Kincardine Municipal Bridge Master Plan

Municipality of Kincardine

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1. Introduction

1.1. Municipality of Kincardine Study Area

The Municipality of Kincardine is located on the eastern shore of Lake Huron in Bruce County Ontario and currently covers an area of 537.8 km^2. The 2021 census provided a residential population of 11,398 people and a population density of 22.8/km^2. The population is concentrated within the urban boundary and is less dense in the surrounding agricultural areas. All future growth is expected to be within the urban boundaries. The Bruce Nuclear Generating Station (Bruce Power) is located in the northern end of the municipality and employs over 4,000 workers. The municipality contains several smaller communities including Armow, Underwood, and Tiverton, and has numerous small waterways which outlet to Lake Huron, making bridges an expensive necessity for the well-connected road network.

There are currently 83 active bridge structures in Kincardine, namely, 51 culverts and 32 bridges. These structures have an average age of 47 years, approaching the Ontario Ministry of Transportation's (MTO) estimated average service life of 50 years. Of the 83, 52 structures have annual average daily traffic (AADT) that counts less than 200 trips per day and are situated in the less-dense agricultural areas surrounding the urban area. Whereas structures within the urban boundary have AADT counts as high as 1500 trips per day.

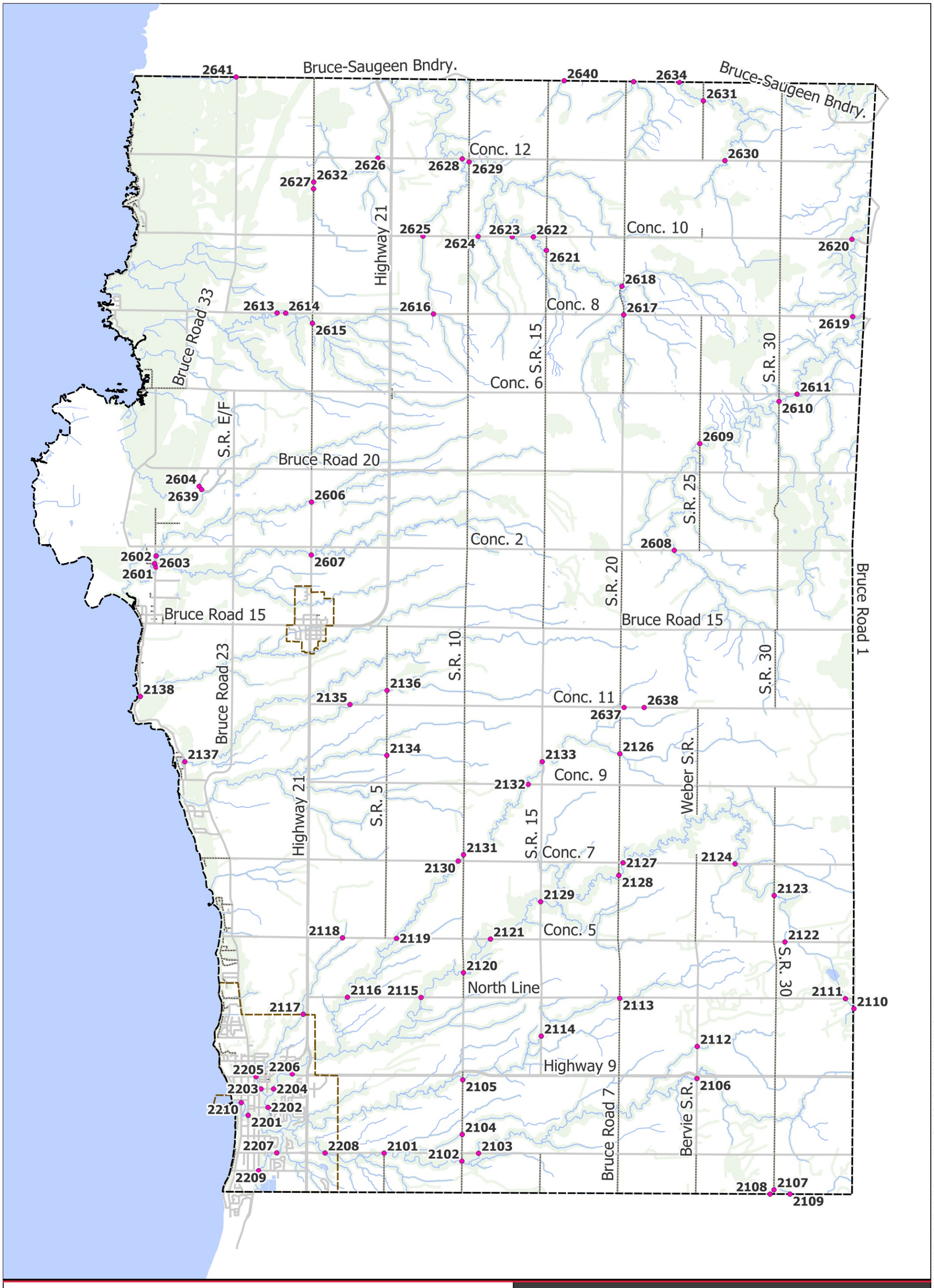
Within the rural areas of Kincardine, the grid-like road network is well connected, with Highway 21 and Highway 9 as the primary routes through the municipality, Highway 21 extending north to Bruce Power. It can be noted that a small number of roads that make up the network have missing sections, making the grid incomplete at a few locations. Any structures present on dead-end roads are necessary; however, the high connectivity of the road system, low population density outside of the urban boundary, and high cost of maintaining bridges present an opportunity to rationalize and reduce the number of structures in the long term.

Figure 1-1 presents the Municipality of Kincardine study area including all active bridge structures.

1.2. Master Plan Objectives

The Municipality of Kincardine ('the Municipality') retained GM BluePlan Engineering (now GEI Consultants Inc.) to provide engineering services for the Municipality's Bridge Master Plan. This Master Plan aims to evaluate which of these structures may be permanently retired, while maintaining an adequate level of service in the next 10 years to avoid, substantial costly upgrades and replacement works. In addition to a short-term program, long-term recommendations of the overall bridge network were also recommended as future maintenance works exceed need and overall functionality. The Master Plan scope of work includes the following:

- Evaluation of bridges through scoring criteria to identify which bridges are critical and must be maintained, and which bridges can be considered for retirement
- Provide short and long-term recommendations on bridge repair, replacement, or retirement
- A short-term (10 year) Capital Investment Program



General Features

- Bridges
- Paved Road
- Unpaved Road
- Waterbody
- SVCA Regulated Areas
- Urban Boundary
- Municipal Boundary

2,000 4,000 6,000 8,000 m

Figure 1-1
Study Area

Project Name:
Kincardine Bridge Master Plan

Client Name:
Regional Municipality of Kincardine
Ontario, Canada

GEI Consultants

Last Updated: December 2024
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2. Background Review

A background review was completed to summarize previous relevant reports and data. This included a review of the following:

- Ontario Structure Inspection (OSIM) reports (BM Ross, 2023)
- 2023-2024 Traffic Counts
- 2021 Kincardine Official Plan
- Water and Wastewater Servicing Master Plan Update (BM Ross, 2022)
- Municipality of Kincardine Geographic Information System (GIS) data
    - Transportation network
    - Environmental features
    - Parcel fabric

2.1. Ontario Structural Inspection Reports

In 2023, BM Ross was retained by the Municipality to complete inspections of 85 structures (2 of which are small-span culverts). The findings were summarized in a report provided in **Appendix A**, which included OSIM reports for each structure, repair and replacement recommendations, and a priority list of the recommended work.

Replacement of 4 structures was recommended in the next 5 years, and 8 structures were identified as requiring replacement in a 6-10 year period. Similarly, repairs are recommended to 21 structures in the next 5 years, and 10 structures in the 6-10 year period. This will cost the Municipality $5,314,000 in repair costs and $14,268,000 in replacement costs over the next 10 years following completion.

The OSIM reports also identified each bridge via a Bridge ID. This unique 4-digit number will be carried forth in this report for consistency in identifying each structure.

2.2. Growth

Following a review of both the Municipalities' Official Plan and Water and Wastewater Master Plan Update, growth projections and greenfield growth locations were identified to ensure decisions made on the transportation network will not impact future development.

Greenfield growth development is proposed primarily within the existing settlement areas of Kincardine, Tiverton, and Lakeshore (along Lake Huron shoreline including Inverhuron). The Official Plan outlines an increase in population from approximately 11,400 people in 2016 to 14,039 people by 2045. Of this growth population, approximately 1,500 people are anticipated within the existing settlement boundary. Further, growth outside the settlement boundary generally consists of the severance of agricultural lots or addition of secondary suites on agricultural lots. **Table 2-1** provides a summary of growth, by household, within the Municipality.

Table 2-1. Municipality of Kincardine Growth by Household

Growth Area	2017 Households	2045 Households	Growth Households
Kincardine	4,179	5,080	901
Tiverton	409	497	88
Lakeshore	1,044	1,269	225
Total	**5,632**	**6,846**	**1,214**

As part of this Master Plan, proposed bridge retirement aims to avoid impacts to growth areas and overall network connectivity between these areas. As growth is primarily within the existing settlement boundary, all urban bridges will not be considered for retirement.

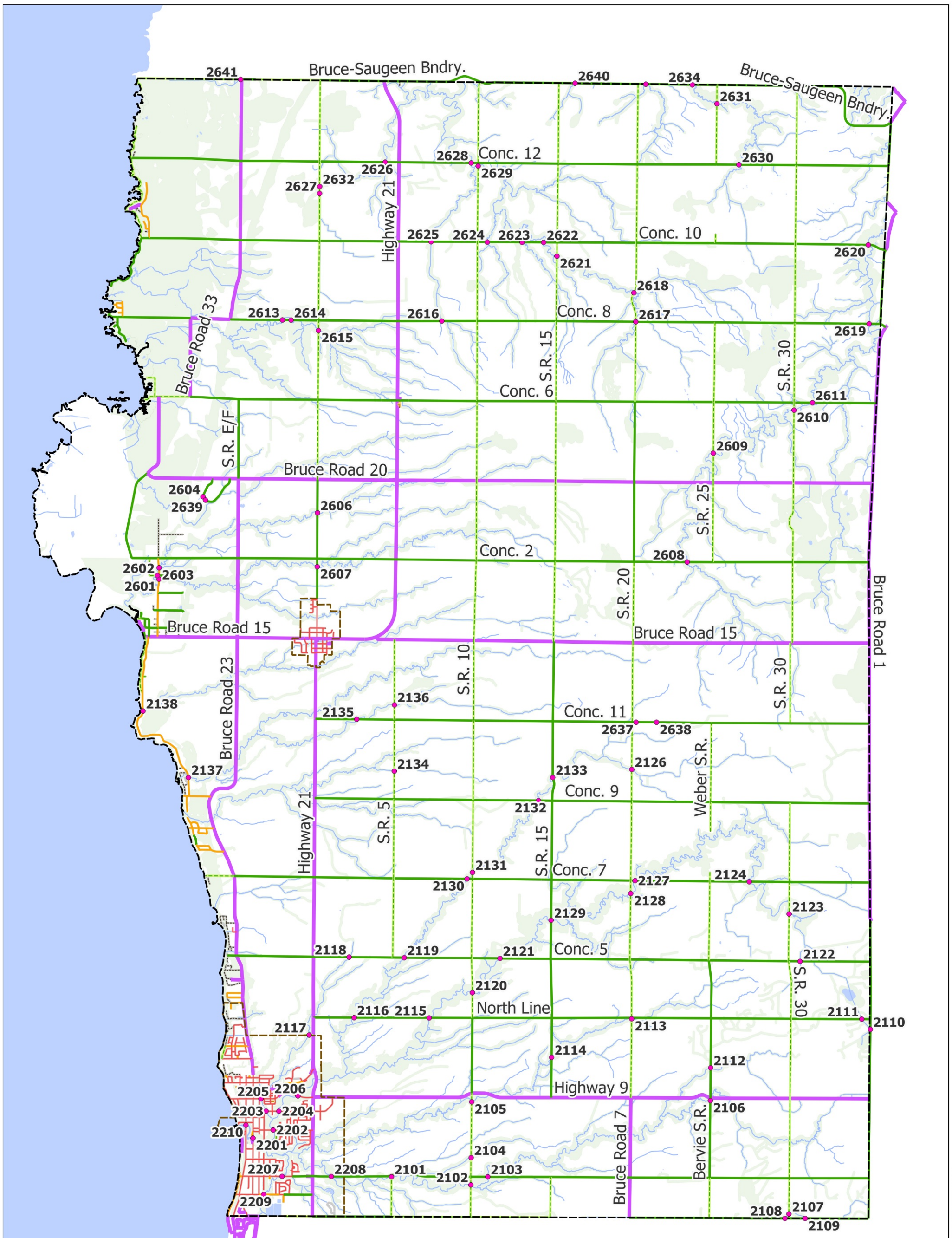
2.3. Existing Transportation Network

The existing municipal road network, shown in **Figure 2-1**, is generally categorized into the following categories:

- Urban, generally located within the urban boundary of Kincardine and Tiverton.
- Semi-urban, generally located along the Lake Huron Lakeshore.
- Rural, located within the remaining municipal boundary outside the settlement boundaries. This rural network is generally a grid system with a few incomplete sections, including north-south sections along Sideroad 25/Weber Sideroad, Sideroad 30, Sideroad 5, and Sideroad 15.
    - Paved roads are generally the east to west Concession Roads.
    - Gravel roads are generally the north to south Sideroads .
- The remaining network is not maintained by the Municipality as it consists of both Provincial, Highway 21 and Highway 9, and County roads (i.e. Bruce Road 1).

The municipal traffic counts were collected in 2023/2024 generally within the rural network, as shown in **Figure 2-2**. These traffic counts were used to verify AADT provided for each bridge in the OSIM. Further, where traffic counts were not collected for the entire road network, AADT collected as part of the OSIMs was used to confirm traffic impact on each bridge.

Due to the large rural network, winter maintenance is not provided for the entire network, particularly along the rural, gravel sideroads. The snowplow routes for municipal road winter maintenance are provided in **Figure 2-3**.



Road by Surface Type

- Rural/Gravel Road
- Rural/Paved Road
- Semi-Urban/Gavel Road
- Semi-Urban/Paved Road
- Urban/Paved Road
- County and Provincial Roads

General Features

- Bridges
- Paved Road
- Unpaved Road
- Waterbody
- SVCA Regulated Areas
- Urban Boundary
- Municipal Boundary

2,000 4,000 6,000 8,000 m

Figure 2-1
Road Classification and Material

Project Name:
Kincardine Bridge Master Plan

Client Name:
Regional Municipality of Kincardine
Ontario, Canada

GEI Consultants

Last Updated: January 2025
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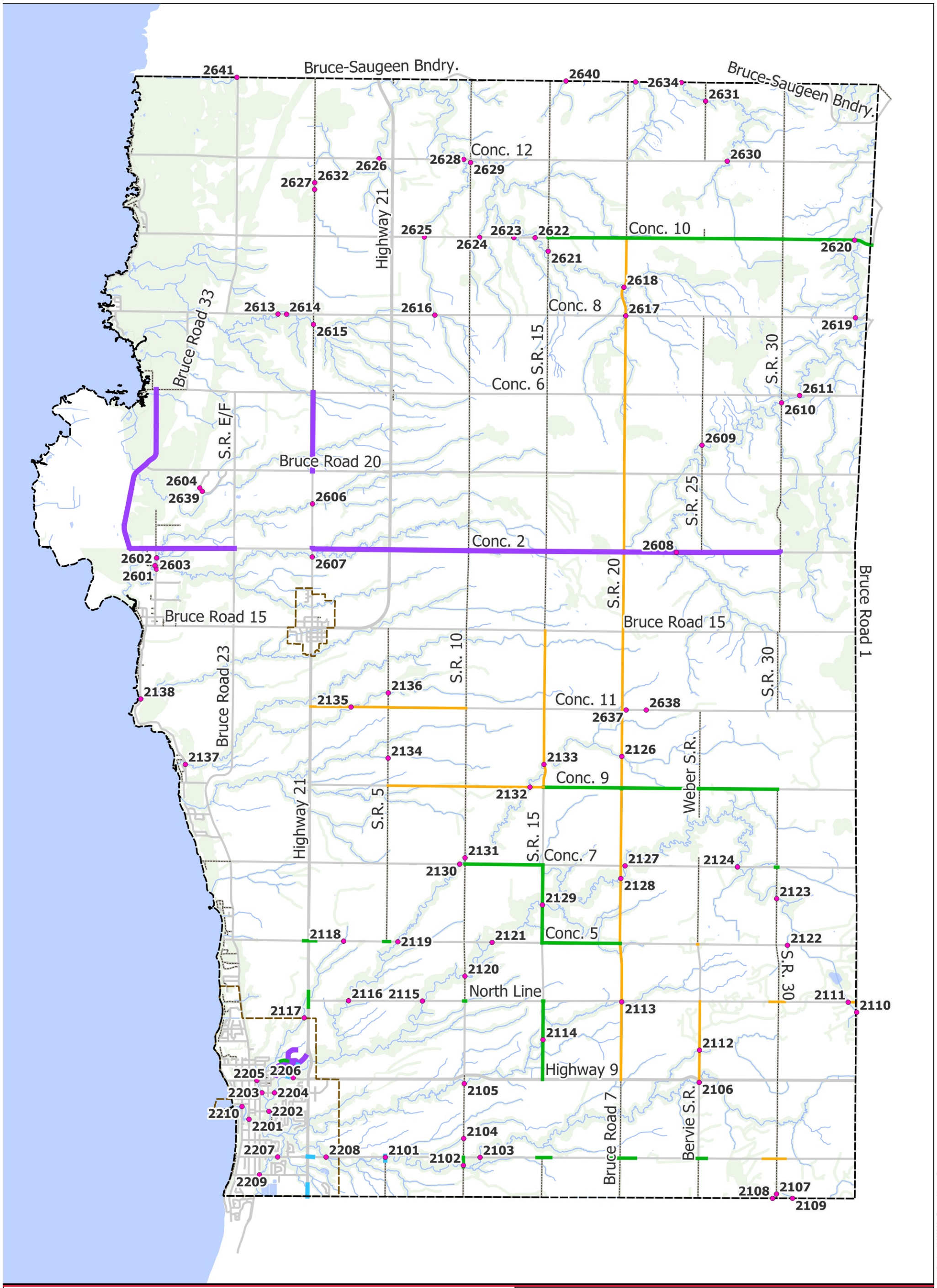

Figure 2-2
2023-2024 Traffic Counts

Project Name:
Kincardine Bridge Master Plan

Client Name:
Regional Municipality of Kincardine
Ontario, Canada

GEI Consultants

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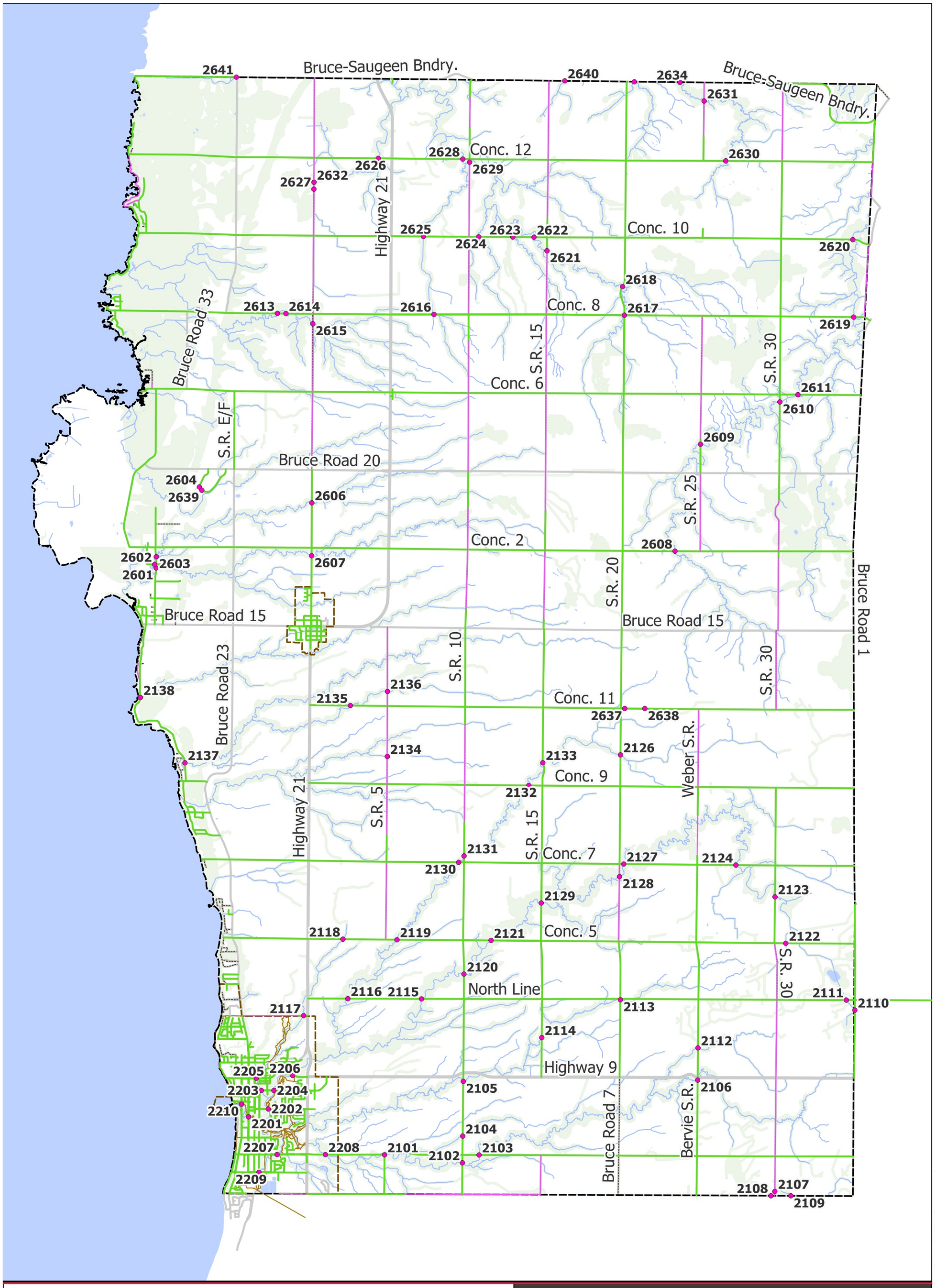

Winter Maintenance Roads

- Winter Maintenance Provided
- No Winter Maintenance

General Features

- Bridges
- Waterbody
- SVCA Regulated Areas
- Urban Boundary
- Municipal Boundary

Figure 2-3
Winter Maintenance Routes

Project Name:
Kincardine Bridge Master Plan

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3. Existing Bridge Summary

The 83 active bridges, evaluated as part of this Master Plan, are summarized in **Table 3-1** to **Table 3-3** as OSIM identified repairs required, replacement required, and no works required respectively. These tables provide a summary of:

- General bridge information including ID and name (where applicable).
- Road information including:
    - Road name, classification, surface type, and posted speed limit.
    - AADT to confirm annual traffic along the bridge road segment.
    - Detour distance based on required route to avoid bridge crossing.
- Installation date (where known).
- Bridge condition index (BCI) which is an assigned value which considers overall condition of a bridge considering the state of each element. Generally, a BCI between 70-100 is considered good, 50-70 is fair, and <50 is poor.
- Current replacement value (CRV) which is current value of a bridge based on a standardized calculation which includes deck area, structure type, and material type.
- Repair or replacement cost which is the cost of required works based on calculated capital construction.

Further, it can be noted that of all evaluated bridges, none were identified as having heritage designation.

Figure 3-1 to **Figure 3-4** presents a map of all the bridges within the Municipality by AADT, BCI, CRV, and repair/replacement cost as these components are considered in the evaluation presented in **Section 5**. Full details for each bridge are provided in the OSIM reports provided in **Appendix A**.

Table 3-1. Bridge Structures Requiring Repairs in the Next 10 Years

Bridge ID	Bridge Name	Structure Type	Street	Street Type	Surface Type	Speed (km/h)	AADT	Detour (km)	Install Date	BCI	CRV	Repair Cost	Timing	OSIM Comment
2102	Stewart Bridge	I-beam or Girders	Sideroad 10	Rural	Gravel	80	0-49	6	2006	95	$2,603,000	$2,000	1-5 Years	Prestressed girder bridge in excellent condition
2103	Farrell Bridge	Rectangular Culvert	South Line	Rural	HCB - 2 lifts	80	200-499	5	1975	50	$1,101,600	$5,000	1-5 Years	Twin concrete box culvert in fair condition. Water levels are too high to inspect/
2113	-	Solid Slab	Sideroad 20	Rural	Gravel	80	50-199	6	1930	39	$361,000	$7,000	1-5 Years	Rectangular concrete culvert in fair condition. Railings require repairs.
2116	Munro Bridge	Rigid Frame Vertical Legs	North Line	Rural	HCB - 2 lifts	80	200-499	6	1987	75	$1,149,500	$145,000	1-5 Years	Rigid frame bridge in good condition.
2117	-	Rectangular Culvert	Northline Ext	Rural	Gravel	80	0-49	Dead End	1960	39	$606,900	$46,000	1-5 Years	Rectangular concrete culvert in fair to poor condition. Water levels are too high for inspection.
2119	-	Arch Culvert	Concession 5	Rural	HCB - 2 lifts	80	200-499	6	1975	74	$1,165,500	$15,000	1-5 Years	Arch culvert in good condition
2123	-	Solid Slab	Sideroad 30	Rural	Gravel	80	50-199	6	1960	38	$513,000	$235,000	1-5 Years	Concrete slab bridge in fair to poor condition. Railings require replacement.
2126	Robertson Bridge	Rectangular Culvert	Sideroad 20	Rural	Gravel	80	50-199	6	1990	99	$550,800	$5,000	1-5 Years	Rectangular culvert in excellent condition.
2131	-	Arch Culvert	Sideroad 10	Rural	Gravel	80	0-49	6	1985	68	$783,000	$60,000	1-5 Years	Multi-plate arch culvert in fair to good condition/
2132	White Bridge	Rigid Frame Vertical Legs	Concession 9	Rural	HCB - 2 lifts	80	50-199	6	1940	37	$807,500	$506,000	1-5 Years	Rigid frame bridge in fair to poor condition. Repairs warranted to extended service life.
2138	Evans Bridge	Solid Slab	Victoria St	Semi-Urban	HCB - 2 lifts	80	50-199	6	1960	56	$589,000	$380,000	1-5 Years	Structure in fair condition. Repairs recommended to extend service life.
2204	Durham St Bridge East	I beam or Girders	Durham St	Urban	HCB - 2 lifts	50	500-999	2	1975	72	$5,605,000	$178,000	1-5 Years	NA
2205	Broadway St Culvert	Rectangular Culvert	Broadway St	Urban	HCB - 2 lifts	50	>1000	1	1980	66	$1,392,300	$10,000	1-5 Years	Culvert barrel bends to follow stream alignment. Guiderail requires repairs.
2601	Buchanan Bridge	Rigid Frame Vertical Legs	Albert Rd	Semi-Urban	HCB - 2 lifts	50	500-999	6	1974	57	$1,083,000	$278,000	1-5 Years	Rigid frame bridge in fair condition. Deck repairs recommended to extend service life.
2619	-	Arch Culvert	Concession 8	Rural	HCB - 2 lifts	80	50-199	6	1990	38	$1,422,900	$119,000	1-5 Years	Arch structure is in fair condition. Guiderail and shoulder improvements recommended.
2621	Sullivan Bridge	T Beam	Sideroad 15	Rural	Gravel	80	0-49	6	1947	38	$532,000	$216,000	1-5 Years	Concrete slab bridge in fair to poor condition. Beam reinforcement and erosion protection recommended. Road has 5 tonne posting.
2622	Terry Tuck Bridge	Rigid Frame Vertical Legs	Concession 10	Rural	HCB - 2 lifts	80	50-199	6	1970	72	$1,121,000	$53,000	1-5 Years	Rigid frame bridge in good condition. Isolated repairs to railings recommended.
2625	-	Rectangular Culvert	Concession 10	Rural	HCB - 2 lifts	80	50-199	6	1990	38	$367,200	$40,000	1-5 Years	Rectangular concrete culvert in fair condition. Erosion protection recommended for the footings.
2626	-	Arch Culvert	Concession 12	Rural	HCB - 2 lifts	80	50-199	6	1985	30	$400,500	$10,000	1-5 Years	Multi-plate arch culvert in poor condition. Corroded plates and fasteners/
2629	-	Arch Culvert	Sideroad 10	Rural	Gravel	80	0-49	6	1980	40	$895,500	$10,000	1-5 Years	Multi-plate arch in fair condition. Guiderail modifications recommended.
2631	-	Arch Culvert	Glen Cumming Rd	Rural	Gravel	80	0-49	6	1985	75	$441,000	$12,000	1-5 Years	Multi-plate arch culvert in good condition. Guiderail improvements recommended.
2106	Shane Weir Bridge	Rigid Frame Vertical Legs	Bervie Sideroad	Rural	HCB - 2 lifts	80	50-199	6	1992	81	$2,023,500	$96,000	6-10 Years	Rigid frame bridge in good condition. Gabion basket and erosion protection recommended.
2115	Thompson Bridge	I-beam or Girders	Northline	Rural	HCB - 2 lifts	80	200-499	2.5	1982	74	$2,850,000	$393,000	6-10 Years	Prestressed concrete cinder bridge in good condition.
2120	Manners Bridge	Rigid Frame Vertical Legs	Sideroad 10	Rural	Gravel	80	50-199	6	1970	58	$959,500	$464,000	6-10 Years	Rigid frame bridge in fair condition
2127	Stephenson Bridge	Rigid Frame, Vertical Legs	Concession 7	Rural	HCB - 2 lifts	80	200-499	6	1960	44	$1,377,500	$494,000	6-10 Years	Rigid frame bridge in fair condition. Repairs recommended for the 6-10 year period to extend service life.
2133	Mcteer Bridge	Rectangular Culverts	Sideroad 15	Rural	HCB - 2 lifts	80	50-199	6	1945	42	$698,700	$165,000	6-10 Years	Rigid concrete culvert deteriorated at west end and soffit.

Bridge ID	Bridge Name	Structure Type	Street	Street Type	Surface Type	Speed (km/h)	AADT	Detour (km)	Install Date	BCI	CRV	Repair Cost	Timing	OSIM Comment
2134	-	Rectangular Culvert	Sideroad 5	Rural	Gravel	80	0-49	6	1940	39	$224,400	$159,000	6-10 Years	Rectangular concrete culvert in fair condition with deterioration at ends.
2137	Collins Bridge	Rigid Frame, Vertical Legs	Upper Lorne Beach Rd	Semi-Urban	HCB - 2 lifts	80	50-199	11	1960	71	$921,500	$155,000	6-10 Years	Rigid frame bridge in fair to good condition.
2610	30Th Sideroad	Rigid Frame Vertical Legs	Sideroad 30	Rural	Gravel	80	0-49	6	1950	37	$902,500	$519,000	6-10 Years	Rigid frame bridge in fair to poor condition.
2616	-	Rectangular Culvert	Concession 8	Rural	HCB - 2 lifts	80	50-199	6	1990	49	$346,800	$159,000	6-10 Years	Rectangular concrete culvert in fair condition. With some deterioration along abutment faces.
2620	Mielke Bridge	Rigid Frame Vertical Legs	Concession 10	Rural	HCB - 2 lifts	80	50-199	6	1960	72	$1,463,000	$378,000	6-10 Years	Rigid frame bridge in fair to good condition. Approaches in poor condition/
											Total	**$5,314,000**		

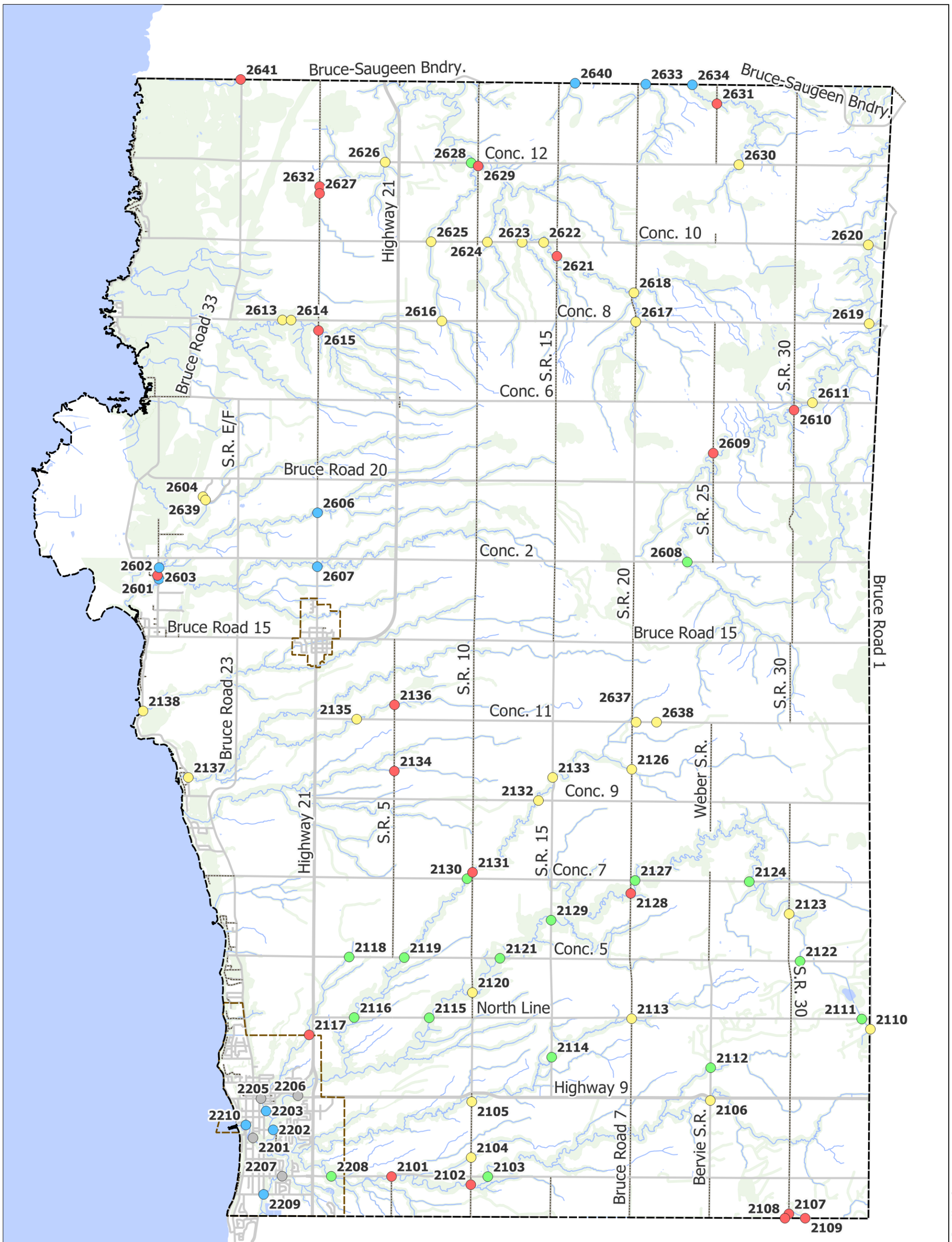
Table 3-2. Bridges Requiring Replacement in the Next 10 Years

Bridge ID	Bridge Name	Structure Type	Street	Street Type	Surface Type	Speed (km/h)	AADT	Detour (km)	Install Date	BCI	CRV	Replacement Cost	Timing	OSIM Comment
2121	Campbell Bridge	Rigid Frame Vertical Legs	Concession 5	Rural	HCB - 2 lifts	30	200-499	6	1950	19	$2,033,000	$3,927,000	1-5 Years	Rigid frame bridge in poor condition. Replacement and road improvements recommended.
2128	Shewfelt Bridge	Arch Culvert	Sideroad 20	Rural	Gravel	80	0-49	6	1950	20	$1,458,600	$3,592,000	1-5 Years	Arch bridge in poor condition. Provide load posting signage at intersections and bridge.
2136	-	Rectangular Culvert	Sideroad 5	Rural	Gravel	80	0-49	6	1934	23	$112,200	$562,000	1-5 Years	Rectangular concrete culvert in poor condition. Replacement recommended.
2207	-	Rectangular	Kincardine Ave	Urban	HCB - 2 lifts	80	>1000	3.2	1960	44	$438,600	$848,000	1-5 Years	NA
2104	Smalls Bridge	Solid Slab	Sideroad 10	Rural	Gravel	80	50-199	10	1950	29	$370,500	$633,000	6-10 Years	Concrete slab bridge in poor condition. Headwalls were installed to support road edges in 20212. Provide load posting signage at bridge and intersections as required.
2110	Hayes Bridge	Rectangular Culvert	Kincardine Kinloss Bdry	Rural	HCB - 2 lifts	80	50-199	6	1960	31	$290,700	$601,000	6-10 Years	Boundary bridge with Huron-Kinloss structure K19. Rectangular concrete culvert in poor condition. Reinforced in 2008.
2111	-	Arch Culvert	Northline	Rural	HCB - 2 lifts	80	200-499	6	1960	36	$333,000	$661,000	6-10 Years	Multi-plate arch culvert in poor condition.
2122	-	Rectangular Culvert	Concession 5	Rural	HCB - 2 lifts	80	200-499	6	1980	59	$499,800	$175,000	6-10 Years	Rectangular concrete culvert in fair to good condition. The structure has been extended.
2603	-	Arch Culvert	Albert Rd	Semi-Urban	HCB - 2 lifts	50	500-999	6	1974	34	$810,000	$980,000	6-10 Years	Multi-plate arch culvert in fair to poor condition. Corrosion below spring-line.
2623	-	Arch Culvert	Concession 10	Rural	HCB - 2 lifts	80	50-199	6	1980	34	$490,500	$675,000	6-10 Years	Arch culvert in poor condition. Future replacement recommended.
2624	-	Arch Culvert	Concession 10	Rural	HCB - 2 lifts	80	50-199	6	1980	38	$522,000	$816,000	6-10 Years	Multi-plate arch culvert that has been reinforced at the spring-line.
2630	-	Arch Culvert	Concession 12	Rural	HCB - 2 lifts	80	50-199	6	1990	34	$508,500	$816,000	6-10 Years	Multi-plate arch culvert in fair to poor condition. Corrosion below spring-line.
											Total	**$14,286,000**		

Table 3-3. Bridge Structures with No Works Required in the Next 10 Years

Bridge ID	Bridge Name	Structure Type	Street	Street Type	Surface Type	Speed (km/h)	AADT	Detour (km)	Install Date	BCI	CRV	OSIM Comment
2101	Owen Davey Bridge	Rigid Frame Vertical Legs	Sideroad 5	Rural	Gravel	80	0-49	5	1990	73	$1,567,500	Rigid frame bridge in fair to good condition
2105	Anderson Bridge	Rectangular Culvert	Sideroad 10	Rural	Gravel	80	50-199	10	1960	73	$734,400	Rectangular concrete culvert in fair to good condition.
2107	-	Rectangular Culvert	Sideroad 30	Rural	Gravel	80	0-49	5	1970	40	$469,400	Rectangular concrete culvert in fair condition. Reinforced and protected with rip rap in 2018.
2108	-	Culvert	Huron Kincardine East	Rural	LCB - 2 lifts	80	0-49	4	2017	95	$315,000	Boundary bridge with Huron-Kinloss structure H64. Round pipe in excellent condition. Shape distorted. Deflection at the north end.
2109	-	Culvert	Huron Kincardine East	Rural	LCB - 2 lifts	80	0-49	4	2017	100	$297,000	Boundary Bridge with Huron-Kinloss structure H63. Round pipe in excellent condition. Shape distorted.
2112	Bervie Bridge	Solid Slab	Bervie Sideroad	Rural	HCB - 2 lifts	80	200-499	6	1950	100	N/A	Pre-cast box culvert in excellent condition.
2114	-	Rectangular Culvert	Sideroad 15	Rural	HCB - 2 lifts	80	200-499	6	1960	65	$300,900	Rectangular concrete culvert in fair to good condition. Structure extended in 2013.
2118	-	Rectangular Culvert	Concession 5	Rural	HCB - 2 lifts	80	200-499	6	1980	54	$418,200	Rectangular concrete culvert in fair to good condition.
2124	-	Rectangular Culvert	Concession 7	Rural	HCB - 2 lifts	80	200-499	6	1990	50	$647,700	Rectangular concrete culvert in fair condition. Water levels too high to inspect.
2129	Armow Bridge	I-beam or Girders	Sideroad 15	Rural	HCB - 2 lifts	80	200-499	6	1966	70	$2,964,000	Pre-stressed girder bridge in fair to good condition. Erosion protection in 2016 and 2017.
2130	Matheson Bridge	I-beam or Girders	Concession 7	Rural	HCB - 2 lifts	80	200-499	6	1990	67	$760,000	Steel beam, integral abutment bridge in fair to good condition.
2135	-	Rectangular Culvert	Concession 11	Rural	HCB - 2 lifts	80	50-199	6	1970	62	$311,100	Rectangular concrete culvert in fair condition with extensive retaining walls at south end. One missing hazard marker on north side of road.
2201	Queen St Bridge	I-beam or Girders	Queen St	Urban	HCB - 2 lifts	50	>1000	4.5	1971	72	$8,939,500	NA
2202	Russell St Bridge	Rigid Frame Vertical Legs	Russell Street	Urban	HCB - 2 lifts	50	500-999	2.3	1962	65	$2,327,500	NA
2203	Durham St Culvert	Round Culvert	Durham St	Urban	HCB - 2 lifts	50	500-999	1.5	2004	100	$1,512,000	NA
2206	Broadway St Bridge	T Beam	Broadway	Urban	HCB - 2 lifts	50	>1000	2.5	1965	41	$4,959,000	NA
2208	Buttery Bridge	I-beam or Girders	Kincardine Ave	Rural	LCB - 2 lifts	80	200-499	4	2001	95	$2,223,000	NA
2209	-	Rectangular Culvert	Bruce Ave	Semi-Urban	HCB - 2 lifts	50	500-999	2.3	2020	100	$948,600	NA
2210	Huron Terr Bridge	I-beam or Girders	Huron Terr	Urban	HCB - 2 lifts	50	500-999	1	2009	100	$8,217,500	NA
2602	-	Arch Culvert	Alma Street	Rural	Gravel	50	0-49	1	1945	36	$387,600	Arch culvert in fair to poor condition.
2604	-	Rectangular Culvert	Farrell Drive	Rural	HCB - 2 lifts	50	50-199	1	1975	73	$265,200	Rectangular culvert in good condition
2606	-	Arch Culvert	J/1	Rural	HCB - 2 lifts	80	500-999	6	1970	47	$576,000	Multi-plate arch culvert in fair condition. Cracked zones at spring-line have been reinforced.
2607	Pettigrew Bridge	Rigid Grame Vertical Legs	Sideroad J/1	Rural	HCB - 2 lifts	80	500-999	6	1990	53	$1,168,500	Rigid frame bridge in fair condition
2608	-	Rectangular Culvert	Concession 2	Rural	HCB - 2 lifts	80	200-499	6	1990	95	$683,400	Rectangular concrete culvert in excellent condition. Water is too deep to review.
2609	-	Rectangular Culvert	Sideroad 25	Rural	Gravel	80	0-49	6	1992	75	$1,020,000	Twin barrel rectangular concrete culvert in good condition. Water is too deep to review.
2611	-	Rectangular Culvert	Concession 6	Rural	HCB - 2 lifts	80	50-199	6	1980	98	$1,213,800	Twin rectangular culvert in excellent condition.
2613	-	Rectangular Culvert	Concession 8	Rural	HCB - 2 lifts	80	50-199	6.1	1970	75	$754,800	Rectangular culvert in good condition. Water too deep to inspect.
2614	-	Rectangular Culvert	Concession 8	Rural	HCB - 2 lifts	80	50-199	6.1	1970	75	$688,500	Rectangular concrete culvert in good condition
2615	Arda Bridge	Solid Slab	Sideroad J/1	Rural	Gravel	80	0-49	6	1940	37	$427,500	Concrete slab bridge in fair to poor condition. Water too deep for review. Railings repaired in 2017. Road has 5 tonne posting.

Bridge ID	Bridge Name	Structure Type	Street	Street Type	Surface Type	Speed (km/h)	AADT	Detour (km)	Install Date	BCI	CRV	OSIM Comment
2617	-	Rectangular Culvert	Concession 8	Rural	HCB - 2 lifts	80	50-199	6	1990	73	$770,100	Rectangular concrete culvert in good condition
2618	-	Round Culvert	Sideroad 20	Rural	Gravel	80	50-199	6	2000	61	$846,000	Twin barrel CSP culvert in fair condition. Corrosion below normal water level.
2627	-	Rectangular Culvert	Sideroad J/1	Rural	Gravel	80	0-49	6	1970	74	$255,000	Rectangular concrete culvert in good condition. Erosion protection recommended.
2628	Howard Ribey Bridge	Rigid Frame Vertical Legs	Concession 12	Rural	HCB - 2 lifts	80	200-499	6	1970	65	$1,159,000	Rigid frame bridge in fair to good condition.
2632	-	Solid Slab	Sideroad J/1	Rural	Gravel	80	0-49	6	1965	40	$494,000	Rectangular Concrete culvert in fair condition. Structure reviewed from ends due to deep water.
2633	-	Rectangular Culvert	Bruce Saugeen Townline	Rural	HCB - 2 lifts	80	500-999	6	1980	75	$525,300	Rectangular concrete culvert in good condition. Extensive gabion retaining walls protected with rip rap/
2634	-	Rectangular Culvert	Bruce Saugeen Townline	Rural	HCB - 2 lifts	80	500-999	6	1980	64	N/A	Rectangular concrete culvert in fair to good condition. Deterioration at west end of deck.
2639	-	Round Culverts	Farrell Dr	Rural	HCB - 2 lifts	50	50-199	1	-	75	$387,000	Round multi-plate culvert in good condition
2640	-	Rectangular Culvert	Bruce Saugeen Townline	Rural	HCB - 2 lifts	80	500-999	6	-	40	$275,400	Rectangular concrete culvert in fair condition
2637	-	Arch Culvert	Concession 10	Rural	HCB - 2 lifts	80	50-199	6	2014	98	$189,000	CSP round culvert with polymer coating in excellent condition
										Total:	**$49,998,400**	



Bridges - AADT

- 0-49
- 50-199
- 200-499
- 500-999
- >1000

General Features

- Paved Road
- Unpaved Road
- Waterbody
- SVCA Regulated Areas
- Urban Boundary
- Municipal Boundary

2,000 4,000 6,000 8,000 m

Figure 3-1
Bridges by AADT

Project Name:
Kincardine Bridge Master Plan

Client Name:
Regional Municipality of Kincardine
Ontario, Canada

GEI Consultants

Last Updated: January 2025
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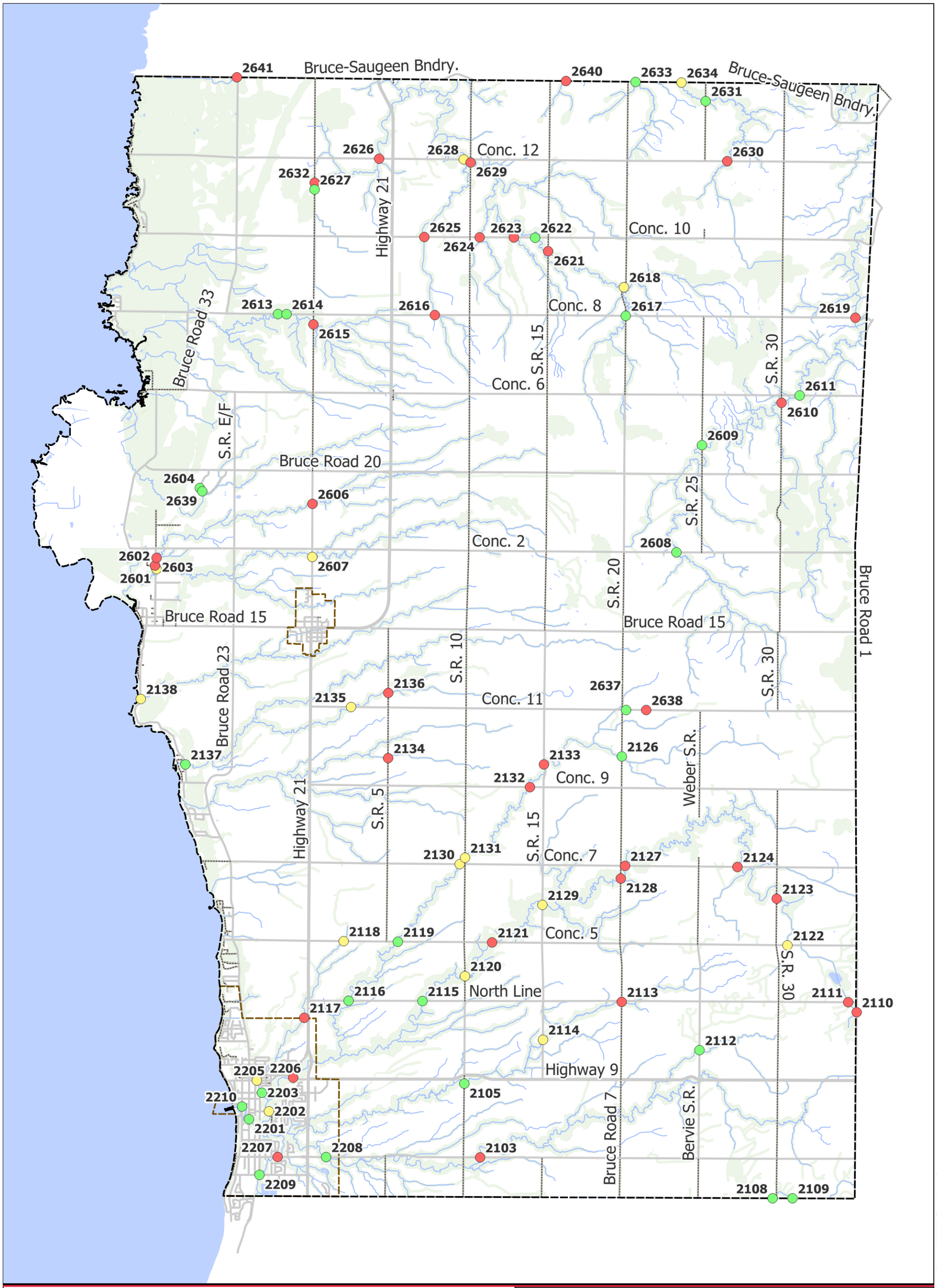

Bridges - BCI

- <50 (poor)
- 50 - 70 (fair)
- 70 - 100 (good)

General Features

- Paved Road
- Unpaved Road
- Waterbody
- SVCA Regulated Areas
- Urban Boundary
- Municipal Boundary

2,000 4,000 6,000 8,000 m

Figure 3-2
Bridges by BCI

Project Name:
Kincardine Bridge Master Plan

Client Name:
Regional Municipality of Kincardine
Ontario, Canada

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Last Updated: January 2025
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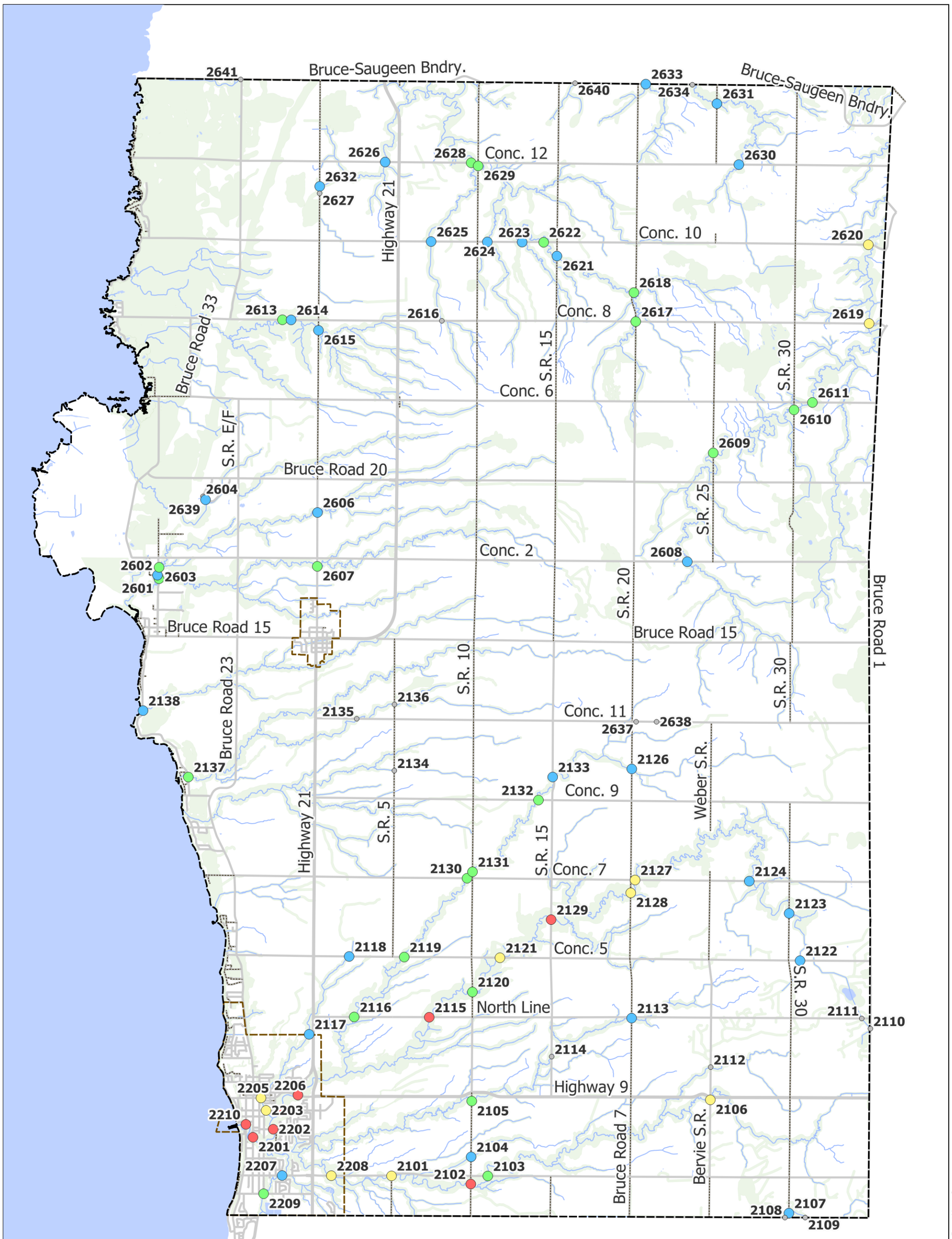


Bridges - CRV

- <$0.35 M
- $0.35M - $0.7M
- $0.7M - $1.25M
- $1.25M - $2.25M
- >$2.25M

General Features

- Paved Road
- Unpaved Road
- Waterbody
- SVCA Regulated Areas
- Urban Boundary
- Municipal Boundary

2,000 4,000 6,000 8,000 m

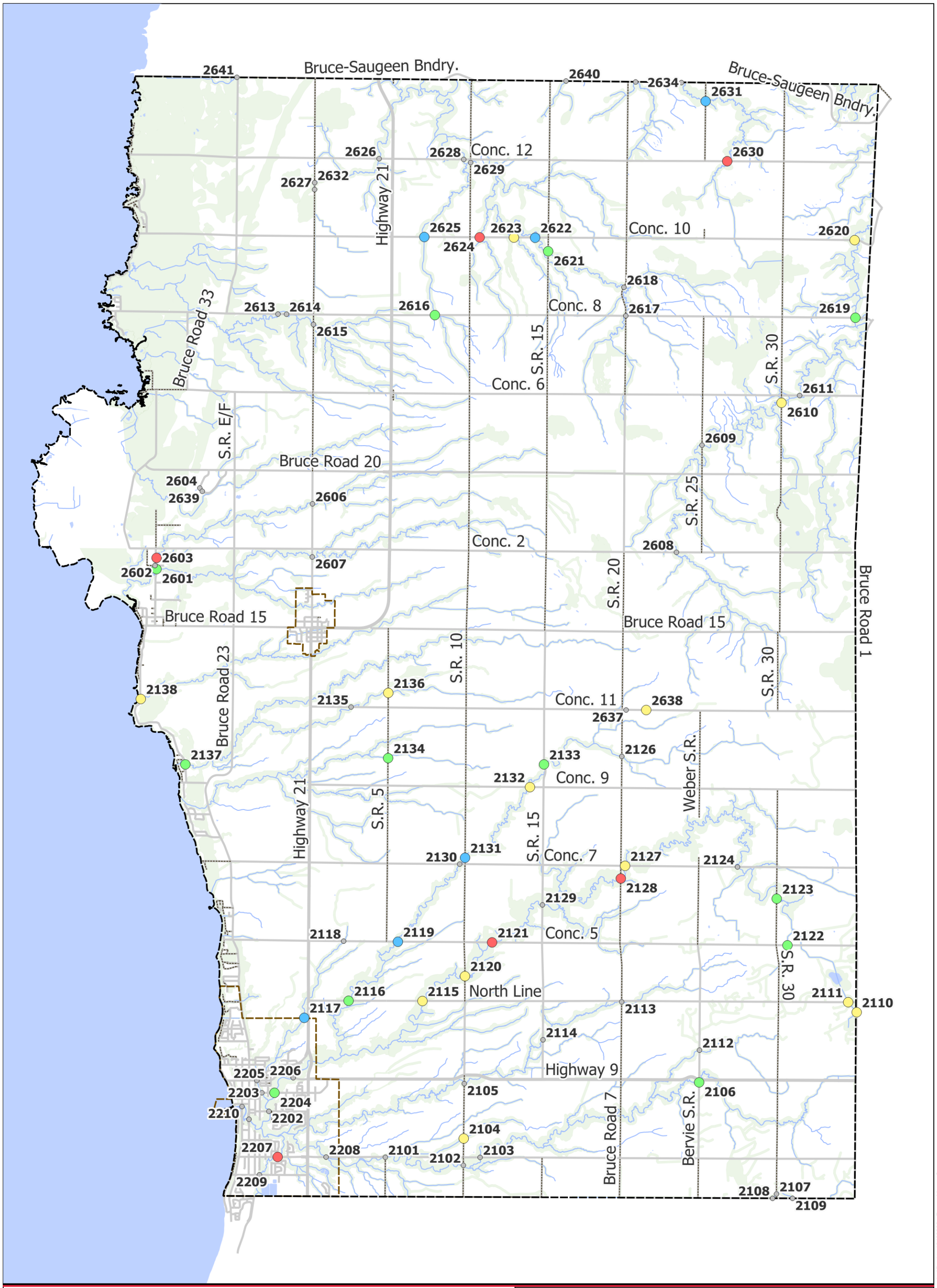
Figure 3-3
Bridges by CRV

Project Name:
Kincardine Bridge Master Plan

Client Name:
Regional Municipality of Kincardine
Ontario, Canada

GEI Consultants

Last Updated: January 2025
Document ID: 2402806-G-001



Bridges - Repair/Replacement

- <$0.01 M
- $0.01 M - $0.07 M
- $0.07 M - $0.3 M
- $0.3 M - $0.75 M
- >$0.75 M

General Features

- Paved Road
- Unpaved Road
- Waterbody
- SVCA Regulated Areas
- Urban Boundary
- Municipal Boundary

2,000 4,000 6,000 8,000 m

Figure 3-4
Bridges by Repair or Replacement Cost

Project Name:
Kincardine Bridge Master Plan

Client Name:
Regional Municipality of Kincardine
Ontario, Canada

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4. Evaluation Methodology

The evaluation of all bridges was completed to determine potential capital works for the following short and long-term services:

- Do nothing: No short-term work to be completed on the bridge.
- Repair or replacement: Perform short-term maintenance (i.e. repair or replacement of bridge) as recommended through OSIM.
- Retire: Close bridge as repair or replacement costs outweigh benefits to existing and future users.

The evaluation considered both the short (0-10 year) and long-term (>10 year) capital works to ensure that a recommended strategy considers the long-term overall network connectivity. The short-term strategy was evaluated based on recommendations from the OSIM reports for either repairs or replacement. The bridges not included in the short-term evaluation were carried forward into the long-term evaluation. These bridges do not have any short-term work; however, future repair or replacement needs may warrant them for retirement rather than proceeding with the proposed work.

The evaluation considered a 2-step process:

1. Screening Bridges: All bridges with repair or replacement needs, as per the OSIMs, were evaluated with a set of criteria and ranked based on their retirement potential. A threshold score determined which bridges would be carried forward for further detailed analysis.
    a. Short term capital works (0-10 years) were evaluated based on OSIM recommended repair or replacement costs, detour time, and AADT.
    b. Long term capital works (>10 years) were evaluated based on CRV, age, detour length, and AADT.
2. Detailed Evaluation: A comprehensive review, detailing potential impacts of all bridges which met screening criteria threshold score.

4.1. Screening of Bridges Methodology

The screening methodology was considered in 2 steps to ensure both short-term capital work needs, and potential long-term capital work were adequately screened. This process ensured the highest cost savings to the Municipality with the lowest overall impact to existing and future users and was followed by a detailed review to confirm action of each flagged bridge. Further this process was also used to further determine the priority needs of the proposed works as the highest-ranking bridges would be the most critical for either repair or replacement.

Several bridges, while currently in good condition, will be costly to replace and maintain in the coming decades. This is measurable through the OSIM reports' CRV. These bridges also do not have high traffic and are primarily used for local access.

4.1.1. Short Term Screening Methodology

The short-term screening process evaluated all bridges within the Municipality, with short-term repair or replacement needs as per the OSIMs, with prioritization for further evaluation based on feasibility for future retirement. The screening process considered the following criteria in the evaluation:

- **AADT**: Traffic impacts indicate that less traffic along a bridge will have reduced overall network connectivity impacts should the bridge be retired.
- **Repair or Replacement Cost**: High costs associated with repair or replacement, as indicated by the OSIMs, are prioritized for retirement to reduce capital burden on the Municipality.
- **Annual Detour Time**: Total time spent detouring per year to avoid bridge retirement. This criterion considers maximum length of the detour, total traffic along the road, and speed limits of the detour. A low total detour time is an indication of a reduced overall inconvenience due to a bridge retirement.

The screening process considered scoring criteria, from 1 to 5, based on the AADT, repair or replacement cost, and annual detour time is shown in **Table 4-1**. The sum of these scores was normalized to give each bridge a maximum score of 100 points noting an equal weight for each criterion. Following the screening a threshold score of 80 points carried forward bridges for a more comprehensive evaluation. Distributions of bridges within each scoring category are located in **Appendix C** and a complete list of all bridges' scores are located in **Appendix B**.

Table 4-1. Short-Term Screening Scoring

Criteria	Score				
	5	**4**	**3**	**2**	**1**
AADT	0 - 49 vehicles/day	50 - 199 vehicles/day	200 - 499 vehicles/day	500 - 999 vehicles/day	1000 + vehicles / day
Repair or Replacement Cost	≥$750,000	$300,000 - $749,999	$70,000 - $299,999	$10,000 - $69,999	<$10,000
Annual Detour Time	<200 hours	200 - 499 hours	500 - 999 hours	1000 - 1999 hours	≥2000 hours

4.1.2. Long Term Screening Methodology

The long-term screening process evaluated all bridges within Kincardine regardless of what work was recommended through the OSIM reports with prioritization for further evaluation based on feasibility for future retirement. Bridges considered for long-term retirement were evaluated based on CRV instead of repair or replacement costs as it is predicted that in the coming years these structures will deteriorate to the point of requiring replacement. The screening process considered the following criteria in the evaluation:

- **AADT**: Traffic impacts indicate that less traffic along a bridge will have reduced overall network connectivity impacts should the bridge be retired.
- **CRV**: High replacement costs associated with the structure, as indicated by the OSIMs, are prioritized for retirement to reduce future capital burden on the Municipality.
- **Annual Detour Time**: Total time spent detouring per year to avoid bridge retirement. This criterion considers maximum length of the detour, total traffic along the road, and speed limits of the detour. A low total detour time is an indication of a reduced overall inconvenience due to a bridge retirement.
- **Age**: Newer structures are typically in good condition and are not considered for retirement regardless of small traffic volumes or high replacement values.

The screening process considered scoring criteria, from 1 to 5, based on the AADT, CRV, age, and annual detour time as shown in **Table 3-1**. The sum of these scores was normalized to give each bridge a maximum score of 100 points noting an equal weight for each criterion. Following the screening, a threshold score of 70 points carried forward bridges for a more comprehensive evaluation. Distributions of bridges within each scoring category are located in **Appendix C** and a complete list of all bridges' scores are located in **Appendix B**.

Table 4-2. Long-Term Screening Scoring

Criteria	Score				
	5	**4**	**3**	**2**	**1**
AADT	0 - 49 vehicles/day	50 - 199 vehicles/day	200 - 499 vehicles/day	500 - 999 vehicles/day	1000 + vehicles / day
CRV	≥$2,250,000	$1,250,000 - $2,249,999	$700,000 - $1,249,999	$350,000 - $699 ,999	<$350,000
Annual Detour Time	<200 hours	200 - 499 hours	500 - 999 hours	1000 - 1999 hours	≥2000 hours
Age	>75 years	50 - 74 years	25 - 49 years	10 - 24 years	0 - 9 years

4.2. Detailed Evaluation Methodology

The detailed evaluation considered a comprehensive review of each bridge, which met the threshold scoring during the screening evaluation for its capacity to be retired. A threshold was chosen for both long- and short-term based on the distribution of scores for the bridges evaluated – values of 70/100 and 80/100 respectively. A sufficient number of bridges had to be above each threshold to ensure that being above the threshold did not necessarily mean the bridge was recommended for retirement. There are many factors that require consideration beyond what is captured in the scoring criteria, and these factors were considered in the detailed evaluation stage.

Due to the general grid of the road network the detailed evaluation considered quantitative direct impacts between 2 road segments and the overall network connectivity needs:

- **Land Use**: Review of land use types including residential, agricultural needs (i.e. farm access), wind turbine access, and other industrial/commercial/institutional (ICI) properties.
- **Impact on Key Vehicles**: Overall need and effectiveness of emergency vehicles, snowplows, and waste management vehicles.
- **Overall Network Connectivity**: Traffic impacts of vehicle rerouting and network access.
- **Other Possible Constraints**: Any miscellaneous items identified in the OSIMs which may have an impact on retirement possibility.

Following the detailed evaluation, mitigation measures were proposed to determine if identified constraints could be alleviated.

5. Screening Evaluation

The results of the screening evaluation are presented in the following sections with the detailed scoring results provided in **Appendix C**. All bridges which meet the screening threshold scores are carried forward to a detailed evaluation presented in the **Section 6** which will further determine their ability for potential retirement.

5.1. Short Term Screening Evaluation

Of the 43 bridges identified as having either a repair or replacement need within the next 10 years, 7 met the short-term threshold score of 80 points. Additionally, by request from Municipal staff Bridge 2121 was considered for additional detailed evaluation due to the magnitude of the short-term replacement costs. **Table 5-1** presents results of the short-term screening evaluation.

Table 5-1: Short-Term Screening Evaluation Results

Bridge ID	AADT Score	Repair/ Replacement Score	Detour Time Score	Short-Term Score
2128	5	5	5	**100**
2610	5	4	5	**93**
2136	5	4	5	**93**
2621	5	3	5	**87**
2624	4	5	4	**87**
2630	4	5	4	**87**
2134	5	3	5	**87**
2121	3	5	2	**67**

5.2. Long Term Screening Evaluation

Of the remaining 75 bridges which were evaluated for the long-term screening, 10 bridges met the threshold score of 70 points. **Table 5-2** presents results of the long-term screening evaluation.

Table 5-2: Long-Term Screening Evaluation Results

Bridge ID	AADT Score	CRV Score	Age Score	Detour Time Score	Long-Term Score
2101	5	4	3	5	**74**
2102	5	5	2	5	**74**
2602	5	2	5	5	**74**
2615	5	2	5	5	**74**
2629	5	3	3	5	**73**
2131	5	3	3	5	**73**
2609	5	3	3	5	**73**
2632	5	2	4	5	**73**
2107	5	2	4	5	**73**
2627	5	2	4	5	**73**

5.3. Screening Evaluation Results

The results of the screening evaluation process, shown in **Figure 5-1**, produced a total of 18 bridges to be further evaluated for their potential retirement.

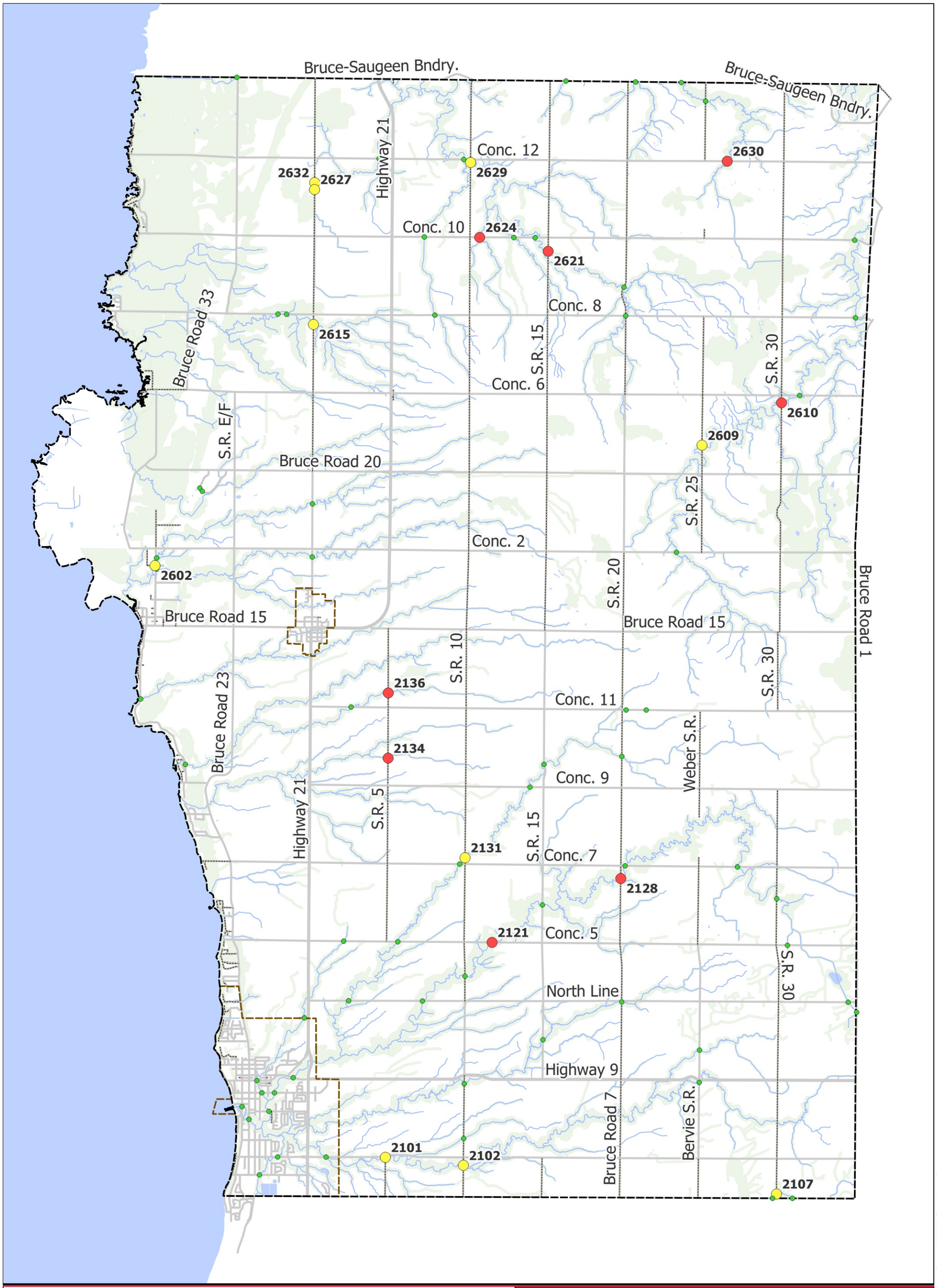

Figure 5-1
Short and Long-Term Screening Results

Project Name:
Kincardine Bridge Master Plan

Client Name:
Regional Municipality of Kincardine
Ontario, Canada

GEI Consultants

Last Updated: January 2025
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6. Detailed Evaluation

The results of the screening evaluation developed a list of 18 potential bridges for retirement. Each of these bridges have been further evaluation based on both the qualitative impacts from the screening evaluation and additional quantitative impacts. The results of the evaluation recommend do nothing, repair or replacement, or retire the bridge. The remaining bridges not carried forward for this detailed evaluation are recommended to continue with the recommended works as outlined in the OSIMs.

6.1. Short-Term Detailed Evaluation

Bridges considered for retirement within the next 0-10 years are included in this section.

6.1.1. Bridge 2128

Bridge 2128 was evaluated for the screening criteria, with key details summarized in **Table 6-1**, to a total score of 100/100 and rank of 1. Through the OSIM report, this bridge was recommended for replacement which will cost the Municipality $3,592,000.

Table 6-1: Key Details and Screening of Bridge 2128

Criteria	Details
Type	Arch Bridge
Install Year	1950 (74 years)
BCI	20
Road Class	Local (Gravel)
Speed Limit	80 km/h
AADT	0 - 49 (Score of 5)
Repair/ Replacement Cost	$3,592,000 (Score of 5)
Annual Detour Time	56 days for a 6 km detour (Score of 5)
Screening Score	**100/100**
Ranking	**1**

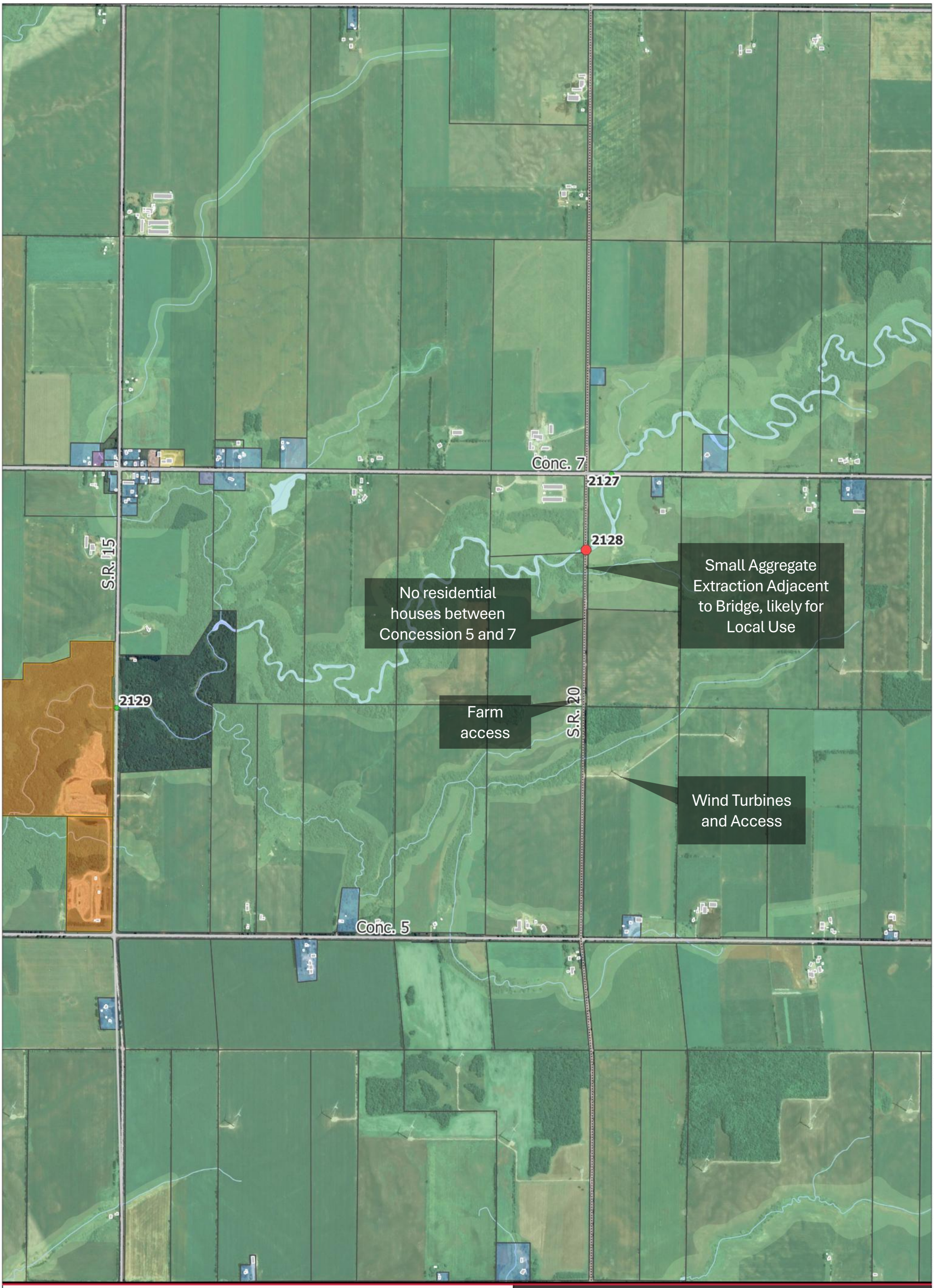
The detailed evaluation of Bridge 2128 outlined that there are a number of opportunities and constraints related to its retirement, summarized in **Table 6-2** and shown in **Figure 6-1**. The opportunities and constraints as well as mitigation measures are provided as follows:

- **Land Use**: The section of Side Road 20 between Concession 5 and Concession 7 has 6 agricultural properties and 1 wind turbine. As there are several farm accesses along this section of Side Road 20 public consultation is recommended as these farmers are to be the most impacted by retirement.
- **Impact on Key Vehicles**:
    - There exists a small aggregate pit which will be impacted by Bridge 2128's retirement. The detour crosses Bridge 2129 which has a posted load limit of 10 tonnes.
    - No winter maintenance.
    - Additional truck traffic exists on the adjacent side road which could increase the detour time.
- **Overall Network Connectivity**: Side Road 20 has a low flow of traffic with an AADT of 0-49. Bridge retirement would result in very low annual detour times at 56 days per year.

Table 6-2: Opportunities and Constraints for Retirement of Bridge 2128

Opportunities	Constraints
● Minimal impact on Emergency Vehicle routing. ● Minimal local access to existing agricultural properties and wind turbines which will require use of detour routes. ● No winter maintenance. ● Capital cost savings if retired rather than replaced.	● Detour routes can accommodate the required load limit. ● Coordination with aggregate pit should be considered to ensure lessened impact to local farmer.

This is the highest short-term score, with high repair costs and low traffic volumes. A short detour length with high posted speed limits also contributes to the high score and makes **retirement** financially beneficial to the Municipality.



Subject Bridge
Remaining Bridges
Vacant Land
Agricultural
Residential
Commercial
Institutional
Industrial
Misc
Landfill
Emergency Services
Alternate Route

300 600 900 1,200 m

Figure 6-1
Bridge 2128 Details

Project Name:
Kincardine Bridge Master Plan

Client Name:
Regional Municipality of Kincardine
Ontario, Canada

GEI Consultants

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6.1.2. Bridge 2610

Bridge 2610 was evaluated for the screening criteria, with key details summarized in **Table 6-3**, to a total score of 93/100. This score is tied for second in the rankings for short-term retirement with Bridge 2136. Through the OSIM report repairs are recommended for this bridge which will cost the Municipality $519,000.

Table 6-3: Key Details and Screening of Bridge 2610

Criteria	Details
Type	Frame Bridge
Install Year	1950 (74 years)
BCI	37
Road Class	Local (Gravel)
Speed Limit	80 km/h
AADT	0-49 (Score of 5)
Repair/ Replacement Cost	$519,000 (Score of 4)
Annual Detour Time	56 days for a 6 km detour (Score of 5)
Screening Score	**93/100**
Ranking	**2**

The detailed evaluation of Bridge 2610 outlined that there are a number of opportunities and constraints as they relate to its retirement, summarized in **Table 6-4** and shown in **Figure 6-2**. The opportunities and constraints as well as mitigation measures are provided as follows:

- **Land Use**: The section of road along Side Road 30, between Concession 6 and Bruce Road 20 has access to 3 agricultural properties, 1 manufacturing facility and 2 residential properties. Public consultation is recommended as the farmers and manufacturing facility employees will be impacted by this retirement.
- **Impact on Key Vehicles**:
    - Due to the bridge's distance from Kincardine and Tiverton there is anticipated to be minimal impact to emergency vehicles as the existing transportation network from the urban areas can be accommodated by other Concessions and Provisional Highways.

  - Winter maintenance is currently provided at Side Road 30 as there are several residential properties and a manufacturing facility. To accommodate the turnaround of large vehicles, including snowplows, assessment of necessary turning radius should be completed to ensure existing road width or farm accesses can be appropriately utilized.
  - Side Road 30 provides a direct route to a wind turbine manufacturing facility, shipping vehicles may be impacted by this retirement.

- **Overall Network Connectivity**: Side Road 20 has a low flow of traffic with an AADT of 0-49. Bridge retirement would result in very low annual detour times at 56 days per year.
  - A paved detour route already exists which will be able to accommodate increased traffic volumes.
  - Confirmation of load limits on potential detours would need to ensure a minimum of 15 tonnes could be accommodated.

Table 6-4: Opportunities and Constraints for Retirement of Bridge 2610

Opportunities	Constraints
● Minimal impact on Emergency Vehicle routing. ● Moderate number of local accesses to existing residential properties, agricultural properties, and wind turbines which will require use of detour routes. ● Capital cost savings if retired rather than replaced. ● Low traffic volume on Side Road 30 (0-49).	● Manufacturing facility (wind turbines) may have an impact on shipping. ● Detour routes can accommodate the required load limit. ● Snowplow turning radius may need to be accommodated to maintain winter maintenance to residential properties.

Following further detailed evaluation, **retirement** within the next 5 years is recommended.

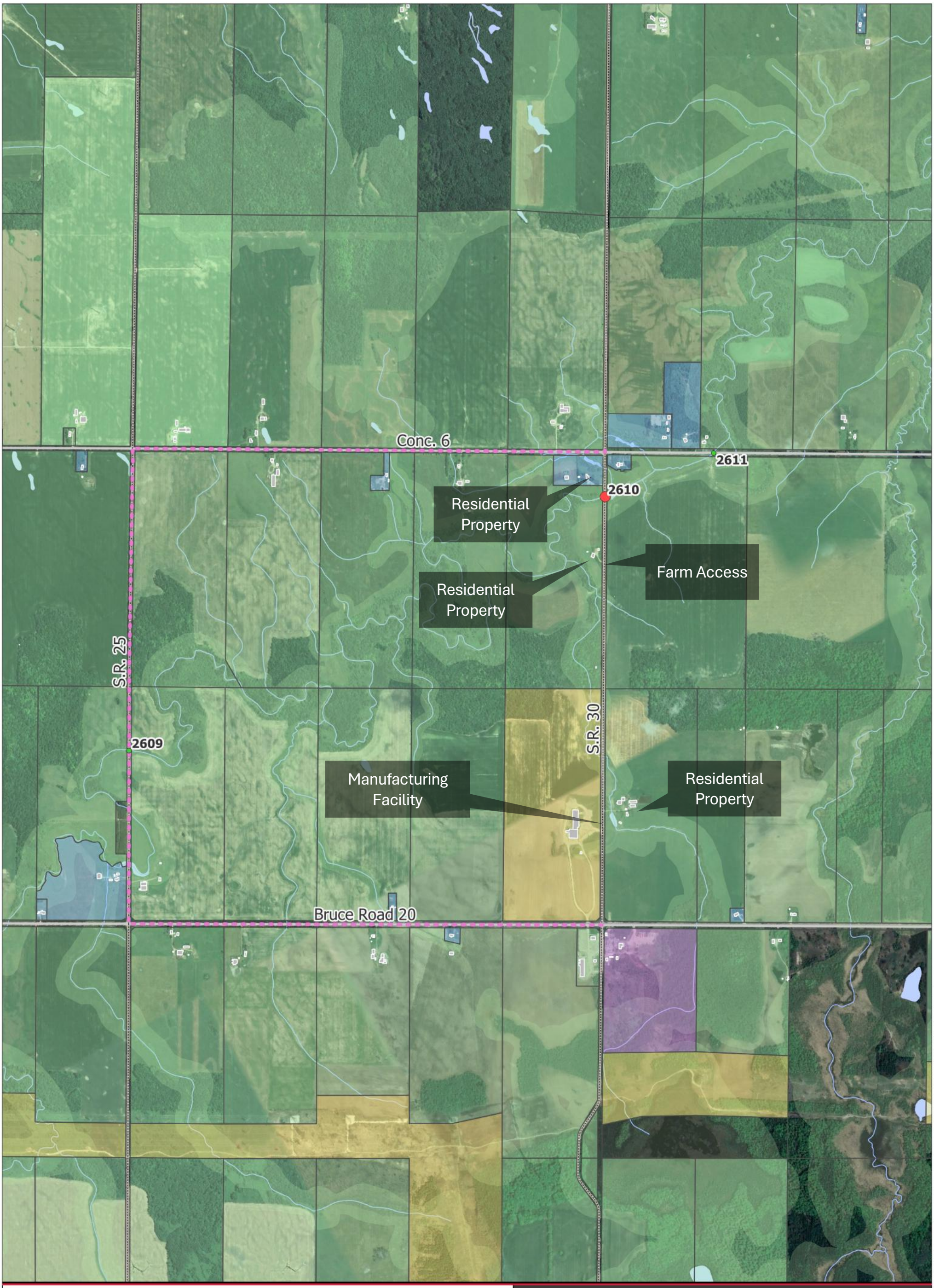

Figure 6-2
Bridge 2610 Details

Project Name:
Kincardine Bridge Master Plan

Client Name:
Regional Municipality of Kincardine
Ontario, Canada

GEI Consultants

Last Updated: January 2025
Document ID: 2402806-G-001

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6.1.3. Bridge 2136

Bridge 2136 was evaluated for the screening criteria, details summarized in **Table 6-5**, to a total score of 93/100, tied for rank 2 with Bridge 2610. Located on Side Road 5 between Concession 11 and Bruce Road 15, BM Ross recommended that this structure be replaced in the next 5 years. This work would cost the Municipality $562,000.

Table 6-5: Key Details and Screening of Bridge 2136

Criteria	Details
Type	Concrete Culvert
Install Year	1950 (74 years)
BCI	23
Road Class	Local (Gravel)
Speed Limit	80 km/h
AADT	0 - 49 (Score of 5)
Repair/ Replacement Cost	$562,000 (Score of 4)
Annual Detour Time	56 days for a 6 km detour (Score of 5)
Screening Score	**93/100**
Ranking	**3**

The detailed evaluation of Bridge 2136 outlined that there are a number of opportunities and constraints relating to its retirement, summarized in **Table 6-6** and shown in **Figure 6-3**. The opportunities and constraints as well as mitigation measures are provided as follows:

- **Land Use**: The section of Side Road 5 between Concession 11 and Bruce Road 15 has no residential properties, 4 agricultural properties and 1 farm access. This stretch of road will be minimally impacted by retirement.
- **Impact on Key Vehicles**:
    - While it is not expected to impact emergency vehicles, this bridge is only 2 kilometers from Highway 21 and is near Tiverton and will impact trips travelling to and from these destinations, however, it is anticipated that this traffic volume will be accommodated by surrounding roadways.

    - No winter maintenance on this section of Side Road 5 means turning radius of snowplows is not a concern for this retirement. To accommodate the turnaround of large vehicles, including farm equipment, assessment of necessary turning radius should be completed to ensure existing road width or farm accesses can be appropriately utilized.

- **Overall Network Connectivity**: Side Road 5 has a low flow of traffic with an AADT of 0-49. Bridge retirement would result in very low annual detour times at 56 days per year.
    - A paved detour route already exists which will be able to accommodate increased traffic volumes.

Table 6-6: Opportunities and Constraints for Retirement of Bridge 2136

Opportunities	Constraints
● Minimal impact on Emergency Vehicle routing. ● No residential properties, few agricultural properties, and no wind turbines will require use of detour routes. ● Capital cost savings if retired rather than replaced.	● Proximity to Tiverton and Highway 21, trips to these destinations will be impacted. ● Farm equipment turning radius may need to be accommodated to maintain access to agricultural properties.

Following further detailed evaluation **retirement** within the next 5 years is recommended.

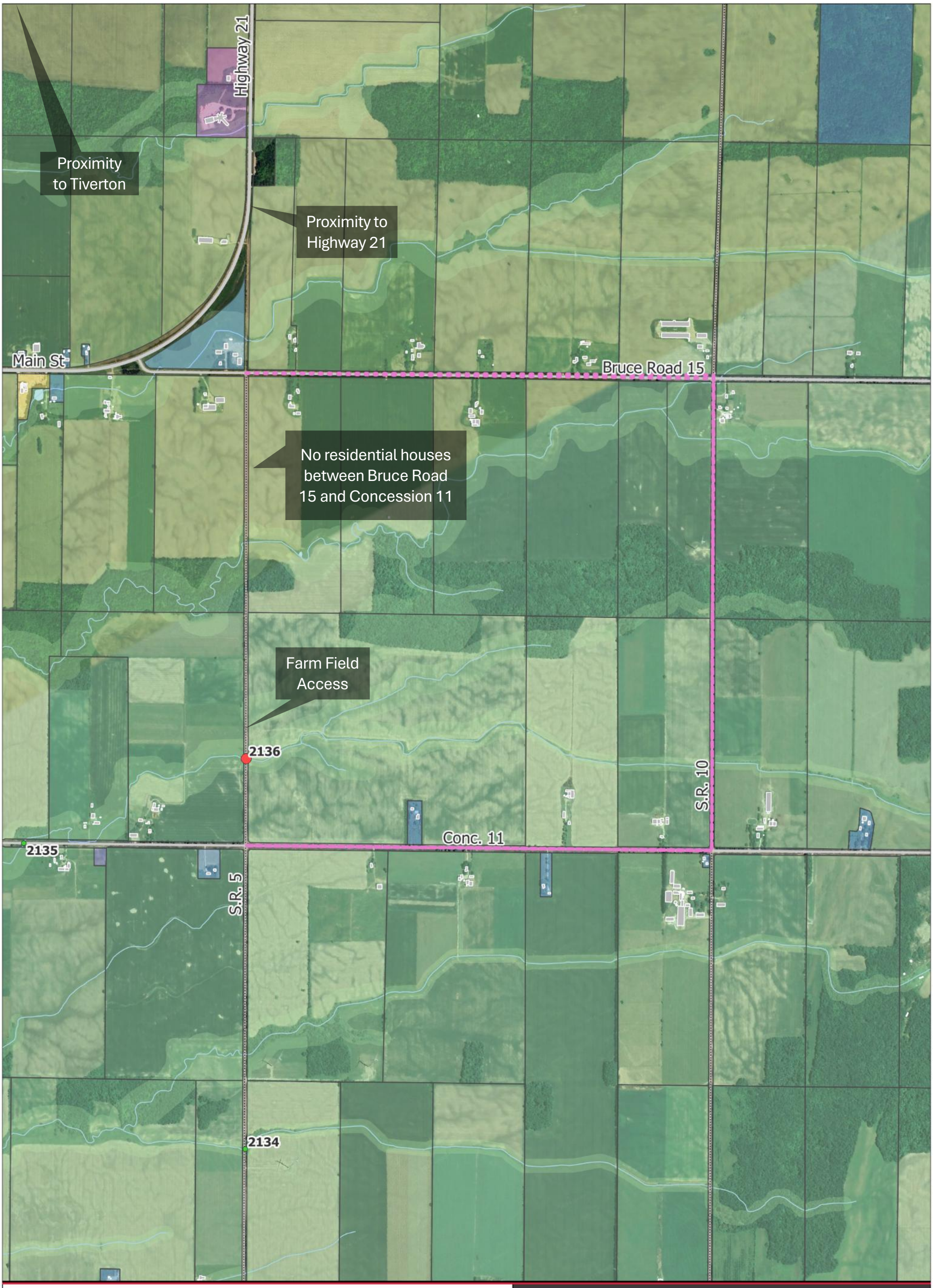

Figure 6-3
Bridge 2136 Details

Project Name:
Kincardine Bridge Master Plan

Client Name:
Regional Municipality of Kincardine
Ontario, Canada

GEI Consultants

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6.1.4. Bridge 2621

Bridge 2621 was evaluated with the screening criteria for a total score of 87, as summarized in **Table 6-7**, surpassing the threshold for retirement. Located on Side Road 15 this structure is in poor condition and requires $216,000 repairs.

Table 6-7: Key Details and Screening of Bridge 2621

Criteria	Details
Type	Concrete Slab Bridge
Install Year	1947 (77 years)
BCI	38
Road Class	Local (Gravel)
Speed Limit	80 km/h
AADT	0-49 (Score of 5)
Repair/ Replacement Cost	$216,000 (Score of 3)
Annual Detour Time	56 days for a 6 km detour (Score of 5)
Screening Score	**87/100**
Ranking	**4**

The detailed evaluation of Bridge 2621 outlined that there are a number of opportunities and constraints, as summarized in **Table 6-8** and shown in **Figure 6-4**, relating to its retirement. The opportunities and constraints as well as mitigation measures are provided as follows:

- **Land Use**: The section of road along Side Road 15, between Concession 8 and Concession 10, has access to 1 residential property, 4 agricultural properties, 1 farm access, and 1 wind turbine access. The residential property is near the corner of Concession 10 and Side Road 15, making this retirement less impactful to the residents.
- **Impact on Key Vehicles**:
    - There is anticipated to be minimal impact to emergency vehicles as the existing transportation network from the urban areas can be accommodated by other Concessions and Provisional Highways.
    - No winter maintenance on this section of Side Road 5 means turning radius of snowplows is not a concern for this retirement.

    - To accommodate the turnaround of large vehicles, including farm equipment or maintenance vehicles, assessment of necessary turning radius should be completed to ensure existing road width or farm accesses can be appropriately utilized.

- **Overall Network Connectivity**: Side Road 5 has a low flow of traffic with an AADT of 0-49. Bridge retirement would result in very low annual detour times at 56 days per year.
    - The unpaved road has low traffic volumes and because it is unpaved there is no need to consider road upgrades to parallel roads to accommodate this retirement.
    - While the section of road is near Highway 21, Side Road 15 runs parallel to the provincial highway and therefore this retirement will not have a major impact on vehicles travelling to and from Highway 21.

Table 6-8: Opportunities and Constraints for Retirement of Bridge 2621

Opportunities	Constraints
● Minimal impact on Emergency Vehicle routing. ● Minimal amount of local access to existing residential properties, agricultural properties, and wind turbines which will require use of detour routes. ● Capital cost savings if retired rather than replaced.	● Bridge has a number of what appear to be swallow nests which may be an environmental constraint. Additional environmental inventory may be necessary before retirement. ● Farm equipment and wind turbine maintenance vehicles turning radius may need to be accommodated to maintain current use of road.

Following further detailed evaluation, **retirement** within the next 5 years is recommended. An environmental inventory is recommended on this bridge to confirm the impact to nesting swallow nests.

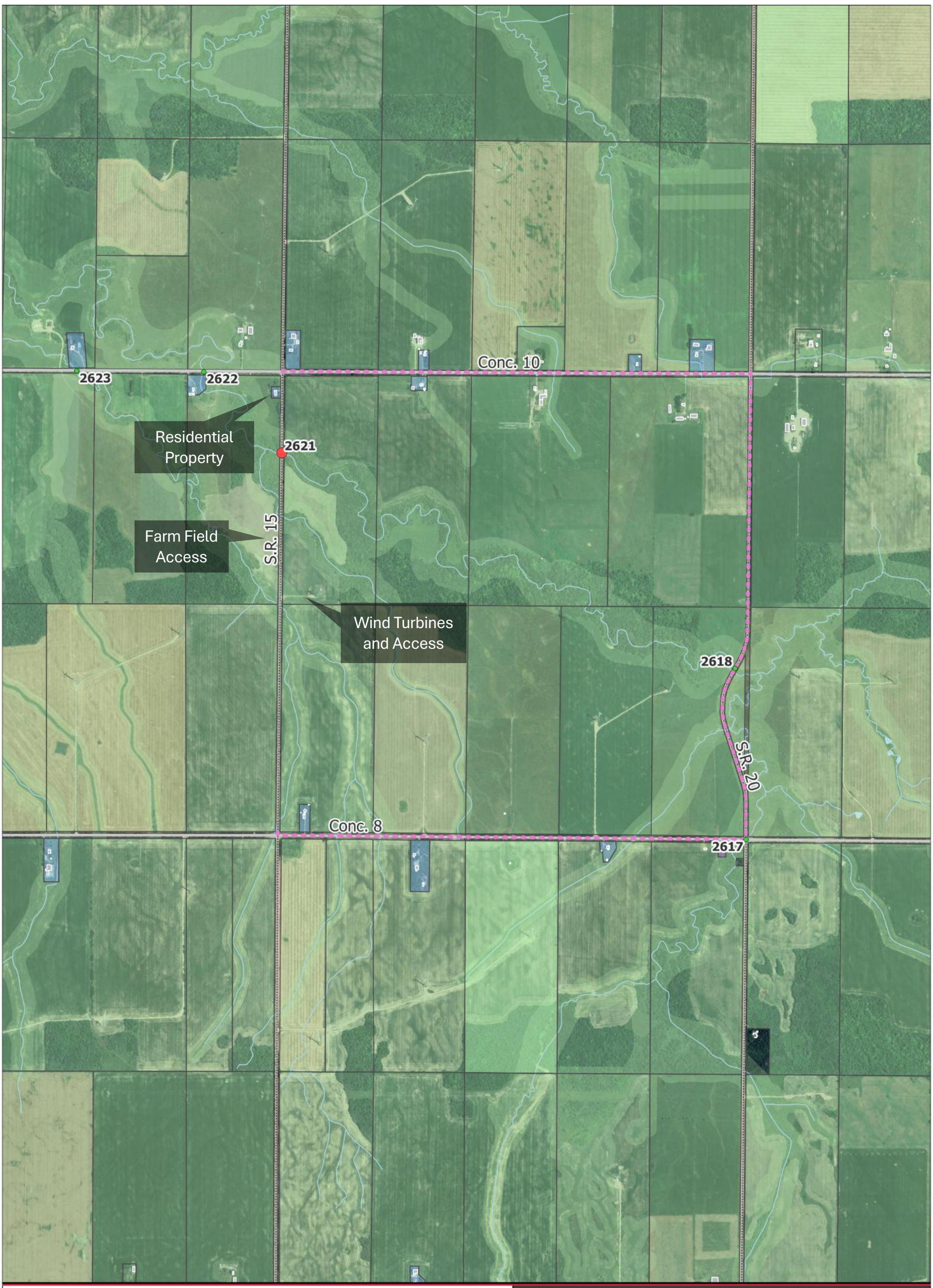

Figure 6-4
Bridge 2621 Details

Project Name:
Kincardine Bridge Master Plan

Client Name:
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Ontario, Canada

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6.1.5. Bridge 2624

Bridge 2624 was evaluated for the screening criteria, with key details summarized in **Table 6-9**, to a total score of 87/100. Through the OSIM report this bridge was recommended for replacement which will cost the Municipality $816,000.

Table 6-9: Key Details and Screening of Bridge 2624

Criteria	Details
Type	Culvert
Install Year	1980 (44 years)
BCI	38
Road Class	Local (Paved)
Speed Limit	80 km/h
AADT	50-199 (Score of 4)
Repair/ Replacement Cost	$816,000.00 (Score of 5)
Annual Detour Time	227 days for 6 km detour (Score of 4)
Screening Score	**87/100**
Ranking	**4**

The detailed evaluation of Bridge 2624 outlined that there are a number of opportunities and constraints, as summarized in **Table 6-10** and shown in **Figure 6-5**. The opportunities and constraints as well as mitigation measures are provided as follows:

- **Land Use**: Located on Concession 10 between Sideroad 10 and Sideroad 15, this bridge services numerous residential, agricultural, and warehouse properties making retirement unfavourable as it denies access to a larger number of users.
- **Impact on Key Vehicles**:
    - There is anticipated to be minimal impact to emergency vehicles as the existing transportation network from the urban areas can be accommodated by other Concessions and Provisional Highways.
    - Winter maintenance is currently provided to Concession Road 10 as it is a paved road and there are a number of residential properties. As the bridge is a 2-lane bridge, it should not impact turn around needs for the snowplow.

- **Overall Network Connectivity**: Concession 10 has a moderate flow of traffic with an AADT of 50-199. Bridge retirement would result in moderate impacts to the overall flow of traffic as concession roads are generally used as a more primary aspect to the overall network.
    - 2 additional bridges are located along the same stretch along the road along Concession 10 between Sideroad 10 and Sideroad 15, which would also require continue ongoing maintenance.

Table 6-10: Opportunities and Constraints for Retirement of Bridge 2624

Opportunities	Constraints
● Minimal impact on Emergency Vehicle routing. ● Capital cost savings if retired rather than replaced.	● Moderately impacted network connectivity as it is along a Concession Road. ● Impacts to a number of property accesses between Sideroad 10 and Sideroad 15.

While retirement of this structure would not impact emergency services and the road is wide enough to support winter maintenance, the number of residents who would be negatively impacted by the retirement outweighs the financial benefit of retiring this bridge. In addition, Bridge 2632 and Bridge 2622 are on this stretch of road as well and are in fair condition. Retiring Bridge 2624 would lessen their range of service. It is recommended that this bridge be **replaced**.

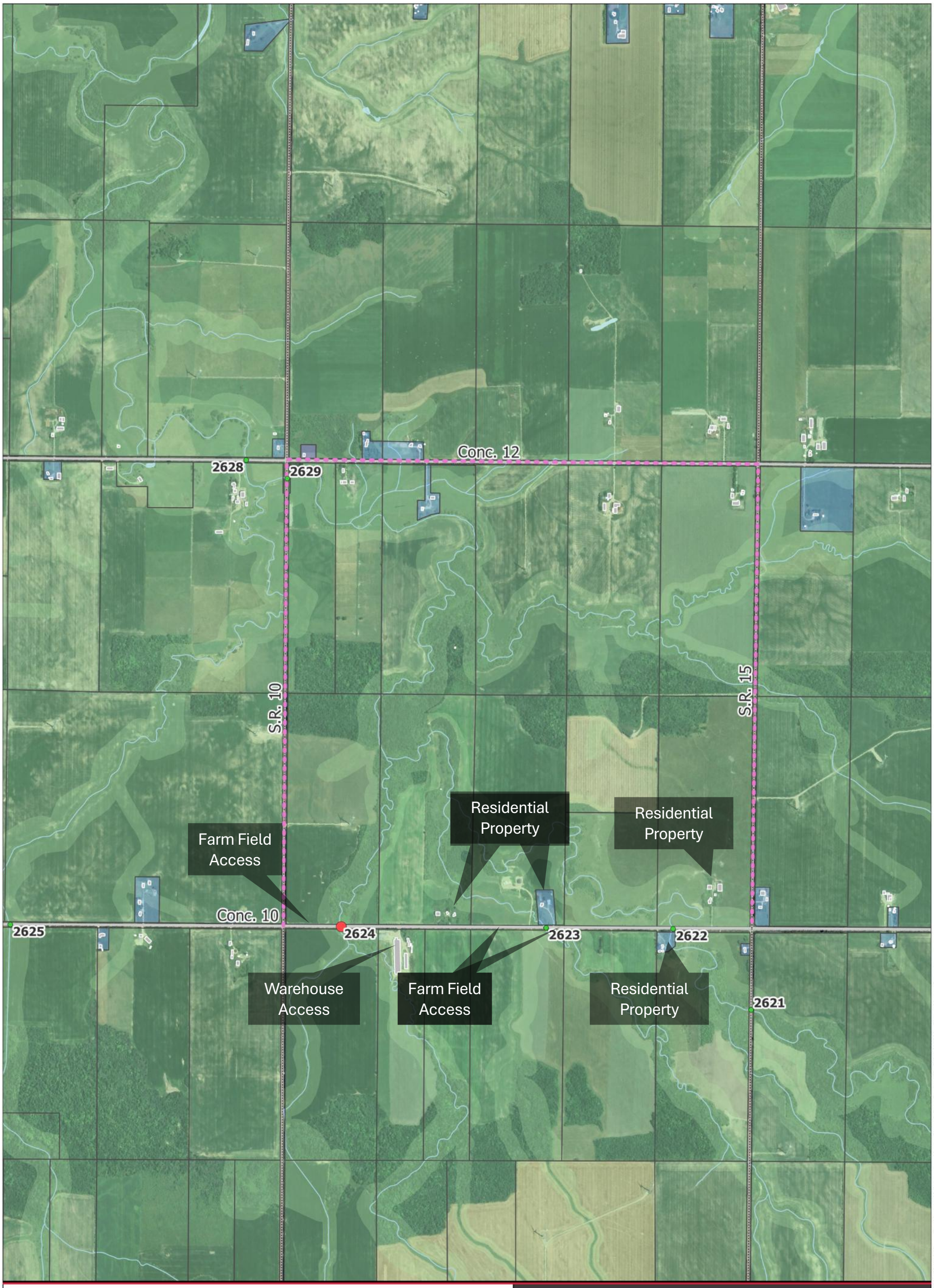

Figure 6-5
Bridge 2624 Details

Project Name:
Kincardine Bridge Master Plan

Client Name:
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6.1.6. Bridge 2630

Bridge 2624 was evaluated for the screening criteria, with key details summarized in **Table 6-11**, to a total score of 87/100. Through the OSIM report, this bridge was recommended for replacement which will cost the Municipality $508,500.

Table 6-11: Key Details and Screening of Bridge 2630

Criteria	Details
Type	Culvert
Install Year	1990 (34 years)
BCI	34
Road Class	Collector (Paved)
Speed Limit	80 km/h
AADT	50-199 (Score of 4)
Repair/ Replacement Cost	$816,000.00 (Score of 5)
Annual Detour Time	227 days for 6 km detour (Score of 4)
Screening Score	**87/100**
Ranking	**6**

The detailed evaluation of Bridge 2630 outlined that there are a number of opportunities and constraints, as summarized in **Table 6-12** and shown in **Figure 6-6**. The opportunities and constraints as well as mitigation measures are provided as follows:

- **Land Use**: Located on Concession 12 between Sideroad 20 and Sideroad 30, this bridge services numerous residential, agricultural, and warehouse properties making retirement unfavourable as it denies access to a larger number of users.
- **Impact on Key Vehicles**:
    - There is anticipated to be minimal impact to emergency vehicles as the existing transportation network from the urban areas can be accommodated by other Concessions and Provisional Highways (Bruce Saugeen Townline).
    - Winter maintenance is currently provided to Concession Road 12 as it is a paved road and there are a number of residential properties. As the bridge is a 2-lane bridge, it should not impact turn around needs for the snowplow.

- **Overall Network Connectivity**: Concession 12 has a moderate flow of traffic with an AADT of 50-199. Bridge retirement would result in moderate impacts to the overall flow of traffic as concession roads are generally used as a more primary aspect to the overall network. Further, this bridge is in proximity to the community of Paisley in the Municipality of Arran-Elderslie.

Table 6-12: Opportunities and Constraints for Retirement of Bridge 2630

Opportunities	Constraints
● Minimal impact on Emergency Vehicle routing. ● Capital cost savings if retired rather than replaced.	● Moderately impacted network connectivity as it is along a Concession Road and near the community of Paisley. ● Impacts to a number of property accesses between Sideroad 10 and Sideroad 15.

With numerous residential and agricultural properties lining Concession 12, retiring Bridge 2630 is not recommended. The burden placed on residents would outweigh the financial benefit the Municipality would draw from retirement, and it is therefore recommended that Bridge 2630 be **replaced** within the next 5 years as per the OSIM report recommendations.

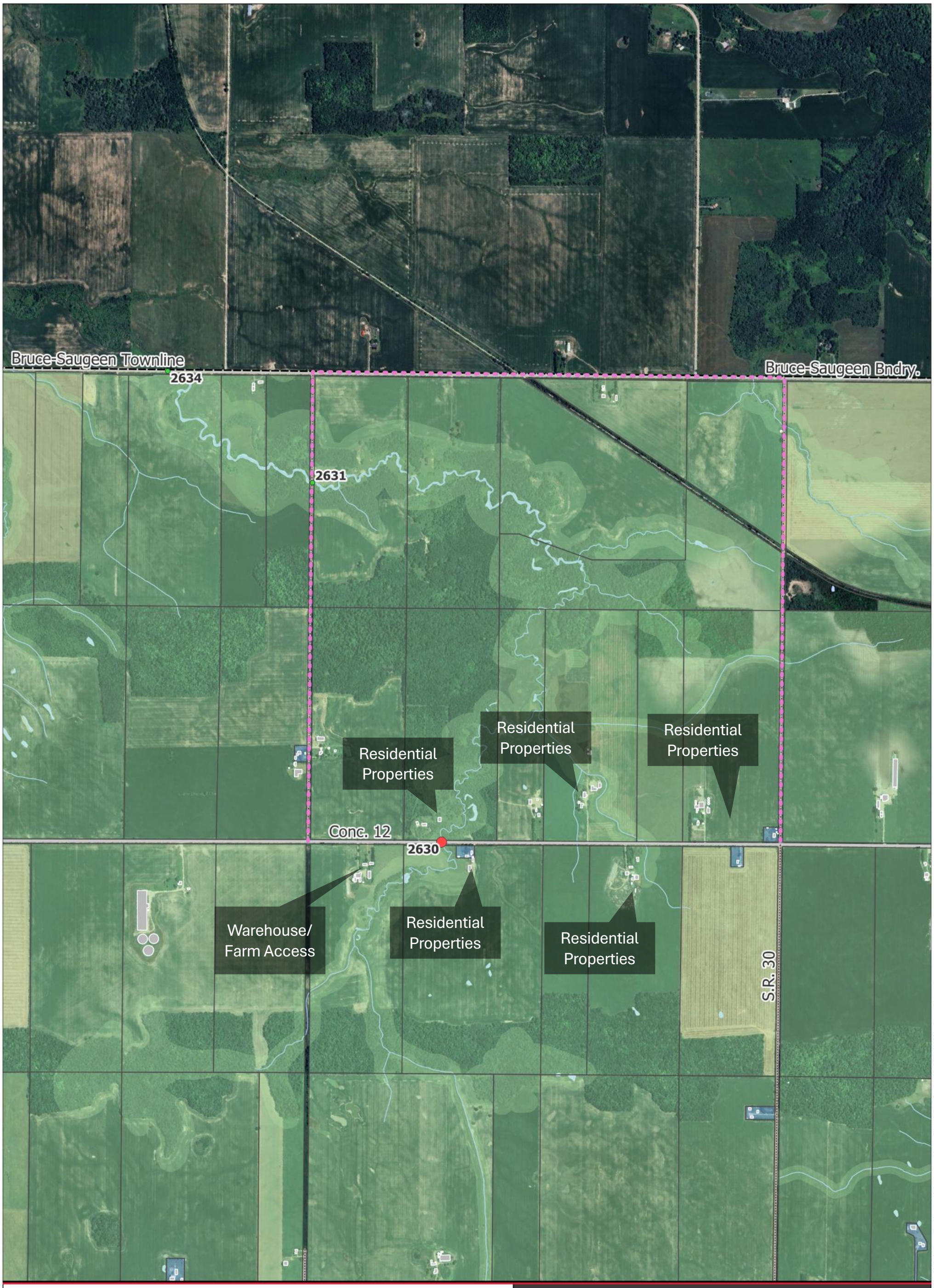

Figure 6-6
Bridge 2630 Details

Project Name:
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Client Name:
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6.1.7. Bridge 2134

Bridge 2134 was evaluated for the screening criteria, with key details summarized in **Table 6-13**, to a total score of 87/100. Through the OSIM report, this bridge has repairs which will cost the Municipality $159,000.

Table 6-13: Key Details and Screening of Bridge 2134

Criteria	Details
Type	Culvert
Install Year	1940 (84 years)
BCI	39
Road Class	Local (Gravel)
Speed Limit	80 km/h
AADT	0-49 (Score of 5)
Repair/ Replacement Cost	$159,000.00 (Score of 3)
Annual Detour Time	56 days for 6 km detour (Score of 5)
Screening Score	**87/100**
Ranking	**8**

The detailed evaluation of Bridge 2134 outlined that there are a number of opportunities and constraints, as summarized in **Table 6-14** and shown in **Figure 6-7**. The opportunities and constraints as well as mitigation measures are provided as follows:

- **Land Use**: Located on Sideroad 5 between Concession 11 and Concession 9, this bridge services no residential properties with a minimal number of farm and wind turbine access. This stretch of road will be minimally impacted by retirement.
- **Impact on Key Vehicles**:
    - While it is not expected to impact emergency vehicles, this bridge is only 2 kilometers from Highway 21 and is near Tiverton and will impact trips travelling to and from these destinations, however, it is anticipated that this traffic volume will be accommodated by surrounding roadways.

    - No winter maintenance on this section of Side Road 5 means turning radius of snowplows is not a concern for this retirement.
    - To accommodate the turnaround of large vehicles, including farm equipment, assessment of necessary turning radius should be completed to ensure existing road width or farm accesses can be appropriately utilized.

- **Overall Network Connectivity**: Side Road 5 has a low flow of traffic with an AADT of 0-49. Bridge retirement would result in very low annual detour times at 56 days per year; however, retirement of Bridge 2136 just north of Concession 11 would result in reduced overall network connectivity.
    - A paved detour route already exists which will be able to accommodate increased traffic volumes.

Table 6-14: Opportunities and Constraints for Retirement of Bridge 2630

Opportunities	Constraints
● Minimal impact on Emergency Vehicle routing. ● No residential properties, few agricultural properties, and no wind turbines will require use of detour routes. ● Paved detour route exists and can accommodate increased traffic volumes.	● Proximity to Tiverton and Highway 21, trips to these destinations will be impacted. ● Farm equipment turning radius may need to be accommodated to maintain access to agricultural properties. ● Proximity to the retirement of Bridge 2136, which is more costly to repair, and may impact on the overall connectivity of the network. ● Minimal capital cost savings if retired rather than replaced.

Following further detailed evaluation **retirement** within 6-10 years is recommended. It can be noted that this structure is 2 km south of Bridge 2136 which has also been recommended for retirement. However, a review of the overall network outlines that a paved detour route exists and is able to accommodate increased traffic volumes.

2136

2135

Conc. 11

Farm Access

No Residential Houses between Concession 9 and 11

Wind Turbines and Access

S.R. 5

2134

Wind Turbines and Access

S.R. 10

Conc. 9

Subject Bridge
Other Identified Bridge
Remaining Bridges
Vacant Land
Agricultural
Residential
Commercial
Institutional
Industrial
Misc
Landfill
Emergency Services
Alternate Route

300 600 900 1,200 m

Figure 6-7
Bridge 2134 Details

Project Name:
Kincardine Bridge Master Plan

Client Name:
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6.1.8. Bridge 2121

Bridge 2121 was evaluated for the screening criteria, with key details summarized in **Table 6-15**, to a total score of 67/100. This is not a high score due to the higher volume of traffic seen on this bridge noting that the bridge is on the route to the Armow Waste Management Center, contributing to the higher AADT.

It should be noted that Bridge 2121 did not meet the threshold criteria for screening primarily due to its higher traffic counts; however, as its repair is one of the costliest at $3,927,000, in the short term (<10 years), additional detailed evaluations were performed to confirm preferred action.

Table 6-15: Key Details and Screening of Bridge 2121

Criteria	Details
Type	Frame Bridge
Install Year	1950 (74 years)
BCI	19
Road Class	Local (Paved)
Speed Limit	30 km/h
AADT	200-499 (Score of 3)
Repair/ Replacement Cost	$3,927,000 (Score of 5)
Annual Detour Time	1265 days for a 5 km detour (Score of 2)
Screening Score	**67/100**
Ranking	**27**

The detailed evaluation of Campbell Bridge outlined that there are a number of opportunities and constraints as they relate to its retirement, as summarized in **Table 6-16** and shown **Figure 6-8**. The opportunities and constraints as well as mitigation measures are provided as follows:

- **Land Use**: The section of road along Concession Road 5, between Sideroad 15 and Sideroad 10, has access to 3 residential properties, 7 agricultural properties, and 2 wind turbines. As there are a number of residential properties and farm access along this section of Concession Road 5.

- **Impact on Key Vehicles**:
    - Due to the bridge's distance from Kincardine and Tiverton there is anticipated to be minimal impact to emergency vehicles as the transportation network from the urban areas can be accommodated by other Concessions and Provisional Highways.
    - Winter maintenance is currently provided to Concession Road 5 as it is a paved road and there are a number of residential properties. To accommodate the turnaround of large vehicles, including snowplows, assessment of necessary turning radius should be completed to ensure existing road width or farm accesses can be appropriately utilized.
    - Concession Road 5 provides a direct route for waste management vehicles and residents from the Kincardine to the Armow Waste Management Center. If the bridge is retired this traffic will likely be detoured to Sideroad 15 and Concession Road 7 or North Line. This retirement impacts local and system wide network connectivity and places additional traffic onto the adjacent road network.
- **Overall Network Connectivity**: Concession Road 5 has a moderate flow of traffic with an AADT of 200-499 likely due to the proximity to the Armow Waste Management Center and general east-west transportation conveyance along Concession roads. As this is a moderately used bridge retirement would result in a significant rerouting impact with an estimated 1,256 days in annual detour time.
    - Potential detours may occur along Sideroad 10 which is unpaved with gravel. Road improvements (i.e. assessment of granular for road base improvements, paving with asphalt, more frequent resurfacing, replacement of road base) would likely be necessary, especially to accommodate large vehicles during winter months, to prevent damage to the road and ensure vehicular safety. Further, an increase in AADT would likely warrant paving the road as its function is no longer as a low-volume road.
    - Confirmation of load limits on potential detours would need to ensure a minimum of 15 tonnes could be accommodated.

Table 6-16: Opportunities and Constraints for Retirement of Bridge 2121

Opportunities	Constraints
● Minimal impact on Emergency Vehicle routing. ● Moderate number of local accesses to existing residential properties, agricultural properties, and wind turbines which will require use of detour routes. ● Capital cost savings if retired rather than replaced.	● Moderately impacted network connectivity and limited effectiveness of routes to the Waste Management Center. ● Traffic (AADT of 200-499) along Concession Road 5 will impact increasing traffic to detour routes. ● Potential road improvement needs for Sideroad 10 as a detour route to accommodate an increase in traffic. ● Snowplow turning radius may need to be accommodated to maintain winter maintenance to residential properties.

Retirement of Bridge 2121 would be beneficial for the Municipality in terms of cost saving due to the high cost of replacement; however, the overall impact to the transportation network outweighs the cost saving benefits. Further, road base works and paving may be necessary on adjacent roads to accommodate an increase in traffic due to a detour further reducing the cost benefits. It is more beneficial to provide a well-connected network to the Waste Management Center; as such, it is recommended that Bridge 2121 should be **replaced**.

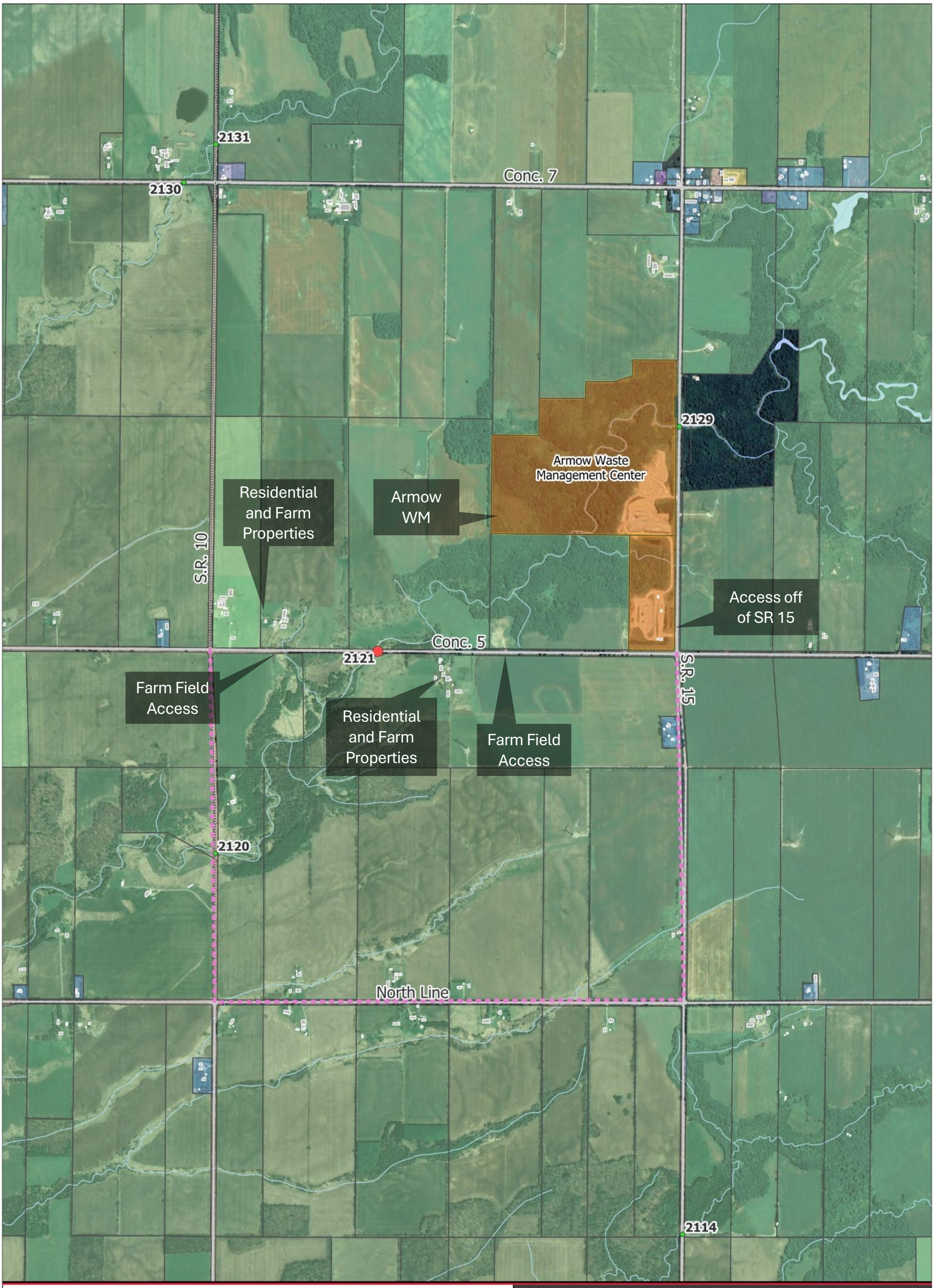

Figure 6-8
Bridge 2121 Details

Project Name:
Kincardine Bridge Master Plan

Client Name:
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Ontario, Canada

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6.2. Long-Term Detailed Evaluation

Bridges considered for retirement in more than 10 years are included in this section.

6.2.1. Bridge 2101

Bridge 2101 was evaluated for the long-term screening criteria, with details summarized in **Table 6-17,** to a total score of 74/100. The replacement, as per the CRV, would cost the Municipality $1,567,500.

Table 6-17. Key Details and Screening of Bridge 2101

Criteria	Details
Type	Frame Bridge
Install Year	1990 (34 years) (Score of 3)
BCI	73
Road Class	Local (Gravel)
Speed Limit	80 km/h
AADT	0-49 (Score of 5)
CRV	$1,567,500.00 (Score of 4)
Annual Detour Time	47 days for 5 km detour (Score of 5)
Screening Score	**74/100**
Ranking	**1**

The detailed evaluation of Bridge 2101 outlined that there are a number of opportunities and constraints, as summarized in **Table 6-18** and shown in **Figure 6-9**. The opportunities and constraints as well as mitigation measures are provided as follows:

- **Land Use**: Located on Sideroad 15 between South Line and Huron-Kincardine West, this bridge services 1 residential property and has 1 farm access. This stretch of road will be minimally impacted by retirement.
- **Impact on Key Vehicles**:
    - While it is not expected to impact emergency vehicles this bridge is less than 2 kilometers from Kincardine and may impact trips south, however, it is anticipated that this traffic volume will be accommodated by surrounding roadways.

    - Winter maintenance is currently provided to Sideroad 15. To accommodate the turnaround of large vehicles, including snowplows, assessment of necessary turning radius should be completed to ensure existing road width or farm accesses can be appropriately utilized.

- **Overall Network Connectivity**: Side Road 15 has a low flow of traffic with an AADT of 0-49. Bridge retirement would result in very low annual detour times at 47 days per year; however, retirement of the bridge may impact traffic flow from Kincardine due to the proximity

Table 6-18: Opportunities and Constraints for Retirement of Bridge 2101

Opportunities	Constraints
● 1 residential property and farm access will require use of detour routes. ● Capital cost savings if retired rather than replaced.	● Located in proximity to Kincardine and has potential to impact emergency service routes and overall network connectivity. ● Consideration for snowplow turning radius. ● Relatively young bridge with good BCI.

The proximity to Kincardine, South Line, and Bridge 2102 makes this structure a good candidate for continued maintenance despite passing the long-term threshold for retirement. Emergency services likely use this road to access properties east of Kincardine, however they could use Highway 21. This bridge should **remain open** but can be re-evaluated following deterioration as long as Bridge 2102 stays in service, despite both surpassing the threshold for long-term retirement.

It should be noted that Bridge 2102 and Bridge 2101 cannot both be decommissioned to maintain a well-connected network.

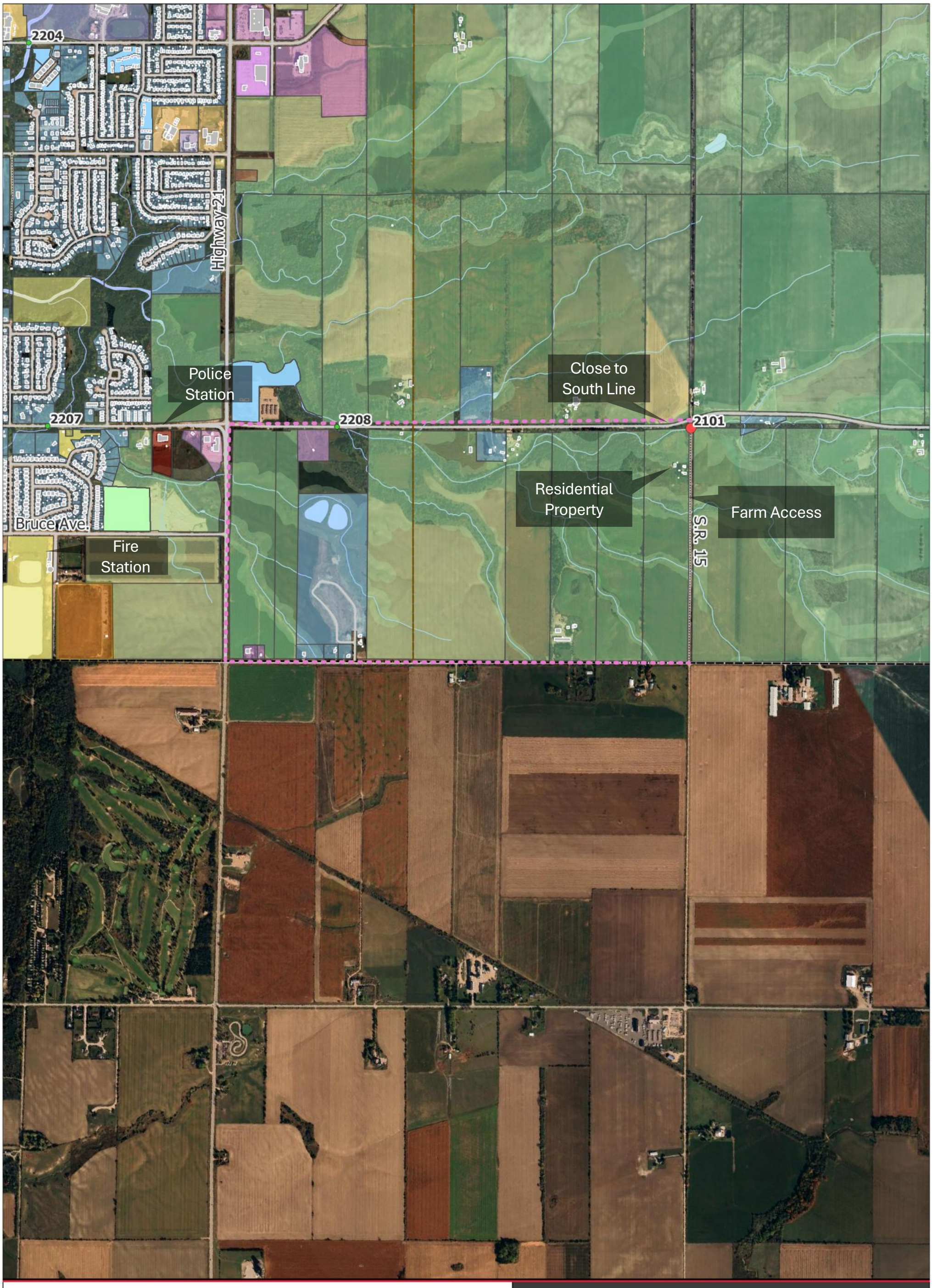

Figure 6-9
Bridge 2101 Details

Project Name:
Kincardine Bridge Master Plan

Client Name:
Regional Municipality of Kincardine
Ontario, Canada

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6.2.2. Bridge 2102

Bridge 2102 was evaluated for the long-term screening criteria, with details summarized in **Table 6-19**, to a total score of 74/100. The replacement, as per the CRV, would cost the Municipality $2,603,500.

Table 6-19. Key Details and Screening of Bridge 2102

Criteria	Details
Type	Beam Bridge
Install Year	2006 (18 years) (Score of 2)
BCI	95
Road Class	Local (Gravel)
Speed Limit	80 km/h
AADT	0-49 (Score of 5)
Repair/ Replacement Cost	$2,603,500.00 (Score of 5)
Annual Detour Time	56 days for 6 km detour (Score of 5)
Screening Score	**74/100**
Ranking	**1**

The detailed evaluation of Bridge 2102 outlined that there are a number of opportunities and constraints, as summarized in **Table 6-20** and shown in **Figure 6-10**. The opportunities and constraints as well as mitigation measures are provided as follows:

- **Land Use**: Located on Sideroad 10 between South Line and Huron-Kincardine West, this bridge services 1 residential property access. This stretch of road will be minimally impacted by retirement.
- **Impact on Key Vehicles**:
    - While it is not expected to impact emergency vehicles, this bridge is approximately 3 kilometers from Kincardine and may impact trips south, however, it is anticipated that this traffic volume will be accommodated by surrounding roadways.

    - Winter maintenance is currently provided to Sideroad 10. To accommodate the turnaround of large vehicles, including snowplows, assessment of necessary turning radius should be completed to ensure existing road width or farm accesses can be appropriately utilized.

- **Overall Network Connectivity**: Side Road 10 has a low flow of traffic with an AADT of 0-49. Bridge retirement would result in very low annual detour times at 47 days per year; however, retirement of the bridge may impact traffic flow from Kincardine due to the proximity.

Table 6-20: Opportunities and Constraints for Retirement of Bridge 2102

Opportunities	Constraints
● 1 residential property and farm access will require use of detour routes. ● Capital cost savings if retired rather than replaced.	● Located in proximity to Kincardine and has potential to impact emergency service routes and overall network connectivity. ● Consideration for snowplow turning radius. ● Relatively young bridge with good BCI.

Bridge 2102 is located in proximity to Bridge 2101 and therefore faces similar constraints as they relate to retirement. This young bridge services 2 residential properties 2 agricultural properties and has a wide width suitable for snowplow turning. Its proximity to both Kincardine, South Line, and emergency services in Kincardine make this bridge unsuitable for retirement despite it surpassing the threshold score for long-term retirement and a very high CRV. While Highway 21 is a suitable detour route for emergency services, it is recommended that this structure be repaired and **maintained** and re-evaluated following further deterioration.

It should be noted that Bridge 2102 and Bridge 2101 cannot both be decommissioned to maintain a well-connected network.

Figure 6-10
Bridge 2102 Details

Project Name:
Kincardine Bridge Master Plan

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6.2.3. Bridge 2602

Bridge 2602 was evaluated for long-term retirement, scoring 74/100, summarized in **Table 6-21**. The replacement, as per the CRV, would cost the Municipality $387,600.

Table 6-21. Key Details and Screening of Bridge 2602

Criteria	Details
Type	Culvert
Install Year	1945 (79 years) (Score of 5)
BCI	36
Road Class	Local (Paved)
Speed Limit	50 km/h
AADT	0-49 (Score of 5)
CRV	$387,600 (Score of 2)
Annual Detour Time	15 days for a 1 km detour (Score of 5)
Screening Score	**74/100**
Ranking	**1**

The detailed evaluation of Bridge 2602 outlined that there are a number of opportunities and constraints as they relate to its retirement, as summarized in **Table 6-22** and shown in **Figure 6-11**. The opportunities and constraints as well as mitigation measures are provided as follows:

- **Land Use**: 2 residential properties are located on this road section; both can be easily accessed from Concession 2. Emergency vehicles will not be impacted. This culvert is located near Bruce Power but is not a major route.
    - This culvert falls within the boundaries of Inverhuron National Park and is south of a planned subdivision. While it is typically not recommended to retire structures near an area with planned growth, it will be beneficial to the Municipality to reduce traffic in the area ahead of the subdivision's construction.
    - Access to existing and future properties would require a left turn from Concession 2.

- **Impact on Key Vehicles**:
    - In proximity to Bruce Power; however, it is not a major through road and will not access emergency vehicles.
    - While this structure is located near Bruce Power, it is not a through road and will therefore not impact trips to and from the plant.
    - This road is maintained in the winter. To accommodate the turnaround of large vehicles, including snowplows, assessment of necessary turning radius should be completed to ensure existing road width or farm accesses can be appropriately utilized.
- **Overall Network Connectivity**: Alma Street has low traffic with development planned nearby. Retiring this structure will reduce traffic in the area and therefore in the new subdivision which is to the Municipality's benefit. Retirement will result in increased left-hand turns off Concession 2, increasing westbound traffic.
    - Adding a left turning lane on Concession 2 in the westbound direction will alleviate congestion if this becomes burdensome after development.
    - Development may require access by both Concession 2 and Albert Road.

Table 6-22: Opportunities and Constraints for Retirement of Bridge 2602

Opportunities	Constraints
● Minimal impact on Emergency Vehicle routing. ● Minimal number of local accesses to existing residential properties, agricultural properties, and wind turbines which will require use of detour routes. ● Will decrease traffic surrounding proposed development. ● Capital cost savings if retired rather than maintained following deterioration.	● Near Bruce Power, increased traffic on Concession 2, including left turns to existing and future properties, may impact trips. ● Obstacle to Huron National Park access. ● Consideration must be made for snowplow turning radius. ● Proposed development within this area may require additional access from both Concession 2 and Albert Road.

Following further investigation, **retirement** of this structure following its deterioration is recommended. As access is maintained to existing and future properties, as well as to Inverhuron National Park, future retirement may be explored.

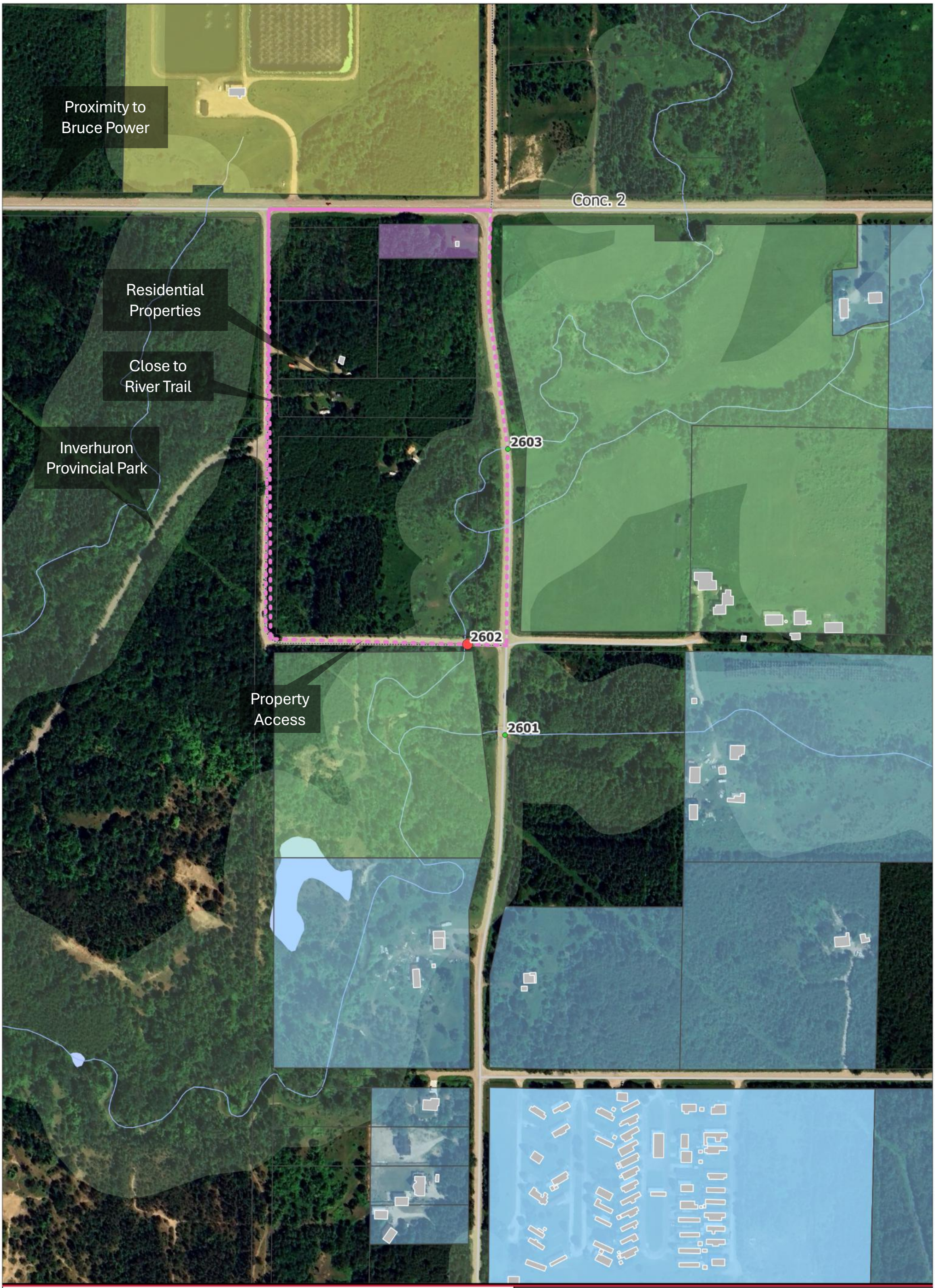

Figure 6-11
Bridge 2602 Details

Project Name:
Kincardine Bridge Master Plan

Client Name:
Regional Municipality of Kincardine
Ontario, Canada

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6.2.4. Bridge 2615

Bridge 2615, located on Sideroad J 1 between Concession 6 and Concession 8, was evaluated for the screening criteria to a total score of 74/100, summarized in **Table 6-23**. The replacement, as per the CRV, would cost the Municipality $427,500.

Table 6-23. Key Details and Screening of Bridge 2615

Criteria	Details
Type	Concrete Slab Bridge
Install Year	1940 (84 years) (Score of 5)
BCI	37
Road Class	Local (Paved)
Speed Limit	80 km/h
AADT	0-49 (Score of 5)
CRV	$427,500 (Score of 2)
Annual Detour Time	56 days for a 6 km detour (Score of 5)
Screening Score	**74/100**
Ranking	**1**

The detailed evaluation of Bridge 2615 outlined that there are a number of opportunities and constraints as they relate to its retirement, as summarized in **Table 6-24** and shown in **Figure 6-12**. The opportunities and constraints as well as mitigation measures are provided as follows:

- **Land Use**: The section of road along Sideroad J 1, between Concession 6 and Concession 8, has no residential properties, 4 agricultural properties, 2 farm accesses, and 1 wind turbine. As there are several farm accesses and properties along this section of Sideroad J 1, public consultation is recommended as locally, they are to be the most impacted by retirement.
- **Impact on Key Vehicles**:
    - Due to the bridge's proximity to Underwood and Bruce Power, there is anticipated to be a minimal impact to emergency vehicles as the existing transportation network from the urban areas can be accommodated by other Concessions and Provisional Highways.

    - Winter maintenance is not currently provided to Sideroad J 1 as it is an unpaved road and there are no residential properties. However, as the road is used for farm access and is bisected by a hydro corridor, it is important that the turning radius of farm equipment and maintenance equipment be maintained on this road.

- **Overall Network Connectivity**: Sideroad J 1 has a low flow of traffic with an AADT of 0-49 vehicles per day and is parallel and adjacent to paved Highway 21, which takes on more of the local north and south-bound traffic. Despite its proximity to Underwood, this road is not critical to local traffic movements and therefore retirement would only result in an annual detour time of 56 days.
    - Detour routes are paved with no bridges and are therefore an already more appealing option for vehicles moving north or south, especially Highway 21 which runs directly east of Sideroad J 1.

Table 6-24: Opportunities and Constraints for Retirement of Bridge 2615

Opportunities	Constraints
● Minimal impact to Emergency Vehicle routing despite proximity to Bruce Power and Underwood. ● Low traffic counts will have minimal impacts on detour routes. ● Moderate number of local accesses to agricultural properties and wind turbines which will require use of detour routes. ● Capital cost savings if retired rather than replaced.	● Bisected by a hydro corridor, access requires use of detour routes. ● Proximity to Bruce Power and Underwood may impact local traffic.

It was determined that the **retirement** of this bridge is beneficial to the Municipality and will not have detrimental effects to the overall road network.

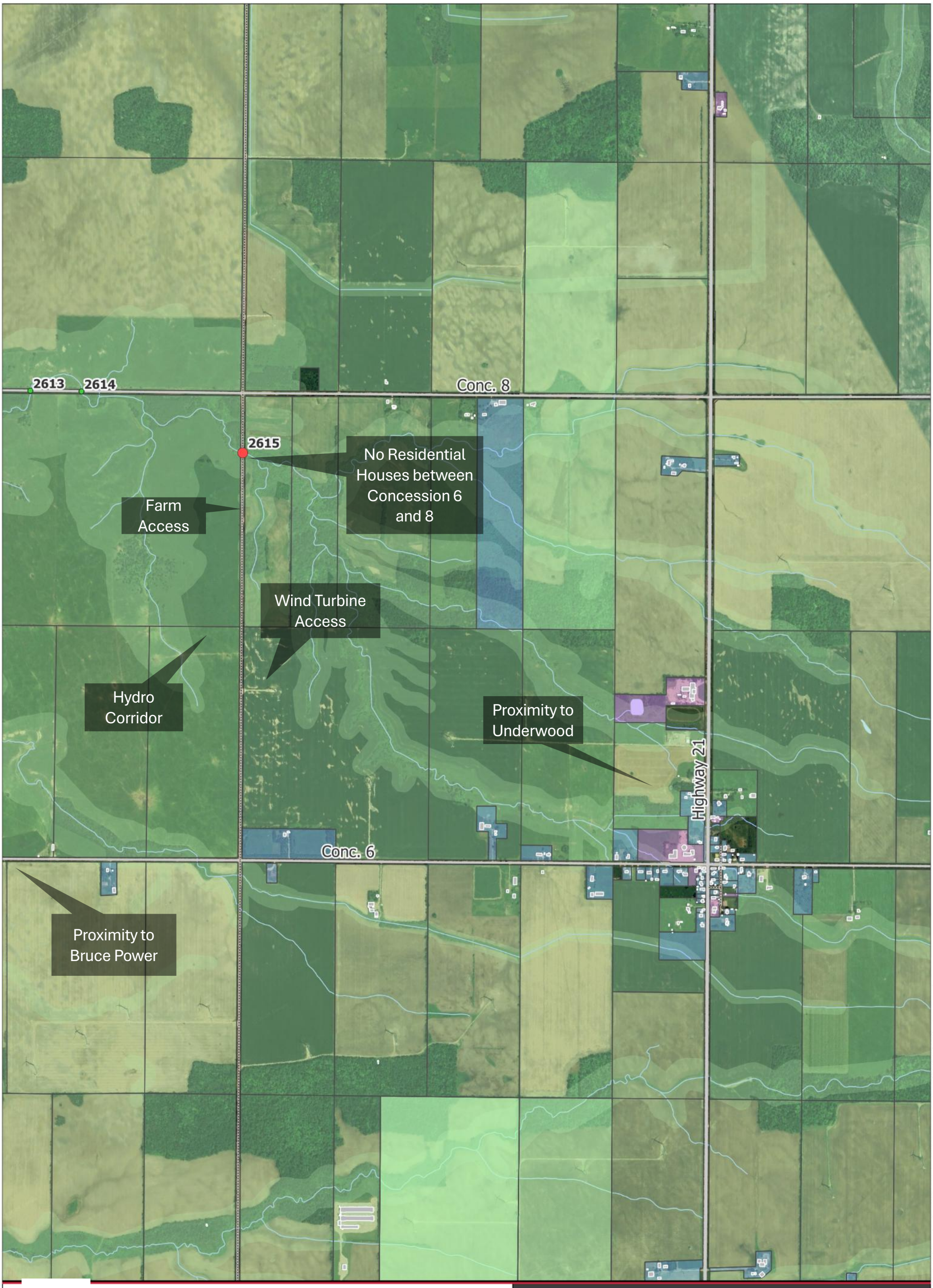

Figure 6-12
Bridge 2615 Scoring

Project Name:
Kincardine Bridge Master Plan

Client Name:
Regional Municipality of Kincardine
Ontario, Canada

GEI Consultants

Last Updated: January 2025
Document ID: 2402806-G-001

Document Path: B:\Working\KINCARDINE CN, MUNI OF\2402806 - 624019 Kincardine Municipal Infrastructure Master Plans & Rate Studies\05_GIS\2402806 - Report Maps - Copy.qgz

6.2.5. Bridge 2629

Bridge 2629 was evaluated for the screening criteria, with key details summarized in **Table 6-25**, to a total score of 73/100. The replacement, as per the CRV, would cost the Municipality $895,000.

Table 6-25. Key Details and Screening of Bridge 2629

Criteria	Details
Type	Culvert
Install Year	1980 (44 years) (Score of 3)
BCI	40
Road Class	Local (Gravel)
Speed Limit	80 km/h
AADT	0-49 (Score of 5)
Repair/ Replacement Cost	$895,000.00 (Score of 3)
Annual Detour Time	56 days for 6 km detour (Score of 5)
Screening Score	**73/100**
Ranking	**5**

The detailed evaluation of Bridge 2629 outlined that there are a number of opportunities and constraints, as summarized in **Table 6-29** and shown in **Figure 6-13**. The opportunities and constraints as well as mitigation measures are provided as follows:

- **Land Use**: The section of Side Road 10, between Concession 10 and Concession 12, has a number of agricultural properties and wind turbine accesses. This stretch of road will be minimally impacted by retirement.
- **Impact on Key Vehicles**:
    - There is anticipated to be minimal impact to emergency vehicles as the existing transportation network from the urban areas can be accommodated by other Concessions and Provisional Highways.
    - No winter maintenance on this section of Side Road 10 means turning radius of snowplows is not a concern for this retirement.

    - Farm access and wind turbine access south of bridge indicates that farm equipment or maintenance vehicles may be transported on this road. To accommodate the turnaround of large vehicles, assessment of necessary turning radius should be completed to ensure existing road width or farm accesses can be appropriately utilized.

- **Overall Network Connectivity**: Side Road 10 has a low flow of traffic with an AADT of 0-49. Bridge retirement would result in very low annual detour times at 56 days per year.

Table 6-26: Opportunities and Constraints for Retirement of Bridge 2629

Opportunities	Constraints
● Minimal impact on Emergency Vehicle routing. ● No residential properties, few agricultural properties, and no wind turbines will require use of detour routes. ● Capital cost savings if retired rather than replaced.	● Farm equipment turning radius may need to be accommodated to maintain access to agricultural properties. ● Relatively young bridge.

Located on Side Road 10 between Concession 12 and Concession 20, Bridge 2629 services 4 agricultural properties, 3 farm accesses, and 2 wind turbine accesses. There is no winter maintenance done on this gravel road and this road section is unlikely to service emergency vehicles frequently. While this structure has a low AADT and detour time, it is a young bridge with a middling CRV (both categories scoring only a 3/5). It is in the Municipality's best interest therefore to repair and **maintain** the bridge and re-evaluate following further and costlier deterioration despite surpassing the threshold for long-term retirement.

Bruce-Saugeen Bndry.

Conc. 12

2628

2629

Farm Access

Farm Access

Farm Access

Highway 21

S.R. 10

Wind Turbine Access

Wind Turbine Access

No Residential Structures from Concession 10 to 12

Conc. 10

2625

2624

2623

2622

Subject Bridge
Remaining Bridges
Other Identified Bridge
Vacant Land
Agricultural
Residential
Commercial
Institutional
Industrial
Misc
Landfill
Emergency Services
Alternate Route

300 600 900 1,200 m

Figure 6-13
Bridge 2629 Details

Project Name:
Kincardine Bridge Master Plan

Client Name:
Regional Municipality of Kincardine
Ontario, Canada

GEI

Last Updated: January 2025
Document ID: 2402806-G-001

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6.2.6. Bridge 2131

Bridge 2131 was evaluated for the screening criteria, with key details summarized in **Table 6-27**, to a total score of 73/100. The replacement, as per the CRV, would cost the Municipality $783,300.

Table 6-27. Key Details and Screening of Bridge 2131

Criteria	Details
Type	Culvert
Install Year	1985 (39 years) (Score of 3)
BCI	68
Road Class	Local (Gravel)
Speed Limit	80 km/h
AADT	0-49 (Score of 5)
Repair/ Replacement Cost	$783,300.00 (Score of 3)
Annual Detour Time	56 days for 6 km detour (Score of 5)
Screening Score	**73/100**
Ranking	**5**

The detailed evaluation of Bridge 2131 outlined that there are a number of opportunities and constraints, as summarized in **Table 6-28** and shown in **Figure 6-14**. The opportunities and constraints as well as mitigation measures are provided as follows:

- **Land Use**: The section of Side Road 10, between Concession 7 and Concession 9, has 4 agricultural properties, with 1 farm access and 1 residential property access. This stretch of road will be minimally impacted by retirement.
- **Impact on Key Vehicles**:
    - There is anticipated to be minimal impact to emergency vehicles as the existing transportation network from the urban areas can be accommodated by other Concessions and Provisional Highways.
    - No winter maintenance on this section of Side Road 10 means.

    - To accommodate the turnaround of large vehicles, including farm equipment, assessment of necessary turning radius should be completed to ensure existing road width or farm accesses can be appropriately utilized.

- **Overall Network Connectivity**: Side Road 10 has a low flow of traffic with an AADT of 0-49. Bridge retirement would result in very low annual detour times at 56 days per year.
    - Bridge 2136 has been recommended for retirement and additional retirement of Bridge 2131 may impact overall network connectivity

Table 6-28: Opportunities and Constraints for Retirement of Bridge 2131

Opportunities	Constraints
● Minimal impact on Emergency Vehicle routing. ● 1 residential property and 1 farm access will require use of detour routes. ● Capital cost savings if retired rather than replaced.	● Farm equipment turning radius may need to be accommodated to maintain access to agricultural properties. ● Relatively young bridge. ● Needed to maintain a well-connected network following retirement of Bridge 2136.

This relatively young bridge is located on Sideroad 10 along with 4 agricultural and 1 residential property. No winter maintenance is performed on this stretch of road, and it has little impact on the trips of emergency vehicles. Located near Bridge 2136, which has been recommended for short-term retirement. To maintain a well-connected network, it is recommended that this structure be repaired and **maintained** despite surpassing the threshold value for long-term retirement.

Proximity to
2136 Closure

2134

Conc. 9

S.R. 5

Farm
Access

Residential
Property

S.R. 10

2131

2130

Conc. 7

Subject Bridge
Other Identified Bridge
Remaining Bridges
Vacant Land
Agricultural
Residential
Commercial
Institutional
Industrial
Misc
Landfill
Emergency Services
Alternate Route

300 600 900 1,200 m

Figure 6-14
Bridge 2131 Details

Project Name:
Kincardine Bridge Master Plan

Client Name:
Regional Municipality of
Kincardine
Ontario, Canada

GEI

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6.2.7. Bridge 2609

Bridge 2609 was evaluated for the screening criteria, with key details summarized in **Table 6-29**, to a total score of 73/100. The replacement, as per the CRV, would cost the Municipality $1,020,000.

Table 6-29. Key Details and Screening of Bridge 2609

Criteria	Details
Type	Culvert
Install Year	1992 (32 years) (Score of 3)
BCI	75
Road Class	Local (Gravel)
Speed Limit	80 km/h
AADT	0-49 (Score of 5)
Repair/ Replacement Cost	$1,020,000.00 (Score of 3)
Annual Detour Time	56 days for 6 km detour (Score of 5)
Screening Score	**73/100**
Ranking	**5**

The detailed evaluation of Bridge 2609 outlined that there are a number of opportunities and constraints, as summarized in **Table 6-34** and shown in **Figure 6-15**. The opportunities and constraints as well as mitigation measures are provided as follows:

- **Land Use**: The section of Side Road 25, between Bruce Road 20 and Concession 6, has 2 residential properties and at minimum 3 farm accesses. This stretch of road will be minimally impacted by retirement.
- **Impact on Key Vehicles**:
    - There is anticipated to be minimal impact to emergency vehicles as the existing transportation network from the urban areas can be accommodated by other Concessions and Provisional Highways.
    - Winter maintenance is currently provided to the south portion of Sideroad as there are residential properties. To accommodate the turnaround of large vehicles, including snowplows, assessment of necessary turning radius should be completed to ensure existing road width or farm accesses can be appropriately utilized.

- **Overall Network Connectivity**: Side Road 25 has a low flow of traffic with an AADT of 0-49. Bridge retirement would result in very low annual detour times at 56 days per year.
    - Bridge 2610 has been recommended for retirement and additional retirement of Bridge 2609 may impact overall network connectivity

Table 6-30: Opportunities and Constraints for Retirement of Bridge 2609

Opportunities	Constraints
● Minimal impact on Emergency Vehicle routing. ● 2 residential properties and 3 farm access will require use of detour routes. ● Capital cost savings if retired rather than replaced.	● Snowplow turning radius may need to be accommodated to maintain winter maintenance to residential properties. ● Relatively young bridge. ● Needed to maintain a well-connected network following retirement of Bridge 2610.

Located on Sideroad 25, this structure is a relatively new bridge that serves several residential and agricultural properties. This section of road is partially plowed in winter months and therefore would require an adequate turning radius if it were retired. While it would not interfere with emergency vehicles, this bridge is in proximity to Bridge 2610, which has been recommended for short-term retirement. Despite surpassing the long-term scoring threshold, it is therefore in the Municipality's best interest to **maintain** this structure.

Conc. 6

2611

2610

Proximity to
2610 Closure

Farm
Access

S.R. 25

Farm
Access

2609

Farm
Access

Bruce Road 20

S.R. 30

Residential
Property

Residential
Property

2608

Conc. 2

- Subject Bridge
- Other Identified Bridge
- Remaining Bridges
- Vacant Land
- Agricultural
- Residential
- Commercial
- Institutional
- Industrial
- Misc
- Landfill
- Emergency Services
- Alternate Route

300 600 900 1,200 m

Figure 6-15
Bridge 2609 Details

Project Name:
Kincardine Bridge Master Plan

Client Name:
Regional Municipality of
Kincardine
Ontario, Canada

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6.2.8. Bridge 2632 & Bridge 2627

Bridges 2632 and 2627 are both located on the stretch of Sideroad J 1 between Concession 10 and Concession 12. This area of road is located between Bruce Road 33 and Highway 21, both paved roads run parallel to Sideroad J 1. Details regarding both Bridge 2632 and 2627 are presented in **Table 6-31** and **Table 6-32** respectively.

Table 6-31. Key Details and Screening of Bridge 2632

Criteria	Details
Type	Slab Bridge
Install Year	1965 (59 years) (Score of 4)
BCI	40
Road Class	Local (Gravel)
Speed Limit	80 km/h
AADT	0-49 (Score of 5)
CRV	$494,000 (Score of 2)
Annual Detour Time	56 days for a 6 km detour (Score of 5)
Screening Score	**73/100**
Ranking	**5**

Table 6-32: Key Details and Screening of Bridge 2627

Criteria	Details
Type	Culvert
Install Year	1970 (54 years) (Score of 4)
BCI	40
Road Class	Local (Gravel)
Speed Limit	80 km/h
AADT	0-49 (Score of 5)
CRV	$255,400 (Score of 2)
Annual Detour Time	56 days for a 6 km detour (Score of 5)
Screening Score	**73/100**
Ranking	**5**

The detailed evaluation of Bridges 2632 and 2627 outlined that there are a number of opportunities and constraints as they relate to their retirement, as shown in **Table 6-33** and shown in **Figure 6-16**. The opportunities and constraints as well as mitigation measures are provided as follows:

- **Land Use**: The section of road along Sideroad J 1, between Concession 10 and Concession 12, has access to 4 agricultural properties and 2 farm accesses.
- **Impact on Key Vehicles**:
    - As the 2 major roadways are parallel and adjacent to this section of road, this retirement will not impact emergency vehicles.
    - No winter maintenance is done on this road.
    - To accommodate the turnaround of large vehicles, including farm equipment, assessment of necessary turning radius should be completed to ensure existing road width or farm accesses can be appropriately utilized.
- **Overall Network Connectivity**: Sideroad J 1 has a low flow of traffic with an AADT of 0-49, this unpaved road has 2 roads with larger traffic flows adjacent and parallel to it which are more appealing options for vehicles.
    - Retiring either structure will result in 56 days of detour time annually, and retiring the second will result in no additional lost time.

Table 6-33: Opportunities and Constraints for Retirement of Bridges 2632 and 2627

Opportunities	Constraints
● Minimal impact to Emergency Vehicle routing, no winter maintenance. ● Low number of properties requiring use of the structures including no residential properties. ● Capital cost savings if retired rather than replaced.	● Traffic on adjacent roads will slightly increase (Bruce Road 33 and Highway 21). ● Potential road improvement needs for Sideroad 10 as a detour route to accommodate an increase in traffic. ● Consideration to accommodate turning radius of farm equipment.

As both bridges are <200 meters apart, both can be considered for **retirement** following their deterioration.

Figure 6-16
Bridge 2627/2632 Details

Project Name:
Kincardine Bridge Master Plan

Client Name:
Regional Municipality of
Kincardine
Ontario, Canada

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6.2.9. Bridge 2107

Bridge 2107 was evaluated for the screening criteria and surpassed the long-term retirement threshold; key details are summarized in **Table 6-34**. The replacement, as per the CRV, would cost the Municipality $469,000.

Table 6-34. Key Details and Screening of Bridge 2107

Criteria	Details
Type	Culvert
Install Year	1970 (54 years) (Score of 4)
BCI	40
Road Class	Local (Gravel)
Speed Limit	80 km/h
AADT	0-49 (Score of 5)
Repair/ Replacement Cost	$469,000 (Score of 2)
Annual Detour Time	47 days for a 5 km detour (Score of 5)
Screening Score	**73/100**
Ranking	**5**

The detailed evaluation of Bridge 2107 outlined that there are a number of opportunities and as they relate to its retirement, as shown in **Table 6-35** and shown in **Figure 6-17**. The opportunities and constraints as well as mitigation measures are provided as follows:

- **Land Use**: Only 1 farm access and 2 agricultural properties on this section of road means very few residents will be frequently inconvenienced by the decommissioning of this culvert. The nearest development is Ripley, however trips to and from this destination will likely prefer to utilize Bruce Road 7 as it is paved and designed for higher flows of traffic.
- **Impact on Key Vehicles**:
    - There is no winter maintenance on this gravel road and as such turning radius of snowplows does not have to be taken into consideration.

  - To accommodate the turnaround of large vehicles, including farm equipment, assessment of necessary turning radius should be completed to ensure existing road width or farm accesses can be appropriately utilized.
  - Emergency vehicles are unlikely to be impacted by this retirement as the surrounding roads are well connected in a grid formation.

- **Overall Network Connectivity**: Concession Road 5 has a low flow of traffic with an AADT of 0-49, a retirement would result in a low rerouting impact with an estimated 47 days in annual detour time.
  - Retirement may result in higher traffic counts along Bruce Road 7 for traffic moving north or southbound. This roadway is paved and designed for higher traffic volumes and will be able to accommodate a slight increase.

Table 6-35: Opportunities and Constraints for Retirement of Bridge 2107

Opportunities	Constraints
• Minimal impact on Emergency Vehicle routing. • Low number of local accesses to existing farms which will require use of detour routes. • Capital cost savings if retired rather than replaced.	• Consideration for turning radius of farm equipment.

This bridge, located on Sideroad 30 between Huron-Kincardine East and South Line, has a score of 73/100, low traffic volumes, and no residential properties along the stretch of road. This makes it an ideal candidate for **retirement** following its deterioration.

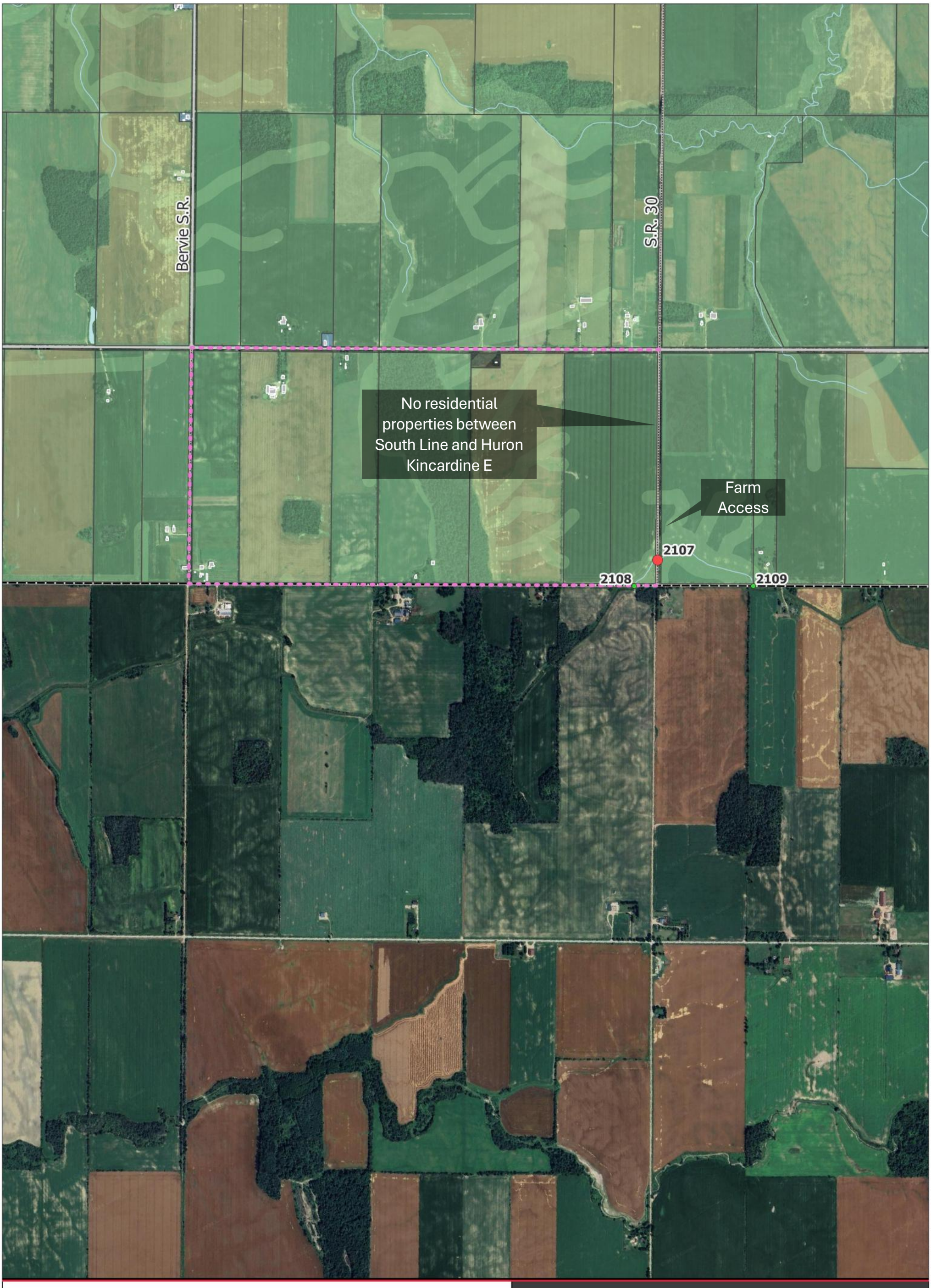


Figure 6-17
Bridge 2107 Details

Project Name:
Kincardine Bridge Master Plan

Client Name:
Regional Municipality of Kincardine
Ontario, Canada

GEI

Last Updated: January 2025
Document ID: 2402806-G-001

7. Preferred Strategy

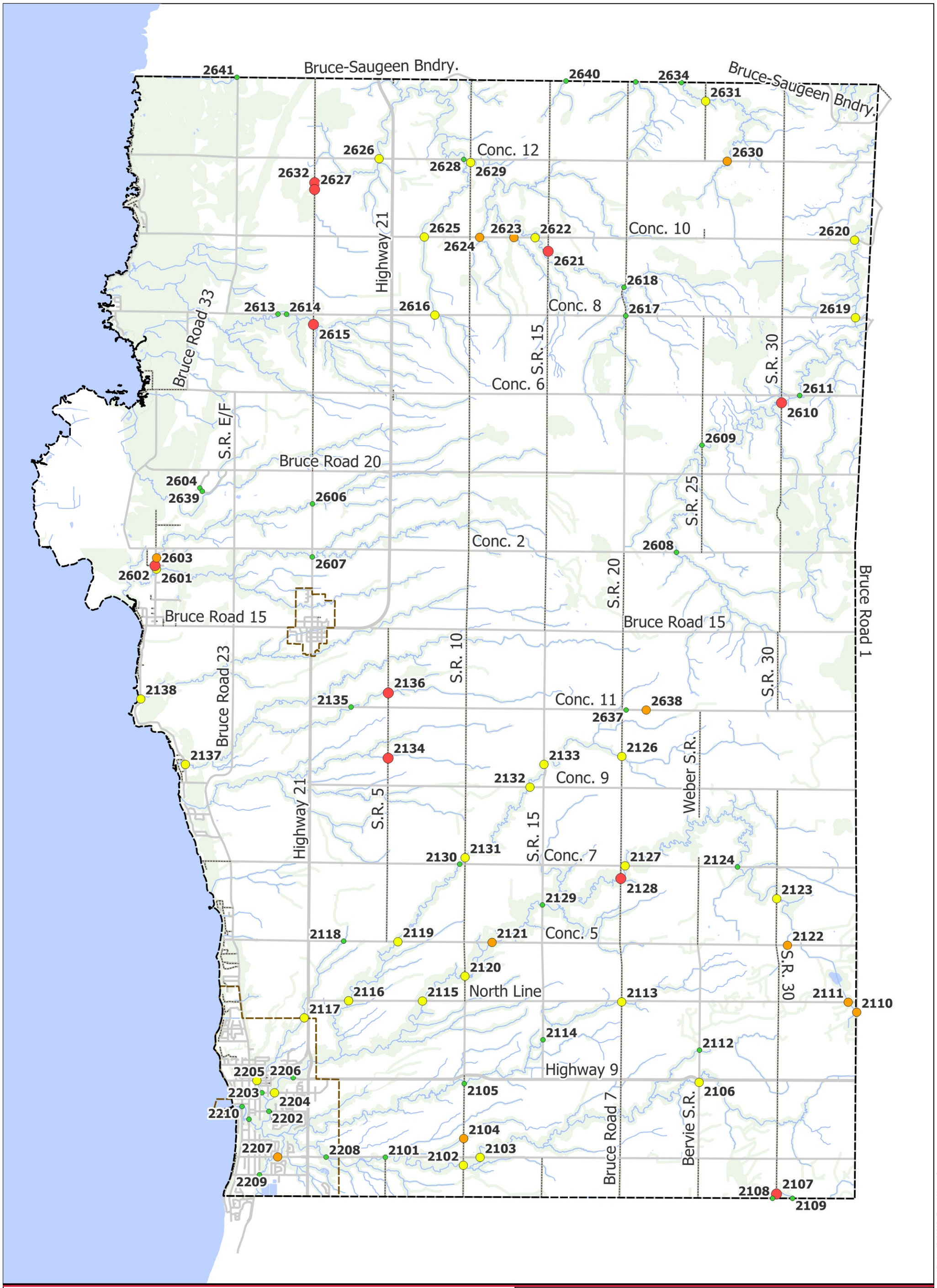
A total of 10 bridges are recommended for retirement while the remaining bridges within the Municipality will be maintained and repaired/replaced at their intended schedule. This preferred strategy optimizes short and long-term capital costs while maintaining a well-connected and efficient road network. The program consists of the following:

- Proposes to retire 10 bridges, 5 within 10 years and 5 following their deterioration and high costs associated with repair or replacement
- Complete repairs on 20 bridges within 1-5 years and 8 bridges within 6-10 years
- Complete replacement of 3 bridges within 1-5 years and 8 bridges within 6-10 years
- Maintain the remaining 37 bridges, performing maintenance as needed following the regular completion of OSIM reports

A summary of the program, following the completion of the detailed evaluation, is outlined in **Table 7-1** and shown in **Figure 7-1**.

Table 7-1: Preferred Program Strategy

Bridge	Recommendation	Timeline
2128	Retire	0-5 Years
2610	Retire	0-5 Years
2136	Retire	0-5 Years
2621	Retire	0-5 Years
2624	Maintain and replace	6-10 Years
2630	Maintain and replace	6-10 Years
2134	Retire	6-10 Years
2121	Maintain and replace	0-5 Years
2101	Maintain, re-evaluate	Following deterioration
2102	Maintain and repair, re-evaluate	Following deterioration
2602	Retire	-
2615	Retire	Following deterioration
2629	Maintain, re-evaluate	Following deterioration
2131	Maintain, re-evaluate	Following deterioration
2609	Maintain	Following deterioration
2632	Retire	Following deterioration
2627	Retire	Following deterioration
2107	Retire	Following deterioration



Preferred Strategy Recommendation

- Close
- Replace
- Repair
- Maintain

General Features

- Paved Road
- Unpaved Road
- Waterbody
- SVCA Regulated Areas
- Urban Boundary
- Municipal Boundary

2,000 4,000 6,000 8,000 m

Figure 7-1
Summary of Preferred Strategy

Project Name:
Kincardine Bridge Master Plan

Client Name:
Regional Municipality of Kincardine
Ontario, Canada

GEI Consultants

Last Updated: February 2025
Document ID: 2402806-G-001

7.1. Short-Term Capital Investment Program

The prioritized short-term capital investment program, based on the short-term screening evaluation ranking, is outlined in **Table 7-2** which describes costs associated with the 1-5 year and 6-10 year project lists. The capital costs provided for the repair and replacement of each bridge were identified in the OSIM reports, which outline detailed works including their associated costs. The retirement of each bridge has been estimated at $100,000; however, refinement of retirement costs is variable and depends on potential heritage concerns, environmental concerns, bridge area and material.

With the short-term program outlined below, the Municipality should be prepared to spend approximately $1.5 million per year for the next 10 years on bridge repair or replacement program.

Table 7-2. Short Term Capital Investment Program

Timeline	Bridge	Recommendation	Capital Costs
1-5 Years	2128	Retire	$100,000
	2136	Retire	$100,000
	2621	Retire	$100,000
	2131	Repair	$60,000
	2629	Repair	$10,000
	2631	Repair	$12,000
	2132	Repair	$506,000
	2638	Replace	$447,000
	2138	Repair	$380,000
	2102	Repair	$2,000
	2619	Repair	$119,000
	2123	Repair	$235,000
	2622	Repair	$53,000
	2625	Repair	$40,000
	2626	Repair	$10,000
	2121	Replace	$3,927,000
	2113	Repair	$7,000
	2126	Repair	$5,000
	2116	Repair	$145,000
	2207	Replace	$848,000
	2103	Repair	$5,000
	2119	Repair	$15,000
	2204	Repair	$178,000
	2205	Repair	$10,000
	2601	Repair	$278,000
	2117	Repair	$46,000
6-10 Years	2610	Retire	$100,000
	2134	Retire	$100,000
	2620	Repair	$378,000
	2120	Repair	$464,000
	2104	Replace	$633,000

Timeline	Bridge	Recommendation	Capital Costs
	2133	Repair	$165,000
	2137	Repair	$155,000
	2106	Repair	$96,000
	2110	Replace	$601,000
	2624	Replace	$816,000
	2630	Replace	$816,000
	2623	Replace	$675,000
	2616	Repair	$159,000
	2115	Repair	$393,000
	2127	Repair	$494,000
	2111	Replace	$661,000
	2122	Replace	$175,000
	2603	Replace	$980,000
1-5 Year Total Capital Cost			**$7,638,000**
6-10 Year Total Capital Cost			**$7,861,000**
Total Short Term Capital Cost			**$15,499,000**

7.2. Cost Savings

Cost saving is realized through the retirement of the bridges presented in the preferred strategy. The savings are present with both short-term savings through reduction in OSIM repair or replacement costs and long-term savings through ongoing maintenance. **Table 7-3** shows the long- and short-term savings for the Municipality in the coming decade should these recommendations be implemented.

All other structures did not pass initial thresholds for short-term or long-term evaluation and are recommended for maintenance and repair when indicated by OSIM reports. As per Provincial Regulation, it is recommended that all bridges with a span of longer than 3 m be inspected every 2 years.

Table 7-3: Preferred Upgrade Strategy

Bridge	OSIM Repair / Replacement Cost
2128	$3,592,000.00
2610	$519,000.00
2136	$562,000.00
2134	$159,000
2621	$216,000.00
Short -Term Savings	**$5,048,000.00**
Bridge	**CRV**
2632	$494,000.00
2602	$387,600.00
2627	$255,000.00
2107	$469,400.00
2615	$427,500.00
Long-Term Savings	**$2,033,500.00**
Total Savings	**$7,081,500.00**

Retiring the above outlined structures rather than spending capital budget to perform the recommended replacements and repairs will therefore save the Municipality upwards of $6 million once all structures have been retired.

While short-term retirement should happen in the next 10 years, long-term retirements have been recommended following deterioration. Once the structures are at a point where they have high costs associated with their repair or replacement, these bridges can be considered deteriorated. Provincial regulations require that all bridges with spans greater than 3 meters be reviewed every 2 years. These inspections are to occur in 2025 and can assist in determining when a structure has reached the point of retirement.

7.3. System Resiliency

A total of 10 bridges have been recommended for potential retirement: 5 in the next 10 years and 5 following their deterioration and high costs associated with repair or replacement. It is in the Municipality's best interest to decommission these structures instead of spending additional capital to maintain or replace them. These structures neither provide service to a high volume of traffic, nor are they integral to network connectivity.

There are several small urban areas within the municipal boundary, the following of which will be impacted by retirement:

- **Tiverton**, the nearest community to Bruce Power, will be impacted by the retirement of both 2602 and 2136. Bridge 2602 is located on Alma Street, which is not part of the grid network. As such, retirement will only affect vehicles whose trip destinations are located on Alma Street. Bridge 2136 is located on the grid; however, it runs parallel to Highway 21 which is a preferrable route as it is paved with the same posted speed limit of 80 km/h.
- **Kincardine** has the highest populations of the urban areas and therefore higher traffic volumes. No bridges were recommended for retirement in this area for that reason.
- **Armow** will be impacted by the retirement of Bridge 2128. Bridge 2128 has the second-highest repair cost, following only Bridge 2121, and has an AADT of between 0-49 vehicles per day. This structure is in proximity to Armow; however, detour routes and increased traffic volumes due to retirement can be accommodated.
- **Bervie** and **Ripley** will be impacted by the retirement of Bridge 2107, however this gravel road has a low AADT of between 0-49 and has ideal surrounding land-usage for retirement. No residential properties will be significantly impacted by this bridge's retirement except by a slight increase in traffic volumes to the surrounding roads.

An overview of both the short and long-term bridge retirement with respect to overall network connectivity is shown in **Figure 7-2**. Due to the grid network of the Municipality's road network, it is anticipated that overall network connectivity will be minimally impacted.

Additional disconnections in overall grid network

County owned Bruce Roads as the Primary Route

Provincially owned Highway 21 as the Primary Route

Provincially owned Highway 9 as the Primary Route

Bruce-Saugeen Bndry.

Conc. 12

Conc. 10

Conc. 8

Conc. 6

Conc. 2

Conc. 11

Conc. 9

Conc. 7

Conc. 5

North Line

Highway 21

Highway 9

Bruce Road 20

Bruce Road 15

Bruce Road 33

Bruce Road 23

Bruce Road 1

S.R. E/F

S.R. 15

S.R. 30

S.R. 25

S.R. 20

S.R. 10

S.R. 5

Weber S.R.

Bervie S.R.

Bruce Road 7

2641 2640 2634 2631 2626 2628 2629 2630 2632 2627 2625 2624 2623 2622 2621 2620 2618 2617 2616 2613 2614 2615 2619 2611 2610 2609 2604 2639 2606 2603 2601 2602 2607 2608 2138 2135 2136 2637 2638 2137 2134 2133 2126 2132 2131 2130 2127 2128 2124 2123 2129 118 2119 2121 2122 2120 2116 2115 2117 2113 2111 2110 2114 2112 2205 2206 2203 2204 2210 2202 2201 2105 2106 2104 2207 2208 2101 2102 2103 2209 2108 2107 2109

Preferred Strategy

- Close Bridge
- Maintain Bridge

General Features

- Paved Road
- Unpaved Road
- Waterbody
- SVCA Regulated Areas
- Urban Boundary
- Municipal Boundary

2,000 4,000 6,000 8,000 m

Figure 7-2
Overview of Network Connectivity

Project Name:
Kincardine Bridge Master Plan

Client Name:
Regional Municipality of Kincardine
Ontario, Canada

GEI

Last Updated: February 2025
Document ID: 2402806-G-001

Document Path: C:\Users\aykoc4048\OneDrive - GEI Consultants, Inc\Desktop\2402806 - Report Maps - Copy.qgz

8. Retirement Implementation

The next steps of this study include the implementation of the preferred strategy including the endeavor to retire the previously identified bridges. Within the short term, additional work and/or studies may need to be completed in preparation for bridge retirement.

Continued maintenance of the bridges not outlined in the retirement strategy should be carried out at their intended schedules. This ensures that the structures are being properly maintained to allow for their full-service life to be reached.

8.1. Bridge Retirement Mitigation Measures

The potential retirement of bridges requires mitigation measures to be considered following the implementation. Identified mitigation measures are listed but not limited to the following:

- Allow appropriate turning radius to accommodate slow plows for continued winter maintenance on existing roadways, this may need to be in the form of a cul-de-sac and can be evaluated on an as needed basis.
- Confirmation of load limits on identified detour routes can accommodate farm equipment and other large vehicles (i.e. wind turbine installation/maintenance vehicles).
- Notification of bridge retirement to emergency services.
- Completion of an additional environmental inventory where required for Bridge 2621, this may require the completion of an additional Class Environmental Assessment to confirm constraints are addressed.

8.2. Bridge Retirement Additional Studies

The potential retirement of each bridge has been estimated at approximately $100,000 per structure. This estimation includes an estimation for dismantling and disposal of the existing structure, installation of guard rails, environmental restoration works, and necessary permitting with the Conservation Authorities. Additional costs may be necessary and are dependent on additional concerns as they arise. This includes costs associated with additional studies, mitigation of additional environmental needs, cultural heritage assessments, environmental assessments, etc.

It can be noted that no structure has been previously identified as having cultural heritage significance; however, due to the age of the short-term structures generally between 75-90 years old, a cultural heritage assessment may be necessary to confirm no additional mitigation is required. To confirm, the Municipal Engineers Association, Municipal Class Environment Assessment checklist should be completed as provided in **Appendix D**.

Additionally, the Municipality should consider consultation with the public to ensure additional constraints and concerns have been appropriately considered. This can be carried out through in-person public meetings or online presentation and public comment forum.

Appendix A OSIM Reports

MUNICIPALITY OF KINCARDINE

BRIDGE INSPECTION REPORT

2023

BMROSS
engineering better communities

MUNICIPALITY OF KINCARDINE

BRIDGE INSPECTION REPORT

2023

December 14, 2023

B. M. ROSS AND ASSOCIATES LIMITED
Engineers and Planners
62 North Street
Goderich, ON N7A 2T4
Phone: 519-524-2641
www.bmross.net

File No. 96038

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File No. 96038

MUNICIPALITY OF KINCARDINE
BRIDGE INSPECTION REPORT
2023

1.0 INTRODUCTION

Bridges are an important and sometimes expensive component within a road network system. The purpose of a bridge inspection report 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 m or more. In the case of barrel culverts, the span is measured normal to the stream. BMROSS completed inspections of 85 structures (83 bridges and 2 small span culverts) in the Municipality of Kincardine in 2023. Structure 2139 has been removed since our last review and Structure 2641 and Structure 2140 have been added. 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 bridge structures were last inspected in 2021. OSIM reports have been generated for each structure as part of this round of inspections.

It should be noted that there was deep water at Structures 2103, 2117, 2120, 2124, 2608, 2609, 2613, 2615, and 2632. As such, review of these structures was limited to what could be observed above water level or felt with a probe. In some cases, the water is deep due to the nature of the stream and site, but it is possible that there are dams downstream of some of the structures.

In addition to the roadway bridges, pedestrian bridges were inspected as part of this review. OSIM reports have been generated for each structure as part of this round of inspections. The pedestrian bridges were last inspected in 2021. Details related to pedestrian bridges are included under Section 8.0 of this report. OSIM reports have been generated for each structures as per this round of inspections.

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.

Appendices A and B list an inventory of the structures reviewed. Appendix C contains a map showing locations of the structures that were reviewed.

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 inventory of the bridges using information supplied by the Municipality.
2. The inspections are completed in general accordance with the Ontario Structural Inspection Manual (OSIM) procedures. This includes a review of 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 the short term, within less than 5 years, and anticipated within the next 6 to 10 year period.
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, provide a priority list of the recommended needs and maintenance work with probable cost estimates.

Note: Although a projection of future needs up to 10 years in the future is provided, the Municipality is still required to have biennial inspections completed under the direction of a Professional Engineer; as other safety concerns may develop over time, or the integrity of the structures may deteriorate quicker than anticipated. While timelines for repairs or replacements are provided in the report, the ultimate decision on the order of repairs or replacement is to be made by the Municipality.

While there may be comments in the individual reports about signage, a review of signage is beyond the scope of this report.

The site inspections were completed between May 10, 2023 and September 20, 2023 by Dan Austin CET, and Andrew McGarvey. The report and recommended priority list were reviewed by Nic Gowing, P.Eng.

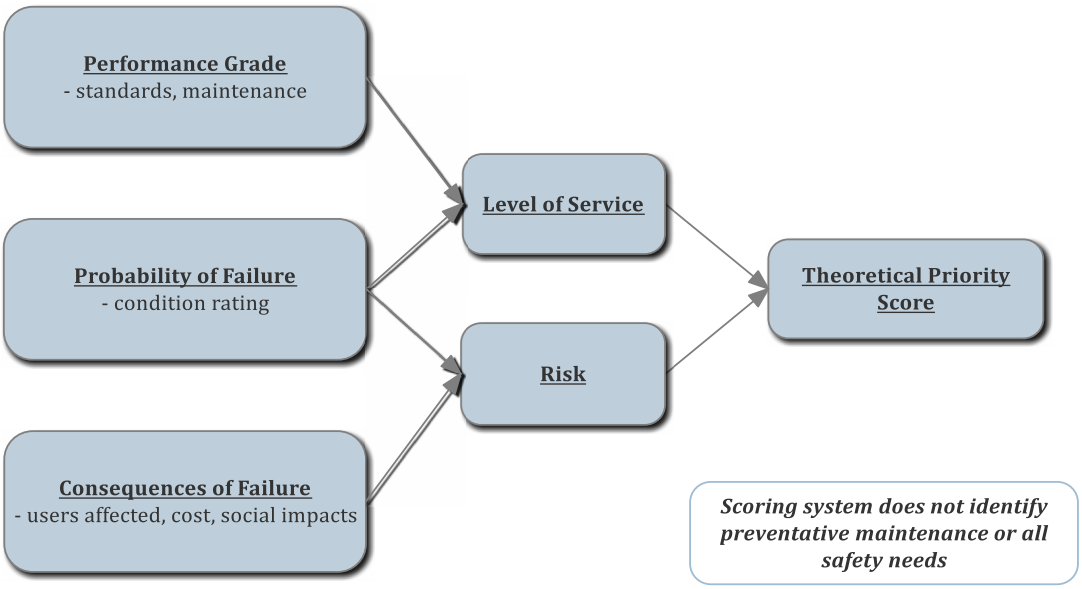
3.0 METHODOLOGY TO PRIORITIZE IMPROVEMENTS

When prioritizing the recommended capital improvements for a Bridge Needs Assessment or Asset Management Plan, 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 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 have implemented a suggested scoring and weighing system. 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 score 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.

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 Municipal 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 over time 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

The following structures are posted with load limits:

- Structure 2104 – 15 tonnes
- Structure 2128 – 10 tonnes
- Structure 2121 – 20 tonnes

It is our opinion that the load limit posting for 2104 can remain for the next two years. The condition of the structures should be reviewed at that time.

It is our opinion that the load limit posting for 2128 can remain for the next two years. The condition of the structures should be reviewed at that time. The Municipality should be prepared to close Structure 2128 in two years if the condition worsens.

It is our opinion that the load limit posting for structure 2121 should be reduced to 15 tonnes for the next two years. The condition of the structure should be reviewed at that time. It is not common to load post rigid frame bridges; however, the deck is in poor condition over a significant area, and the area of deterioration appears to be growing. Also, the condition of the wingwall at the southeast corner of the bridge appears to be worsening. No analysis was completed as it is not practical without design drawings.

Load posting signage is required on each side of the structure and at each approach intersection (generally four signs per structure).

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 $50,000 + HST should be budgeted for new steel beam guiderail, channel, and end treatments. At some locations, additional fill may be required to widen the road to allow for placement of guiderail.

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

Bridges that have a width 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. Structures 2121, 2136, 2602 and 2615 are single lane bridges.

A number of structures in the Municipality have widths between 6.0 m and 7.0 m between curbs or railings. These are considered two lane bridges. It is assumed that these structures have value to the Municipality despite their relatively narrow width, and in some cases, repairs have been recommended.

4.4 Waterproofing

In the 1970s, 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. The MTO now recommends 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 about 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.

4.6 Footing Struts for Open Footing Culverts

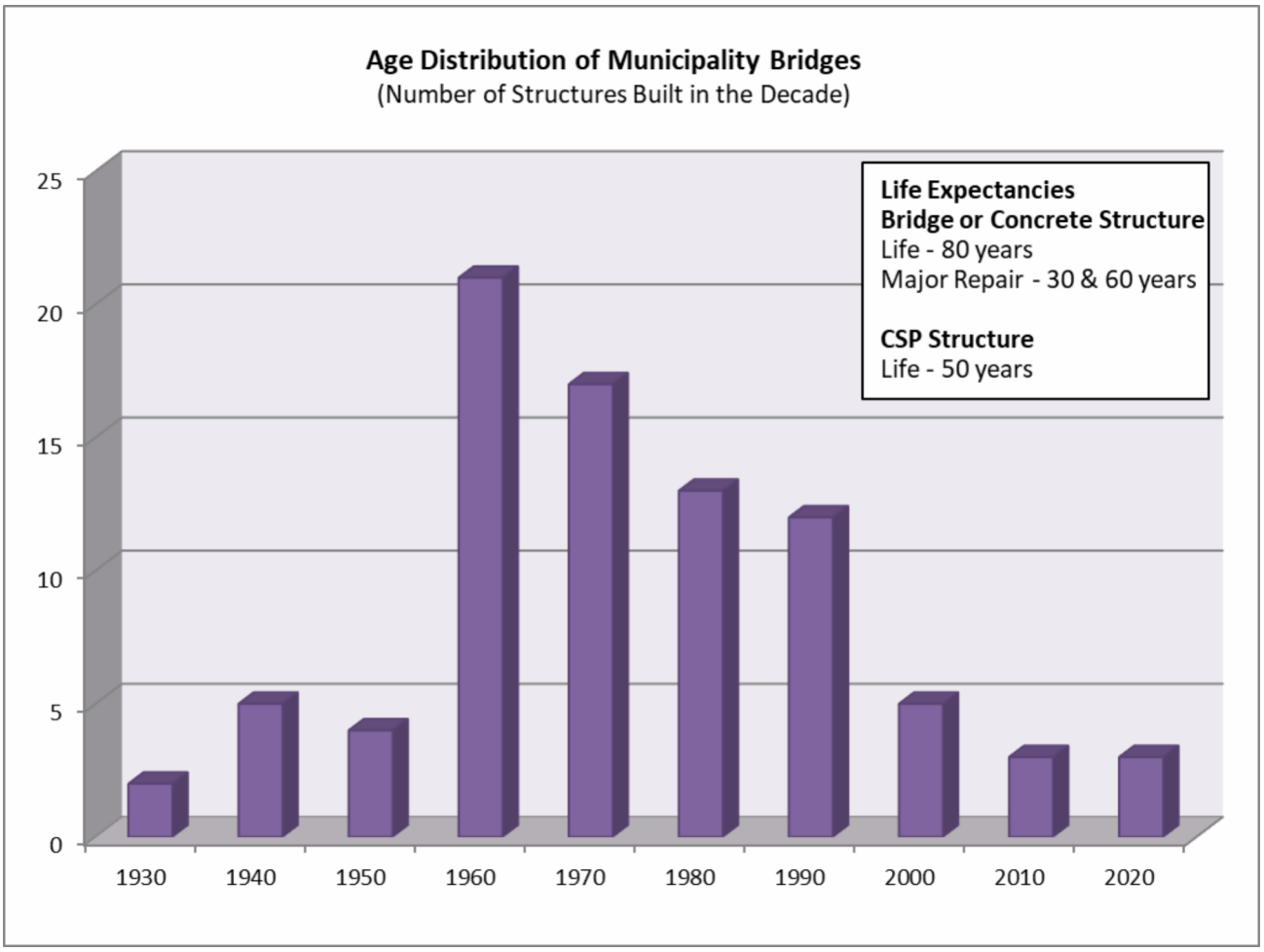
When cracks are observed between the top slab and the top of the abutment wall of articulated frame concrete culverts, this can indicate that the abutment walls are rotating due to inward movement of the footings. This behavior is more concerning at structures where the concrete footings are exposed 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, or replacement.

5.0 SUMMARY OF 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 if properly maintained and repaired. Eighty-five structures were reviewed (83 bridges and 2 small span structures). On average, the Municipality should be replacing five structures in any 5-year period to avoid a concentrated replacement program in the future. Five structures were identified as requiring replacement in the next 5 years, and eight structures were identified as requiring replacement in the 6 to 10 year period. Figure No. 2 shows an age distribution of the structures in the Municipality based on documented and estimated dates of construction.

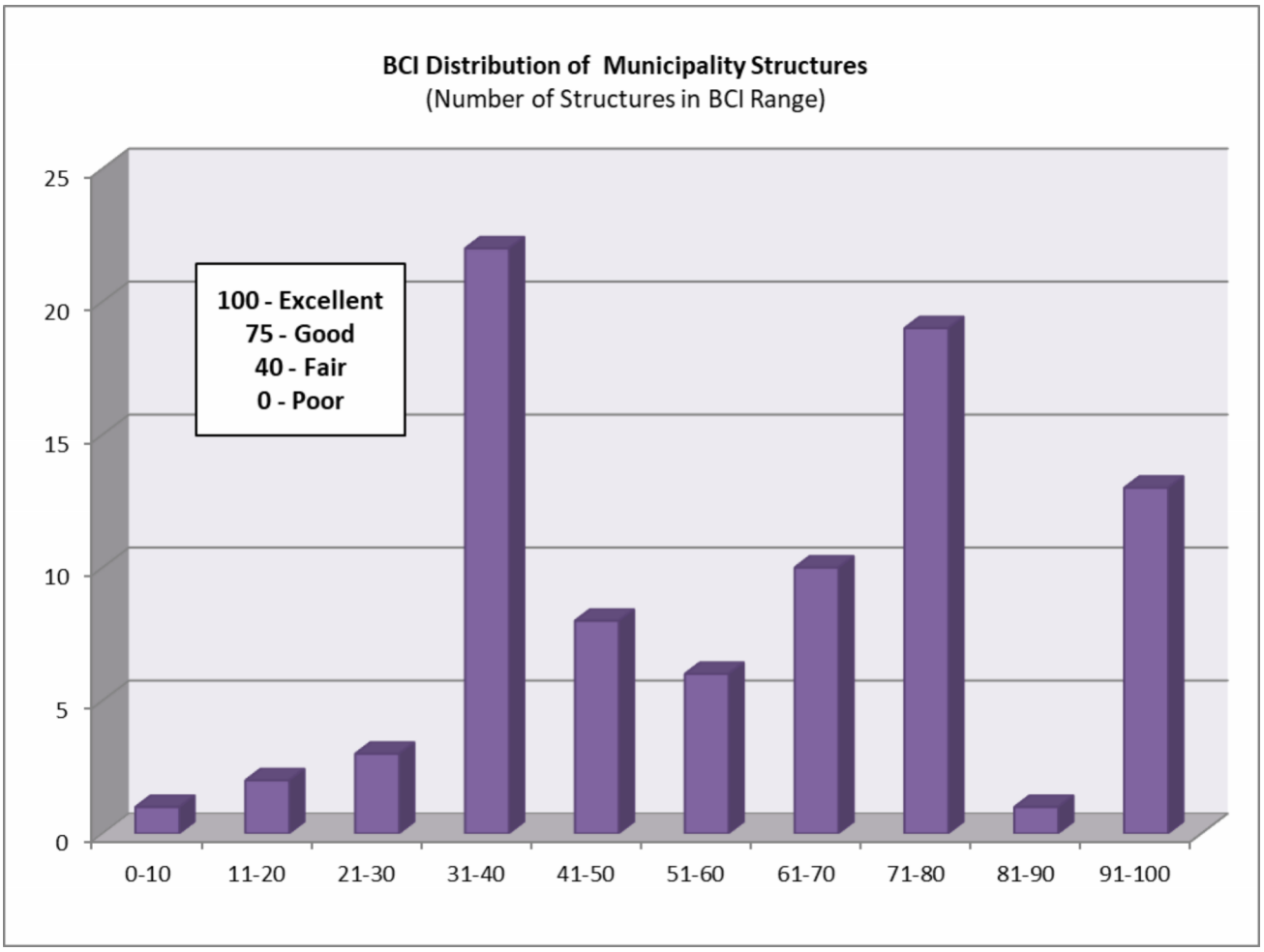
Figure No. 2



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 would be considered to be in excellent condition, 70 to 89 in good condition, 40 to 69 in fair condition and below 40 in poor condition.

Figure No. 3



6.0 RECOMMENDED WORK

The list of recommended repairs and structure replacement type improvements has been assembled in Tables 1 to 3. Tables 1 and 2 include the higher priority tasks recommended for completion within the next 5 years and Table 3 has tasks recommended for completion in the 6 to 10 year period. The needs have been prioritized based on the opinion of the Engineer. The tables have been formatted to include traffic volumes and work in the tables has been grouped into replacements and repairs as requested by the Municipality. This priority list is only a recommended sequence and the ultimate decision on the order of repairs or replacement should be made by the Municipality.

Another influence on the priority list may be the Municipality's schedule for road reconstruction or 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.

Table 1
Suggested Priority List of Repair and Replacement Needs
Within 1 Year

Site Number	Location	Repair Description	Probable Cost	Priority Score
2104	Sideroad 10 (50-199)	Confirm signage at intersections and both sides of bridge, and provide signage as required	$1,000	29
2121	Concession 5 (200-499)	New 15 tonne load posting signage	$1,000	19
2128	Sideroad 20 (0-49)	Confirm signage at intersections and both sides of bridge, and provide signage as required	$1,000	20
		TOTAL	**$3,000 + HST**	

Table 2
Suggested Priority List of Repair and Replacement Needs
1 to 5 Year Period

Site Number	Location (Traffic Count)	Repair Description	Probable Cost	BCI	Priority Score
Replacement					
2121	Concession 5 (200-499)	Replace structure including $1,310,000 allowance for road work	$3,927,000	19	18
2638	Concession 10 (50-199)	Replace culvert	$447,000	0	13
2207	Kincardine Ave. (>1000)	Replace culvert, including new retaining walls and protection of utilities	$848,000	44	14
2128	Sideroad 20 (0-49)	Replace structure including $550,000 allowance for road work	$3,592,000	20	14

Site Number	Location (Traffic Count)	Repair Description	Probable Cost	BCI	Priority Score
2136	Sideroad 5 (0-49)	Replace culvert	$562,000	23	12
Repairs					
2204	Durham Street	Patch repair abutments and extend deck drains	$178,000	72	9
2621	Sideroad 15 (0-49)	Reinforce beams	$216,000	38	11
2117	North Line Extension	Erosion Protection	$46,000	39	12
2625	Concession 10 (50-199)	Erosion protection	$40,000	38	13
2601	Albert Road (500-999)	Deck overlay, waterproof and pave	$278,000	57	11
2138	Victoria St. (50-199)	Replace curbs and replace railings	$380,000	56	9
2132	Concession 9 (50-199)	Replace railings, patch repair, waterproof, and pave	$506,000	37	13
2123	Sideroad 30 (50-199)	Replace railings, patch repair deck	$235,000	38	13
2116	North Line (200-499)	Waterproof and pave	$145,000	75	8
2622	Concession 10 (50-199)	Patch repair railings	$53,000	72	7
2619	Concession 8	Guiderail and shoulder improvements	$119,000	38	13
2113	Sideroad 20 (50-199)	Guiderail repairs	$7,000	39	14
2626	Concession 12	Guiderail repairs	$10,000	30	13
2629	Sideroad 10	Guiderail repairs	$10,000	40	10
2119	Concession 5	Guiderail repairs	$15,000	74	8
2631	Glen Cumming Road	Guiderail repairs	$12,000	75	6
2102	Sideroad 10 (0-49)	Repair guiderail connection at NE corner	$2,000	95	4
2103	South Line (200-499)	Guiderail repairs	$5,000	50	12
2126	Sideroad 20 (50-199)	Guiderail repairs	$5,000	99	5
2131	Sideroad 10 (0-49)	Repair cut-off wall and repair spring-line cracks	$60,000	68	8
2205	Broadway Street (>1000)	Repair Guiderail	$10,000	66	12
		TOTAL	**$11,708,000 +HST**		

Table 3
Suggested Priority List of Repair and Replacement Needs
6 to 10 Year Period

Site Number	Location (Traffic Count)	Repair Description	Probable Cost	BCI	Priority Score
Replacement					
2104	Sideroad 10 (50-199)	Replace culvert	$633,000	29	14
2623	Concession 10 (50-199)	Replace culvert	$675,000	34	13
2111	North Line (200-499)	Replace culvert	$661,000	36	14
2624	Concession 10	Replace Culvert	$816,000	38	13
2630	Concession 12	Replace Culvert	$816,000	34	13
2110	Kincardine-Kinloss Road	Replace culvert	$601,000	31	13
2603	Albert Road (500-999)	Replace culvert	$980,000	34	15
2626	Concession 10 (50-199)	Replace culvert	$816,000	30	13
Repairs					
2106	Sideroad 25 (50-199)	Erosion protection for south abutment and gabion walls	$96,000	81	7
2115	North Line (200-499)	Replace expansion joints, patch repair, waterproof and pave, and construct approach slabs	$393,000	74	6
2127	Concession 7 (200-499)	Patch repair deck, waterproof and pave, replace railings	$494,000	44	12
2610	Sideroad 30 (0-49)	Patch repair deck, waterproof and pave, replace railings	$519,000	37	12
2133	Sideroad 15 (50-199)	Patch repair culvert	$165,000	42	11
2620	Concession 10 (50-199)	Patch repair deck, waterproof and pave, replace railings	$378,000	72	7
2120	Sideroad 10 (50-199)	Replace railings, patch repair deck, erosion protection	$464,000	58	9
2137	Upper Lorne Beach Road (50-199)	Patch repair, Waterproof, and pave	$155,000	71	7
2122	Concession 5 (200-499)	Patch repair soffit, erosion protection	$175,000	59	10
2134	Sideroad 5 (0-49)	Patch repair, erosion protection	$159,000	39	12

Site Number	Location (Traffic Count)	Repair Description	Probable Cost	BCI	Priority Score
2616	Concession 8 (50-199)	Patch repair original structure	$159,000	49	11
		TOTAL	**$9,155,000 +HST**		

Culvert replacement costs are based on replacement with a pre-cast concrete structure, road widening, guiderail, and in some cases retaining walls. Options are available to reduce costs but provide a lower level of service.

Bridge replacement costs are based on new integral abutment bridges, roadwork, and guiderail. Options are available to reduce costs but provide a lower level of service.

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 Tables 1 and 2 include engineering, design, administration, and a 10% 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 be gained by grouping like projects together to keep costs down.

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 3. Probable costs for these structures are based on 2023 prices and 2023 quantities. 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 may have to be changed.

To complete all the work recommended within the next 5 years would cost on average about $2,342,200 + HST per year over 5 years and within the 10-year period would be about $2,086,600 + HST per year over 10 years, not considering any new or emerging deficiencies. Please note that a significant proportion of the above noted costs relates to replacement of Structure 2121 and Structure 2128 ($7,519,000 + HST). If this amount exceeds the Municipality's 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 or by delaying the work. If the work is delayed, it is possible that costs will increase, and that load limits or bridge closures may be recommended in the future.

Please note that the Broadway St. Bridge (2206) has not been included in the list of needs. It has been possible to make repairs to the structure to avoid the need for a load posting. Due to the age of the structure, it has the potential to deteriorate rapidly.

7.0 PEDESTRIAN BRIDGES

In addition to the roadway bridges, 26 pedestrian bridges in Kincardine were reviewed. A map of the bridge locations is provided in Appendix C. OSIM reports were generated for each structure.

It is understood that structure P13, P15, and P16 are removed in the fall of each year. They are in good condition, but their support conditions should be reviewed and monitored regularly. It should be noted that their railings do not meet code requirements for opening size and height.

The beams used for structure P12, P20, P21, and P23 are logs spanning from bank to bank. They are sagged, and it may be impractical to show that they can resist the pedestrian loading defined in the bridge code. An allowance has been included below to reinforce these structures. However, replacement may be more cost effective.

Table 4
Suggested Priority List for Pedestrian Bridges
Within 1 Year

Site Number	Location	Repair Description	Probable Cost
P2	Green Trail	Clean bearing seats, replace deteriorated deck boards, plates at expansion joints	$2,500
P4	Blue Trail	Re-attach lower rail	$500
P6	Blue Trail	Stabilize pier, reinforce framing at west bays	$130,000
P9	Yellow Trail	Remove debris from top flange	$500
P13	Green Trail	Replace missing bolts	$500
P16	Red Trail	Repair deck	$1,000
P17	Red Trail	Reinforce north railing	$500
P18	Red Trail	Stabilize east abutment	$1,000
P20	Blue Trail	Reinforce railings	$2,000
		TOTAL	**$138,500 +HST**

Table 5
Suggested Priority List for Pedestrian Bridges
1 to 5 Year Period

Site Number	Location	Repair Description	Probable Cost
P1	Yellow Trail	Cut back vegetation, replace deteriorated deck boards	$5,000
P7	Blue Trail	Erosion protection	$10,000
P8	Blue Trail	Erosion protection	$30,000
P10	Yellow Trail	Replace deteriorated deck boards, reinforce railings, replace retaining walls	$10,000
P11	Green Trail	Reinforce railings, review, and adjust posts	$8,000
P12	Green Trail	Reinforce structure and railings, erosion protection.	$25,000
P19	Blue Trail	Reinforce railings	$2,000
P20	Blue Trail	Reinforce structure	$18,000
P21	Blue Trail	Reinforce structure and railings, erosion protection	$25,000
P23	Blue Trail	Reinforce structure and railings	$20,000
		TOTAL	**$153,000 +HST**

The railings for several structures do not meet code requirements for opening size, height and possibly resistance. These structures include: P8, P10, P11, P12, P13, P14, P15, P16, P17, P18, P19, P20, P21, P22, P23, P25, P26. Repairs are recommended for some bridge railings, typically when repairs to other members are recommended. The Municipality should consider if railings can be reinforced to be in closer compliance with code requirements. P3 is an example of what may be achievable.

8.0 FURTHER INSPECTIONS

Provincial regulations require all bridges with spans greater than 3 m to be reviewed every two years under the supervision of a Professional Engineer. The structures should be reviewed in 2025.

All of which is respectfully submitted.

B. M. ROSS AND ASSOCIATES LIMITED

Per _____
Ryan J. Munn, P. Eng.

Per _____
Nic Gowing, P. Eng.

:hv

APPENDIX A

BRIDGE INVENTORY SUMMARY BY SITE NUMBER

Site Number	BMROSS Number	Structure Type	Structure Name	Road Name	Structure Location	Span Length (m)	Year Built	BCI	Probable Cost of 1-5 Year Recommended Work	Probable Cost of 6-10 Year Recommended Work
2101		Rigid Frame, Vertical Legs	Owen Davey Bridge	Sideroad 5S	30m South of South Line, over the Penetangore River	15.1	1990	73	$0	$0
2102	BR835	I-beam of Girders	Stewart Bridge	Sideroad 10	0.2 km South of South Line	29.1	2006	95	$2,000	$0
2103	BR062	Rectangular Culvert	Farrell Bridge	South Line	0.4 km East of Sideroad 10, over Penetangore River	12.2		50	$5,000	$0
2104	BR1039	Solid Slab		Sideroad 10	0.5 km North of South Line	4.5		29	$0	$633,000
2105	BR116	Rectangular Culvert	Anderson Bridge	Sideroad 10	0.2 km South of Highway 9	6.12	1964	73	$0	$0
2106		Rigid Frame, Vertical Legs	Weir Sheane Bridge	Bervie Sideroad	50m South of Highway 9, Over the Penetangore River	9	1992	81	$0	$96,000
2107	BR1294	Rectangular Culvert		Sideroad 30	0.1 km North of Huron-Kincardine Rd	3.65		40	$0	$0
2108		CSP Round Culvert		Huron-Kincardine Road	0.1 km West of Sideroad 30 South	3.3	2017	99	$0	$0
2109		CSP Round Culvert		Huron-Kincardine Rd	0.4 km East of Sideroad 30 South	3	2017	100	$0	$0
2110		Rectangular Culvert		Kincardine-Kinloss Rd	0.25 km South of North Line	3.55		31	$0	$601,000
2111		CSP Arch Culvert		North Line	0.2 km West of Kincardine-Kinloss Rd.	3.8		36	$0	$661,000
2112	BR1421	Rectangular Culvert		Bervie Sideroad	0.8 km North of Highway 9	5.18	2021	100	$0	$0
2113		Solid Slab		Sideroad 20	20 m South of North Line	3.1		39	$7,000	$0
2114	BR1039	Rectangular Culvert		Sideroad 15	1.0 km North of Highway 9	3.7		65	$0	$0
2115	BR432	I-beam of Girders	Thompson Bridge	North Line	1.1 km West of Sideroad 10, North Penetangore River	31.3	1982	74	$0	$393,000
2116		Rigid Frame, Vertical Legs	Munro Bridge	North Line	1.0 km East of Highway 21, over Kincardine Creek	11	1987	75	$145,000	$0
2117		Rectangular Culvert		North Line Extension	0.1 km West of Highway 21	6.1		39	$46,000	$0
2118	BR083	Rectangular Culvert		Concession 5	0.9 km East of Highway 21	2.7	1963	54	$0	$0
2119	BR357	CSP Arch Culvert		Concession 5	0.3 km East of Sideroad 5, Over Kincardine Creek	8.1	1975	74	$15,000	$0
2120		Rigid Frame, Vertical Legs	Manner's Bridge	Sideroad 10	0.6 km North of North Line, over North Penetangore River	10.8		58	$0	$464,000
2121	BR1048	Rigid Frame, Vertical Legs	Campbell Bridge	Concession 5	0.7 km East of Sideroad 10, over North Penetangore River	15.24		19	$3,927,000	$0
2122		Rectangular Culvert		Concession 5	0.6 km East of Sideroad 30	4.25		59	$0	$188,000
2123		Solid Slab		Sideroad 30	0.8 km South of Concession 7	5.5		38	$235,000	$0
2124		Rectangular Culvert		Concession 7	1.0 km West of Sideroad 30	5.3		50	$0	$0
2126		Rectangular Culvert		Sideroad 20	0.8 km North of Concession 9	5.5		99	$5,000	$0
2127	BR784	Rigid Frame, Vertical Legs	Stephenson Bridge	Concession 7	0.1 km East of Sideroad 20, over Penetangore River	12.2		44	$0	$494,000
2128	BR701/BR372	Arch Culvert	Shewfelt Bridge	Sideroad 20	0.3 km South of Concession 7, over North Penetangore River	11.4		20	$3,592,000	$0
2129	BR130	I-beam of Girders	Armow Bridge	Sideroad 15	1.0 km South of Concession 7, over North Penetangore River	31.9	1966	70	$0	$0
2130		I-beam of Girders	Matheson Bridge	Concession 7	0.15 km West of Sideroad 10, over Kincardine Creek	7.3		67	$0	$0
2131	BR317	CSP Arch Culvert		Sideroad 10	0.15 km North of Concession 7, over Kincardine Creek	6.2	1976	68	$60,000	$0
2132		Rigid Frame, Vertical Legs	White Bridge	Concession 9	0.35 km West of Sideroad 15	9.15		37	$501,000	$0
2133	BR052	Rectangular Culvert	McTeer Bridge	Sideroad 15	0.6 km North of Concession 9	6.15	1961	42	$0	$165,000
2134		Rectangular Culvert		Sideroad 5	0.7 km North of Concession 9	3.65		39	$0	$159,000
2135	BR1359	Rectangular Culvert		Concession 11	1.0 km West of Sideroad 5	3.05		62	$0	$0
2136		Rectangular Culvert		Sideroad 5	0.4 km North of Concession 11	3.05	1934	23	$562,000	$0
2137	BR067	Rigid Frame, Vertical Legs	Collins Bridge	Upper Lorne Beach Road	0.5 km North of Lorne Beach Road, over Andrew Creek	9	1962	71	$0	$155,000
2138		Solid Slab	Evans Bridge	Victoria Street	1.9 km South of Bruce Road 15, over Tiverton Creek	6.7		56	$380,000	$0
2140	BR1360	CSP Arch Culvert		Concession 11	675m West of Sideroad 5 North	3.65	2021	99	$0	$0
2201	BR236	I-beam of Girders	Queen Street Bridge (Floyd Wieck)	Queen Street	0.5 km North of St. Albert Street	74.7	1971	72	$0	$0
2202	BR544	Rigid Frame, Vertical Legs	Russel Street Bridge	Russel Street	0.2 km East of Olde Victoria Street	21.5	1962	65	$0	$0
2203	BR817	CSP Round Culvert	Durham Street Culvert (West Structure)	Durham Street	50 m East of Olde Victoria Street	5.5	2004	100	$0	$0
2204	BR355	I-beam of Girders	Durham Street Bridge-East Structure	Durham Street	150 m East of River Lane	49.9	1975	72	$178,000	$0
2205		Rectangular Culvert	Broadway Street Culvert	Broadway Street	50 m East of Princes Street	5.5		66	$10,000	$0
2206	BR532	T-Beam	Broadway Street Bridge	Broadway Street	150 m East of North Street	45		41	$0	$0
2207	BR1367	Rectangular Culvert		Kincardine Avenue	150 m East of Park Street	3.66		44	$848,000	$0
2208	BR700	I-beam of Girders	Buttery Bridge	South Line	0.5 km East of Highway 21, over the Penetangore River	20	2001	95	$0	$0
2209		Rectangular Culvert		Bruce Avenue	115 m East of Princes Street	5	2020	100	$0	$0
2210	BR870	I-beam of Girders	Huron Terrace Bridge	Huron Terrace	50 m South of Harbour Street	60.4	2009	100	$0	$0

Site Number	BMROSS Number	Structure Type	Structure Name	Road Name	Structure Location	Span Length (m)	Year Built	BCI	Probable Cost of 1-5 Year Recommended Work	Probable Cost of 6-10 Year Recommended Work
2601	BR332	Rigid Frame, Vertical Legs		Albert Road	100 m South of Alma Street	9.15	1974	57	$278,000	$0
2602		Arch Culvert		Alma Street	50 m West of Albert Road	6		36	$0	$0
2603		CSP Arch Culvert		Albert Road	0.25 km South of Concession 2	6.2	1974	34	$0	$980,000
2604		Rectangular Culvert		Farrell Drive	0.5 km South of Bruce Road 20	3		73	$0	$0
2606		CSP Arch Culvert		Sideroad J/1	0.9 km South of Bruce Road 20	5.05		47	$0	$0
2607	BR654	Rigid Frame, Vertical Legs	Pettigrew Bridge	Sideroad J/1	0.2 km South of Concession 2	9.6		53	$0	$0
2608		Rectangular Culvert		Concession 2	1.4 km East of Sideroad 20	6		95	$0	$0
2609		Rectangular Culvert		Sideroad 25	0.75 km North of Bruce Road 20	9	1992	75	$0	$0
2610		Rigid Frame, Vertical Legs		Sideroad 30	0.2 km South of Concession 6	12.2		37	$0	$519,000
2611		Rectangular Culvert		Concession 6	0.4 km East of Sideroad 30	9		98	$0	$0
2613		Rectangular Culvert		Concession 8	0.9 km West of Sideroad J/1	6.1		75	$0	$0
2614		Rectangular Culvert		Concession 8	0.7 km West of Sideroad J/1	6.05		75	$0	$0
2615	BR1257	Solid Slab		Sideroad J/1	0.25 km South of Concession 8	6.15		37	$0	$0
2616		Rectangular Culvert		Concession 8	1.1 km East of Highway 21	4.3		49	$0	$159,000
2617		Rectangular Culvert		Concession 8	Intersection of Concession 8 and Sideroad 20	4.9		73	$0	$0
2618		CSP Round Culvert		Sideroad 20	0.7 km North of Concession 8	6		61	$0	$0
2619	BR059	Arch Culvert		Concession 8	0.3 km West of Bruce Greenock Road	13.1	1961	38	$119,000	$0
2620		Rigid Frame, Vertical Legs		Concession 10	1.8 km East of Sideroad 30	14.2		72	$0	$378,000
2621		T-Beam		Sideroad 15	0.3 km South of Concession 10	7.3	1947	38	$216,000	$0
2622	BR203	Rigid Frame, Vertical Legs		Concession 10	0.3 km West of Sideroad 15	10.7	1968	72	$53,000	$0
2623		CSP Arch Culvert		Concession 10	0.9 km West of Sideroad 15	3.8		34	$0	$675,000
2624		CSP Arch Culvert		Concession 10	0.25 km East of Sideroad 10	4.55		38	$0	$816,000
2625		Rectangular Culvert		Concession 10	0.8 km East of Highway 21	3.4		38	$40,000	$0
2626	BR248	CSP Arch Culvert		Concession 12	0.3 km West Highway 21	4.3	1968	30	$10,000	$816,000
2627		Rectangular Culvert		Sideroad J/1	0.8 km South of Concession 12	3.05		74	$0	$0
2628		Rigid Frame, Vertical Legs		Concession 12	0.15 km West of Sideroad 10	11		65	$0	$0
2629		CSP Arch Culvert		Sideroad 10	0.1 km South of Concession 12	7.5		40	$10,000	$0
2630	BR170	CSP Arch Culvert		Concession 12	0.6 km East of Glen Cummings Road	4.8	1966	34	$0	$816,000
2631		CSP Arch Culvert		Glen Cumming Road	1.6 km North of Concession 12	5		75	$12,000	$0
2632		Solid Slab		Sideroad J/1	0.6 km South of Concession 12 (North of Structure 2627)	3.6		40	$0	$0
2633		Rectangular Culvert		Bruce-Saugeen Townline	0.2 km East of Sideroad 20	4.3		75	$0	$0
2634		Rectangular Culvert		Bruce-Saugeen Townline	1.4 km East of Sideroad 20	5.2		64	$0	$0
2637	BR1121	CSP Round Culvert		Concession 10	0.1 km West of Sideroad 20	2.2	2014	98	$0	$0
2638		CSP Arch Culvert		Concession 10	0.6 km West of Sideroad 20	1.5		0	$447,000	$0
2639		CSP Round Culvert		Farrell Drive	0.7 km South of Bruce Road 20	3.3		75	$0	$0
2640		Rectangular Culvert		Bruce-Saugeen Townline	0.4 km East of Sideroad 15	3.3		40	$0	$0
2641		CSP Ellipse Culvert		Bruce-Saugeen Townline	40m West of Bruce Road 33	3.8		40	$0	$0

APPENDIX B

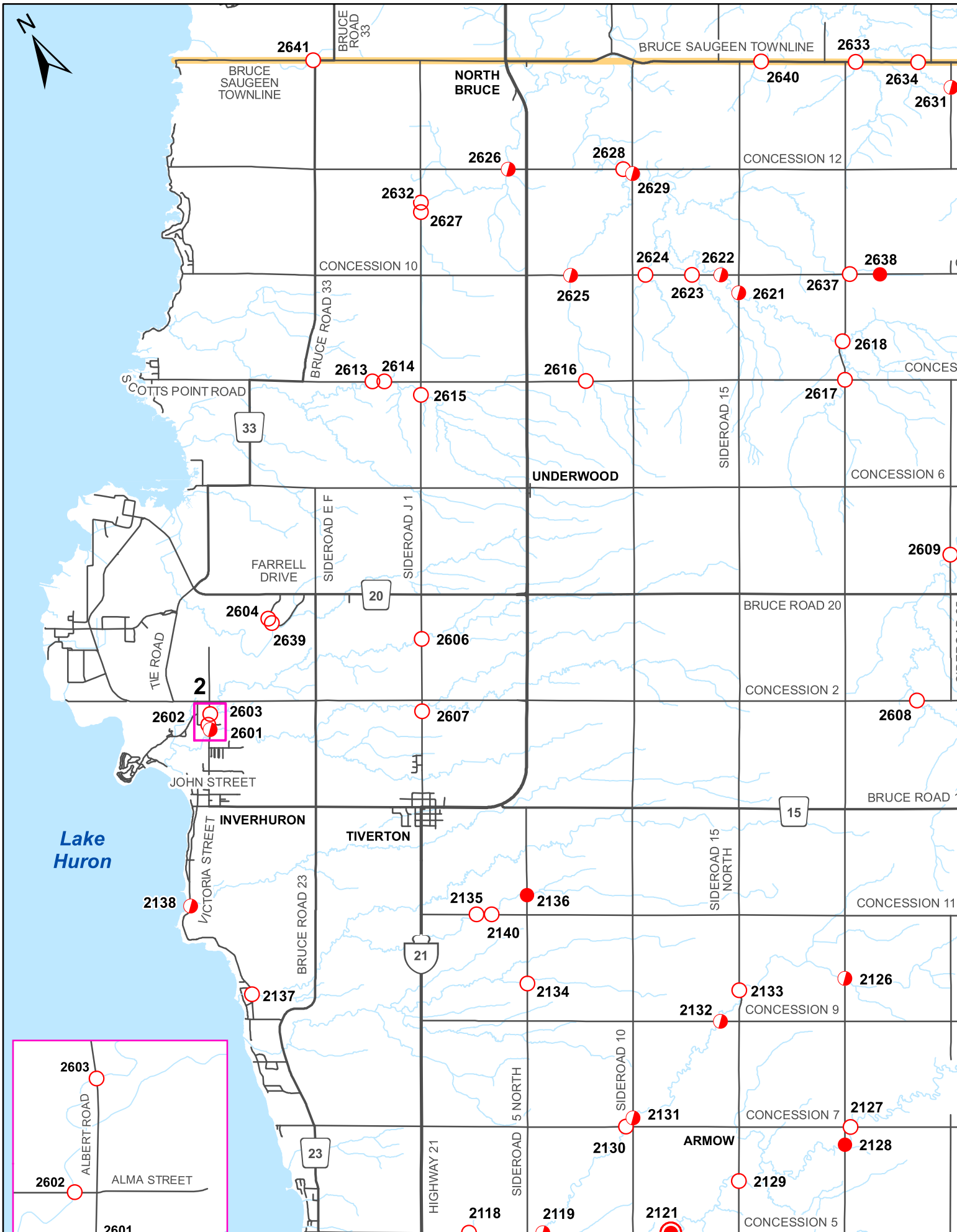
BRIDGE INVENTORY SUMMARY BY BCI

Site Number	BMROSS Number	Structure Type	Structure Name	Road Name	Structure Location	Span Length (m)	Year Built	BCI	Probable Cost of 1-5 Year Recommended Work	Probable Cost of 6-10 Year Recommended Work
2638		CSP Arch Culvert		Concession 10	0.6 km West of Sideroad 20	1.5		0	$447,000	$0
2121	BR1048	Rigid Frame, Vertical Legs	Campbell Bridge	Concession 5	0.7 km East of Sideroad 10, over North Penetangore River	15.24		19	$3,927,000	$0
2128	BR701/BR372	Arch Culvert	Shewfelt Bridge	Sideroad 20	0.3 km South of Concession 7, over North Penetangore River	11.4		20	$3,592,000	$0
2136		Rectangular Culvert		Sideroad 5	0.4 km North of Concession 11	3.05	1934	23	$562,000	$0
2104	BR1039	Solid Slab		Sideroad 10	0.5 km North of South Line	4.5		29	$0	$633,000
2626	BR248	CSP Arch Culvert		Concession 12	0.3 km West Highway 21	4.3	1968	30	$10,000	$816,000
2110		Rectangular Culvert		Kincardine-Kinloss Rd	0.25 km South of North Line	3.55		31	$0	$601,000
2603		CSP Arch Culvert		Albert Road	0.25 km South of Concession 2	6.2	1974	34	$0	$980,000
2623		CSP Arch Culvert		Concession 10	0.9 km West of Sideroad 15	3.8		34	$0	$675,000
2630	BR170	CSP Arch Culvert		Concession 12	0.6 km East of Glen Cummings Road	4.8	1966	34	$0	$816,000
2111		CSP Arch Culvert		North Line	0.2 km West of Kincardine-Kinloss Rd.	3.8		36	$0	$661,000
2602		Arch Culvert		Alma Street	50 m West of Albert Road	6		36	$0	$0
2132		Rigid Frame, Vertical Legs	White Bridge	Concession 9	0.35 km West of Sideroad 15	9.15		37	$501,000	$0
2610		Rigid Frame, Vertical Legs		Sideroad 30	0.2 km South of Concession 6	12.2		37	$0	$519,000
2615	BR1257	Solid Slab		Sideroad J/1	0.25 km South of Concession 8	6.15		37	$0	$0
2123		Solid Slab		Sideroad 30	0.8 km South of Concession 7	5.5		38	$235,000	$0
2619	BR059	Arch Culvert		Concession 8	0.3 km West of Bruce Greenock Road	13.1	1961	38	$119,000	$0
2621		T-Beam		Sideroad 15	0.3 km South of Concession 10	7.3	1947	38	$216,000	$0
2624		CSP Arch Culvert		Concession 10	0.25 km East of Sideroad 10	4.55		38	$0	$816,000
2625		Rectangular Culvert		Concession 10	0.8 km East of Highway 21	3.4		38	$40,000	$0
2113		Solid Slab		Sideroad 20	20 m South of North Line	3.1		39	$7,000	$0
2117		Rectangular Culvert		North Line Extension	0.1 km West of Highway 21	6.1		39	$46,000	$0
2134		Rectangular Culvert		Sideroad 5	0.7 km North of Concession 9	3.65		39	$0	$159,000
2107	BR1294	Rectangular Culvert		Sideroad 30	0.1 km North of Huron-Kincardine Rd	3.65		40	$0	$0
2629		CSP Arch Culvert		Sideroad 10	0.1 km South of Concession 12	7.5		40	$10,000	$0
2632		Solid Slab		Sideroad J/1	0.6 km South of Concession 12 (North of Structure 2627)	3.6		40	$0	$0
2640		Rectangular Culvert		Bruce-Saugeen Townline	0.4 km East of Sideroad 15	3.3		40	$0	$0
2641		CSP Ellipse Culvert		Bruce-Saugeen Townline	40m West of Bruce Road 33	3.8		40	$0	$0
2206	BR532	T-Beam	Broadway Street Bridge	Broadway Street	150 m East of North Street	45		41	$0	$0
2133	BR052	Rectangular Culvert	McTeer Bridge	Sideroad 15	0.6 km North of Concession 9	6.15	1961	42	$0	$165,000
2127	BR784	Rigid Frame, Vertical Legs	Stephenson Bridge	Concession 7	0.1 km East of Sideroad 20, over Penetangore River	12.2		44	$0	$494,000
2207	BR1367	Rectangular Culvert		Kincardine Avenue	150 m East of Park Street	3.66		44	$848,000	$0
2606		CSP Arch Culvert		Sideroad J/1	0.9 km South of Bruce Road 20	5.05		47	$0	$0
2616		Rectangular Culvert		Concession 8	1.1 km East of Highway 21	4.3		49	$0	$159,000
2103	BR062	Rectangular Culvert	Farrell Bridge	South Line	0.4 km East of Sideroad 10, over Penetangore River	12.2		50	$5,000	$0
2124		Rectangular Culvert		Concession 7	1.0 km West of Sideroad 30	5.3		50	$0	$0
2607	BR654	Rigid Frame, Vertical Legs	Pettigrew Bridge	Sideroad J/1	0.2 km South of Concession 2	9.6		53	$0	$0
2118	BR083	Rectangular Culvert		Concession 5	0.9 km East of Highway 21	2.7	1963	54	$0	$0
2138		Solid Slab	Evans Bridge	Victoria Street	1.9 km South of Bruce Road 15, over Tiverton Creek	6.7		56	$380,000	$0
2601	BR332	Rigid Frame, Vertical Legs		Albert Road	100 m South of Alma Street	9.15	1974	57	$278,000	$0
2120		Rigid Frame, Vertical Legs	Manner's Bridge	Sideroad 10	0.6 km North of North Line, over North Penetangore River	10.8		58	$0	$464,000
2122		Rectangular Culvert		Concession 5	0.6 km East of Sideroad 30	4.25		59	$0	$188,000
2618		CSP Round Culvert		Sideroad 20	0.7 km North of Concession 8	6		61	$0	$0
2135	BR1359	Rectangular Culvert		Concession 11	1.0 km West of Sideroad 5	3.05		62	$0	$0
2634		Rectangular Culvert		Bruce-Saugeen Townline	1.4 km East of Sideroad 20	5.2		64	$0	$0
2114	BR1039	Rectangular Culvert		Sideroad 15	1.0 km North of Highway 9	3.7		65	$0	$0
2202	BR544	Rigid Frame, Vertical Legs	Russel Street Bridge	Russel Street	0.2 km East of Olde Victoria Street	21.5	1962	65	$0	$0
2628		Rigid Frame, Vertical Legs		Concession 12	0.15 km West of Sideroad 10	11		65	$0	$0
2205		Rectangular Culvert	Broadway Street Culvert	Broadway Street	50 m East of Princes Street	5.5		66	$10,000	$0
2130		I-beam of Girders	Matheson Bridge	Concession 7	0.15 km West of Sideroad 10, over Kincardine Creek	7.3		67	$0	$0
2131	BR317	CSP Arch Culvert		Sideroad 10	0.15 km North of Concession 7, over Kincardine Creek	6.2	1976	68	$60,000	$0

Site Number	BMROSS Number	Structure Type	Structure Name	Road Name	Structure Location	Span Length (m)	Year Built	BCI	Probable Cost of 1-5 Year Recommended Work	Probable Cost of 6-10 Year Recommended Work
2129	BR130	I-beam of Girders	Armow Bridge	Sideroad 15	1.0 km South of Concession 7, over North Penetangore River	31.9	1966	70	$0	$0
2137	BR067	Rigid Frame, Vertical Legs	Collins Bridge	Upper Lorne Beach Road	0.5 km North of Lorne Beach Road, over Andrew Creek	9	1962	71	$0	$155,000
2201	BR236	I-beam of Girders	Queen Street Bridge (Floyd Wieck)	Queen Street	0.5 km North of St. Albert Street	74.7	1971	72	$0	$0
2204	BR355	I-beam of Girders	Durham Street Bridge-East Structure	Durham Street	150 m East of River Lane	49.9	1975	72	$178,000	$0
2620		Rigid Frame, Vertical Legs		Concession 10	1.8 km East of Sideroad 30	14.2		72	$0	$378,000
2622	BR203	Rigid Frame, Vertical Legs		Concession 10	0.3 km West of Sideroad 15	10.7	1968	72	$53,000	$0
2101		Rigid Frame, Vertical Legs	Owen Davey Bridge	Sideroad 5S	30m South of South Line, over the Penetangore River	15.1	1990	73	$0	$0
2105	BR116	Rectangular Culvert	Anderson Bridge	Sideroad 10	0.2 km South of Highway 9	6.12	1964	73	$0	$0
2604		Rectangular Culvert		Farrell Drive	0.5 km South of Bruce Road 20	3		73	$0	$0
2617		Rectangular Culvert		Concession 8	Intersection of Concession 8 and Sideroad 20	4.9		73	$0	$0
2115	BR432	I-beam of Girders	Thompson Bridge	North Line	1.1 km West of Sideroad 10, North Penetangore River	31.3	1982	74	$0	$393,000
2119	BR357	CSP Arch Culvert		Concession 5	0.3 km East of Sideroad 5, Over Kincardine Creek	8.1	1975	74	$15,000	$0
2627		Rectangular Culvert		Sideroad J/1	0.8 km South of Concession 12	3.05		74	$0	$0
2116		Rigid Frame, Vertical Legs	Munro Bridge	North Line	1.0 km East of Highway 21, over Kincardine Creek	11	1987	75	$145,000	$0
2609		Rectangular Culvert		Sideroad 25	0.75 km North of Bruce Road 20	9	1992	75	$0	$0
2613		Rectangular Culvert		Concession 8	0.9 km West of Sideroad J/1	6.1		75	$0	$0
2614		Rectangular Culvert		Concession 8	0.7 km West of Sideroad J/1	6.05		75	$0	$0
2631		CSP Arch Culvert		Glen Cumming Road	1.6 km North of Concession 12	5		75	$12,000	$0
2633		Rectangular Culvert		Bruce-Saugeen Townline	0.2 km East of Sideroad 20	4.3		75	$0	$0
2639		CSP Round Culvert		Farrell Drive	0.7 km South of Bruce Road 20	3.3		75	$0	$0
2106		Rigid Frame, Vertical Legs	Weir Sheane Bridge	Bervie Sideroad	50m South of Highway 9, Over the Penetangore River	9	1992	81	$0	$96,000
2102	BR835	I-beam of Girders	Stewart Bridge	Sideroad 10	0.2 km South of South Line	29.1	2006	95	$2,000	$0
2208	BR700	I-beam of Girders	Buttery Bridge	South Line	0.5 km East of Highway 21, over the Penetangore River	20	2001	95	$0	$0
2608		Rectangular Culvert		Concession 2	1.4 km East of Sideroad 20	6		95	$0	$0
2611		Rectangular Culvert		Concession 6	0.4 km East of Sideroad 30	9		98	$0	$0
2637	BR1121	CSP Round Culvert		Concession 10	0.1 km West of Sideroad 20	2.2	2014	98	$0	$0
2108		CSP Round Culvert		Huron-Kincardine Road	0.1 km West of Sideroad 30 South	3.3	2017	99	$0	$0
2126		Rectangular Culvert		Sideroad 20	0.8 km North of Concession 9	5.5		99	$5,000	$0
2140	BR1360	CSP Arch Culvert		Concession 11	675m West of Sideroad 5 North	3.65	2021	99	$0	$0
2109		CSP Round Culvert		Huron-Kincardine Rd	0.4 km East of Sideroad 30 South	3	2017	100	$0	$0
2112	BR1421	Rectangular Culvert		Bervie Sideroad	0.8 km North of Highway 9	5.18	2021	100	$0	$0
2203	BR817	CSP Round Culvert	Durham Street Culvert (West Structure)	Durham Street	50 m East of Olde Victoria Street	5.5	2004	100	$0	$0
2209		Rectangular Culvert		Bruce Avenue	115 m East of Princes Street	5	2020	100	$0	$0
2210	BR870	I-beam of Girders	Huron Terrace Bridge	Huron Terrace	50 m South of Harbour Street	60.4	2009	100	$0	$0

APPENDIX C

MAP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2641
BRUCE ROAD 33
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CONCESSION 10
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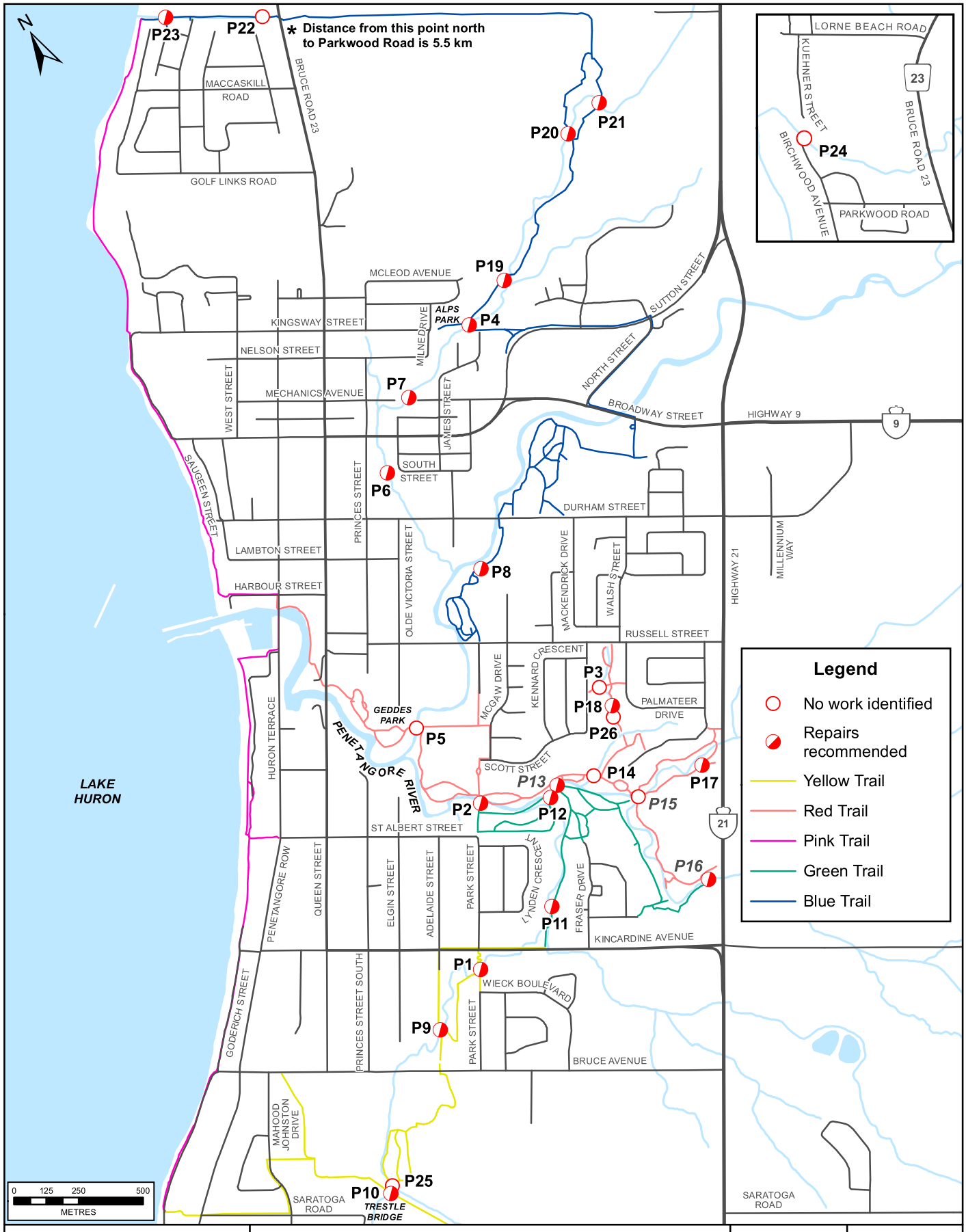
BRUCE ROAD 33
2618
2613
2614
2616
CONCES
SCOTTS POINT ROAD
2615
2617
SIDEROAD 15
33
UNDERWOOD
CONCESSION 6
SIDEROAD E F
SIDEROAD J 1
2609
FARRELL DRIVE
20
2604
BRUCE ROAD 20
2639
2606
TIE ROAD
2
CONCESSION 2
2602
2603
2607
2608
2601
JOHN STREET
BRUCE ROAD 1
15
INVERHURON
TIVERTON
Lake Huron
VICTORIA STREET
SIDEROAD 15 NORTH
2138
2135
2136
CONCESSION 11
BRUCE ROAD 23
2140
21
2134
2126
2133
2137
2132
CONCESSION 9
SIDEROAD 10
5 NORTH
2131
CONCESSION 7
2127
23
2130
ARMOW
2128
HIGHWAY 21
SIDEROAD
2129
2118
2119
2121
CONCESSION 5
2603
ALBERT ROAD
2602
ALMA STREET
2601



BMROSS engineering better communities

MUNICIPALITY OF KINCARDINE

BRIDGE NEEDS STUDY

PEDESTRIAN BRIDGE LOCATIONS

DATE	PROJECT No.
DEC. 2023	96038
SCALE	APPENDIX
1 : 20,000	C-2

APPENDIX D

PRIORITY SCORE TABLE

Priority Score Calculation Factors for Bridges

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

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

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)

When Traffic is Less than 200 AADT

Load Limit

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

Single Axle load limit assessed

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)

Probability of Failure:

BCI (Bridge Condition Index)

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

Risk = Consequence of Failure + Probability of Failure

Priority Score = Risk + Level of Service

Level of Service = Performance Grade + Probability of Failure

APPENDIX E

PEDESTRIAN BRIDGE INVENTORY SUMMARY BY SITE NUMBER

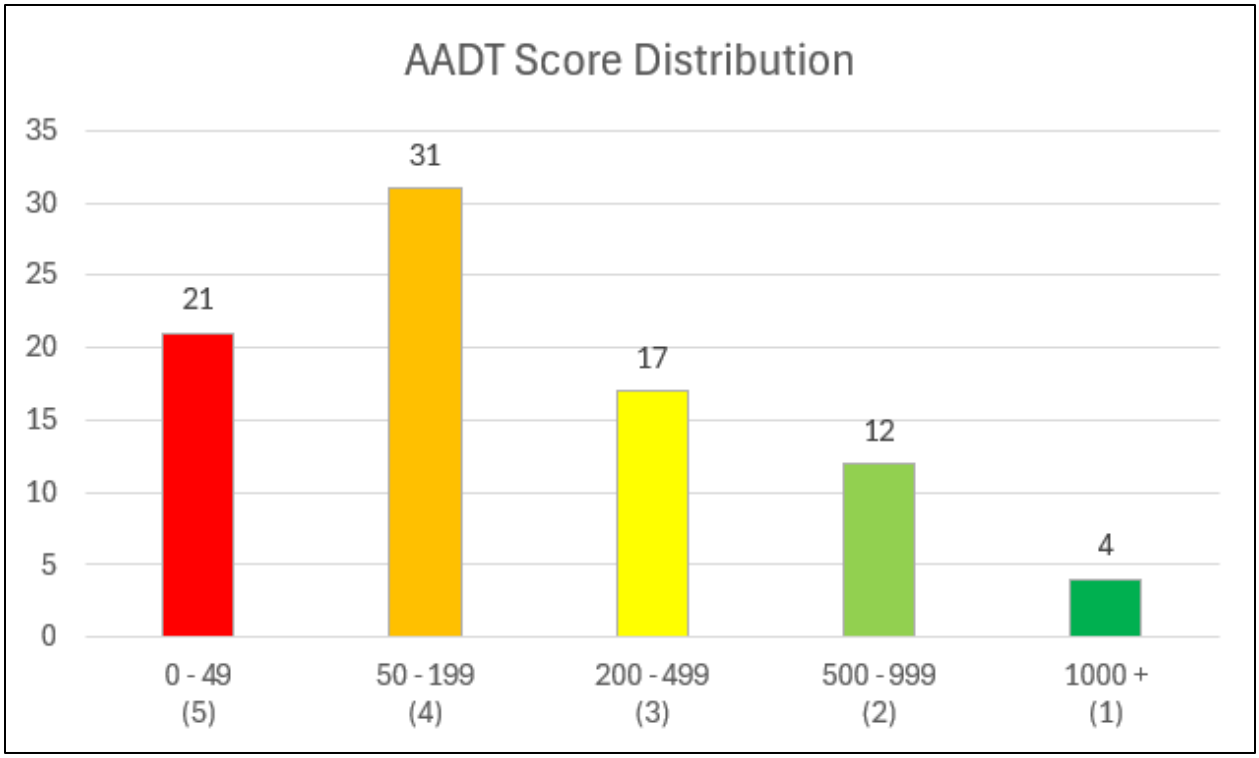
Site Number	BMROSS Number	Structure Type	Structure Name	Road Name	Structure Location	Span Length (m)	Year Built	BCI	Probable Cost of Recommended Work Within 1 Year	Probable Cost of 1-5 Year Recommended Work
P1	BR1083	Half-Through Truss	Stonehaven Pedestrian Bridge	Yellow Trail	South of Kincardine Ave	45	2014	93	$0	$5,000
P2	BR906	Half-Through Truss	South Penetangore Bridge	Green Trail	Between St. Albert St and Scott St	75.05	2012	87	$2,500	$0
P3		I-beam of Girders		Red Trail	Between Scott Street and Palmateer Drive (Helliwell Park)	11.8		71	$0	$0
P4		Round Culvert		Blue Trail	Alps Park	2.4	2020	98	$500	$0
P5	BR804	Half-Through Truss	North Penetangore Bridge	Red Trail	Geddes Park	40.4	2007	76	$0	$0
P6	BR1258	I-beam of Girders		Blue Trail	Between Princess St. and William St.	52.2		38	$130,000	$0
P7	BR789	I-beam of Girders		Blue Trail	Mechanics Avenue	11.6		75	$0	$10,000
P8		I-beam of Girders		Blue Trail	Between Russell St. and Durham St.	7.3		62	$0	$30,000
P9		I-beam of Girders		Yellow Trail	Between Bruce Ave. and Kincardine Ave.	10.3		72	$500	$0
P10		I-beam of Girders	Trestle Bridge	Yellow Trail	South of Bruce Ave.	11.36		39	$0	$10,000
P11		Box Beams of Girders		Green Trail	North of Kincardine Ave.	10		39	$0	$8,000
P12		Box Beams of Girders		Green Trail		7		4	$0	$25,000
P13		I-beam of Girders		Green Trail	Transition from Green to Red Trail	24.4		73	$500	$0
P14		I-beam of Girders		Red Trail		7.4		61	$0	$0
P15		I-beam of Girders		Red Trail		9.2		72	$0	$0
P16		I-beam of Girders		Red Trail	South End of Red Trail	15.25	2016	73	$1,000	$0
P17		I-beam of Girders		Red Trail	East End of Red Trail	4.98		27	$500	$0
P18		I-beam of Girders		Red Trail	North End of Red Trail	7		51	$1,000	$0
P19		I-beam of Girders		Blue Trail	89-North Line Extension	4.87		68	$0	$2,000
P20		Box Beams of Girders		Blue Trail	84-North Line Extension	11.2		27	$2,000	$18,000
P21		Box Beams of Girders		Blue Trail	95-North Line Extension	8		28	$0	$25,000
P22		Box Beams of Girders		Blue Trail	West of Road 23	4.9		60	$0	$0
P23		Box Beams of Girders		Blue Trail	West End of Blue Trail	7.8		28	$0	$20,000
P24		Half-Through Truss		Birchwood Ave. Trail	North end of Birchwood Ave	36.5		74	$0	$0
P25		I-beam of Girders		Yellow Trail	South of Bruce Ave.	4.4		65	$0	$0
P26		I-beam of Girders		Red Trail	North End of Red Trail	7		50	$0	$0

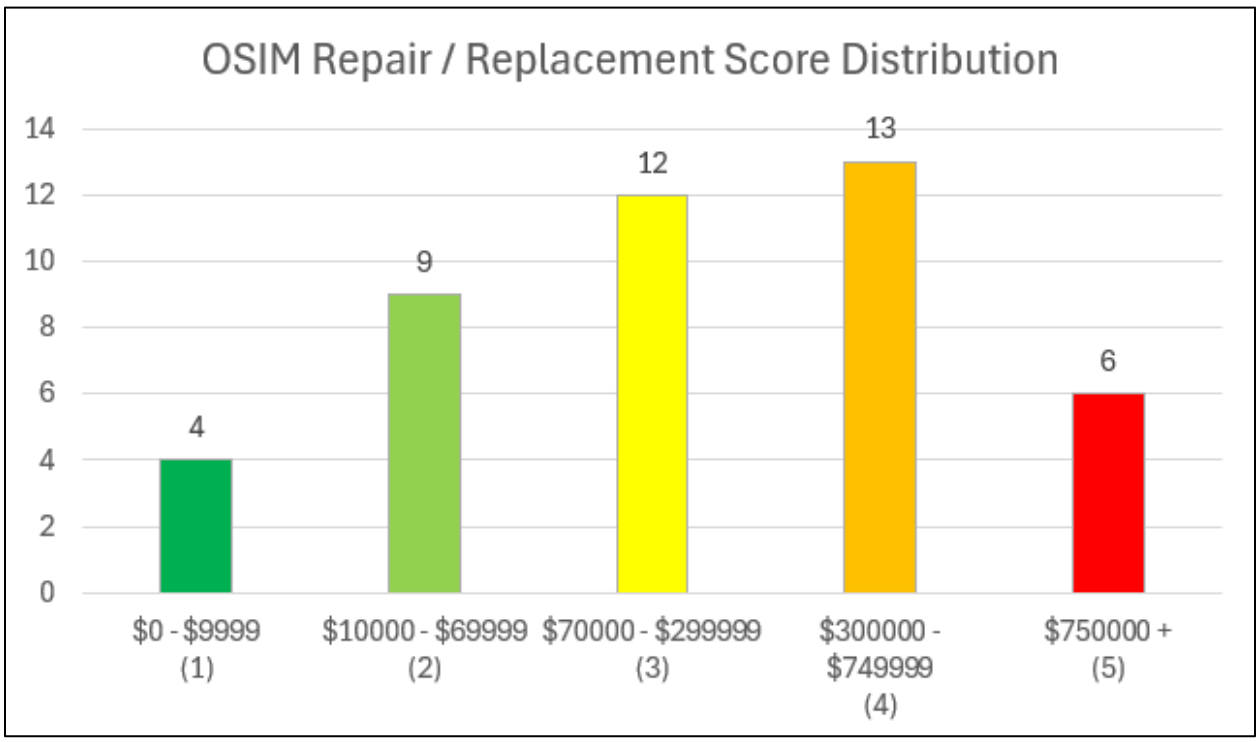
Appendix B Bridge Scoring Data

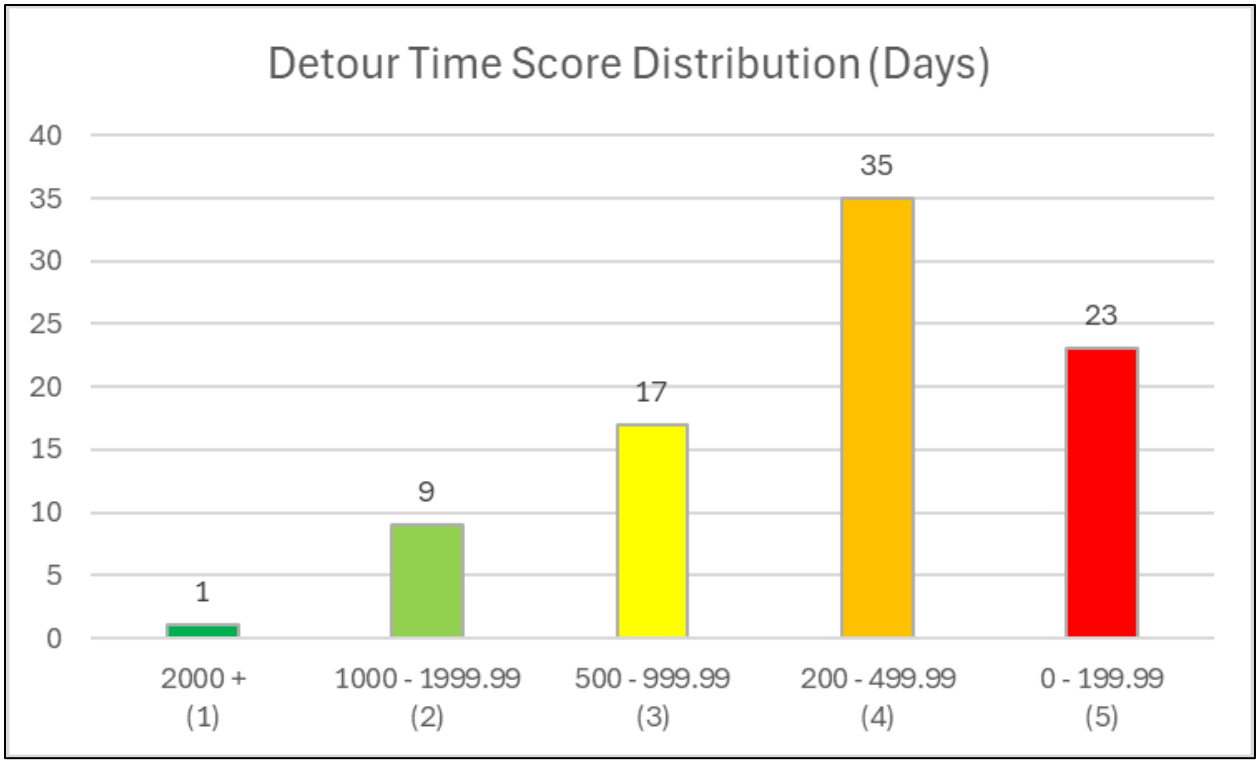
Bridge ID	Short Term Score	Long Term Score	AADT Score	Repair Cost Score	Detour Score	Age Score	CRV Score
2128	100	75	5	5	5	4	4
2136	93	74	5	4	5	5	2
2610	93	74	5	4	5	4	3
2621	87	74	5	3	5	5	2
2134	87	74	5	3	5	5	2
2102	73	74	5	1	5	2	5
2101	73	74	5	1	5	3	4
2641	73	74	5	1	5	5	2
2602	73	74	5	1	5	5	2
2615	73	74	5	1	5	5	2
2140	73	74	5	1	5	5	2
2131	80	73	5	2	5	3	3
2629	80	73	5	2	5	3	3
2609	73	73	5	1	5	3	3
2632	73	73	5	1	5	4	2
2107	73	73	5	1	5	4	2
2627	73	73	5	1	5	4	2
2631	80	72	5	2	5	3	2
2108	73	71	5	1	5	2	2
2109	73	71	5	1	5	2	2
2639	67	67	4	1	5	5	2
2604	67	65	4	1	5	3	2
2132	80	61	4	4	4	5	3
2620	80	61	4	4	4	4	4
2120	80	60	4	4	4	4	3
2638	80	60	4	4	4	5	2
2133	73	60	4	3	4	5	2
2137	73	60	4	3	4	4	3
2619	73	60	4	3	4	3	4
2106	73	60	4	3	4	3	4
2622	67	60	4	2	4	4	3
2113	60	60	4	1	4	5	2
2105	60	60	4	1	4	4	3
2613	60	60	4	1	4	4	3
2104	80	59	4	4	4	4	2
2110	80	59	4	4	4	4	2
2138	80	59	4	4	4	4	2
2123	73	59	4	3	4	4	2
2611	60	59	4	1	4	3	3
2614	60	59	4	1	4	4	2
2617	60	59	4	1	4	3	3
2135	60	59	4	1	4	4	2

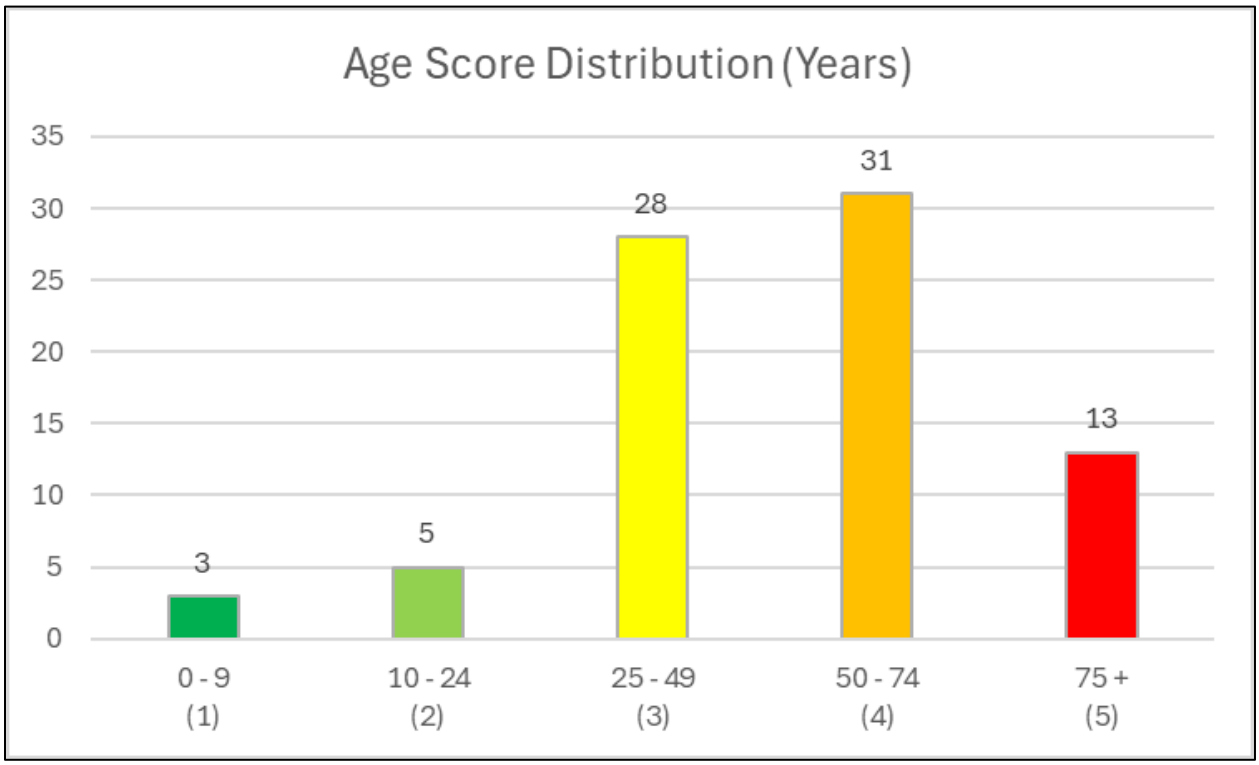
2624	87	58	4	5	4	3	2
2630	87	58	4	5	4	3	2
2623	80	58	4	4	4	3	2
2616	73	58	4	3	4	3	2
2625	67	58	4	2	4	3	2
2626	67	58	4	2	4	3	2
2126	60	58	4	1	4	3	2
2618	60	58	4	1	4	2	3
2637	60	57	4	1	4	2	2
2115	73	55	3	4	4	3	5
2103	53	53	3	1	4	3	3
2208	53	53	3	1	4	2	4
2129	47	49	3	1	3	4	5
2127	67	48	3	4	3	4	4
2210	47	47	2	1	4	2	5
2628	47	47	3	1	3	4	3
2111	67	46	3	4	3	4	2
2116	60	46	3	3	3	3	3
2119	53	46	3	2	3	3	3
2130	47	46	3	1	3	3	3
2203	47	46	2	1	4	2	4
2112	47	46	3	1	3	4	2
2114	47	46	3	1	3	4	2
2122	60	45	3	3	3	3	2
2124	47	45	3	1	3	3	2
2608	47	45	3	1	3	3	2
2118	47	45	3	1	3	3	2
2202	40	42	2	1	3	4	5
2121	67	41	3	5	2	4	4
2204	53	41	2	3	3	3	5
2205	47	40	1	2	4	3	4
2209	40	38	2	1	3	2	3
2603	60	34	2	5	2	4	3
2601	47	34	2	3	2	4	3
2640	33	34	2	1	2	5	2
2207	60	33	1	5	3	4	2
2607	33	33	2	1	2	3	3
2606	33	33	2	1	2	4	2
2633	33	32	2	1	2	3	2
2634	33	32	2	1	2	3	2
2206	27	29	1	1	2	4	5
2201	20	22	1	1	1	4	5
2117	0	0	5	2	5	4	2

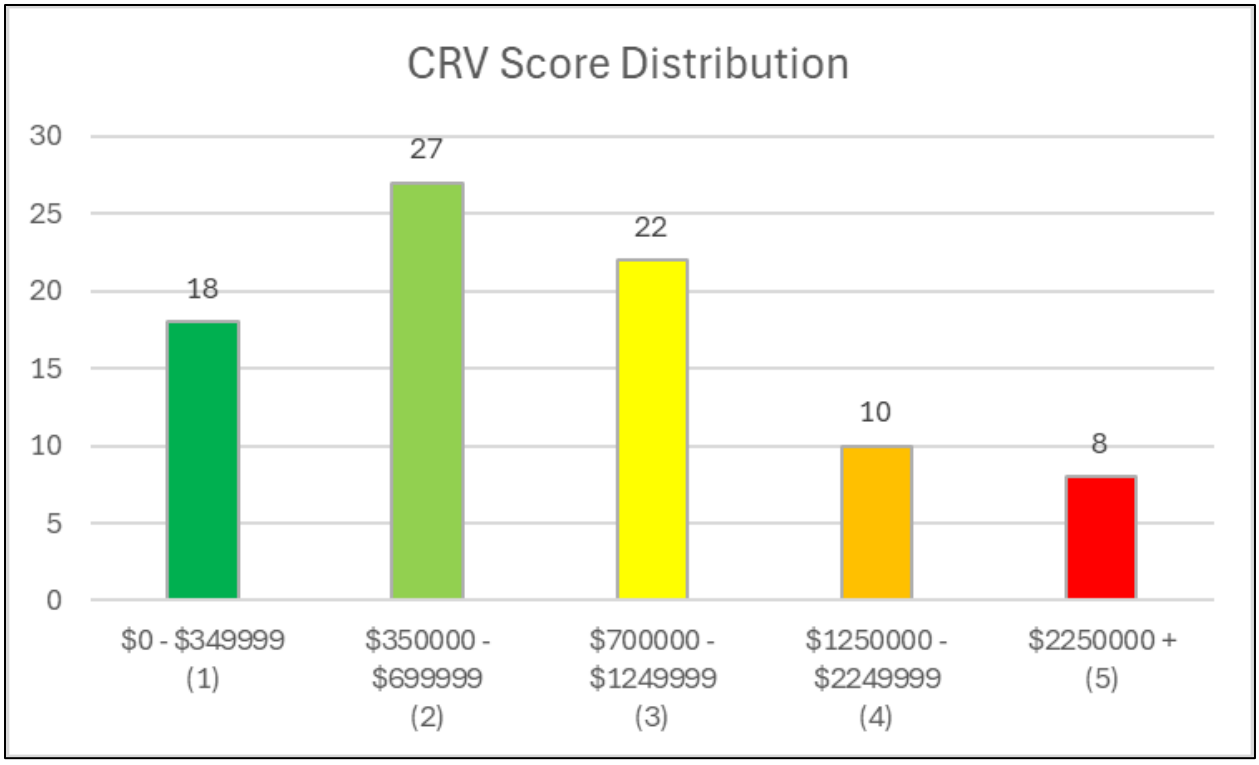
Appendix C Bridge Scoring Distribution


AADT Score Distribution
35
30
25
20
15
10
5
0
21
31
17
12
4
0 - 49
(5)
50 - 199
(4)
200 - 499
(3)
500 - 999
(2)
1000 +
(1)


OSIM Repair / Replacement Score Distribution
14
12
10
8
6
4
2
0
4
9
12
13
6
$0 - $9999
(1)
$10000 - $69999
(2)
$70000 - $299999
(3)
$300000 - $749999
(4)
$750000 +
(5)


Detour Time Score Distribution (Days)
40
35
30
25
20
15
10
5
0
1
9
17
35
23
2000 +
(1)
1000 - 1999.99
(2)
500 - 999.99
(3)
200 - 499.99
(4)
0 - 199.99
(5)


Age Score Distribution (Years)
35
30
25
20
15
10
5
0
3
5
28
31
13
0 - 9
(1)
10 - 24
(2)
25 - 49
(3)
50 - 74
(4)
75 +
(5)


CRV Score Distribution
30
25
20
15
10
5
0
18
27
22
10
8
$0 - $349999 (1)
$350000 - $699999 (2)
$700000 - $1249999 (3)
$1250000 - $2249999 (4)
$2250000 + (5)

Appendix D Criteria for Evaluating Potential for Cultural Heritage Resources

Municipal Bridges
Criteria for Evaluating Potential for Cultural Heritage Resources
(revised April 27, 2023)

This checklist was prepared by the Municipal Engineers Association in consultation with the Ministry of Heritage, Sport, Tourism and Culture Industries (MCM) to assist with undertaking cultural heritage due diligence as per the requirements of the Municipal Class Environmental Assessment.

Project Name:

Location:

Municipality:

Project Engineer:

Checklist completed by:

Date:

NOTE: Complete all sections of Checklist. Both Built Heritage Resources/Cultural Heritage Landscapes (B) and Archaeological (C) Sections must be satisfied before proceeding.

Questions apply to the entire study area including temporary storage or work areas as well as temporary roads/detours, except as otherwise stated.

Please have the following available, when requesting information related to the screening questions below:
• a clear map showing the location and boundary of the property or project area
• large scale and small scale showing nearby township names for context purposes
• the municipal addresses of all properties within the project area
• the lot(s), concession(s), and parcel number(s) of all properties within a project area
Answer each question in succession and follow the instructions in blue. Continue until all questions are answered or a definitive conclusion is reached.

Refer to the Appendix for additional details and resources to assist in answering select questions.

Font Colour
Green – MEA's Advice
Blue - Instructions

PART A – MUNICIPAL CLASS EA ACTIVITY SELECTION

Which of the following describes the proposed project?	MCEA Schedule	Selection
1. Normal or emergency operation and maintenance of linear paved facilities, cycling lanes/facilities & multi-purpose paths, sidewalks, parking lots and related facilities located within or outside existing rights- of-way • *Related facilities include bridges.* **Maintenance** means work that extends the life of the structure or keeps the structure safe for intended use. **Repairs** means work that fixes or replaces components of the structure to return the structure to its original condition	Schedule A Complete Part C of this checklist to determine whether an archaeological assessment is required.	☐
24a Retirement of existing roads and road related facilities. • *Related facilities include bridges* • *Proponents should consider cultural heritage value in accordance with MEA's Municipal Heritage Bridge Checklist developed with the Ministry of Citizenship and Multiculturalism (MCM) and posted on the MEA website. Completion of the checklist does not mean approval or permission from MCM to remove a bridge with potential heritage value* **RETIREMENT** Means the taking out of operation, abandonment, removal, demolition or disposal of a road, bridge, sewage, stormwater management or water facility for which approval under the EAA would have been necessary for its	Exempt – Schedule A+ Complete Parts B of this checklist if the bridge is > 40 years old and C of this checklist if the project involves excavation activities to determine whether any technical cultural heritage studies are required prior to removal of the bridge	☐

establishment and includes sale, lease, or other transfer of the facility for purposes of taking out of operation, abandonment, removal, demolition or disposal.		
25b Construction or removal of sidewalks, multi-purpose paths or cycling facilities including water crossings outside existing right-of-way and/or in a utility or rail corridor	Schedule A+ if <$4.1m Schedule B if >$4.1m Schedule C if >$12m *This clause does not include qualifiers such as property requirements or proximity to sensitive features. Instead cost of project triggers classification*	☐
30. Reconstruction of a water crossing where the reconstructed facility will be for the same purpose, use, capacity and at the same location • Capacity refers to either hydraulic or road capacity but does not include alterations to include or remove facilities for cycling, pedestrians or to support utilities • This includes ferry docks **BRIDGE CAPACITY** Means the number of through travel lanes for vehicles on the bridge. Adjusting lane width to current standards that do not increase the number of travel lanes and cycling, parking or turning lanes are not through travel lanes. Increasing the width of a narrow bridge (one lane with two way traffic) to the current standard to accommodate two way traffic (two lane) is not considered an increase in capacity. **OPERATION** Means use, maintenance, repair, and management of a municipal facility where the purpose, use, capacity and location remain the same. Same purpose, use, capacity and location refers to the replacement or upgrading of a structure or facility or its	Item 30 applies to bridges <40 yrs old. Exempt – Schedule A+ If the project involves excavation, complete Part C of this checklist to determine whether an archaeological assessment is required. *Hydraulic capacity of a bridge is controlled by the openings between abutment walls and piers. The bridge elevation needs to be set a minimum clearance above high-water elevations. Further adjusting the elevation of the bridge to match road grades will not change the hydraulic characteristics. However, if the hydraulic capacity of the bridge is part of the flood control system for the water course and the openings between abutment walls and priers is changing then item 63 "Modify existing water crossings for the purposes of flood control" from the Water/Wastewater table applies and the project is Schedule B.* ***Substantial Change -** Within the existing road allowance or utility corridor, a substantial change could be considered a change of more than approximately >10%.*	☐

performance, where the objective and application remain unchanged, and the volume, size and capability do not exceed the minimum municipal standard (defined above), or the existing rated capacity (defined above), and there is no substantial change in location	*For example, a road allowance 20m wide and 1 km long has an area of 20,000 m^2 and a change of < 2000m^2 would be <10%* ***Property Acquisition** – No EA process is required for property purchase. If the proponent acquires property through separate process (negotiation with owner or planning policies for minimum width of road allowances) such that the proponent owns the property required for a project before the Notice of Completion then no property acquisition is required for the project. For many project types, this could mean the project would be classified as Schedule A or A+ (exempt). If there is dispute about the property acquisition then a Schedule B process should be followed to support the acquisition (expropriation).* ***Utility Corridor** – A utility corridor may include property that is non-linear, for example a rectangular area for a Stormwater Management Pond.*	
31a Reconstruction of, or alteration to a structure or the grading adjacent to it, when the structure is over 40 years old and has been found not to have cultural heritage value or interest *To determine whether a bridge has "cultural heritage value" refer to the MEA's municipal heritage bridge checklist developed with the Ministry of Citizenship and Multiculturalism and posted on the MEA website*	Item 31 applies to bridges >40 yrs old. Exempt – Schedule A+ Complete Parts B and C of this checklist to determine whether any technical cultural heritage studies are required.	☐

31b Reconstruction of, or alteration to a structure or the grading adjacent to it when the structure is over 40 years old, the structure is found to have cultural heritage value or interest, and the heritage attributes will be conserved in accordance with the recommendations of a Heritage Impact Assessment *To determine whether a bridge has "cultural heritage value", refer to the MEA's municipal heritage bridge checklist developed with the Ministry of Citizenship and Multiculturalism and posted on the MEA website*	Exempt - Schedule A+ after completing Archaeological Screening Process (ASP) and provided the heritage attributes will be conserved in accordance with the recommendations of a Heritage Impact Assessment Complete Parts B and C of this checklist to determine whether any technical cultural heritage studies are required.	☐
31c Reconstruction of, or alteration to a structure or the grading adjacent to it, when the structure is over 40 years old the structure is found to have cultural heritage value or interest, but heritage attributes will not be conserved in accordance with the recommendations of a Heritage Impact Assessment *To determine whether a bridge has "cultural heritage value", refer to the MEA's municipal heritage bridge checklist developed with the Ministry of Citizenship and Multiculturalism and posted on the MEA website*	Schedule B Proponents should always strive to conserve/recognize cultural heritage attributes.	☐
32a. Construction of underpasses or overpasses for pedestrian, cycling, recreational or agricultural use	Schedule A+ if <$3.0m No qualifiers	☐

32b Construction of underpasses or overpasses for pedestrian, cycling, recreational or agricultural use, and where the underpass or overpass would not be located in or adjacent to an environmentally sensitive natural area, potential built heritage resource or cultural heritage landscape or other sensitive land use, or on lands with archaeological potential • *To determine whether there is "archaeological potential" refer to MCM's Criteria for Evaluating Archaeological Potential checklist* *Refer to new definition of "environmentally sensitive natural area" in the Glossary*	Applies to projects >$3M Schedule A+ after completing Archaeological Screening Process (ASP). Otherwise Schedule B **A1-2 Archaeological Screening Process (ASP)** The projects that are identified as eligible for screening, subject to the archaeological screening process (identified as "ASP") may be exempt from the requirements of the EAA as determined by the archaeological screening process set out below. In order to proceed with a project that is identified as eligible for screening, a proponent must either; (i) carry out the process for a Schedule B/C project; or (ii) complete the archaeological screening process and follow the directions set out in the screening process. If the outcome of the screening process is that the project is exempt from the requirements of the EAA, the proponent may proceed with the undertaking/project without further application of the EAA to the project	☐
32c Construction of underpasses or overpasses for pedestrian, cycling, recreational or agricultural use, and where the underpass or overpass would be located in or adjacent to an environmentally sensitive natural area, potential built heritage resource or cultural heritage landscape or other sensitive land use, or on lands with archaeological potential • *To determine whether there is "archaeological potential" refer to MCM's*	Applies to projects >$3M Schedule B	☐

Criteria for Evaluating Archaeological Potential checklist *Refer to new definition for "environmentally sensitive natural area" in the Glossary*		
35 Reconstruction of a water crossing where the reconstructed facility will not be for the same purpose, use, capacity or at the same location • *Capacity refers to either hydraulic or road capacity but does not include alterations to include or remove facilities for cycling, pedestrians or to support utilities* • *This includes ferry docks*	Schedule B Applies to all bridges with an increase to travel lanes.	☐
36a Reconstruction of, or alteration to a structure or the grading adjacent to it when the structure is over 40 years old and has cultural heritage value or interest and the heritage attributes will **not be** conserved in accordance with the recommendations of a Heritage Impact Assessment • *To determine whether a bridge has "cultural heritage value", refer to the MEA's municipal heritage bridge checklist developed with the Ministry of Citizenship and Multiculturalism and posted on the MEA website*	Schedule B Proponents should always strive to conserve/recognize cultural heritage attributes	☐
36b Reconstruction of, or alteration to a structure or the grading adjacent to it when the structure is over 40 years old and is not found to have cultural heritage value or interest or is found to have cultural heritage value or interest but the heritage attributes will be conserved in accordance with the recommendations of a Heritage Impact Assessment • *To determine whether a bridge has "cultural heritage value", refer to the MEA's municipal heritage bridge checklist developed with the Ministry*	Schedule B The heading for this group of projects is "RECOONSTNRUCTION OF BRIDGES WITH INCREASE TO TRAVEL LANES". The increase to travel lanes triggers Schedule B	☐

of Citizenship and Multiculturalism and posted on the MEA website		
37. Construction of new water crossings • This includes ferry docks • This does not apply to culverts. See Projects # 8 and 20.	Schedule B	☐
38. Construction of new grade separations and interchanges	Schedule B	☐

PART B – SCREENING FOR BUILT HERITAGE RESOURCES AND CULTURAL HERITAGE LANDSCAPES

If you are not sure how to answer one or more of the questions on the checklist, you may want to hire a qualified person to undertake technical cultural heritage studies as identified at the end of Part B.

Screening Questions	**Response**	
Part B1: Screening for Recognized Cultural Heritage Value or Interest		
1. Is the proposed undertaking consistent with an approved conservation plan, if one exists?	Yes ☐	No ☐
If you answered **YES**, then it is not necessary to complete the remaining questions in the checklist. The proponent will include this information in the project file and follow the recommendations of the conservation plan during project planning and implementation.		
If you answered **NO**, continue to question 2.		
2. Has the bridge and the study area been evaluated before and found not be of cultural heritage value or interest (CHVI)?	Yes ☐	No ☐
If you answered **YES**, it is not necessary to complete the remaining questions in the Part B. The proponent will summarize the previous evaluation and add this checklist to the project file, with appropriate documentation demonstrating that a cultural heritage evaluation was undertaken. Proceed to Part C: Screening for Archaeological Resources.		
If you answered **NO**, continue to question 3.		
3. Is the bridge, or a parcel of land in the study area:		
a. designated under the *Ontario Heritage Act*?	Yes ☐	No ☐

b. subject to an agreement, covenant or easement entered into under Parts II or IV of the *Ontario Heritage Act?*	Yes ☐	No ☐
c. included on a register or inventory of heritage properties maintained by the municipality?	Yes ☐	No ☐
d. subject to a notice of • intention to designate (under Part IV of the *Ontario Heritage Act)*? • a Heritage Conservation District study area by-law (under Part V of the *Ontario Heritage Act*)?	Yes ☐	No ☐
e. included in MCM's list of provincial heritage properties?	Yes ☐	No ☐
f. designated under the *Heritage Railway Stations Protection Act*?	Yes ☐	No ☐
g. designated under the *Heritage Lighthouse Protection Act*?	Yes ☐	No ☐
h. identified as a Federal Heritage Building by Federal Heritage Buildings Review Office?	Yes ☐	No ☐
i. a National Historic Site or part of one?	Yes ☐	No ☐
j. located within a United Nations Educational, Scientific and Cultural Organization (UNESCO) World Heritage Site?	Yes ☐	No ☐
If you answered **YES** to any of the questions 3a through 3h, a Heritage Impact Assessment is necessary. Proceed to Part C.		
If you answered **YES** to either of questions 3i or 3j, follow the direction in the conservation and management documents for the National Historic Site or UNESCO World Heritage Site. Proceed to Part C.		
If you answered **NO** to all of the above questions, continue to Part B2		

Part B2: Screening for potential Cultural Heritage Value or Interest		
4. Will the proposed project involve a bridge structure that was: a) constructed less than 40 years ago?	Yes ☐	No ☐
b) constructed after 1956 with a plain concrete substructure, and the superstructure construction is with common steel and/or concrete products involving one of the following four bridge types? - Rigid Frame - Precast Girders with Concrete Deck	Yes ☐	No ☐

- Culvert or Simple Span - Steel Girders/Concrete Deck		
If you answered **YES** to 4 (a) or (b), continue this Part.		
If you answered **NO** to both 4 (a) and (b), the bridge has potential CHVI. Proceed to Part B3 to screen for potential impacts.		
5. Will the project involve replacement of a bridge's substructure, or any alteration of adjacent lands?	Yes ☐	No ☐
If you answered **YES**, continue this Part to screen for potential CHVI of the property/location.		
If you answered **NO**, proceed to Part C.		

6. Is the bridge or project area described by an on-site municipal, provincial or federal commemorative or interpretive plaque?	Yes ☐	No ☐
7. Does the project area contain a parcel of land that has or is adjacent to a known burial site or cemetery?	Yes ☐	No ☐
8. Does the proposed project involve a crossing of a Canadian Heritage River?	Yes ☐	No ☐
9. Is there local or Indigenous knowledge or accessible documentation suggesting that the property (or project area) is situated on a parcel of land that:		
a. Is considered a landmark in the local community or contains any structures or sites that are important in defining the character of the area? (For example: buildings or landscape features accessible to the public or readily noticeable and widely known, complexes of buildings, monuments, ruins)	Yes ☐	No ☐
b. Has a special association with a community, person or historical event? (For example: Indigenous sacred site, traditional-use area, battlefield, birthplace of an individual of importance to the community, etc.)	Yes ☐	No ☐
c. Contains or is part of a cultural heritage landscape (for example, an Indigenous trail, historic road or rail corridor, park, designed garden, unique landform, or any other area in which multiple features are valued together for their interrelationship, meaning or association)?	Yes ☐	No ☐
If you answered **YES** to one or more of questions 6, 7, 8 or 9, there is potential for built heritage resources and/or cultural heritage landscapes in the study area. Continue to Part B3 to screen for potential impacts.		
If you answered **NO**, there is a low potential for built heritage resources and/or cultural heritage landscapes to be impacted. Proceed to Part C.		

B3 Screening for potential Cultural Heritage Impacts to the Bridge Structure		
10. a) Will the proposed project leave the substructure of the bridge unchanged?	Yes ☐	No ☐
b) Is the substructure of the bridge constructed with plain concrete with no untypical elements?	Yes ☐	No ☐
If you answered **YES** to either 10 (a) or (b), proceed to question 11.		
If you answered **NO** to both 10 (a) and (b), there is potential for cultural heritage impacts on the bridge structure. You need to hire a qualified person(s) to undertake a CHER for the existing bridge area. Continue to Part C.		
11. a) Is the superstructure of the bridge constructed with common steel and/or concrete products involving one of the following four bridge types? - Rigid Frame - Precast with Concrete Deck - Culvert or Simple Span - Steel Girders/Concrete Deck	Yes ☐	No ☐
b) Will the finished product replicate the existing superstructure?	Yes ☐	No ☐
If you answered **YES** to **both** 11 (a) and (b), continue to 12.		
If you answered **NO** to **either** 11 (a) or (b), there is potential for cultural heritage impacts on the bridge structure. You need to hire a qualified person(s) to undertake a CHER for the existing bridge area. Proceed to Part C.		
12. a) Is work proposed on the parapet walls/railings of the bridge?	Yes ☐	No ☐
b) If YES to (a), are the parapet walls/railings contain materials other than plain concrete and steel, or any untypical elements?	Yes ☐	No ☐
If you answered **YES** to both 12 (a) and (b), continue to question 12 (c).		
If you answered **NO** to either 12 (a) or (b), there is low potential for cultural heritage impacts on the bridge structure. Proceed to Part C.		
c) Is the purpose of the work being done on the parapet walls/railings to upgrade them to meet current crash test standards?	Yes ☐	No ☐
If you answered **YES**, proceed with reconstructing the parapet walls/railings to a **sympathetic design**; see guidance in the Appendix. Hire a qualified person(s) to undertake a CHER if this is not practicable. Proceed to Part C.		
If you answered **NO**, there is potential for cultural heritage impacts on the bridge structure. You need to hire a qualified person(s) to undertake a CHER for the existing bridge area. Continue to Part C: Screening for Archaeological Resources.		

PART C – SCREENING FOR ARCHAEOLOGICAL RESOURCES

If you are not sure how to answer one or more of the questions on the checklist, you may want to hire a licensed archaeologist to undertake an archaeological assessment. See description of this process in the Appendix.

Screening Questions	**Response**	
1. Will the proposed project involve disturbance to the bed of a waterbody, including a river or creek?	Yes ☐	No ☐
If you answered **YES**, complete MCM's *Criteria for Evaluating Marine Archaeological Potential* to determine whether it is necessary to complete a marine archaeological assessment. Continue with this Part to determine whether it is necessary to complete a terrestrial archaeological assessment.		
If you answered **NO**, continue to 2.		
2. Has an archaeological assessment been prepared for this proposed study area that recommends that there are no further concerns about impacts and that has been entered into the Ontario Public Register of Archaeological Reports maintained by MCM?	Yes ☐	No ☐
If you answered **YES**, then it is not necessary to complete the remaining questions in the checklist. The proponent will summarize this conclusion and include this checklist with the appropriate documentation (e.g. MCM letter indicating that the report has been entered into the Register) to the project file. The summary and appropriate documentation will be maintained by the proponent.		
If you answered **NO**, continue to question 3.		
3. Are there known archaeological sites within 300 metres of the proposed project?	Yes ☐	No ☐
If you answered **YES**, an archaeological assessment is required. It is not necessary to complete the remaining questions in the checklist		
If you answered **NO**, continue to question 4. Include the information used to answer question 3 (e.g. a response from MCM or the municipality to an inquiry on this topic) with EA documentation.		
4. Will the proposed project, decision or activity result in significant ground disturbance?	Yes ☐	No ☐
If you answered **YES**, continue to question 5. Documentation to support an answer of YES is not required.		
If you answered **NO**, an archaeological assessment is NOT required and it is not necessary to fill out the remainder of the checklist. The proponent will summarize this conclusion and include appropriate documentation demonstrating that no ground disturbance will take place to the project file.		
5. Have all areas to be impacted by ground disturbing activities been subjected to recent extensive and intensive disturbances and to depths greater than the depths of the proposed activities?	Yes ☐	No ☐
If you answered **YES**, an archaeological assessment is NOT required. The checklist and any supporting documentation demonstrating that no activities will go deeper than past ground disturbances or will occur in previously undisturbed lands is to be included in the summary.		
If you answered **NO**, then there is potential for archaeological resources and an archaeological assessment is required.		

Appendix: Additional instructions, information sources, and definitions to assist in answering checklist questions

Part A	
1	**Maintenance** means work that extends the life of the structure or keeps the structure safe for intended use. **Repairs** means work that fixes or replaces components of the structure to return the structure to its original condition.
2	**Rehabilitation** means a modification, alteration, or improvement of the condition of a structure or bridge subsystem that is designed to correct deficiencies in order to achieve a particular design life and live load level. **Vehicle capacity** means the number of through travel lanes for vehicles on the bridge. Adjusting lane width to current standards does not increase the number of travel lanes and cycling, parking, or turning lanes are not through travel lanes. Increasing the width of a narrow bridge (one lane with two-way traffic) to the current standard to accommodate two-way traffic (two lane) is not considered an increase in capacity.
Part B	
1	Municipal heritage staff and municipal heritage committees can help determine whether an approved conservation plan, or previous cultural heritage evaluation, exist.
2	A previous evaluation might have been carried out by: • A heritage consultant, in a CHER prepared for a previous consultant/applicant • The Municipal Heritage Committee, in considering the property for inclusion on the municipality's Heritage Register • The municipality, in a Bridge Infrastructure Master Plan Evaluations should use the criteria in Ontario Regulation 9/06. Re-evaluation is necessary if new information is available or there is evidence that heritage attributes have changed.
3	Where to find information: a) For OHA-designated properties contact the municipal clerk, or search the Ontario Heritage Trust (OHT) Register at https://www.heritagetrust.on.ca/en/pages/tools/ontario-heritage-act-register b) - For municipal easements, contact the municipal clerk - For OHT easements, contact the OHT Provincial Heritage Registrar at registrar@heritagetrust.on.ca or see https://www.heritagetrust.on.ca/en/property-types/easement-properties - Easements can also be identified through thelocal land registry (title search) c) For listed or inventoried properties, contact the municipal clerk or heritage staff

	d) For properties subject to a notice of intention to designate or notice of Heritage Conservation District Study, contact the municipal clerk or heritage staff e) For provincial heritage properties, contact the MCM Registrar at registrar@ontario.ca f) For all federal designations, search the Directory of Federal Heritage Designations at https://www.pc.gc.ca/apps/dfhd/default_eng.aspx g) See (f) above h) See (f) above i) See (f) above j) For UNESCO World Heritage Sites see the UNESCO website: http://whc.unesco.org/en/statesparties/CA (note: as of 2020, Ontario's only UNESCO World Heritage Sites are the Rideau Canal and Pimachiowin Aki)
6	Plaque locations can be found from the following sources: • Municipal heritage committees or local heritage organizations • Ontario Heritage Trust: https://www.heritagetrust.on.ca/en/online-plaque-guide • Historic Sites and Monuments Board of Canada: http://www.pc.gc.ca/apps/dfhd/default_eng.aspx
7	Cemeteries can be located through the Bereavement Authority of Ontario's Public Register of licensed cemeteries: https://licensees.bereavementauthorityontario.ca/public-register If cemetery limits are unclear, an Investigation Authorization issued by the Bereavement Authority of Ontario may be required. In this context, adjacent means contiguous or as otherwise defined in a municipal official plan.
8	A list of the Canadian Heritage Rivers in Ontario can be found at http://chrs.ca/the-rivers-ontario/.
9	For information, contact: • Elders in Indigenous Communities or community researchers who may have information on potential cultural heritage resources. Please note that Indigenous traditional knowledge may be considered sensitive. • municipal heritage committees or local heritage organizations • Ontario Historical Society's "Heritage Directory" - for a list of historical societies and heritage organizations in the province: https://ontariohistoricalsociety.ca/directory-and-map/ Information specific to trails may be obtained through Ontario Trails at https://www.ontariotrails.on.ca/index.php?url=trails
10 11 12	If the checklist indicates the need to hire a qualified person to undertake a Cultural Heritage Evaluation Report (CHER), do this during the EA study and follow its recommendations, which may include completing a Heritage Impact Assessment (HIA) if the structure or property is found to have cultural heritage value or interest (CHVI) and may be impacted by the project. Both the CHER and the HIA should be included in EA documentation and inform the decision-making in the EA process.

12 (c)	To develop a **sympathetic design** for railings, the proponent should first consider retaining the existing railing. If the existing railing is tall enough for pedestrian safety, consider providing a new barrier wall between road and sidewalk if adequate space and bridge capacity is available, and snow clearing operations can continue. If inadequate space and structural capacity exists, or snow clearing cannot be accommodated, or pedestrian Ontario Building Code (OBC) safety requirements are not met, then the existing railings should be removed and replaced with a new Canadian Highway Bridge Design Code- and OBC- (if applicable) compliant barrier with a design that, as much as possible, uses the same materials and elements (e.g. vertical steel posts) as the original railing.
Part C	
If this Part indicates the need for an archaeological assessment, you will need to hire an archaeologist licensed under the Ontario Heritage Act. This licensee will follow the archaeological assessment process laid out in the *Standards and Guidelines for Consultant Archaeologists* and submit archaeological assessment reports directly to MCM for technical review. Archaeological assessment follows a phased approach that begins with evaluation of archaeological potential and proceeds as necessary to a field survey, an assessment of any sites identified, and mitigation measures such as excavation, with each phase resulting in recommendations as to whether the next is necessary. MCM will inform the client/proponent when review of and any necessary revisions to archaeological assessment reports have been completed. Archaeological assessment reports should be included in EA documentation. You can find information on archaeological assessments, and a list of licensed Archaeologists in Ontario, on MCM's website at http://www.mtc.gov.on.ca/en/archaeology/archaeology_assessments.shtml and http://www.mtc.gov.on.ca/en/archaeology/licensed_archaeologists.shtml .	
2	Information can be obtained from MCM by emailing archaeology@ontario.ca .
3	The municipality may be able to answer Question 3 if it has a data sharing agreement with MCM.
4	**Significant ground disturbance** means to interfere with or alter the existing condition of the ground, whether it is above or below water, through human actions that have potential to affect cultural heritage resources, and includes, but not limited to: altering the existing grade of land power spraying placing or dumping fill allowing heavy vehicle traffic drainage ditch construction scarification and soil mechanics studies compacting, excavating or removing topsoil dredging removing vegetation trenching (e.g. for services) trail construction A ground disturbance does not include: normal, regular farming practices such as ploughing or tilling or gardening
5	**Recent** means since 1960. **Extensive** means over all or most of the area. **Intensive** means thorough or complete disturbance.