, Vertical Legs	Vanderloo Bridge	Adelaide Street	0.8 km North of Twelve Mile Road	13.2	1982	73	\$0	\$0	\$0	10
B-136	Box Beams of Girders	White Bridge	Thirteen Mile Road	0.8 km East of Hwy. #4	15.2	1976	73	\$0	\$0	\$0	8
B-114	Rigid Frame, Vertical Legs	Connor Bridge (West)	Eight Mile Road	1.2 km East of Hwy. #4	13.7	1951	74	\$0	\$0	\$0	9
B-107	Rigid Frame, Vertical Legs	McLean Bridge	Denfield Road	0.8 km North of Sunningdale Road	15.4	1977	75	\$0	\$0	\$0	7
B-123	Rigid Frame, Vertical Legs	Carmichael Bridge	Ten Mile Road	0.5 km East of Hwy.#4	15.4	1975	75	\$0	\$0	\$0	7
B-146	Box Beams of Girders	Stanley Bridge	Sixteen Mile Road	0.5 km East of Hwy. #4	11.9	1958	75	\$0	\$0	\$0	7
C-106	Rectangular Culvert	Vanneck Road Culvert	Vanneck Road	0.01 km South of Thirteen Mile Road	3	1999	75	\$0	\$0	\$0	10
C-127	Rectangular Culvert	Kennedy Bridge	Twelve Mile Road	0.1 km East of Wonderland Road	6.3	1996	75	\$0	\$0	\$0	7
C-158	Rectangular Culvert		Sixteen Mile Road	1.0 km East of Hyde Park Road	3	1991 est.	75	\$0	\$0	\$0	6
C-544	Rectangular Culvert		Ivan Drive	0.2 km East of Coldstream Road	4.5	1975 est.	75	\$0	\$0	\$0	7
C-561	Rectangular Culvert		Ilderton Road	0.7 km West of Egremont Drive	2.38	1990 est.	75	\$0	\$0	\$0	10
B-510	Rigid Frame, Vertical Legs	Bridge No. 32	Greystead Drive	0.9 km West of New Ontario Road	9.2	1970	77	\$0	\$0	\$0	7
B-124	Box Beams of Girders	Oxbow Creek Bridge	Ten Mile Road	0.6 km East of Hyde Park Road	11.8	1959	81	\$0	\$0	\$0	7
C-103	Rectangular Culvert		Fourteen Mile Road	0.4 km East of Highbury	3	2006	81	\$0	\$0	\$0	7
C-525	Rectangular Culvert		Gold Creek Drive	0.7 km East of Amiens Road	11.8	2006	83	\$0	\$0	\$0	7
C-557	CSP Round Culvert		Fernhill Drive	100m West of Siddall Road	10.8	2000 est.	86	\$0	\$0	\$0	4
B-507	Rigid Frame, Vertical Legs		Bear Creek Road	0.6 km South of Fernhill Drive	10.6	2009	88	\$0	\$0	\$0	5
C-553	Rectangular Culvert		McEwen Drive	0.7 km West of New Ontario Road	3.1	2012	90	\$0	\$0	\$0	5
C-110	Rectangular Culvert	Hasket Bridge	Thirteen Mile Road	0.5 km East of Wonderland Road	4	2013	91	\$0	\$0	\$0	6
C-542	CSP Arch Culvert		Lamont Drive	0.7 km East of Coldstream Road	3.7	2018	93	\$0	\$0	\$0	5
C-125	CSP Arch Culvert	Sharpe Culvert	Twelve Mile Road	0.5 km East of Denfield Road	4.5	2016	94	\$0	\$0	\$0	5
C-150	CSP Arch Culvert	Fitzgerald-Sixteen Mile Culvert	Sixteen Mile Road	0.8 km East of Clarke Road	4.7	2016	94	\$0	\$0	\$0	4
C-511	Rectangular Culvert		Charton Drive	0.8 km East of Bear Creek Road	5.8	2014	94	\$0	\$0	\$0	5
C-527	CSP Arch Culvert	Taylor Drain Culvert Concession 6-7	Sinclair Drive	0.7 km West of Bear Creek Road	3.2	2017	95	\$0	\$0	\$0	5
B-128	Rigid Frame, Vertical Legs	Filson Bridge	Wonderland Road	Ilderton at Twelve Mile Road	12.2	2011	96	\$0	\$0	\$0	8
B-306	Rigid Frame, Vertical Legs	Heatley Bridge	Heatley Drive	0.6 km West of Springer Road	9.5	2016	97	\$0	\$0	\$0	4
C-565	CSP Round Culvert		Wood Road	0.2 km North of McEwen Drive	3.2	2015 est.	97	\$0	\$0	\$0	4
C-311	Rectangular Culvert		Westdel Bourne	0.3 km North of Littlewood Drive	4.5	2017	99	\$0	\$0	\$0	6
C-313	Rectangular Culvert		Westdel Bourne	0.4 km North of Little Church Drive	3.6	2017	99	\$0	\$0	\$0	5
C-101	Rectangular Culvert		Denfield Road	0.5 km North of Sunningdale Road	3.7	2018	100	\$0	\$0	\$0	5
C-147	Rectangular Culvert	Roberts Bridge	Hyde Park Road	0.1 km South of Sixteen Mile Road	3.65	2021	100	\$0	\$0	\$0	8
C-165	CSP Arch Culvert		Nine Mile Road	0.9 km West of Wonderland Road	2.4	2018 est.	100	\$0	\$0	\$0	5
C-533	Rectangular Culvert		New Ontario Road	0.5 km North of Hedly Drive	4.3	2021	100	\$0	\$0	\$0	7
C-573	Round Culvert		Poplar Hill Road	0.25 km North of Zavits Drive	2.8	2020	100	\$0	\$0	\$0	6
C-577	CSP Round Culvert		Vanneck Road	67m South of Nine Mile Road	2.7	2021 est.	100	\$0	\$0	\$0	8

APPENDIX C

MAP



Legend

- Replacement recommended
- ◐ Repairs recommended
- No 1-5 Year Work Identified
- Middlesex Centre Boundary
- ~ Watercourse



MUNICIPALITY OF MIDDLESEX CENTRE
 BRIDGE LOCATIONS AND 1-5 YEAR NEEDS

DATE SEPT. 19, 2023	PROJECT No. 19234
SCALE 1:130,000	APPENDIX C

APPENDIX D

PRIORITY SCORES TABLE

Priority Score Calculation Factors for Bridges

Performance Grade: (Load limit + Structure Type Width Value) / 2

Consequence of Failure:

Average Annual Daily Traffic (AADT)

Traffic Volume	Value
0-49	1
50-199	2
200-499	3
500-999	4
>1000	5

When Traffic is Greater than 200 AADT

Load Limit

Posted	Value
No	1
Yes	5

Width Value if Bridge

Roadway Width (m)	Value
>= 7	1
6-6.9	3
< 6	5

OR

Width Value if Culvert

Overall Structure Width Criteria	Value
If the overall structure width > (10 m + (2 x Fill))	1
If the overall structure width < (10 m + (2 x Fill))	3
If the overall structure width > (7 m + (2 x Fill))	3
If the overall structure width < (7 m + (2 x Fill))	5

* Fill = Fill on structure (slope to road)

Probability of Failure:

BCI (Bridge Condition Index)

BCI	Value
85-100	1
70-84	2
55-69	3
40-54	4
< 40	5

When Traffic is Less than 200 AADT

Load Limit

Posted	Value
No	1
Yes, >12	3
Yes, <12	5

Width Value if Bridge

Roadway Width (m)	Value
>= 7	1
6-6.9	1
< 6	3

OR

Width Value if Culvert

Overall Structure Width Criteria	Value
If the overall structure width > (10 m + (2 x Fill))	1
If the overall structure width < (10 m + (2 x Fill))	1
If the overall structure width > (7 m + (2 x Fill))	1
If the overall structure width < (7 m + (2 x Fill))	3

* Fill = Fill on structure (slope to road)

Single Axle load limit assessed

Risk = Consequence of Failure + Probability of Failure

Priority Score = Risk + Level of Service

Level of Service = Performance Grade + Probability of Failure