APPENDIX 1

OSIM REPORTS

Prepared By:

City Of Guelph

Structure 112 Mcdonell Street Soffit Inspection Report

GMBP File: 123117

February 29, 2024

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650 WOODLAWN RD. W., BLOCK C, UNIT 2, GUELPH ON N1K 1B8 P: 519-824-8150

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STRUCTURE 112 MCDONELL STREET SOFFIT INSPECTION REPORT

CITY OF GUELPH

FEBRUARY 29, 2024

GMBP FILE: 123117

1. INTRODUCTION AND BACKGROUND

Structure 112, constructed in 1963, is located on Macdonell Street, approximately 50m east of Wellington Street / Woolwich Street. The structure is a two-span reinforced cast-in-place rigid frame concrete slab, overlain with an asphalt wearing surface and carries two lanes of traffic in each direction on Macdonell Street, crossing over the Speed River.

The following documents, included in **Appendix A**, were reviewed by GMBP as part of this assignment:

- 2018 Ontario Structure Inspection Manual (OSIM) Inspection Form completed by GMBP.
- 2020 OSIM Inspection Form completed by J.L. Richards & Associated Ltd.
- 2021 Detailed Deck Condition Survey (DDCS) completed by Bridge Check Canada.
- 2022 OSIM Inspection Form and Capital Investment Program (CIP) Memo completed by GMBP.

Since 2018, the biennial OSIM inspection reports have noted that the structure is in overall fair to poor condition and that the structure should be scheduled for replacement. The OSIM inspections, as well as the DDCS completed in 2021, have reported varying degrees of scaling, cracking, delamination and spalling on the deck soffit. Generally, the quantity of these reported deficiencies has incrementally increased over time, as represented in the condition data for the “Decks, Soffit – Thick Slab” elements on the OSIM inspection forms.

On November 13, 2022, GMBP carried out the most recent inspection in accordance with the Ontario Structure Inspection Manual (OSIM) on Structure 112 as part of the City’s biennial OSIM Bridge and Culvert Condition Assessments program. The accompanying OSIM inspection report noted that the structure was in overall fair to poor condition and recommended for replacement in the 1–5 year priority window. A Capital Investment Plan was also prepared by GMBP as part of OSIM project, which recommended that the capital works for Structure 112 be scheduled for 2024. The capital works associated with Structure 112 was ranked as the fourth highest priority for all structures inspected as part of the 2022 OSIM Bridge and Culvert Condition Assessment Program.

The City has noted that Structure 112 is subject to an ongoing Municipal Class Environmental Assessment (MCEA), which was initiated to consider improvements and modifications to the Macdonell Street Bridge area as a whole, including an adjacent bridge (Structure 131) and dam (Structure 320), as well as adjacent intersections. The completion date for the MCEA is currently unknown. The City noted that they are working towards completing capital works at Structure 112; however, due to current lead times of completing the MCEA and engineering design, construction may not occur until 2030.

In consideration of the above, the City has requested that, in addition to the ongoing biennial OSIM inspections, the advancing deterioration of Structure 112’s soffit be reviewed annually.

2. INSPECTION SUMMARY

GMBP completed a visual inspection of the deck soffit of Structure 112 on December 15, 2023. For the purposes of the report, Structure 112 is considered to span east/west. The following is a summary of general observations from the inspection:

North Fascia:

- Medium to wide vertical and horizontal cracks, some with efflorescence, rust and moisture stains;
- Medium to severe delamination along the entire length, generally near the top of the fascia;
- Medium to severe spalls throughout; and,
- Medium disintegration along construction joint.

South Fascia

- Narrow to wide horizontal cracks, some with efflorescence, rust and moisture stains;
- Medium to severe spalls throughout along the bottom edge of fascia and construction joint; and,
- Severe spalls at base of barrier posts.

East Span Soffit

- Wide longitudinal and pattern cracking with active leakage, rust staining and efflorescence;
- Severe spalls near the mid span;
- Narrow to wide cracking throughout with moisture staining; and,
- Severe delamination, with some spalling, surrounding all deck drains.

West Span Soffit

- Longitudinal wide crack with active leakage, rust staining and efflorescence along the centerline of the deck soffit continuing into pier wall;
- Longitudinal wide crack with moisture staining and efflorescence near centerline continuing into west abutment wall;
- Severe delamination near north fascia continuing transversely into the centerline near west abutment face; and,
- Severe delamination surrounding all deck drains.

Photos from our inspection are included in **Appendix B**. Additionally, a figure detailing area of deterioration on the deck soffit is included in **Appendix C**.

3. DISCUSSION

The observations from our 2023 inspection of the deck soffit of Structure 112 were compared to prior observations and photos from the 2022 OSIM inspection. Photos 1 through 14 in **Table 1** below show a comparison of significant areas of deterioration between the 2022 OSIM inspection and the 2023 inspection.

Table 1: Comparison of areas of deterioration between the 2022 OSIM Inspection and 2023 Inspection

North Fascia showing severe delamination, exposed corroded rebar and spalls:

Photo 1: December 7, 2022 Inspection

Photo 2: December 15, 2023 Inspection

Northwest deck drain showing severe delamination and rust stains:

Photo 3: December 7, 2022 Inspection

Photo 4: December 15, 2023 Inspection

West span soffit showing wide crack with moisture staining, efflorescence and rust staining on centerline:

Photo 5: December 7, 2022 Inspection

Photo 6: December 15, 2023 Inspection

South fascia showing spalls and exposed corroded rebar:

Photo 7: December 7, 2022 Inspection

Photo 8: December 15, 2023 Inspection

South soffit showing spalls and exposed corroded rebar:

Photo 9: December 7, 2022 Inspection

Photo 10: December 15, 2023 Inspection

East span deck soffit showing wide crack wih moisture staining, efflorescene and rust staining on centerline:

Photo 11: December 7, 2022 Inspection

Photo 12: December 15, 2023 Inspection

Northeast deck drain showing severe delamination:

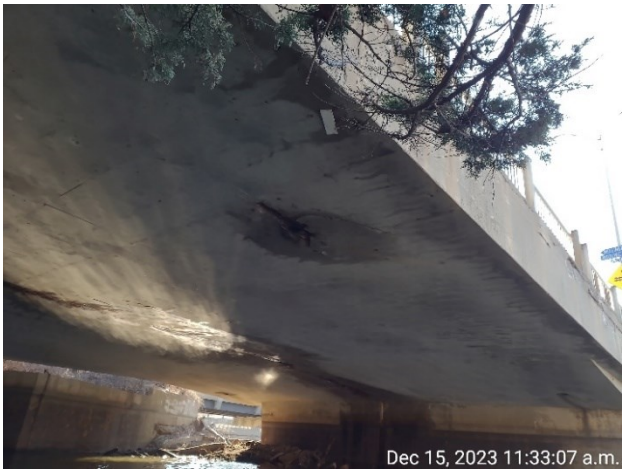

Photo 13: December 7, 2022 Inspection

Photo 14: December 15, 2023 Inspection

4. CONCLUSION AND RECOMMENDATIONS

Based on the observations from our 2023 visual inspection with comparison to the 2022 inspection photos, the areas of severe deficiencies on the deck soffit of Structure 112 do not appear to have discernibly changed from 2022 to 2023.

It is recommended that the deck soffit of Structure 112 continues to be monitored for signs of advancing deterioration until the structure is replaced. GMBP is scheduled to return in November/December of 2024 to conduct an OSIM inspection as well as a detailed visual inspection of the deck soffit. The deterioration figure included in **Appendix C** shall be used as a baseline to compare against any future deterioration of the soffit.

We are in agreement with recommendations from the 2022 OSIM inspection report, specifically that the replacement of Structure 112 should be prioritized in the 1-5 year priority window. It is recommended that the City explore opportunities to expedite the tentative construction date of 2030. It is recommended that annual inspections of the soffit are continued until the structure is replaced.

Should any indications of structural destress or accelerated structure deterioration be observed, immediate remedial actions such as load postings or road closure would be recommended.

Based on the limited time from observance of distress to action required, plus the spatial constraints of this downtown location, the planning and detailed design phases of this project will take longer than the typical bridge project. Therefore, we recommend that the planning and detailed design phases of the project be completed within the next 1 to 3 years.

5. LIMITATIONS

This report is intended exclusively for the Owner(s) named in the report. The material in it reflects our best judgment in light of the information reviewed by GM BluePlan Engineering Limited at the time of preparation. Unless otherwise agreed in writing by GM BluePlan Engineering Limited, this report shall not be used to imply warranty as to the fitness of the property for a particular purpose. This report is not a certification of compliance with past or present regulations. No portion of this report may be used as a separate entity, it is written to be read in its entirety.

Only the specific information identified has been reviewed. The consultant is not obligated to identify mistakes or insufficiencies in the information obtained from the various sources or to verify the accuracy of the information.

The Consultant may use such specific information obtained in performing its services and is entitled to rely upon the accuracy and completeness thereof.

This assessment does not wholly eliminate uncertainty regarding the potential for existing or future losses in connection with a property. No physical or destructive testing has been performed unless specifically recorded. We can perform further investigation on items of concern, if so required.

We thank you for engaging the services of GM BluePlan Engineering Limited for this work, and we trust it meets your needs at this time. Should you require additional assistance, or if you have any questions, please do not hesitate to contact the undersigned.

All of which is respectfully submitted,

GM BLUEPLAN ENGINEERING LIMITED

Per:

Simon Green, P.Eng.
Project Engineer

APPENDIX A:
BACKGROUND DOCUMENTS

APPENDIX A.I:
2018 OSIM INSPECTION REPORT

Summary Action Report

Inspection Date: 6/19/2018

Next Biennial Inspection: 6/19/2020

Bridge Condition Value (BCI) 64

Performance Deficiencies

Element Group	Element Name	Performance Deficiency
Barriers	Railing Systems	Other
Decks	Drainage	Deck drainage
Decks	Wearing Surface	Rough riding surface
Embankments & Streams	Embankments	Other

Maintenance Needs

Element Group	Element Name	Maintenance Need
Accessories	Other	Other
Barriers	Railing Systems	Other
Decks	Drainage	Bridge Deck Drainage
Embankments & Streams	Embankments	Other

Repair/Rehabilitation

Element Group	Element Name	Repair/Rehabilitation	Priority	Est. Cost
Abutments	Abutment Walls	Replace structure	1-5 Years	$1,250,000
			Total Repair/Rehabilitation Cost	$1,250,000
			Total Associated Work Cost	$500,000
			Total Cost	$1,750,000

Overall Comments

Structure in overall fair to poor condition. Structure should be scheduled for replacement. A Municipal Class Environmental Assessment should be completed in conjunction with Structure 131 and Structure 320. Consideration could be given to only a superstructure replacement.
Second inspection completed in October 2018 during low water levels.

Additional Investigations

$0.00

Ontario Structure Inspection Manual - Inspection Form

MTO Site Number: 112

Structure Name: Macdonell Bridge

Structure ID: 112

Structure Name	Macdonell Bridge				
Main Hwy/Road #		On ☑	Under ☐	Crossing Type: Nav Water ☐	Non Nav Water ☑
Hwy/Road Name	Macdonell Street	Rail ☐	Road ☐	Ped ☐	Other ☐
Structure Location	60m E of Woolwich Street				
Latitude (decimal degrees)	43.547378	Longitude (decimal degrees)	-80.243633		
Owner(s)	City of Guelph	Heritage:	Not Cons ☐	Cons Not/App ☐	List/Not Desig ☐
Region	Southwestern	Designation:		Desig Not List ☐	Desig List ☐
District		Road Class:	Freeway ☐	Arterial ☑	Collector ☐ Local ☐
Old County		No. of Lanes	4	Posted Speed	60 (km/h)
Geographic Twp	City of Guelph	AADT	10000	Trucks	(%)
Structure Type	Rigid Frame, Vertical Legs				
Total Deck Length	18.4 (m)				
Overall Str Width	43 (m)				
Total Deck Area	791.2 (sq m)	Min. Vertical Clearance		(m)	
Roadway Width	14.6	Special Routes:	Transit ☑	Truck ☑	School ☑ Bicycle ☑
Skew Angle	(deg)	Detour Length		(km)	
No. of Spans	2	Direction of Structure	East/West		
Span Lengths	24.4, 18.6 (m)	Fill on Structure	(m)		

Historical Data:

Year Built	1963	Year of Last Rehab	1988
Last OSIM Inspection	06/27/2017	Last Evaluation	
Last Enhanced OSIM Inspection		Current Load Limit	(tonnes)
Enhanced Access Equipment (ladder, boat, lift, etc)		Load Limit By Law	
		By Law expiry Date	
Last Condition Survey		Last underwater Inspection	

Rehabiliation History:

Date	Type	Description
12/13/1988		Concrete overlay and resurfacing

Ontario Structure Inspection Manual - Inspection Form

MTO Site Number: 112

Structure Name: Macdonell Bridge

Structure ID: 112

Date of Inspection: (mm/dd/yyyy)	06/19/2018	Inspection Type:	OSIM
Inspector:	SG		
Others in Party:	DW		
Equipment Used:	Measuring Tape, Hammer, Camera		
Weather:	Sunny		
Temperature °C:	25		

	Priority			Estimated Cost
	None	Normal	Urgent	
Detailed Deck Condition Survey	☑	☐	☐	$0
Non-destructive Delam. Survey of Asphalt-Covered Deck	☑	☐	☐	$0
Concrete Substructure Condition Survey	☑	☐	☐	$0
Detailed Coating Condition Survey	☑	☐	☐	$0
Detailed Timber Investigation	☑	☐	☐	$0
Post-Tensioned Strand Investigation	☑	☐	☐	$0
Underwater Investigation	☑	☐	☐	$0
Fatigue Investigation	☑	☐	☐	$0
Seismic Investigation	☑	☐	☐	$0
Structure Investigation	☑	☐	☐	$0
Monitoring Deformations, Settlements, Movements	☑	☐	☐	$0
Monitoring Crack Widths	☑	☐	☐	$0
			Total Cost:	**$0**

Investigation Notes:

Overall Comments: Structure in overall fair to poor condition. Structure should be scheduled for replacement. A Municipal Class Environmental Assessment should be completed in conjunction with Structure 131 and Structure 320. Consideration could be given to only a superstructure replacement.
Second inspection completed in October 2018 during low water levels.

Recommended Work: Replace

Next Inspection: 06/19/2020

Recommended Work Time: 1-5yr

Suspected Performance Deficiencies
00 None
01 Load carrying capacity
02 Excessive deformations (deflections & rotations)
03 Continuing settlement
04 Continuing movements
05 Seized bearings
06 Bearing not uniformly loaded/unstable
07 Jammed expansion joint
08 Pedestrian/vehicular hazard
09 Rough riding surface
10 Surface ponding
11 Deck drainage
12 Slippery surface
13 Flooding/channel blockage
14 Undermining of foundation
15 Unstable embankments
16 Other

Maintenance Needs
01 Lift & Swing Bridge Maintenance
02 Bridge Cleaning
03 Bridge Handrail Maintenance
04 Painting Steel Bridge Structures
05 Bridge Deck Joint Repair
06 Bridge Bearing Maintenance
07 Repair to Structural Steel
08 Repair to Bridge Concrete
09 Repair to Bridge Timber
10 Bailey Bridges - Maintenance
11 Animal/Pest Control
12 Bridge Surface Repair
13 Erosion Control at Bridges
14 Concrete Sealing
15 Rout and Seal
16 Bridge Deck Drainage
17 Scaling (Loose Concrete or ACR Steel)
18 Other

Element Data:

Element Group:	**Abutments**	Length:	0.00
Element Name:	**Abutment Walls**	Width:	18.80
Location:	East/West	Height:	3.50
Material:	Cast-in-Place Concrete	Count:	2.0
Element Type:	Legs of Rigid Frame	Total Quantity:	131.6
Environment:	Benign	Limited Inspection	☐
Protection System:	None		

Condition Data:	Units:	Exc.	Good:	Fair:	Poor:	Performance Deficiencies:
	sq.m.	0.0	111.6	15.0	5.0	

Comments: Wide vertical cracking with moisture staining; Medium spall below storm outlet

Recommended Work:		Maint. Needs:		Maint. Priority:	
Recommended Timing:	1-5 Years	Maint. Desc.:			

Work Details: Replace structure

Element Group:	**Abutments**	Length:	2.85
Element Name:	**Wingwalls**	Width:	0.00
Location:	Northwest	Height:	1.20
Material:	Cast-in-Place Concrete	Count:	1.0
Element Type:	Reinforced Concrete	Total Quantity:	3.4
Environment:	Moderate	Limited Inspection	☐
Protection System:	None		

Condition Data:	Units:	Exc.	Good:	Fair:	Poor:	Performance Deficiencies:
	sq.m.	0.0	2.1	1.0	0.3	

Comments: Severe spalling with exposed corroded rebar

Recommended Work:		Maint. Needs:		Maint. Priority:	
Recommended Timing:		Maint. Desc.:			

Work Details:

Element Group:	**Accessories**	Length:	0.00
Element Name:	**Other**	Width:	0.00
Location:	Light masts	Height:	0.00
Material:	Hybrid	Count:	5.0
Element Type:	-	Total Quantity:	5.0
Environment:	Severe	Limited Inspection	☐
Protection System:	None		

Condition Data:	Units:	Exc.	Good:	Fair:	Poor:	Performance Deficiencies:
	Each	0.0	5.0	0.0	0.0	

Comments: Cap to electrical housing is missing on southeast post

Recommended Work:		Maint. Needs:	17	Maint. Priority:	
Recommended Timing:		Maint. Desc.:			
Work Details:					

Element Group:	**Approaches**	Length:	6.00
Element Name:	**Approach Slabs**	Width:	14.60
Location:	East/West end	Height:	0.00
Material:	Cast-in-Place Concrete	Count:	2.0
Element Type:	-	Total Quantity:	175.2
Environment:	Benign	Limited Inspection	☑
Protection System:	None		

Condition Data:	Units:	Exc.	Good:	Fair:	Poor:	Performance Deficiencies:
	sq.m.	0.0	75.2	100.0	0.0	

Comments: Not visible; Assumed in fair condition based on condition of asphalt wearing surface

Recommended Work:		Maint. Needs:		Maint. Priority:	
Recommended Timing:		Maint. Desc.:			
Work Details:					

Element Group:	**Approaches**	Length:	6.00
Element Name:	**Sidewalk**	Width:	1.90
Location:	East/West approach	Height:	0.00
Material:	Cast-in-Place Concrete	Count:	4.0
Element Type:	-	Total Quantity:	45.6
Environment:	Severe	Limited Inspection	☐
Protection System:	None		

Condition Data:	Units:	Exc.	Good:	Fair:	Poor:	Performance Deficiencies:
	sq.m.	0.0	28.6	12.0	5.0	

Comments: Light scaling; Narrow to wide cracking throughout; Isolated medium to severe delamination on north side; Light spalling on north side

Recommended Work:		Maint. Needs:		Maint. Priority:	
Recommended Timing:		Maint. Desc.:			
Work Details:					

Element Group:	**Approaches**	Length:	6.00
Element Name:	**Wearing Surface**	Width:	14.60
Location:	East/West ends	Height:	0.00
Material:	Asphalt	Count:	2.0
Element Type:	-	Total Quantity:	175.2
Environment:	Severe	Limited Inspection	☐
Protection System:	None		

Condition Data:	Units:	Exc.	Good:	Fair:	Poor:	Performance Deficiencies:
	sq.m.	0.0	75.2	65.0	35.0	

Comments: Light longitudinal cracking; Isolated severe transverse and alligator cracking; Light wheel rutting

Recommended Work:		Maint. Needs:		Maint. Priority:	
Recommended Timing:		Maint. Desc.:			
Work Details:					

Element Group:	**Barriers**	Length:	132.00
Element Name:	**Railing Systems**	Width:	0.00
Location:	North/South	Height:	1.07
Material:	Steel	Count:	2.0
Element Type:	Steel post and Steel Panel	Total Quantity:	264.0
Environment:	Severe	Limited Inspection	☐
Protection System:	Hot dip galvanizing		

Condition Data:	Units:	Exc.	Good:	Fair:	Poor:	Performance Deficiencies:
	m	0.0	209.0	35.0	20.0	16

Comments: Isolated deformations and impact damage; Isolated bolts are too short for nut; Discontinuity in railing at light posts; Isolated end caps missing; Isolated light to severe corrosion

Recommended Work:		Maint. Needs:	17	Maint. Priority:	
Recommended Timing:		Maint. Desc.:	Reinstall missing end caps		
Work Details:					

Element Group:	**Decks**	Length:	0.00
Element Name:	**Drainage**	Width:	0.00
Location:	North/South sides	Height:	0.00
Material:	Cast-in-Place Concrete	Count:	10.0
Element Type:	Holes in Deck	Total Quantity:	10.0
Environment:	Severe	Limited Inspection	☐
Protection System:	None		

Condition Data:	Units:	Exc.	Good:	Fair:	Poor:	Performance Deficiencies:
	Each	0.0	0.0	0.0	10.0	11

Comments: Drainage pipes are plugged at curbs; Severe corrosion of drains on soffit

Recommended Work:		Maint. Needs:	16	Maint. Priority:	
Recommended Timing:		Maint. Desc.:	Clear plugged drains		
Work Details:					

Element Group:	**Decks**	Length:	43.00
Element Name:	**Soffit - Thick Slab**	Width:	1.60
Location:	Exterior Soffit	Height:	0.00
Material:	Cast-in-Place Concrete	Count:	2.0
Element Type:	Exterior	Total Quantity:	137.6
Environment:	Moderate	Limited Inspection	☐
Protection System:	None		

Condition Data:	Units:	Exc.	Good:	Fair:	Poor:	Performance Deficiencies:
	sq.m.	0.0	41.6	69.5	26.5	

Comments: Narrow to wide vertical and horizontal cracking on fascia, some with efflorescence, rust and moisture stains; Medium to severe delamination and spalling with exposed corroded rebar; Medium disintegration along construction joint; Some severe spalls at base of barrier posts; No drip edge present

Recommended Work:		Maint. Needs:		Maint. Priority:	
Recommended Timing:		Maint. Desc.:			
Work Details:					

Element Group:	**Decks**	Length:	43.00
Element Name:	**Soffit - Thick Slab**	Width:	17.50
Location:	West Interior Soffit	Height:	0.00
Material:	Cast-in-Place Concrete	Count:	1.0
Element Type:	Interior	Total Quantity:	752.5
Environment:	Benign	Limited Inspection	☐
Protection System:	None		

Condition Data:	Units:	Exc.	Good:	Fair:	Poor:	Performance Deficiencies:
	sq.m.	0.0	568.5	107.0	77.0	

Comments: Full span wide crack with active leakage, rust staining and some efflorescence; Narrow to wide longitudinal and transverse cracking with moisture staining; Medium to severe delamination; Severe delamination around deck drains

Recommended Work:		Maint. Needs:		Maint. Priority:	
Recommended Timing:		Maint. Desc.:			
Work Details:					

Ontario Structure Inspection Manual - Inspection Form

MTO Site Number: 112

Structure Name: Macdonell Bridge

Structure ID: 112

Element Group:	**Decks**	Length:	43.00
Element Name:	**Wearing Surface**	Width:	14.60
Location:	Over structure	Height:	0.00
Material:	Asphalt	Count:	1.0
Element Type:	-	Total Quantity:	627.8
Environment:	Severe	Limited Inspection	☐
Protection System:	None		

Condition Data:	Units:	Exc.	Good:	Fair:	Poor:	Performance Deficiencies:
	sq.m.	0.0	297.8	300.0	30.0	9

Comments: Light wheel rutting; Medium to severe transverse and longitudinal cracks throughout; Severe alligator cracking; Roughly patched pot holes

Recommended Work:		Maint. Needs:		Maint. Priority:	
Recommended Timing:		Maint. Desc.:			
Work Details:					

Element Group:	**Embankments & Streams**	Length:	0.00
Element Name:	**Embankments**	Width:	0.00
Location:	Each Quadrant	Height:	0.00
Material:	Native	Count:	4.0
Element Type:	-	Total Quantity:	4.0
Environment:	Severe	Limited Inspection	☐
Protection System:	None		

Condition Data:	Units:	Exc.	Good:	Fair:	Poor:	Performance Deficiencies:
	Each	0.0	4.0	0.0	0.0	16

Comments: Overgrown vegetation

Recommended Work:		Maint. Needs:	17	Maint. Priority:	
Recommended Timing:		Maint. Desc.:			
Work Details:					

Ontario Structure Inspection Manual - Inspection Form

MTO Site Number: 112

Structure Name: Macdonell Bridge

Structure ID: 112

Element Group:	**Embankments & Streams**	Length:	0.00
Element Name:	**Streams and Waterways**	Width:	0.00
Location:	All	Height:	0.00
Material:		Count:	1.0
Element Type:	-	Total Quantity:	1.0
Environment:		Limited Inspection	☐
Protection System:			

Condition Data:

Units:	Exc.	Good:	Fair:	Poor:	Performance Deficiencies:
All	0.0	1.0	0.0	0.0	

Comments: Heavy sediment and debris built up in front of dam

Recommended Work:		Maint. Needs:		Maint. Priority:	
Recommended Timing:		Maint. Desc.:			
Work Details:					

Element Group:	**Foundations**	Length:	0.00
Element Name:	**Foundation (below ground level)**	Width:	0.00
Location:	All	Height:	0.00
Material:	Cast-in-Place Concrete	Count:	1.0
Element Type:	Unknown	Total Quantity:	1.0
Environment:	Benign	Limited Inspection	☑
Protection System:	None		

Condition Data:

Units:	Exc.	Good:	Fair:	Poor:	Performance Deficiencies:
All	0.0	0.0	0.0	0.0	

Comments: Assumed in good condition based on lack of settlement defects

Recommended Work:		Maint. Needs:		Maint. Priority:	
Recommended Timing:		Maint. Desc.:			
Work Details:					

Ontario Structure Inspection Manual - Inspection Form

MTO Site Number: 112

Structure Name: Macdonell Bridge

Structure ID: 112

Element Group:	**Piers**	Length:	0.90
Element Name:	**Shafts/Columns/Pile Bents**	Width:	17.80
Location:	Central Pier	Height:	3.50
Material:	Cast-in-Place Concrete	Count:	1.0
Element Type:	Concrete Rectangular Columns	Total Quantity:	130.9
Environment:	Benign	Limited Inspection	☐
Protection System:	None		

Condition Data:

Units:	Exc.	Good:	Fair:	Poor:	Performance Deficiencies:
sq.m.	0.0	120.9	5.0	5.0	

Comments: Wide vertical cracks, some with efflorescence

Recommended Work: | Maint. Needs: | Maint. Priority:

Recommended Timing: | Maint. Desc.:

Work Details:

Element Group:	**Retaining Walls**	Length:	7.00
Element Name:	**Walls**	Width:	0.00
Location:	Southeast Retaining Wall	Height:	2.50
Material:	Cast-in-Place Concrete	Count:	1.0
Element Type:	Reinforced Concrete	Total Quantity:	17.5
Environment:	Benign	Limited Inspection	☐
Protection System:	None		

Condition Data:

Units:	Exc.	Good:	Fair:	Poor:	Performance Deficiencies:
sq.m.	0.0	15.5	1.0	1.0	

Comments: Wide cracking

Recommended Work: | Maint. Needs: | Maint. Priority:

Recommended Timing: | Maint. Desc.:

Work Details:

Ontario Structure Inspection Manual - Inspection Form

MTO Site Number: 112

Structure Name: Macdonell Bridge

Structure ID: 112

Element Group:	**Retaining Walls**	Length:	13.00
Element Name:	**Walls**	Width:	0.00
Location:	Northeast Retaining Wall	Height:	2.00
Material:	Cast-in-Place Concrete	Count:	1.0
Element Type:	Reinforced Concrete	Total Quantity:	26.0
Environment:	Benign	Limited Inspection	☐
Protection System:	None		

Condition Data:

Units:	Exc.	Good:	Fair:	Poor:	Performance Deficiencies:
sq.m.	0.0	26.0	0.0	0.0	

Comments: Isolated light delamination near abutment wall; 4 wall drains

Recommended Work: | Maint. Needs: | Maint. Priority:

Recommended Timing: | Maint. Desc.:

Work Details:

Element Group:	**Retaining Walls**	Length:	13.60
Element Name:	**Walls**	Width:	0.00
Location:	Northwest Retaining Wall	Height:	2.30
Material:	Cast-in-Place Concrete	Count:	1.0
Element Type:	Reinforced Concrete	Total Quantity:	31.3
Environment:	Benign	Limited Inspection	☐
Protection System:	None		

Condition Data:

Units:	Exc.	Good:	Fair:	Poor:	Performance Deficiencies:
sq.m.	0.0	28.3	1.0	2.0	

Comments: Severe scaling; Isolated light delamination around STM outlet; 3 wall drains

Recommended Work: | Maint. Needs: | Maint. Priority:

Recommended Timing: | Maint. Desc.:

Work Details:

Element Group:	**Retaining Walls**	Length:	2.50
Element Name:	**Walls**	Width:	0.00
Location:	Southwest Retaining Wall	Height:	3.10
Material:	Cast-in-Place Concrete	Count:	1.0
Element Type:	Reinforced Concrete	Total Quantity:	7.8
Environment:	Benign	Limited Inspection	☐
Protection System:	None		

Condition Data:	Units:	Exc.	Good:	Fair:	Poor:	Performance Deficiencies:
	sq.m.	0.0	5.8	1.0	1.0	

Comments: Wide cracking

Recommended Work:		Maint. Needs:		Maint. Priority:	
Recommended Timing:		Maint. Desc.:			
Work Details:					

Element Group:	**Retaining Walls**	Length:	10.00
Element Name:	**Walls**	Width:	0.00
Location:	Under East Span	Height:	3.50
Material:	Cast-in-Place Concrete	Count:	1.0
Element Type:	Reinforced Concrete	Total Quantity:	35.0
Environment:	Benign	Limited Inspection	☐
Protection System:	None		

Condition Data:	Units:	Exc.	Good:	Fair:	Poor:	Performance Deficiencies:
	sq.m.	0.0	33.0	1.0	1.0	

Comments: Wide cracking

Recommended Work:		Maint. Needs:		Maint. Priority:	
Recommended Timing:		Maint. Desc.:			
Work Details:					

Ontario Structure Inspection Manual - Inspection Form

MTO Site Number: 112

Structure Name: Macdonell Bridge

Structure ID: 112

Element Group:	**Sidewalks/Curbs**	Length:	43.00
Element Name:	**Sidewalk and Medians**	Width:	1.90
Location:	Over Structure (North/South)	Height:	0.20
Material:	Cast-in-Place Concrete	Count:	2.0
Element Type:	-	Total Quantity:	180.6
Environment:	Severe	Limited Inspection	☐
Protection System:	None		

Condition Data:

Units:	Exc.	Good:	Fair:	Poor:	Performance Deficiencies:
sq.m.	0.0	120.6	50.0	10.0	

Comments: Light scaling; Narrow to wide cracking throughout

Recommended Work:		Maint. Needs:		Maint. Priority:	
Recommended Timing:		Maint. Desc.:			
Work Details:					

Element Group	Element	Repair / Rehabilitation	Priority	Const Cost
	Abutment Walls	Replace structure	1-5 Years	$1,250,000

Total Repair/Rehabilitation Cost **$1,250,000**

Comments	Estimated Cost
Detours	$0
Utilities	$0
Environmental Study *Municipal Class EA*	$150,000

Contingencies	10.00%	$140,000
Engineering	15.00%	$210,000
Total Associated Work Cost		**$500,000**
Total Repair / Rehabilitation Cost		
Total Cost		

Justification

North elevation

Wearing surface, looking South

Northeast sidewalk approach

Plugged curb drains

Northwest railing, missing end cap

Insufficient bolt length on northwest railing

Southwest light post, missing electrical cover

South face, looking east

Southeast exterior soffit, spall at post base

Underside of east span, looking south

Soffit and east abutment

Pier, west face

Soffit and west abutment

Typical deck drain in soffit

Northeast retaining wall

Northwest retaining wall

APPENDIX A.II:
2020 OSIM INSPECTION REPORT

Summary Action Report

Inspection Date: 12/15/2020

Next Biennial Inspection: 12/01/2022

Bridge Condition Value (BCI): 64

Performance Deficiencies

Element Group	Element Name	Performance Deficiency
Barriers		Load Carrying Capacity
Decks		Deck drainage
Decks		Rough riding surface

Maintenance Needs

Element Group	Element Name	Maintenance Need
Accessories		
Barriers		
Decks		
Embankments & Streams		

Repair/Rehabilitation

Element Group	Element Name	Repair/Rehabilitation	Priority	Est. Cost
Structure		Major Rehabilitation	1-5 Years	$1,780,000
			Total Repair/Rehabilitation Cost	$1,780,000
			Total Associated Work Cost	$75,000
			Total Cost	$1,855,000

Overall Comments

Structure in overall fair to poor condition. A detailed condition survey and a rehabilitation /replacement study is recommended due to the age of the structure and the condition of the soffit.

Additional Investigations

Detailed Condition Survey	$15,000.00
Rehabilitation/Replacement Study	$20,000.00

Ontario Structure Inspection Manual - Inspection Form

MTO Site Number: 112

Structure Name: Macdonell Bridge

Structure ID: 112

Structure Name	Macdonell Bridge				
Main Hwy/Road #		On ☑	Under ☐	Crossing Type: Nav Water ☐	Non Nav Water ☑
Hwy/Road Name	Macdonell Street	Rail ☐	Road ☐	Ped ☐	Other ☐
Structure Location	60m E of Woolwich Street				
Latitude (decimal degrees)	43.547378	Longitude (decimal degrees)	-80.243633		
Owner(s)	City of Guelph	Heritage:	Not Cons ☐	Cons Not/App ☐	List/Not Desig ☐
Region	Southwestern	Designation:		Desig Not List ☐	Desig List ☐
District		Road Class:	Freeway ☐	Arterial ☑	Collector ☐ Local ☐
Old County		No. of Lanes: 4	Posted Speed: 60 (km/h)		
Geographic Twp	City of Guelph	AADT: 10000	Trucks: (%)		
Structure Type	Rigid Frame, Vertical Legs				
Total Deck Length	43.0 (m)				
Overall Str Width	18.4 (m)				
Total Deck Area	791.2 (sq m)	Min. Vertical Clearance	(m)		
Roadway Width	14.6	Special Routes:	Transit ☑	Truck ☑	School ☑ Bicycle ☑
Skew Angle	(deg)	Detour Length	(km)		
No. of Spans	2	Direction of Structure	East/West		
Span Lengths	24.4, 18.6 (m)	Fill on Structure	(m)		

Year Built	1963	Year of Last Rehab	1988
Last OSIM Inspection	06/19/2018	Last Evaluation	
Last Enhanced OSIM Inspection		Current Load Limit	(tonnes)
Enhanced Access Equipment (ladder, boat, lift, etc)		Load Limit By Law	
		By Law expiry Date	
Last Condition Survey		Last underwater Inspection	

Date	Type	Description
		Concrete overlay and resurfacing

Ontario Structure Inspection Manual - Inspection Form

MTO Site Number: 112

Structure Name: Macdonell Bridge

Structure ID: 112

Date of Inspection: (mm/dd/yyyy)	12/15/2020	Inspection Type:	OSIM
Inspector:	Stephen Gade		
Others in Party:			
Equipment Used:			
Weather:			
Temperature °C:			

	Priority			Estimated Cost
	None	Normal	Urgent	
Detailed Deck Condition Survey	☐	☑	☐	$35,000
Non-destructive Delam. Survey of Asphalt-Covered Deck	☑	☐	☐	$0
Concrete Substructure Condition Survey	☑	☐	☐	$0
Detailed Coating Condition Survey	☑	☐	☐	$0
Detailed Timber Investigation	☑	☐	☐	$0
Post-Tensioned Strand Investigation	☑	☐	☐	$0
Underwater Investigation	☑	☐	☐	$0
Fatigue Investigation	☑	☐	☐	$0
Seismic Investigation	☑	☐	☐	$0
Structure Investigation	☑	☐	☐	$0
Monitoring Deformations, Settlements, Movements	☑	☐	☐	$0
Monitoring Crack Widths	☑	☐	☐	$0
			Total Cost:	**$35,000**

Investigation Notes: A detailed condition survey and a rehabilitation /replacement study is recommended due to the age of the structure and the condition of the soffit.

Overall Comments: Structure in overall fair to poor condition. A detailed condition survey and a rehabilitation /replacement study is recommended due to the age of the structure and the condition of the soffit.

Recommended Work: Major Rehabilitation

Next Inspection: 12/01/2022

Recommended Work Time: 1-5yr

Suspected Performance Deficiencies
00 None
01 Load carrying capacity
02 Excessive deformations (deflections & rotations)
03 Continuing settlement
04 Continuing movements
05 Seized bearings
06 Bearing not uniformly loaded/unstable
07 Jammed expansion joint
08 Pedestrian/vehicular hazard
09 Rough riding surface
10 Surface ponding
11 Deck drainage
12 Slippery surface
13 Flooding/channel blockage
14 Undermining of foundation
15 Unstable embankments
16 Other

Maintenance Needs
01 Lift & Swing Bridge Maintenance
02 Bridge Cleaning
03 Bridge Handrail Maintenance
04 Painting Steel Bridge Structures
05 Bridge Deck Joint Repair
06 Bridge Bearing Maintenance
07 Repair to Structural Steel
08 Repair to Bridge Concrete
09 Repair to Bridge Timber
10 Bailey Bridges - Maintenance
11 Animal/Pest Control
12 Bridge Surface Repair
13 Erosion Control at Bridges
14 Concrete Sealing
15 Rout and Seal
16 Bridge Deck Drainage
17 Scaling (Loose Concrete or ACR Steel)
18 Other

Element Group:	**Abutments**	Length:	0.00
Element Name:	**Abutment Walls**	Width:	18.80
Location:	East/West	Height:	3.50
Material:	Cast-in-Place Concrete	Count:	2.0
Element Type:	Legs of Rigid Frame	Total Quantity:	131.6
Environment:	Benign	Limited Inspection	☐
Protection System:	None		

Condition Data:	Units:	Exc.	Good:	Fair:	Poor:	Performance Deficiencies:
	sq.m.	0.0	111.6	15.0	5.0	

Comments: Wide vertical cracking with moisture staining; Medium spall below storm outlet

Recommended Work:		Maint. Needs:		Maint. Priority:	
Recommended Timing:	1-5 Years	Maint. Desc.:			
Work Details:	Major Rehabilitation				

Element Group:	**Abutments**	Length:	2.85
Element Name:	**Wingwalls**	Width:	0.00
Location:	Northwest	Height:	1.20
Material:	Cast-in-Place Concrete	Count:	1.0
Element Type:	Reinforced Concrete	Total Quantity:	3.4
Environment:	Moderate	Limited Inspection	☐
Protection System:	None		

Condition Data:	Units:	Exc.	Good:	Fair:	Poor:	Performance Deficiencies:
	sq.m.	0.0	2.1	1.0	0.3	

Comments: Severe spalling with exposed corroded rebar

Recommended Work:		Maint. Needs:		Maint. Priority:	
Recommended Timing:	1-5 Years	Maint. Desc.:			
Work Details:	Major Rehabilitation				

Ontario Structure Inspection Manual - Inspection Form

MTO Site Number: 112

Structure Name: Macdonell Bridge

Structure ID: 112

Element Group:	**Accessories**	Length:	0.00
Element Name:	**Other**	Width:	0.00
Location:	Light masts	Height:	0.00
Material:	Hybrid	Count:	5.0
Element Type:	-	Total Quantity:	5.0
Environment:	Severe	Limited Inspection	☐
Protection System:	None		

Condition Data:	Units:	Exc.	Good:	Fair:	Poor:	Performance Deficiencies:
	Each	0.0	5.0	0.0	0.0	

Comments: Cap to electrical housing is missing on southeast post

Recommended Work:		Maint. Needs:	18	Maint. Priority:	
Recommended Timing:		Maint. Desc.:	Replace missing cap		
Work Details:					

Element Group:	**Approaches**	Length:	6.00
Element Name:	**Approach Slabs**	Width:	14.60
Location:	East/West end	Height:	0.00
Material:	Cast-in-Place Concrete	Count:	2.0
Element Type:	-	Total Quantity:	175.2
Environment:	Benign	Limited Inspection	☑
Protection System:	None		

Condition Data:	Units:	Exc.	Good:	Fair:	Poor:	Performance Deficiencies:
	sq.m.	0.0	75.2	100.0	0.0	

Comments: Not visible; Assumed in fair condition based on condition of asphalt wearing surface

Recommended Work:	Major Rehabilitation	Maint. Needs:		Maint. Priority:	
Recommended Timing:	1-5 Years	Maint. Desc.:			
Work Details:	Major Rehabilitation				

Ontario Structure Inspection Manual - Inspection Form

MTO Site Number: 112

Structure Name: Macdonell Bridge

Structure ID: 112

Element Group:	**Approaches**	Length:	6.00
Element Name:	**Sidewalk**	Width:	1.90
Location:	East/West approach	Height:	0.00
Material:	Cast-in-Place Concrete	Count:	4.0
Element Type:	-	Total Quantity:	45.6
Environment:	Severe	Limited Inspection	☐
Protection System:	None		

Condition Data:	Units:	Exc.	Good:	Fair:	Poor:	Performance Deficiencies:
	sq.m.	0.0	28.6	12.0	5.0	

Comments: Light scaling; Narrow to wide cracking throughout; Isolated medium to severe delamination on north side; Light spalling on north side

Recommended Work:	Major Rehabilitation	Maint. Needs:		Maint. Priority:	
Recommended Timing:	1-5 Years	Maint. Desc.:			
Work Details:	Major Rehabilitation				

Element Group:	**Approaches**	Length:	6.00
Element Name:	**Wearing Surface**	Width:	14.60
Location:	East/West ends	Height:	0.00
Material:	Asphalt	Count:	2.0
Element Type:	-	Total Quantity:	175.2
Environment:	Severe	Limited Inspection	☐
Protection System:	None		

Condition Data:	Units:	Exc.	Good:	Fair:	Poor:	Performance Deficiencies:
	sq.m.	0.0	75.2	65.0	35.0	

Comments: Narrow to medium longitudinal cracking; Isolated severe transverse and alligator cracking; Light wheel rutting

Recommended Work:	Major Rehabilitation	Maint. Needs:		Maint. Priority:	
Recommended Timing:	1-5 Years	Maint. Desc.:			
Work Details:	Major Rehabilitation				

Element Group:	**Barriers**	Length:	132.00
Element Name:	**Railing Systems**	Width:	0.00
Location:	North/South	Height:	1.07
Material:	Steel	Count:	2.0
Element Type:	Steel post and Steel Panel	Total Quantity:	264.0
Environment:	Severe	Limited Inspection	☐
Protection System:	Hot dip galvanizing		

Condition Data:	Units:	Exc.	Good:	Fair:	Poor:	Performance Deficiencies:
	m	0.0	209.0	35.0	20.0	01

Comments: Isolated deformations and impact damage; Isolated bolts are too short for nut; Discontinuity in railing at light posts; Isolated end caps missing; Isolated light to severe corrosion. Barrier is substandard and should be replaced with a code compliant barrier.

Recommended Work:	Major Rehabilitation	Maint. Needs:	18	Maint. Priority:	
Recommended Timing:	1-5 Years	Maint. Desc.:	Reinstall missing end caps		
Work Details:	Major Rehabilitation				

Element Group:	**Decks**	Length:	0.00
Element Name:	**Drainage**	Width:	0.00
Location:	North/South sides	Height:	0.00
Material:	Cast-in-Place Concrete	Count:	10.0
Element Type:	Holes in Deck	Total Quantity:	10.0
Environment:	Severe	Limited Inspection	☐
Protection System:	None		

Condition Data:	Units:	Exc.	Good:	Fair:	Poor:	Performance Deficiencies:
	Each	0.0	0.0	0.0	10.0	11

Comments: Drainage pipes are plugged at curbs; Severe corrosion of drains on soffit

Recommended Work:	Major Rehabilitation	Maint. Needs:	16	Maint. Priority:	
Recommended Timing:	1-5 Years	Maint. Desc.:	Clear plugged drains		
Work Details:	Major Rehabilitation				

Element Group:	**Decks**	Length:	43.00
Element Name:	**Soffit - Thick Slab**	Width:	1.60
Location:	Exterior Soffit	Height:	0.00
Material:	Cast-in-Place Concrete	Count:	2.0
Element Type:	Exterior	Total Quantity:	137.6
Environment:	Moderate	Limited Inspection	☐
Protection System:	None		

Condition Data:

Units:	Exc.	Good:	Fair:	Poor:	Performance Deficiencies:
sq.m.	0.0	41.6	69.5	26.5	

Comments: Narrow to wide vertical and horizontal cracking on fascia, some with efflorescence, rust and moisture stains; Medium to severe delamination and spalls with exposed corroded reinforcing steel; Medium disintegration along construction joint; Some severe spalls at base of barrier posts; No drip edge present

Recommended Work:	Major Rehabilitation	Maint. Needs:		Maint. Priority:	
Recommended Timing:	1-5 Years	Maint. Desc.:			
Work Details:	Major Rehabilitation				

Element Group:	**Decks**	Length:	43.00
Element Name:	**Soffit - Thick Slab**	Width:	17.50
Location:	Interior Soffit	Height:	0.00
Material:	Cast-in-Place Concrete	Count:	1.0
Element Type:	Interior	Total Quantity:	752.5
Environment:	Benign	Limited Inspection	☐
Protection System:	None		

Condition Data:

Units:	Exc.	Good:	Fair:	Poor:	Performance Deficiencies:
sq.m.	0.0	568.5	107.0	77.0	

Comments: Full span wide crack with active leakage, rust staining and some efflorescence on east span; Narrow to wide longitudinal and transverse cracking with moisture staining; Medium to severe delamination; Severe delamination around deck drains on west span

Recommended Work:	Major Rehabilitation	Maint. Needs:		Maint. Priority:	
Recommended Timing:	1-5 Years	Maint. Desc.:			
Work Details:	Major Rehabilitation				

Ontario Structure Inspection Manual - Inspection Form

MTO Site Number: 112

Structure Name: Macdonell Bridge

Structure ID: 112

Element Group:	**Decks**	Length:	43.00
Element Name:	**Wearing Surface**	Width:	14.60
Location:	Over structure	Height:	0.00
Material:	Asphalt	Count:	1.0
Element Type:	-	Total Quantity:	627.8
Environment:	Severe	Limited Inspection	☐
Protection System:	None		

Condition Data:	Units:	Exc.	Good:	Fair:	Poor:	Performance Deficiencies:
	sq.m.	0.0	297.8	300.0	30.0	9

Comments: Light wheel rutting; Medium to severe transverse and longitudinal cracks throughout; Severe alligator cracking; Roughly patched pot holes

Recommended Work:	Major Rehabilitation	Maint. Needs:		Maint. Priority:	
Recommended Timing:	1-5 Years	Maint. Desc.:			
Work Details:	Major Rehabilitation				

Element Group:	**Embankments & Streams**	Length:	0.00
Element Name:	**Embankments**	Width:	0.00
Location:	Each Quadrant	Height:	0.00
Material:	Native	Count:	4.0
Element Type:	-	Total Quantity:	4.0
Environment:	Severe	Limited Inspection	☐
Protection System:	None		

Condition Data:	Units:	Exc.	Good:	Fair:	Poor:	Performance Deficiencies:
	Each	0.0	4.0	0.0	0.0	

Comments: Overgrown vegetation

Recommended Work:		Maint. Needs:	18	Maint. Priority:	
Recommended Timing:		Maint. Desc.:	Vegetation clearing/maintenance		
Work Details:					

Ontario Structure Inspection Manual - Inspection Form

MTO Site Number: 112

Structure Name: Macdonell Bridge

Structure ID: 112

Element Group:	**Embankments & Streams**	Length:	0.00
Element Name:	**Streams and Waterways**	Width:	0.00
Location:	All	Height:	0.00
Material:		Count:	1.0
Element Type:	-	Total Quantity:	1.0
Environment:		Limited Inspection	☐
Protection System:			

Condition Data:

Units:	Exc.	Good:	Fair:	Poor:	Performance Deficiencies:
All	0.0	1.0	0.0	0.0	

Comments: Moderate volume and low flow with heavy sediment and debris built up in front of dam

Recommended Work: | Maint. Needs: | Maint. Priority:

Recommended Timing: | Maint. Desc.:

Work Details:

Element Group:	**Foundations**	Length:	0.00
Element Name:	**Foundation (below ground level)**	Width:	0.00
Location:	All	Height:	0.00
Material:	Cast-in-Place Concrete	Count:	1.0
Element Type:	Unknown	Total Quantity:	1.0
Environment:	Benign	Limited Inspection	☑
Protection System:	None		

Condition Data:

Units:	Exc.	Good:	Fair:	Poor:	Performance Deficiencies:
All	0.0	0.0	0.0	0.0	

Comments: Limited inspection (below ground level). No signs of foundation settlement or instability at the time of the inspection.

Recommended Work: | Maint. Needs: | Maint. Priority:

Recommended Timing: | Maint. Desc.:

Work Details:

Ontario Structure Inspection Manual - Inspection Form

MTO Site Number: 112

Structure Name: Macdonell Bridge

Structure ID: 112

Element Group:	**Piers**	Length:	0.90
Element Name:	**Shafts/Columns/Pile Bents**	Width:	17.80
Location:	Central Pier	Height:	3.50
Material:	Cast-in-Place Concrete	Count:	1.0
Element Type:	Concrete Rectangular Columns	Total Quantity:	130.9
Environment:	Benign	Limited Inspection	☐
Protection System:	None		

Condition Data:

Units:	Exc.	Good:	Fair:	Poor:	Performance Deficiencies:
sq.m.	0.0	120.9	5.0	5.0	

Comments: Wide vertical cracks, some with efflorescence

Recommended Work:	Major Rehabilitation	Maint. Needs:		Maint. Priority:	
Recommended Timing:	1-5 Years	Maint. Desc.:			
Work Details:	Major Rehabilitation				

Element Group:	**Retaining Walls**	Length:	7.00
Element Name:	**Walls**	Width:	0.00
Location:	Southeast Retaining Wall	Height:	2.50
Material:	Cast-in-Place Concrete	Count:	1.0
Element Type:	Reinforced Concrete	Total Quantity:	17.5
Environment:	Benign	Limited Inspection	☐
Protection System:	None		

Condition Data:

Units:	Exc.	Good:	Fair:	Poor:	Performance Deficiencies:
sq.m.	0.0	15.5	1.0	1.0	

Comments: Wide cracking

Recommended Work:	Major Rehabilitation	Maint. Needs:		Maint. Priority:	
Recommended Timing:	1-5 Years	Maint. Desc.:			
Work Details:	Major Rehabilitation				

Element Group:	**Retaining Walls**	Length:	13.00
Element Name:	**Walls**	Width:	0.00
Location:	Northeast Retaining Wall	Height:	2.00
Material:	Cast-in-Place Concrete	Count:	1.0
Element Type:	Reinforced Concrete	Total Quantity:	26.0
Environment:	Benign	Limited Inspection	☐
Protection System:	None		

Condition Data:	Units:	Exc.	Good:	Fair:	Poor:	Performance Deficiencies:
	sq.m.	0.0	26.0	0.0	0.0	

Comments: Isolated light delamination near abutment wall; 4 wall drains

Recommended Work:		Maint. Needs:		Maint. Priority:	
Recommended Timing:		Maint. Desc.:			
Work Details:					

Element Group:	**Retaining Walls**	Length:	13.60
Element Name:	**Walls**	Width:	0.00
Location:	Northwest Retaining Wall	Height:	2.30
Material:	Cast-in-Place Concrete	Count:	1.0
Element Type:	Reinforced Concrete	Total Quantity:	31.3
Environment:	Benign	Limited Inspection	☐
Protection System:	None		

Condition Data:	Units:	Exc.	Good:	Fair:	Poor:	Performance Deficiencies:
	sq.m.	0.0	28.3	1.0	2.0	

Comments: Severe scaling; Isolated light delamination around STM outlet; 3 wall drains

Recommended Work:	Major Rehabilitation	Maint. Needs:		Maint. Priority:	
Recommended Timing:	1-5 Years	Maint. Desc.:			
Work Details:	Major Rehabilitation				

Element Group:	**Retaining Walls**	Length:	2.50
Element Name:	**Walls**	Width:	0.00
Location:	Southwest Retaining Wall	Height:	3.10
Material:	Cast-in-Place Concrete	Count:	1.0
Element Type:	Reinforced Concrete	Total Quantity:	7.8
Environment:	Benign	Limited Inspection	☐
Protection System:	None		

Condition Data:	Units:	Exc.	Good:	Fair:	Poor:	Performance Deficiencies:
	sq.m.	0.0	5.8	1.0	1.0	

Comments: Wide cracking

Recommended Work:	Major Rehabilitation	Maint. Needs:		Maint. Priority:	
Recommended Timing:	1-5 Years	Maint. Desc.:			
Work Details:	Major Rehabilitation				

Element Group:	**Retaining Walls**	Length:	10.00
Element Name:	**Walls**	Width:	0.00
Location:	Under East Span	Height:	3.50
Material:	Cast-in-Place Concrete	Count:	1.0
Element Type:	Reinforced Concrete	Total Quantity:	35.0
Environment:	Benign	Limited Inspection	☐
Protection System:	None		

Condition Data:	Units:	Exc.	Good:	Fair:	Poor:	Performance Deficiencies:
	sq.m.	0.0	33.0	1.0	1.0	

Comments: Wide cracking

Recommended Work:	Major Rehabilitation	Maint. Needs:		Maint. Priority:	
Recommended Timing:	1-5 Years	Maint. Desc.:			
Work Details:	Major Rehabilitation				

Ontario Structure Inspection Manual - Inspection Form

MTO Site Number: 112

Structure Name: Macdonell Bridge

Structure ID: 112

Element Group:	**Sidewalks/Curbs**	Length:	43.00
Element Name:	**Sidewalk and Medians**	Width:	1.90
Location:	Over Structure (North/South)	Height:	0.20
Material:	Cast-in-Place Concrete	Count:	2.0
Element Type:	-	Total Quantity:	180.6
Environment:	Severe	Limited Inspection	☐
Protection System:	None		

Condition Data:

Units:	Exc.	Good:	Fair:	Poor:	Performance Deficiencies:
sq.m.	0.0	120.6	50.0	10.0	

Comments: Light scaling; Narrow to wide cracking throughout

Recommended Work:	Major Rehabilitation	Maint. Needs:		Maint. Priority:	
Recommended Timing:	1-5 Years	Maint. Desc.:			
Work Details:	Major Rehabilitation				

Repair / Rehabilitation Required

Element Group	Element	Repair / Rehabilitation	Priority	Const Cost
Structure	Structure	Major Rehabilitation	1-5 Years	$1,780,000

Total Repair/Rehabilitation Cost **$1,780,000**

Associated Work

	Comments	Estimated Cost
Approaches		$40,000
Detours		$0
Traffic Control		$35,000
Utilities		$0
Right-of-Way		$0
Environmental Study	*Municipal Class EA*	$0
Other		$0

Contingencies	Incl.	$0
Engineering		
Total Associated Work Cost		**$75,000**
Total Repair / Rehabilitation Cost		$1,780,000
Total Cost		**$1,855,000**

Justification

Photo 1: Structure from East Approach

Photo 2: Structure from West Approach

Photo 3: East Approach from Center of Structure

Photo 4: West Approach from Center of Structure

Photo 5: North Elevation

Photo 6: South Elevation

Photo 7: Wide Transverse Cracks and Bump Transition at East End of Deck

Photo 8: Wide Cracks on North Sidewalk at East End of Deck

Photo 9: Light to Moderate Scaling on North Sidewalk

Photo 10: Light to Localized Moderate Corrosion on Steel Barrier

Photo 11: Wide Transverse and Longitudinal Cracks on Deck Wearing Surface

Photo 12: Medium Cracks and Large Spall with Exposed Corroded Reinforcing Steel on North Soffit Fascia

Photo 13: Wide Cracks and Delaminated Concrete on South Soffit Fascia

Photo 14: Spall with Exposed Corroded Reinforcing Steel and Delaminated Concrete on Soffit, West End of West Span

Photo 15: Spall with Exposed Corroded Reinforcing Steel and Delaminated Concrete on Soffit, Center of West Span

Photo 16: Wide Longitudinal Crack with Damp Staining, Full Length of East Span Soffit

APPENDIX A.III:
2021 DETAILED DECK CONDITION SURVEY

BRIDGE CHECK CANADA

Your Bridge & Concrete Inspection Specialists

DETAILED CONDITION SURVEY REPORT

Structure ID 112, Macdonell Bridge, Guelph, ON

Prepared for: R.V. Anderson Association Limited

BCC Project No.: BCC21015
Report Date: September 15, 2021

Bridge Check Canada Ltd.
200 Viceroy Road, Unit 4, Vaughan, ON L4K 3N8
T 905-660-6608 F 905-660-6608
www.bridgecheckcanada.com

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Structure Identification Sheet

200 Viceroy Road, Unit 4, Vaughan, ON L4K 3N8
www.bridgecheckcanada.com
Tel: 905-660-6608 Fax: 905-660-6609
info@bridgecheckcanada.com

STRUCTURE IDENTIFICATION SHEET

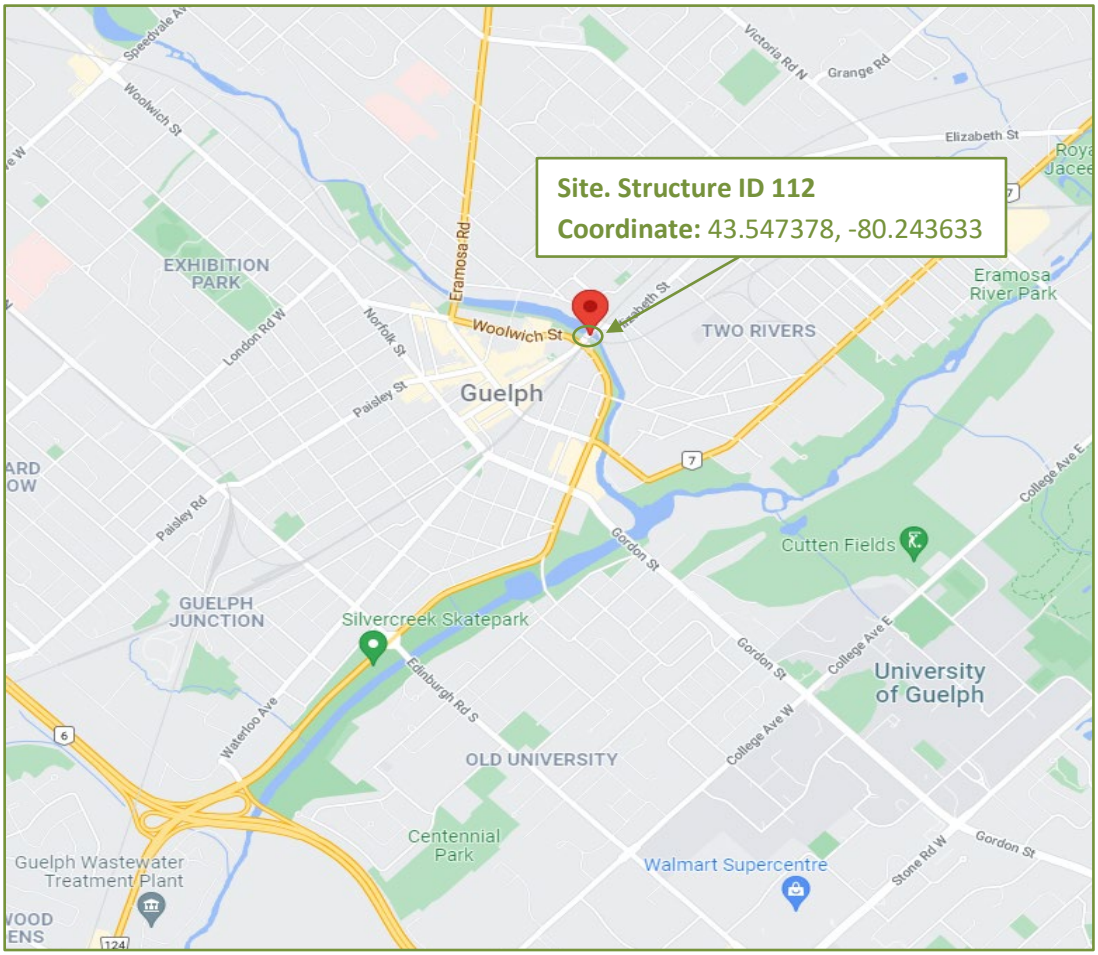
GENERAL INFORMATION			
STRUCTURE NAME	***Macdonell Bridge***		
SITE NUMBER	Structure ID 112	**DISTRICT NUMBER**	N/A
HIGHWAY **above**	Macdonell St.	**Below**	
TYPE OF STRUCTURE	Reinforced cast-in-place concrete slab		
NUMBER OF SPANS	2	**SPAN LENGTHS**	24.4, 18.60 m
ROADWAY WIDTH	14.60 m	**YEAR BUILT**	1963
DIRECTION OF STRUCTURE	East to West		
SEQUENCE NUMBER	N/A	**TOWNSHIP NUMBER**	N/A
LHRS NUMBER	N/A	**MUNICIPAL BRIDGE NUMBER**	N/A
LOCATION	60m E of Woolwich Street	**JURISDICTION**	City of Guelph
INSPECTOR'S NAME	Moe Abdollahi, P.Eng.		
PARTY MEMBERS	A.Rashid, P.Eng., J.Murray, P.Pandiyan, M.Azeem, V.Dave, V.Pandi		
DATE OF INSPECTION	27-Jul-21		
TEMPERATURE	24 **°C**	**WEATHER**	Rainy/Cloudy
MTO REGION	Southwestern	**AADT**	10000
DECK RIDING SURFACE	Asphalt		
YEAR LAST REHABILITATED	1988		

ENGINEER'S STAMP

Key Plan

KEY PLAN

Structure ID 112, Macdonell Bridge,
Guelph, ON



Summary of Significant Findings

SUMMARY OF SIGNIFICANT FINDINGS

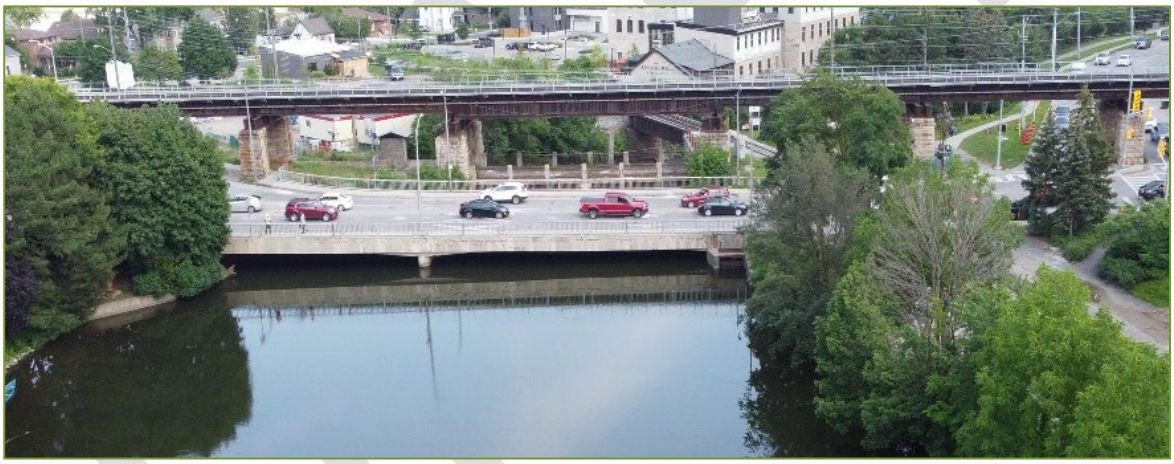
Site No. 112, Macdonell Bridge, Guelph, ON

1.0 INTRODUCTION

Bridge Check Canada Ltd. was retained by R.V. Anderson Associates Limited, under City of Guelph RFP# 20-156, to carry out detailed condition survey for three structures. This report presents *Bridge Check Canada's* findings, through the field investigations and laboratory testing, for Macdonell Bridge (Site No. 112) located on Macdonell Street, 60 m east of Woolwich Street in Guelph, Ontario. First time field investigations were carried out on July 27, 2021.

Site No. 112, constructed in 1963, is a two-span reinforced cast-in-place rigid frame concrete slab, overlain with an asphalt wearing surface and carries two traffic lanes per direction of Macdonell Street.

The total span length of the bridge is 43.00 m and the roadway width is 14.60 m. The structure has an east-to-west orientation. The outer limits of the structure contain concrete sidewalks and steel railing system. Photo P1 shows a view of the north elevation of the site. Photo P2 shows the south elevation.



North Elevation of Site No. 112, Macdonell Bridge

The bridge was rehabilitated in 1988 including concrete overlay and resurfacing, details of which were not available.

In 2018 OSIM Report the bridge Overall Comments were "Structure in overall fair to poor condition. Structure should be scheduled for replacement. A Municipal Class Environmental Assessment should be completed in conjunction with Structure 131 and Structure 320. Consideration could be given to only a superstructure replacement. Second inspection completed in October 2018 during low water levels." The BCI was 64.

2.0 METHODOLOGY

In general, the procedures followed to conduct the condition survey and delamination survey were those defined in Part 1 of the MTO Structure Rehabilitation Manual (2007). This assignment involved the

observation and recording of surface defects, delamination detection, grid layouts (1.5 m x 1.5 m), concrete cores (100 mm ø), sawn asphalt samples, corrosion potential survey, and physical testing of the concrete cores.

The delaminations in the concrete were detected by striking the surface with a heavy hammer and noting the type of sound being emitted. Note that, while this method is quite reliable, it may not detect delaminations at a depth greater than 100 mm. The hammer sounding method was used for all accessible vertical and overhead surfaces. The areas and locations of patches, spalls, delaminations, exposed reinforcement, honey-combing, wet areas, scaling and other observed defects were recorded.

A corrosion potential survey was conducted for the asphalt covered bridge deck and concrete sidewalks. The survey was performed in accordance with the requirements of ASTM C876 and the MTO Structure Rehabilitation Manual. A positive ground connection was made directly to the reinforcing steel, at the locations shown on the accompanying drawings.

Twenty two (22) cores (21 cores in deck and one core in the west approach) and 18 sawn asphalt samples were extracted from the structure, in compliance with the requirements for selecting cores and sawn asphalt samples from deteriorated and sound areas. The inside of the coreholes were examined carefully for cracks and the condition of the concrete. The exposed surface of the concrete at the sawn asphalt samples was carefully examined for evidence of deterioration. All the test holes were reinstated to their original condition using MTO-approved products.

Enclosed with this report are detailed condition survey summary sheets, survey equipment and calibration procedures, core photos/sketches, core logs, sawn asphalt sample photos, sawn asphalt sample logs, site photos, laboratory test results and drawings.

3.0 BRIDGE STRUCTURE

3.1 Asphalt Wearing Surface

The width of the asphalt covered bridge deck between abutments is 14.60 m, with a total surveyed area of 664.20 m^2. The condition of the asphalt wearing surface on the bridge deck was identified through visual field observations and review of cores and sawn asphalt samples. Drawing 1 shows the defects on the asphalt wearing surface as well as the location of the cores and sawn asphalt samples. The general pavement surface condition is shown in Photos P3 to P9. The asphalt wearing surface on the concrete deck was generally in fair-to-poor condition with unsealed transverse cracks (71.0 m), longitudinal cracks (119.0 m), random cracks (204.0 m); sealed random cracks (2.0 m); potholes/patches (9.70 m^2); alligator cracks (36.30 m^2); and rutting in the EB turning lane. The asphalt depth, measured in the drilled holes, coreholes, and sawn asphalt samples, varied from 35 mm to 95 mm with an average depth of 57 mm (refer to Drawing 2).

3.2 Waterproofing

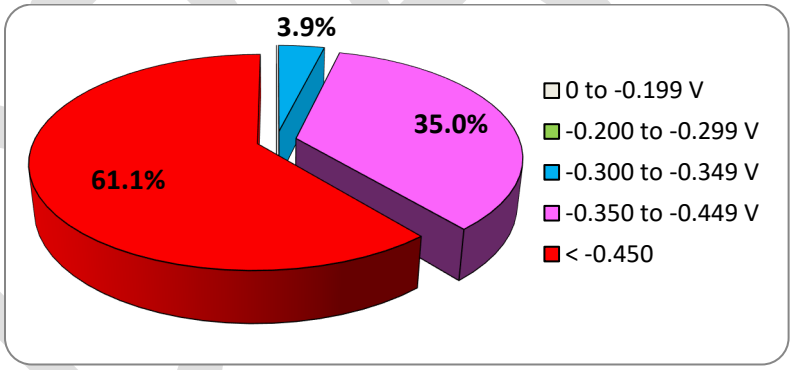
No evidence of a waterproofing system was detected over the concrete deck.

3.3 Concrete Deck

The concrete deck consists of a two-span cast-in-place rigid frame concrete slab, supported by abutments and a centre pier. The condition of the concrete deck was observed at 21 core locations and 18 sawn asphalt sample locations. The inside of the coreholes and the exposed concrete surface at the sawn asphalt samples were examined carefully for cracks and other defects. Photos P64 to P75 show the inside of the coreholes. A review of the concrete cores revealed debonding of the overlay in the majority of the cores. Medium-to-severe scaling was noted in cores C6, C7, C14, C16, C19, C21, C22. Visual review of the exposed concrete surface at the sawn asphalt samples revealed light-to-severe scaling in all sawn samples. Delamination of concrete surface was noted in SS2, SS7, SS9, SS16, SS18. Cracks were observed in SS10 and SS16. Refer to the core and sawn asphalt sample logs and photos.

The concrete overlay, encountered in the coreholes, varied in depth from 55 mm to 130 mm. The concrete cover on the upper rebar layer was found to range from 75 to 135 mm with an average cover of 111 mm. Light rusting of the reinforcement steel was found in core C20. Severe rusting of the reinforcement was noted in core C5.

Corrosion potential values obtained from the half-cell test carried out in the asphalt covered deck ranged from –0.303 V to –0.640 V with an average value of –0.434 V. The half-cell survey indicated uncertain low corrosion activity for 3.9% (0.0%+3.9%) of the deck area, with values ranging from -0.200 V to -0.349 V. Probable active corrosion was detected for 96.1% (35.0%+61.1%) of the deck area with corrosion potential values more negative than -0.350 V. Drawing 3 shows the corrosion potential readings in deck.



Corrosion potential distribution in deck

Core C19 was tested for compressive strength of the hardened concrete in accordance with CSA A23.2-14-14C. The compressive strength of the hardened concrete for this core was found to be 65.2 MPa.

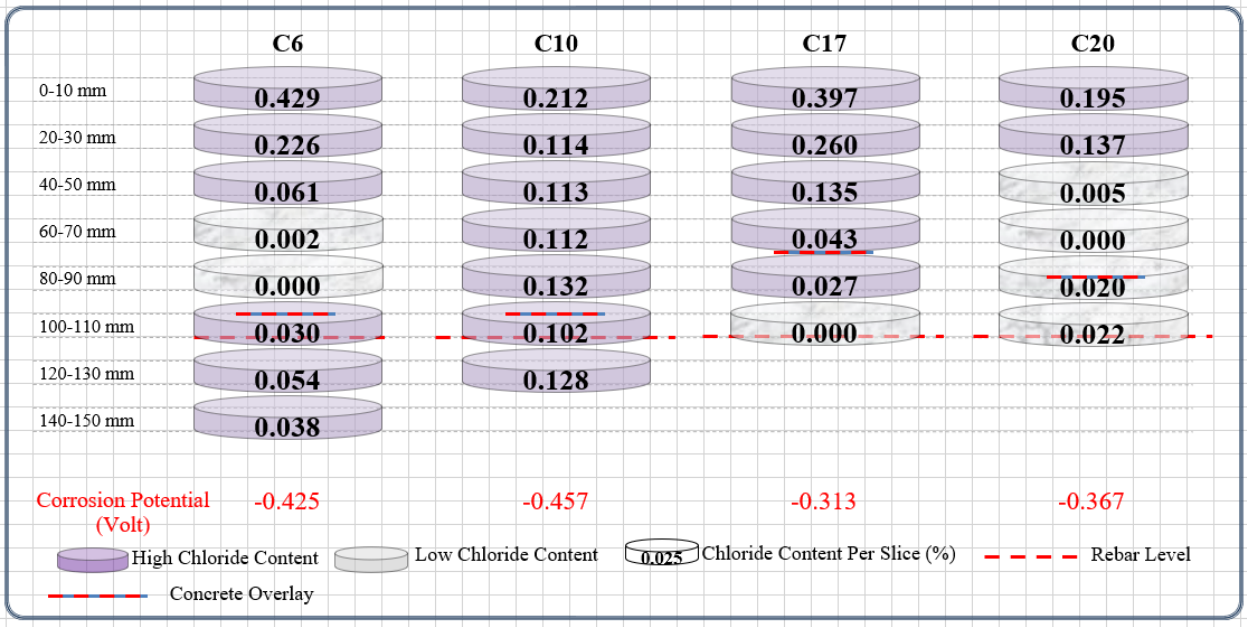
The chloride ion content was determined for four cores using MTO LS-417 “Method of Test for Determination of Total Chloride Ion in Concrete – Acid Soluble”. These core samples were located at areas prone to salt exposure (e.g. along construction joints, low points of the deck, asphalt cracks). In addition, samples from other moderately exposed areas were also taken. The chloride ion content values, at the average concrete cover or at rebar level are summarized below.

Core No.	C6 (Overlay)	C10 (Overlay)	C17 (Parent)	C20 (Parent)
Corrected Chloride Content (%)*	0.030	0.102	0.000	0.022
Corrosion Potential (V)	-0.425	-0.457	-0.313	-0.367

* Background chloride ion content was estimated to be 0.048% for parent concrete and 0.056% for overlay.

The chloride threshold value necessary to depassivate embedded steel and to allow the onset of corrosion (in the presence of oxygen and moisture) is generally taken as 0.025% by mass of concrete. The background chloride content is the lowest chloride content value for all of the cores tested for chloride content. The "background" chlorides do not contribute to corrosion, and thus the results are corrected for the background chloride content. The corrected chloride content, at the rebar level, was above the chloride threshold level of 0.025% in cores C6 and C10, both in the concrete overlay. The results indicate that chloride contamination has extended to the upper rebar level in the concrete overlay on deck.

The corrected chloride content (%) per slice for each tested core is summarized below:



Corrected Chloride Content (%) Per Slice for Each Tested Core

Core C3 was tested to determine the air void system of the hardened concrete in accordance with ASTM C457 using the Modified Point Count Method. Test results are summarized below:

Core No.	Air Content (%)	Specific Surface (mm^{-1})	Spacing Factor (mm)
C3	4.7	39.70	0.139

Concrete is normally considered to be properly air entrained if the air content exceeds 3.0%, the specific surface exceeds 24 mm^{-1}, and the average spacing factor is less than 0.200 mm. Therefore, the air void system for Core C3 is considered air entrained.

3.4 Deck Soffit and Fascia

A detailed visual inspection of deck soffit and fascia was carried out. The deterioration is shown on Drawing 4 and in Photos P10 to P25. Access to west side was limited due to the high-water level below the bridge at west abutment.

The bridge deck soffit and fascia, with a total surveyed area of 968.60 m^2, were in fair condition with clean/stained medium width cracks (155.0 m), clean wide width cracks (110.0 m), pattern cracks (19.70 m^2), delaminations (38.60 m^2), spalling (31.10 m^2), light scaling (108.00 m^2), and wet areas (46.60 m^2). The soffit deteriorations were mainly found along the deck centreline and surrounding deck drains. Wide cracks were located on the fascia.

3.5 Bridge Approaches

The asphalt wearing surface on the bridge approaches was generally in fair-to-poor condition with unsealed cracks and potholes. Photos P26 and P27 show the general pavement condition on the east and west approaches, respectively. Core C1 was taken from the west approach, where granular materials were encountered beneath 140 mm of asphalt. Photo P63 shows the inside of the corehole C1.

3.6 Deck Drainage

A total of eight steel drain pipes were located on bridge deck, each having a 100 mm diametre and a 350 mm length. The drain pipes need to be extended so that they do not discharge drain water on the soffit surface. Catch basins were found at all four quadrants outside structure limits (Photos P28 to P32).

3.7 Joints

Deck joints were found to be paved over and exhibiting multiple transverse cracks, potholes, and settlements (Photos P33 to P35).

3.8 Concrete Sidewalks

The concrete sidewalks, with a total surveyed area of 231.43 m^2, were in fair-to-poor condition with clean medium width cracks (221.0 m), clean wide width cracks (4.0 m), delaminations (11.30 m^2), spalls (1.50 m^2), patches (1.30 m^2), light scaling (10.10 m^2), medium scaling (92.80 m^2), and severe scaling (67.00 m^2). The surface deterioration is shown on Drawing 1 and in Photos P36 to P45.

Corrosion potential values obtained from the half-cell test carried out in the concrete sidewalks ranged from –0.451 V to –0.467 V with an average value of –0.460 V. The half-cell survey indicated probable active corrosion for 100.0% (0.0%+100.0%) of the sidewalk area with corrosion potential values more negative than -0.350 V. Drawing 3 shows the corrosion potential readings in the concrete sidewalk.

3.9 Steel Handrails

The steel handrails were in fair condition with light corrosion (Photos P36 to P45).

4.0 SUBSTRUCTURE COMPONENTS

The abutment walls, retaining walls, and piers were inspected and hammer sounded to check for delaminations, where accessible. Field measurements are presented in the field summary sheets.

4.1 Abutment Walls

The exposed surfaces of the abutment walls were inspected and sounded to check for delaminations, were accessible. The total surveyed area for the east and west abutments were 32.40 m^2 and 24.40 m^2, respectively. The deterioration is shown on Drawing 5. General views of the abutment walls are shown in Photos P46 to P51. Access to west abutment was limited due to the high-water level below the bridge at west abutment. The abutment walls were generally in fair condition. The field investigation of the east abutment wall revealed clean/stained medium width cracks (14.0 m), spalls (0.10 m^2), light scaling (1.10 m^2), medium scaling (2.30 m^2), and wet areas (0.91 m^2). The field investigation of the west abutment wall revealed clean medium width cracks (3.0 m) and light scaling (5.10 m^2).

4.2 Retaining Walls

The exposed surfaces of the retaining walls were inspected and sounded to check for delaminations, where accessible. The total surveyed area for the retaining walls was 44.30 m^2. The deterioration is shown on Drawing 5 and in Photos P52 to P56. The retaining walls were generally in fair-to-good condition with clean/stained medium width cracks (21.0 m), clean wide width cracks (1.0 m), delaminations (0.45 m^2), spalls (1.90 m^2), light scaling (35.40 m^2), medium scaling (0.54 m^2), and severe scaling (0.80 m^2). The wide cracks were found on the NE retaining wall.

4.3 Centre Pier

A detailed visual inspection of the centre pier was carried out. The deterioration is shown on Drawing 5 and in Photos P57 to P62.

The pier, with a total surveyed area of 47.20 m^2, was in fair-to-good condition with clean/stained medium width cracks (12.0 m), stained wide width cracks (1.0 m), light scaling (4.60 m^2), medium scaling (0.58 m^2), and severe scaling (0.10 m^2). The wide cracks were found on the east face of the pier.

Appendix A:

Detailed Condition Survey Summary Sheets

Asphalt Covered Deck, Exposed Concrete Components, Expansion Joint, Drainage

DETAILED CONDITION SURVEY SUMMARY SHEET
ASPHALT COVERED DECK
DECK RIDING SURFACE

Site No. 112

1. Dimensions and Area of Survey

Width between E abutment curbs	14.60 m	Width between W abutment curbs	14.60 m
Length between abutment joints	45.49 m	Area of deck riding surface	664.20 m²

Remarks
Deck dimensions were taken from the structural drawings

2. Asphalt Surface Cracks

Orientation	Unsealed	Sealed	
Transverse	71.0	0.0	**m**
Longitudinal	119.0	0.0	**m**
Random	204.0	2.0	**m**

* Asphalt potholes/patches = 9.70 m²
* Asphalt Alligator Cracks = 36.30 m²
* Asphalt Ravelling = 0.00 m²

3. Asphalt Depth

Remarks

Condition *	Depth			
	Min	Max	Avg	
F to P	35	95	57	**mm**

* G – Good, F – Fair, P – Poor, V - Variable Good to Poor

Remarks

4. Waterproofing

Type	Condition *	Conc. Bond *	Thickness (mm) **			
			Min	Max	Avg	
N/A	N/A	N/A	N/A	N/A	N/A	**mm**

* G – Good, F – Fair, P – Poor, V - Variable Good to Poor
** Report only thickness of waterproofing membrane but note presence of protection board

Site No. 112

5. Concrete Cover – Cores and Sawn Samples

Remarks

Minimum	Maximum	Average	
75	135	111	mm

Note: Only include covers for upper layer of rebars.

6. Corrosion Activity

Remarks

Minimum	Maximum	Average	
-0.303	-0.640	-0.434	V

0 to -0.20	-0.20 to -0.30	-0.30 to -0.35	-0.35 to -0.45	< -0.45	V
0.0	0.0	25.9	232.5	405.8	m^2
0.0	0.0	3.9	35.0	61.1	%

Remarks

7. Defective Cores and Sawn Samples

Corrosion Activity (Volts)	Cores and Sawn Samples						
	Total in Each Area	Delaminated, Spalled, Severe Scaling and Disintegration *			Medium Scaling *		
		No.	m^2	%	No.	m^2	%
0 to -0.20	0	0	0.0	0.0	0	0.0	0.0
-0.20 to -0.30	0	0	0.0	0.0	0	0.0	0.0
-0.30 to -0.35	1	0	0.0	0.0	0	0.0	0.0
-0.35 to -0.45	15	13	201.5	30.3	0	0.0	0.0
<-0.45	23	17	299.9	45.2	0	0.0	0.0

* The percent calculation should be of the entire deck area investigated. The values obtained should be used with caution as large errors may occur when a small number of samples are used for the calculation or when the samples are not randomly distributed over the entire deck area.

Site No. 112

8. Adjusted Chloride Content Profile

*Background (original concrete) chloride content = 0.048
*Background (overlay concrete) chloride content = 0.056

Corrosion Activity at Core Location		0 to -0.20	-0.20 to -0.35	≤-0.35
Chloride Content*	0-10 mm	-	0.397	0.279
	20-30 mm	-	0.260	0.159
	40-50 mm	-	0.135	0.060
	60-70 mm	-	0.043	0.038
	80-90 mm	-	0.027	0.051
	100-110 mm	-	0.000	0.051
	120-130 mm	-	-	0.091
	140-150 mm	-	-	0.038

Remarks

* Average chloride content as % chloride by weight of concrete after deducting background chlorides for all cores taken in each range of corrosion potential.

9. Chloride Content at Rebar Level

Core No.	C6	C10	C7	C20			
Chloride Content*	0.030	0.102	0.000	0.022			
Corrosion Potential	-0.425	-0.457	-0.313	-0.367			
Core No.							
Chloride Content*							
Corrosion Potential							
Core No.							
Chloride Content*							
Corrosion Potential							

* Chloride content as % chloride by weight of concrete after deducting background chlorides.

10. AC Resistance Test Data of Epoxy Coated Rebar

Measured AC Resistance between Connection #1 and #2						Calculated AC Resistance *
Connection #1	Connection #2					
	G1	G2	G3	G4	G5	
G1	N/A	-	-	-	-	-
G2	-	N/A	-	-	-	-
G3	-	-	N/A	-	-	-
G4	-	-	-	N/A	-	-
G5	-	-	-	-	N/A	-

Remarks
Table # 10 is Not Applicable.

* See Appendix 1E for calculating AC resistance contributed by individual rebar.

Site No. 112

Remarks
Table # 11 is Not Applicable.

11. IR Drop and True Half Cell Potential Measurements of Epoxy Coated Rebar

IR Drop Between Connection #1 and #2						True Half Cell Potential *
Connection #1 (positive)	Connection #2 (negative)					
	G1	G2	G3	G4	G5	
G1	N/A	-	-	-	-	-
G2	-	N/A	-	-	-	-
G3	-	-	N/A	-	-	-
G4	-	-	-	N/A	-	-
G5	-	-	-	-	N/A	-

* Half cell reading taken on the same rebar with the ground connection.

12. Concrete Air Entrainment

		Yes	No	Marginal
Concrete Air Entrained?	C3	X		

13. Compressive Strength

Average Compressive Strength **65.2 MPa**

EXPOSED CONCRETE COMPONENTS (Exposed Deck, Deck Soffit, Curbs, Medians, Sidewalks, Barrier/Parapet Walls, etc.): Use separate form for each component

Site No: 112

Component Type & Location: Soffit and Fascia **OSIM Identifier: Decks**

1. Dimensions and Area

Width	-	Length	-	Height	-
Diameter	-	Total Area Surveyed	968.60 m²		

Remarks

Dimensions were taken from the structural drawings & site measurements

2. Cracks (medium and wide)

Type		Transverse	Longitudinal	Other	Total	
Medium Width	**Clean**	8.0	19.0	64.0	155.0	**m**
	Stained	2.0	48.0	14.0		
Wide Width	**Clean**	0.0	110.0	0.0	110.0	**m**
	Stained	0.0	0.0	0.0		

Pattern cracks= 19.70m²

3. Alkali Aggregate Reaction

Area of component with severe to very severe aggregate reaction 0.0 m²

4. Concrete Cover

Minimum	Maximum	Average	
-	-	-	**mm**

0 – 20 mm	-	**40 – 60 mm**	-	m^2
	-		-	%
20 – 40 mm	-	**over 60 mm**	-	m^2
	-		-	%

Remarks

Table # 4 is Not Applicable.

Site No: **112**

Component Type & Location: Soffit and Fascia **OSIM Identifier: Decks**

Remarks
Table # 5 is Not Applicable.

5. Corrosion Activity

Minimum	Maximum	Average	
-	-	-	V

0 to -0.20	-0.20 to -0.30	-0.30 to -0.35	-0.35 to -0.45	< -0.45	
-	-	-	-	-	V
-	-	-	-	-	m^2
-	-	-	-	-	%

6. Delaminations and Spalls

Remarks

Defect Type	Delaminations	Spalls	Patches
Area (m^2)	38.60	31.10	0.00
Total Delaminations and Spalls		Total Delaminations and Spalls in Areas ≤-0.35 V	
69.70 m²	7.2 %	N/A	N/A

*Wet areas = 46.60 m²

7. Scaling

Remarks

Light	Medium	Severe to Very Severe	
108.00	0.00	0.00	m^2
11.2	0.0	0.0	%

8. Honeycombing

Total Area 0.00 m²

Site No: 112

Component Type & Location: Soffit and Fascia **OSIM Identifier: Decks**

Remarks
Table # 9 and 10 are Not Applicable.

9. Adjusted Chloride Content Profile

Corrosion Activity at Core Location (volts)		0 to -0.20	-0.20 to -0.35	≤ -0.35
Chloride Content*	0-10 mm	-	-	-
	20-30 mm	-	-	-
	40-50 mm	-	-	-
	60-70 mm	-	-	-
	80-90 mm	-	-	-
	100-110 mm	-	-	-

* Average chloride content as % chloride by weight of concrete after deducting background chlorides for all cores taken in each range of corrosion potential.

10. Chloride Content at Rebar Level

Core No.	-	-	-	-	-	-
Chloride Content*	-	-	-	-	-	-

* Chloride content as % chloride by weight of concrete after deducting background chlorides.

Remarks
Table # 11 is Not Applicable.

11. AC Resistance Test Data of Epoxy Coated Rebar

Measured AC Resistance between Connection #1 and #2						Calculated AC Resistance *
Connection #1	Connection #2					
	G1	G2	G3	G4	G5	
G1	N/A	-	-	-	-	-
G2	-	N/A	-	-	-	-
G3	-	-	N/A	-	-	-
G4	-	-	-	N/A	-	-
G5	-	-	-	-	N/A	-

* See Appendix 1E for calculating AC resistance contributed by individual rebar.

Site No: **112**

Component Type & Location: Soffit and Fascia **OSIM Identifier: Decks**

Remarks
Table # 12 is Not Applicable.

12. IR Drop and True Half Cell Potential Measurements of Epoxy Coated Rebar

IR Drop Between Connection #1 and #2						True Half Cell Potential *
Connection #1 (positive)	Connection #2 (negative)					
	G1	G2	G3	G4	G5	
G1	N/A	-	-	-	-	-
G2	-	N/A	-	-	-	-
G3	-	-	N/A	-	-	-
G4	-	-	-	N/A	-	-
G5	-	-	-	-	N/A	-

* Half cell reading taken on the same rebar with the ground connection.

13. Concrete Air Entrainment

Concrete Air Entrained: not tested

14. Compressive Strength

Average Compressive Strength: not tested

EXPOSED CONCRETE COMPONENTS (Exposed Deck, Deck Soffit, Curbs, Medians, Sidewalks, Barrier/Parapet Walls, etc.): Use separate form for each component

Site No: **112**

Component Type & Location: Sidewalks **OSIM Identifier: Sidewalks/curbs**

1. Dimensions and Area

Width - Length - Height -

Diameter - Total Area Surveyed 231.43 m²

Remarks

Dimensions were taken from the structural drawings & site measurements

2. Cracks (medium and wide)

Type		Transverse	Longitudinal	Other	Total	
Medium Width	**Clean**	30.0	29.0	162.0	221.0	**m**
	Stained	0.0	0.0	0.0		
Wide Width	**Clean**	2.0	0.0	2.0	4.0	**m**
	Stained	0.0	0.0	0.0		

3. Alkali Aggregate Reaction

Area of component with severe to very severe aggregate reaction 0.0 m²

4. Concrete Cover

Remarks

Minimum	Maximum	Average	
51	118	93	**mm**

0 – 20 mm	0.0	**40 – 60 mm**	23.1	m^2
	0.0		10.0	%
20 – 40 mm	0.0	**over 60 mm**	208.3	m^2
	0.0		90.0	%

Site No: 112

Component Type & Location: Sidewalks **OSIM Identifier: Sidewalks/curbs**

Remarks

5. Corrosion Activity

Minimum	Maximum	Average	
-0.451	-0.467	-0.460	V

0 to -0.20	-0.20 to -0.30	-0.30 to -0.35	-0.35 to -0.45	< -0.45	V
0.0	0.0	0.0	0.0	231.4	m^2
0.0	0.0	0.0	0.0	100.0	%

Remarks

6. Delaminations and Spalls

Defect Type	Delaminations	Spalls	Patches
Area (m^2)	11.30	1.50	1.30

*Wet areas = 0.00 m²

Total Delaminations and Spalls		Total Delaminations and Spalls in Areas ≤-0.35 V	
12.80 m²	5.5 %	12.8 m²	5.5 %

Remarks

7. Scaling

Light	Medium	Severe to Very Severe	
10.10	92.80	67.00	m^2
4.4	40.1	29.0	%

8. Honeycombing

Total Area 0.00 m²

Site No: 112

Component Type & Location: Sidewalks **OSIM Identifier: Sidewalks/curbs**

Remarks
Table # 9 and 10 are Not Applicable.

9. Adjusted Chloride Content Profile

Corrosion Activity at Core Location (volts)		0 to -0.20	-0.20 to -0.35	≤ -0.35
Chloride Content*	0-10 mm	-	-	-
	20-30 mm	-	-	-
	40-50 mm	-	-	-
	60-70 mm	-	-	-
	80-90 mm	-	-	-
	100-110 mm	-	-	-

* Average chloride content as % chloride by weight of concrete after deducting background chlorides for all cores taken in each range of corrosion potential.

10. Chloride Content at Rebar Level

Core No.	-	-	-	-	-	-
Chloride Content*	-	-	-	-	-	-

* Chloride content as % chloride by weight of concrete after deducting background chlorides.

Remarks
Table # 11 is Not Applicable.

11. AC Resistance Test Data of Epoxy Coated Rebar

Measured AC Resistance between Connection #1 and #2						Calculated AC Resistance *
Connection #1	Connection #2					
	G1	G2	G3	G4	G5	
G1	N/A	-	-	-	-	-
G2	-	N/A	-	-	-	-
G3	-	-	N/A	-	-	-
G4	-	-	-	N/A	-	-
G5	-	-	-	-	N/A	-

* See Appendix 1E for calculating AC resistance contributed by individual rebar.

Site No: **112**

Component Type & Location: Sidewalks

OSIM Identifier: Sidewalks/curbs

Remarks
Table # 12 is Not Applicable.

12. IR Drop and True Half Cell Potential Measurements of Epoxy Coated Rebar

IR Drop Between Connection #1 and #2						True Half Cell Potential *
Connection #1 (positive)	Connection #2 (negative)					
	G1	G2	G3	G4	G5	
G1	N/A	-	-	-	-	-
G2	-	N/A	-	-	-	-
G3	-	-	N/A	-	-	-
G4	-	-	-	N/A	-	-
G5	-	-	-	-	N/A	-

* Half cell reading taken on the same rebar with the ground connection.

13. Concrete Air Entrainment

Concrete Air Entrained: not tested

14. Compressive Strength

Average Compressive Strength: not tested

EXPOSED CONCRETE COMPONENTS (Exposed Deck, Deck Soffit, Curbs, Medians, Sidewalks, Barrier/Parapet Walls, etc.): Use separate form for each component

Site No: 112

Component Type & Location: West Abutment Wall **OSIM Identifier: Abutments**

1. Dimensions and Area

Width - Length - Height -

Diameter - Total Area Surveyed 24.40 m²

Remarks

Dimensions were taken from the structural drawings & site measurements

2. Cracks (medium and wide)

Type		Vertical	Horizontal	Diagonal	Total	
Medium Width	Clean	1.0	0.0	2.0	3.0	m
	Stained	0.0	0.0	0.0		
Wide Width	Clean	0.0	0.0	0.0	0.0	m
	Stained	0.0	0.0	0.0		

3. Alkali Aggregate Reaction

Area of component with severe to very severe aggregate reaction 0.0 m²

4. Concrete Cover

Minimum	Maximum	Average	
-	-	-	mm

0 – 20 mm	-	40 – 60 mm	-	m^2
	-		-	%
20 – 40 mm	-	over 60 mm	-	m^2
	-		-	%

Remarks

Table # 4 is Not Applicable.

Site No: **112**

Component Type & Location: West Abutment Wall **OSIM Identifier: Abutments**

Remarks
Table # 5 is Not Applicable.

5. Corrosion Activity

Minimum	Maximum	Average	
-	-	-	V

0 to -0.20	-0.20 to -0.30	-0.30 to -0.35	-0.35 to -0.45	< -0.45	
-	-	-	-	-	V
-	-	-	-	-	m^2
-	-	-	-	-	%

6. Delaminations and Spalls

Remarks

Defect Type	Delaminations	Spalls	Patches
Area (m^2)	0.00	0.00	0.00
Total Delaminations and Spalls		Total Delaminations and Spalls in Areas ≤-0.35 V	
0.00 m²	0.0 %	N/A	N/A

*Wet areas = 0.00 m²

7. Scaling

Remarks

Light	Medium	Severe to Very Severe	
5.10	0.00	0.00	m^2
20.9	0.0	0.0	%

8. Honeycombing

Total Area 0.00 m²

Site No: **112**

Component Type & Location: West Abutment Wall **OSIM Identifier: Abutments**

Remarks
Table # 9 and 10 are Not Applicable.

9. Adjusted Chloride Content Profile

Corrosion Activity at Core Location (volts)		0 to -0.20	-0.20 to -0.35	≤ -0.35
Chloride Content*	0-10 mm	-	-	-
	20-30 mm	-	-	-
	40-50 mm	-	-	-
	60-70 mm	-	-	-
	80-90 mm	-	-	-
	100-110 mm	-	-	-

* Average chloride content as % chloride by weight of concrete after deducting background chlorides for all cores taken in each range of corrosion potential.

10. Chloride Content at Rebar Level

Core No.	-	-	-	-	-	-
Chloride Content*	-	-	-	-	-	-

* Chloride content as % chloride by weight of concrete after deducting background chlorides.

Remarks
Table # 11 is Not Applicable.

11. AC Resistance Test Data of Epoxy Coated Rebar

Measured AC Resistance between Connection #1 and #2						Calculated AC Resistance *
Connection #1	Connection #2					
	G1	G2	G3	G4	G5	
G1	N/A	-	-	-	-	-
G2	-	N/A	-	-	-	-
G3	-	-	N/A	-	-	-
G4	-	-	-	N/A	-	-
G5	-	-	-	-	N/A	-

* See Appendix 1E for calculating AC resistance contributed by individual rebar.

Site No: **112**

Component Type & Location: West Abutment Wall **OSIM Identifier: Abutments**

Remarks
Table # 12 is Not Applicable.

12. IR Drop and True Half Cell Potential Measurements of Epoxy Coated Rebar

IR Drop Between Connection #1 and #2						True Half Cell Potential *
Connection #1 (positive)	Connection #2 (negative)					
	G1	G2	G3	G4	G5	
G1	N/A	-	-	-	-	-
G2	-	N/A	-	-	-	-
G3	-	-	N/A	-	-	-
G4	-	-	-	N/A	-	-
G5	-	-	-	-	N/A	-

* Half cell reading taken on the same rebar with the ground connection.

13. Concrete Air Entrainment

Concrete Air Entrained: not tested

14. Compressive Strength

Average Compressive Strength: not tested

EXPOSED CONCRETE COMPONENTS (Exposed Deck, Deck Soffit, Curbs, Medians, Sidewalks, Barrier/Parapet Walls, etc.): Use separate form for each component

Site No: 112

Component Type & Location: East Abutment Wall **OSIM Identifier: Abutments**

1. Dimensions and Area

Width - Length - Height -

Diameter - Total Area Surveyed 32.40 m²

Remarks

Dimensions were taken from the structural drawings & site measurements

2. Cracks (medium and wide)

Type		Vertical	Horizontal	Diagonal	Total	
Medium Width	**Clean**	3.0	6.0	4.0	14.0	**m**
	Stained	0.0	0.0	1.0		
Wide Width	**Clean**	0.0	0.0	0.0	0.0	**m**
	Stained	0.0	0.0	0.0		

3. Alkali Aggregate Reaction

Area of component with severe to very severe aggregate reaction 0.0 m²

4. Concrete Cover

Remarks

Table # 4 is Not Applicable.

Minimum	Maximum	Average	
-	-	-	**mm**

0 – 20 mm	-	**40 – 60 mm**	-	m^2
	-		-	%
20 – 40 mm	-	**over 60 mm**	-	m^2
	-		-	%

Site No: **112**

Component Type & Location: East Abutment Wall **OSIM Identifier: Abutments**

Remarks
Table # 5 is Not Applicable.

5. Corrosion Activity

Minimum	Maximum	Average	
-	-	-	V

0 to -0.20	-0.20 to -0.30	-0.30 to -0.35	-0.35 to -0.45	< -0.45	
-	-	-	-	-	V
-	-	-	-	-	m^2
-	-	-	-	-	%

Remarks

6. Delaminations and Spalls

Defect Type	Delaminations	Spalls	Patches
Area (m^2)	0.00	0.10	0.00
Total Delaminations and Spalls		Total Delaminations and Spalls in Areas ≤-0.35 V	
0.10 m²	0.3 %	N/A	N/A

*Wet areas = 0.91 m²

Remarks

7. Scaling

Light	Medium	Severe to Very Severe	
1.10	2.30	0.00	m^2
3.4	7.1	0.0	%

8. Honeycombing

Total Area 0.00 m²

Site No: 112

Component Type & Location: East Abutment Wall **OSIM Identifier: Abutments**

Remarks
Table # 9 and 10 are Not Applicable.

9. Adjusted Chloride Content Profile

Corrosion Activity at Core Location (volts)		0 to -0.20	-0.20 to -0.35	≤ -0.35
Chloride Content*	0-10 mm	-	-	-
	20-30 mm	-	-	-
	40-50 mm	-	-	-
	60-70 mm	-	-	-
	80-90 mm	-	-	-
	100-110 mm	-	-	-

* Average chloride content as % chloride by weight of concrete after deducting background chlorides for all cores taken in each range of corrosion potential.

10. Chloride Content at Rebar Level

Core No.	-	-	-	-	-	-
Chloride Content*	-	-	-	-	-	-

* Chloride content as % chloride by weight of concrete after deducting background chlorides.

Remarks
Table # 11 is Not Applicable.

11. AC Resistance Test Data of Epoxy Coated Rebar

Measured AC Resistance between Connection #1 and #2						Calculated AC Resistance *
Connection #1	Connection #2					
	G1	G2	G3	G4	G5	
G1	N/A	-	-	-	-	-
G2	-	N/A	-	-	-	-
G3	-	-	N/A	-	-	-
G4	-	-	-	N/A	-	-
G5	-	-	-	-	N/A	-

* See Appendix 1E for calculating AC resistance contributed by individual rebar.

Site No: **112**

Component Type & Location: East Abutment Wall **OSIM Identifier: Abutments**

Remarks
Table # 12 is Not Applicable.

12. IR Drop and True Half Cell Potential Measurements of Epoxy Coated Rebar

IR Drop Between Connection #1 and #2						True Half Cell Potential *
Connection #1 (positive)	Connection #2 (negative)					
	G1	G2	G3	G4	G5	
G1	N/A	-	-	-	-	-
G2	-	N/A	-	-	-	-
G3	-	-	N/A	-	-	-
G4	-	-	-	N/A	-	-
G5	-	-	-	-	N/A	-

* Half cell reading taken on the same rebar with the ground connection.

13. Concrete Air Entrainment

Concrete Air Entrained: not tested

14. Compressive Strength

Average Compressive Strength: not tested

EXPOSED CONCRETE COMPONENTS (Exposed Deck, Deck Soffit, Curbs, Medians, Sidewalks, Barrier/Parapet Walls, etc.): Use separate form for each component

Site No: **112**

Component Type & Location: Retaining Walls **OSIM Identifier: Retaining Walls**

1. Dimensions and Area

Width - Length - Height -

Diameter - Total Area Surveyed 44.30 m²

Remarks

Dimensions were taken from the structural drawings & site measurements

2. Cracks (medium and wide)

Type		Vertical	Horizontal	Diagonal	Total	
Medium Width	**Clean**	3.0	6.0	11.0	21.0	**m**
	Stained	0.0	0.0	1.0		
Wide Width	**Clean**	0.0	0.0	1.0	1.0	**m**
	Stained	0.0	0.0	0.0		

3. Alkali Aggregate Reaction

Area of component with severe to very severe aggregate reaction 0.0 m²

4. Concrete Cover

Remarks

Table # 4 is Not Applicable.

Minimum	Maximum	Average	
-	-	-	**mm**

0 – 20 mm	-	**40 – 60 mm**	-	m^2
	-		-	%
20 – 40 mm	-	**over 60 mm**	-	m^2
	-		-	%

Site No: 112

Component Type & Location: Retaining Walls

OSIM Identifier: Retaining Walls

5. Corrosion Activity

Remarks

Table # 5 is Not Applicable.

Minimum	Maximum	Average	
-	-	-	V

0 to -0.20	-0.20 to -0.30	-0.30 to -0.35	-0.35 to -0.45	< -0.45	
					V
-	-	-	-	-	m^2
-	-	-	-	-	%

6. Delaminations and Spalls

Remarks

Defect Type	Delaminations	Spalls	Patches
Area (m^2)	0.45	1.90	0.00
Total Delaminations and Spalls		Total Delaminations and Spalls in Areas ≤-0.35 V	
2.35 m²	5.3 %	N/A	N/A

*Wet areas = 0.00 m²

7. Scaling

Remarks

Light	Medium	Severe to Very Severe	
35.40	0.54	0.80	m^2
79.9	1.2	1.8	%

8. Honeycombing

Total Area 0.00 m²

Site No: **112**

Component Type & Location: Retaining Walls **OSIM Identifier: Retaining Walls**

Remarks
Table # 9 and 10 are Not Applicable.

9. Adjusted Chloride Content Profile

Corrosion Activity at Core Location (volts)		0 to -0.20	-0.20 to -0.35	≤ -0.35
Chloride Content*	0-10 mm	-	-	-
	20-30 mm	-	-	-
	40-50 mm	-	-	-
	60-70 mm	-	-	-
	80-90 mm	-	-	-
	100-110 mm	-	-	-

* Average chloride content as % chloride by weight of concrete after deducting background chlorides for all cores taken in each range of corrosion potential.

10. Chloride Content at Rebar Level

Core No.	-	-	-	-	-	-
Chloride Content*	-	-	-	-	-	-

* Chloride content as % chloride by weight of concrete after deducting background chlorides.

Remarks
Table # 11 is Not Applicable.

11. AC Resistance Test Data of Epoxy Coated Rebar

Measured AC Resistance between Connection #1 and #2						Calculated AC Resistance *
Connection #1	Connection #2					
	G1	G2	G3	G4	G5	
G1	N/A	-	-	-	-	-
G2	-	N/A	-	-	-	-
G3	-	-	N/A	-	-	-
G4	-	-	-	N/A	-	-
G5	-	-	-	-	N/A	-

* See Appendix 1E for calculating AC resistance contributed by individual rebar.

Site No: **112**

Component Type & Location: Retaining Walls

OSIM Identifier: Retaining Walls

Remarks
Table # 12 is Not Applicable.

12. IR Drop and True Half Cell Potential Measurements of Epoxy Coated Rebar

IR Drop Between Connection #1 and #2						True Half Cell Potential *
Connection #1 (positive)	Connection #2 (negative)					
	G1	G2	G3	G4	G5	
G1	N/A	-	-	-	-	-
G2	-	N/A	-	-	-	-
G3	-	-	N/A	-	-	-
G4	-	-	-	N/A	-	-
G5	-	-	-	-	N/A	-

* Half cell reading taken on the same rebar with the ground connection.

13. Concrete Air Entrainment

Concrete Air Entrained: not tested

14. Compressive Strength

Average Compressive Strength: not tested

EXPOSED CONCRETE COMPONENTS (Exposed Deck, Deck Soffit, Curbs, Medians, Sidewalks, Barrier/Parapet Walls, etc.): Use separate form for each component

Site No: **112**

Component Type & Location: Pier **OSIM Identifier: Piers**

1. Dimensions and Area

Width - Length - Height -

Diameter - Total Area Surveyed 47.20 m²

Remarks

Dimensions were taken from the structural drawings & site measurements

2. Cracks (medium and wide)

Type		Vertical	Horizontal	Diagonal	Total	
Medium Width	**Clean**	3.0	0.0	8.0	12.0	**m**
	Stained	1.0	0.0	0.0		
Wide Width	**Clean**	0.0	0.0	0.0	1.0	**m**
	Stained	1.0	0.0	0.0		

3. Alkali Aggregate Reaction

Area of component with severe to very severe aggregate reaction 0.0 m²

4. Concrete Cover

Minimum	Maximum	Average	
-	-	-	**mm**

Remarks

Table # 4 is Not Applicable.

0 – 20 mm	-	**40 – 60 mm**	-	m^2
	-		-	%
20 – 40 mm	-	**over 60 mm**	-	m^2
	-		-	%

Site No: 112

Component Type & Location: Pier **OSIM Identifier: Piers**

Remarks
Table # 5 is Not Applicable.

5. Corrosion Activity

Minimum	Maximum	Average	
-	-	-	V

0 to -0.20	-0.20 to -0.30	-0.30 to -0.35	-0.35 to -0.45	< -0.45	
-	-	-	-	-	V
-	-	-	-	-	m^2
-	-	-	-	-	%

6. Delaminations and Spalls

Remarks

Defect Type	Delaminations	Spalls	Patches
Area (m^2)	0.00	0.00	0.00
Total Delaminations and Spalls		Total Delaminations and Spalls in Areas ≤-0.35 V	
0.00 m²	0.0 %	N/A	N/A

*Wet areas = 0.00 m²

Remarks

7. Scaling

Light	Medium	Severe to Very Severe	
4.60	0.58	0.10	m^2
9.7	1.2	0.2	%

8. Honeycombing

Total Area 0.00 m²

Site No: **112**

Component Type & Location: Pier **OSIM Identifier: Piers**

Remarks
Table # 9 and 10 are Not Applicable.

9. Adjusted Chloride Content Profile

Corrosion Activity at Core Location (volts)		0 to -0.20	-0.20 to -0.35	≤ -0.35
Chloride Content*	0-10 mm	-	-	-
	20-30 mm	-	-	-
	40-50 mm	-	-	-
	60-70 mm	-	-	-
	80-90 mm	-	-	-
	100-110 mm	-	-	-

* Average chloride content as % chloride by weight of concrete after deducting background chlorides for all cores taken in each range of corrosion potential.

10. Chloride Content at Rebar Level

Core No.	-	-	-	-	-	-
Chloride Content*	-	-	-	-	-	-

* Chloride content as % chloride by weight of concrete after deducting background chlorides.

Remarks
Table # 11 is Not Applicable.

11. AC Resistance Test Data of Epoxy Coated Rebar

Measured AC Resistance between Connection #1 and #2						Calculated AC Resistance *
Connection #1	Connection #2					
	G1	G2	G3	G4	G5	
G1	N/A	-	-	-	-	-
G2	-	N/A	-	-	-	-
G3	-	-	N/A	-	-	-
G4	-	-	-	N/A	-	-
G5	-	-	-	-	N/A	-

* See Appendix 1E for calculating AC resistance contributed by individual rebar.

Site No: **112**

Component Type & Location: Pier

OSIM Identifier: Piers

Remarks
Table # 12 is Not Applicable.

12. IR Drop and True Half Cell Potential Measurements of Epoxy Coated Rebar

IR Drop Between Connection #1 and #2						True Half Cell Potential *
Connection #1 (positive)	Connection #2 (negative)					
	G1	G2	G3	G4	G5	
G1	N/A	-	-	-	-	-
G2	-	N/A	-	-	-	-
G3	-	-	N/A	-	-	-
G4	-	-	-	N/A	-	-
G5	-	-	-	-	N/A	-

* Half cell reading taken on the same rebar with the ground connection.

13. Concrete Air Entrainment

Concrete Air Entrained: not tested

14. Compressive Strength

Average Compressive Strength: not tested

DRAINAGE

Site No. 112

	Number	Type	Length	Angle	Depth *
Deck Drains	8	100mm Steel pipe	350 mm	N/A	20mm

* For asphalt covered decks, recess depth in mm between top of asphalt and top of drain.

Catch Basins	YES	N/E x 1, N/W x 2, S/E x 2, S/W x 1

* Identify location of catch basins as N/E, N/W, S/E etc. using the same direction of north as shown on the drawings.

Drainage Tubes	NO	**Void Drains**	NO

Typical Condition of Catch Basin @ Southeast

CONDITION SURVEY SUMMARY SHEET - EXPANSION JOINTS

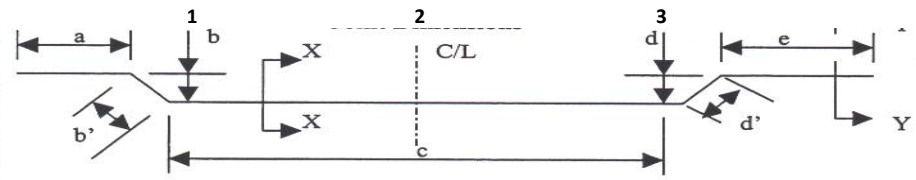
Site No. 112

Dimension	Abutments		Intermediate			
	Joint 1	Joint 2	Joint 3		Joint 4	
	E	W				
a (mm)	1900	1900	-		-	
b (mm)	220	250	-		-	
b' (mm)	230	260	-		-	
c (mm)	14600	14600	-		-	
d (mm)	250	220	-		-	
d' (mm)	260	230	-		-	
e (mm)	1900	1900	-		-	
Depth of Asphalt @ Deck Side			N/E	S/E	N/E	S/W
1 (mm)	35	60	-	-	-	-
2 (mm)	65	80	-	-	-	-
3 (mm)	55	55	-	-	-	-
Width: Top of Ballast Wall and End Dams						
	Ballast Wall	End Dam	Ballast Wall	End Dam	N/E	S/W	N/E	S/W
1 (mm)	-	-	-	-	-	-	-	-
2 (mm)	-	-	-	-	-	-	-	-
3 (mm)	-	-	-	-	-	-	-	-
Gap Dimensions								
1 (mm)	-		-		-		-	
2 (mm)	-		-		-		-	
3 (mm)	-		-		-		-	
Misc. Joint Details			Skew Angle		00° 00' 00"			
Exp	-		-		-		-	
Fixed	-		-		-		-	
Type	-						-	
Leaking	-		-		-		-	
Angle size	-		-		-		-	
Temp °C	Deck		24˚C		Ambient		24˚C	

Remarks

No expansion joints present in structure.

N — JOINT DIMENSIONS — S



Typical Sections at Joints:

Appendix B:

Survey Equipment and Calibration Procedures

200 Viceroy Road, Unit 4, Vaughan, ON L4K 3N8
www.bridgecheckcanada.com
Tel: 905-660-6608 Fax: 905-660-6609
info@bridgecheckcanada.com

SURVEY EQUIPMENT AND CALIBRATION PROCEDURES

Component Type: Asphalt Covered Bridge Deck **Site Number:** 112

1. Delaminations:

Weight of Chain: 2.2 **kg/m**
Other Equipment: Hammer

2. Concrete Cover:

Covermeter Make and Model: ELCOMETER Protovale 331

Battery Check:	**Reading at Start of Test:**	OK
	Reading at End of Test:	OK
Concrete Cover Check:	**Location of Check:**	@ 'SS1'
	Actual Depth and Rebar Diameter:	-
	Reading Before Test:	99 mm
	Readings Each 30 minutes During Test:	99 mm
	Reading at End of Test:	99 mm

3. Corrosion Activity:

Half Cell Make and Model: MC MILLER Electrode RE-3a (3" ø)
Multimeter Make and Model: Mastercraft Digital Multimeter 3R93
Length and Gauge of Lead Wires: 150 m of 18 gauge

Deck Temperature:	**Start of Test:**	24	°C	**End of Test:**	24	°C
Ambient Temperature:	**Start of Test:**	24	°C	**End of Test:**	24	°C

Battery Check: O.K.

Ground Check:	**Method of Connection:**	self-tapping screw		
	Ground Location:	@ Core C5	**Check Location:**	@ Core C7
	Lead Resistance:	1.8 - 1.9 Ω	**Voltage Drop (mV's):**	0.1
	Resistance [c]:	1.8 - 1.9 Ω	**Resistance Reversed:**	1.8 - 1.9 Ω

Grid Point Potential Readings Check – See Table Below

Location	Initial Reading	Check Reading [a]	Check Reading – Latex Concrete Overlay [b]
N1	-0.417	-0.416	-0.422
N2	-0.430	-0.431	-0.436
N3	-0.422	-0.423	-0.427
N4	-0.400	-0.402	-0.406
N5	-0.410	-0.411	-0.414

[a] Check at least five readings at beginning of test and each change in ground.
[b] On decks with latex modified concrete overlay, check at least five locations by drilling holes through the latex concrete overlay into the original concrete substrate.
[c] Resistance is the net resistance after deducting the lead resistance.

Appendix C:

Core Photographs and Sketches

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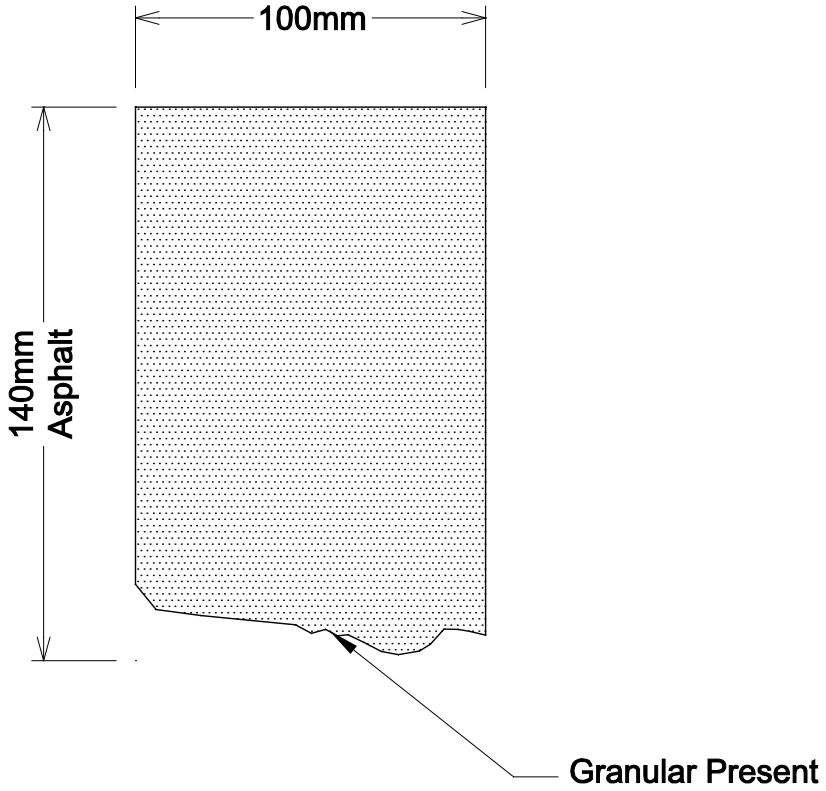
Core C1



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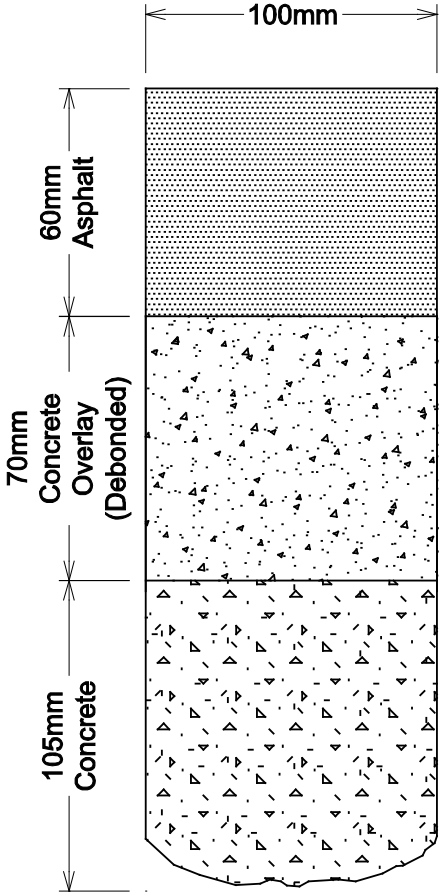

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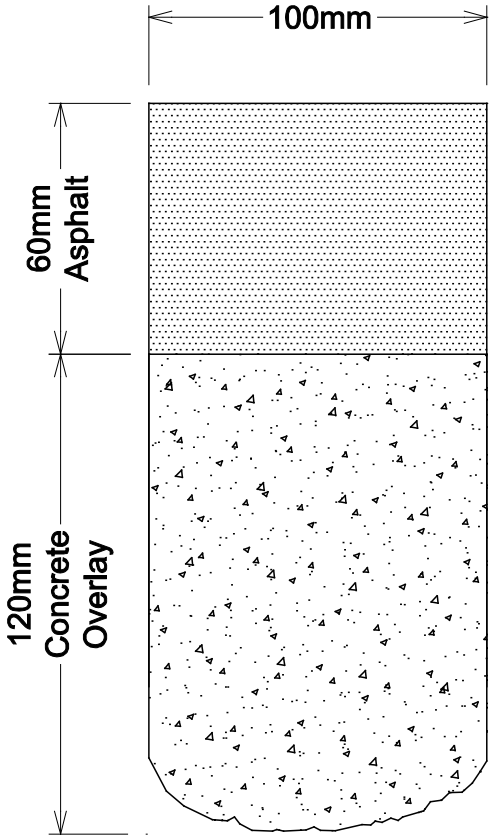
Core C3



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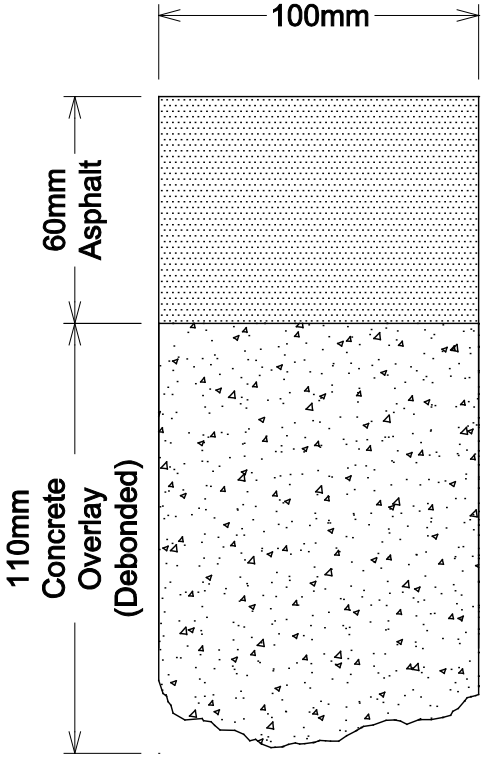
Core C4



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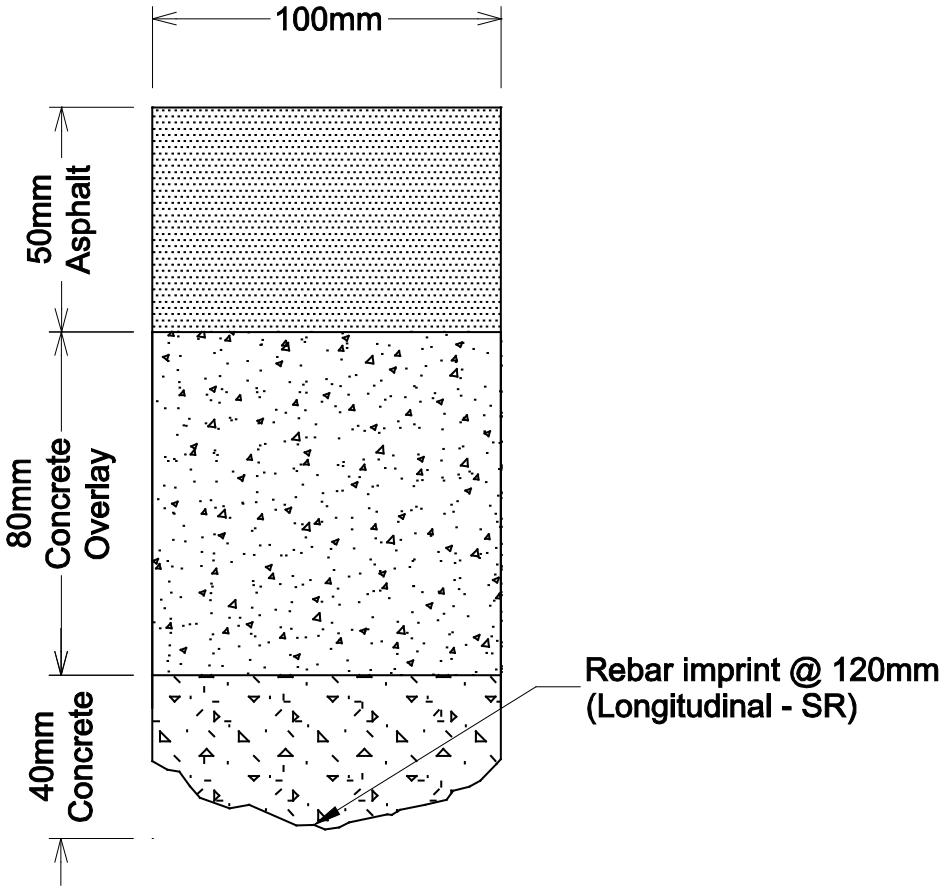
Core C5



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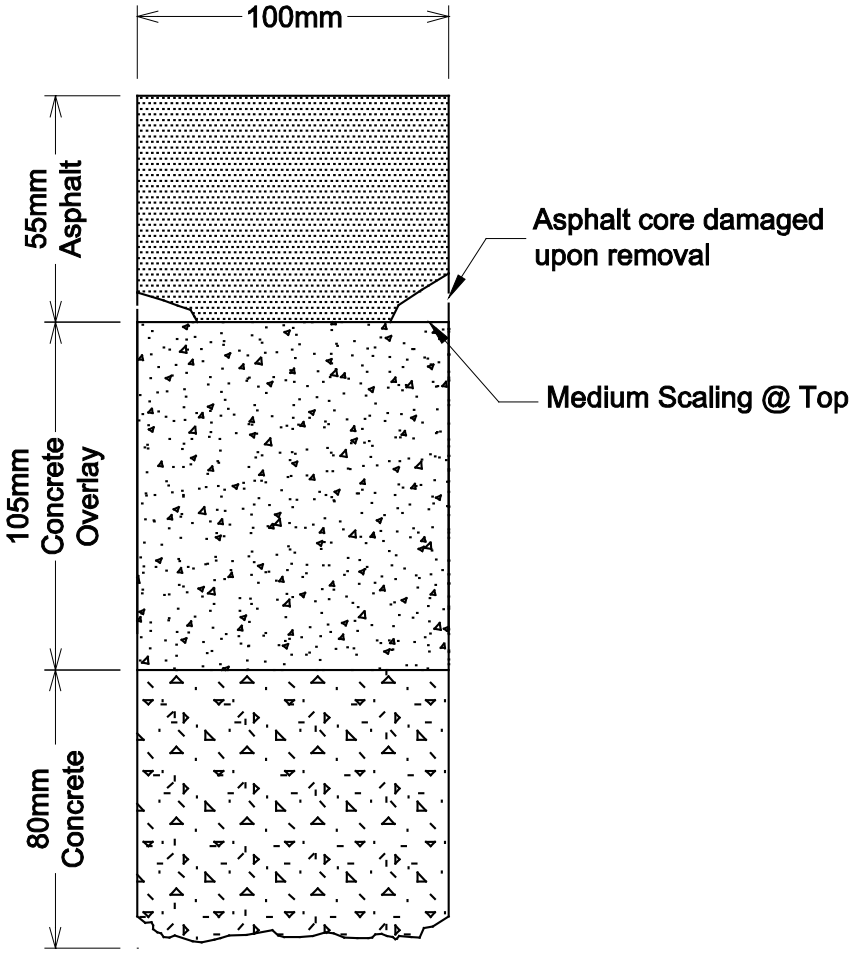
Core C6



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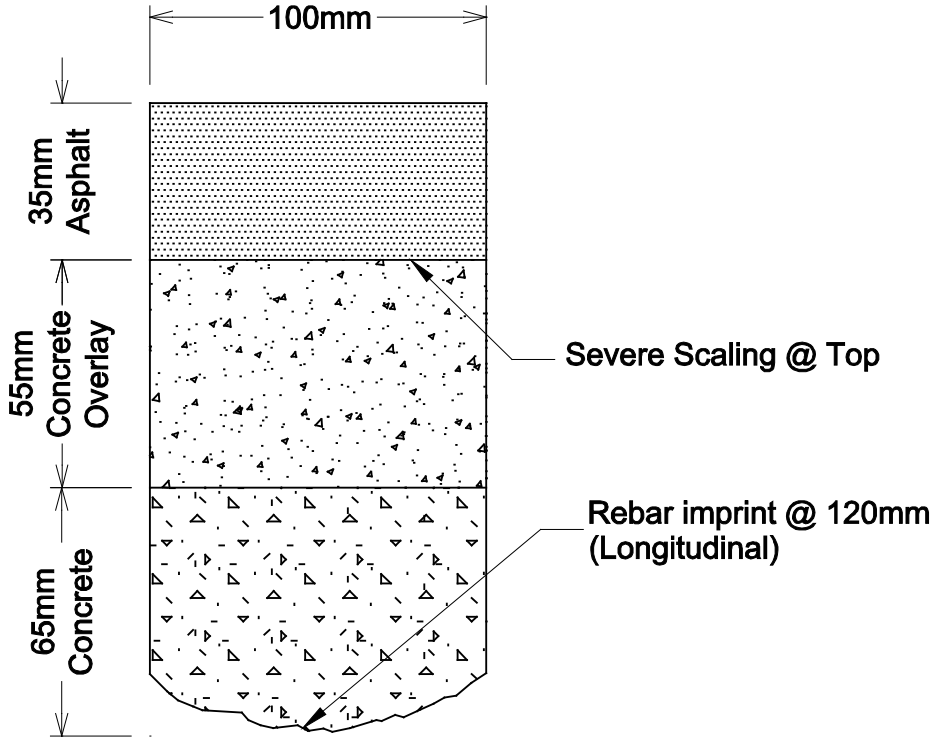
Core C7



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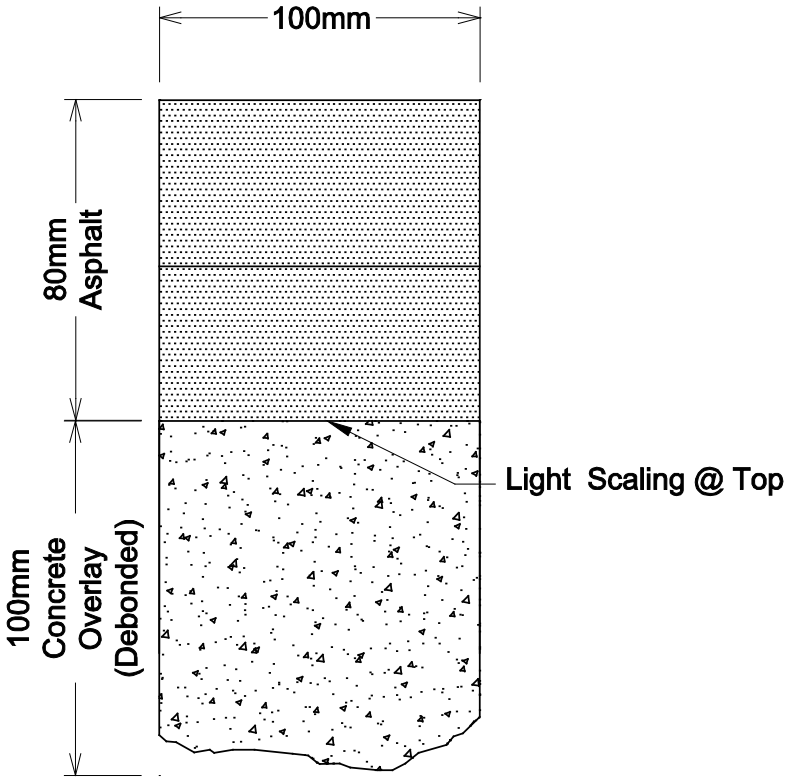
Core C8



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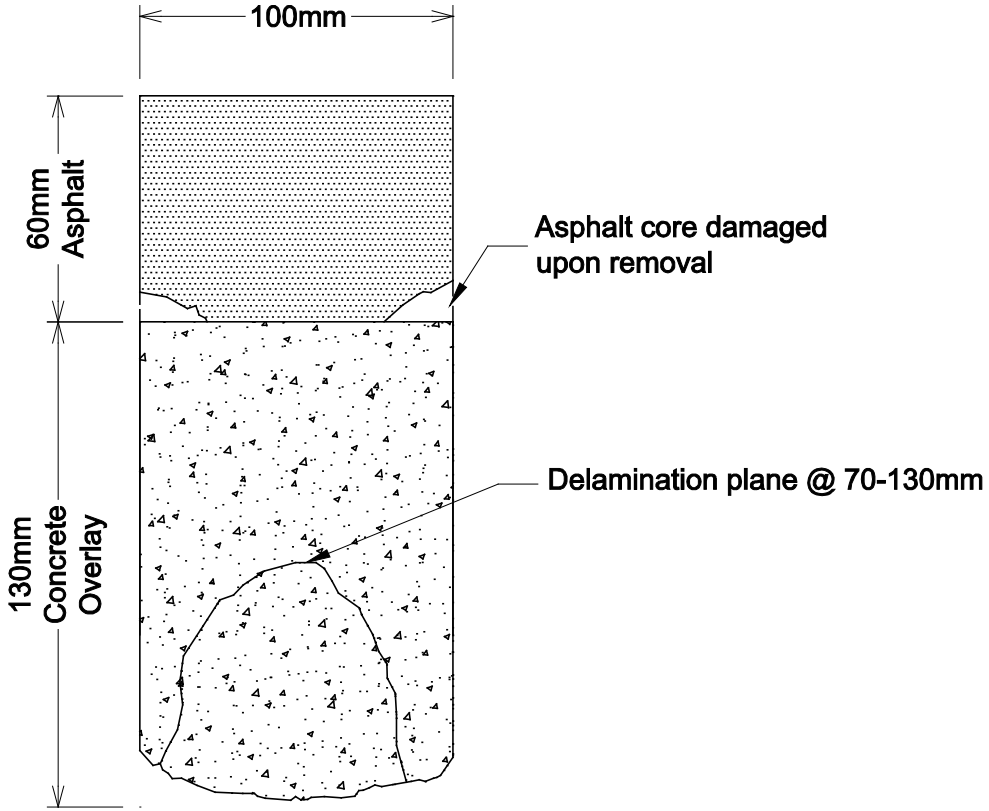
Core C9



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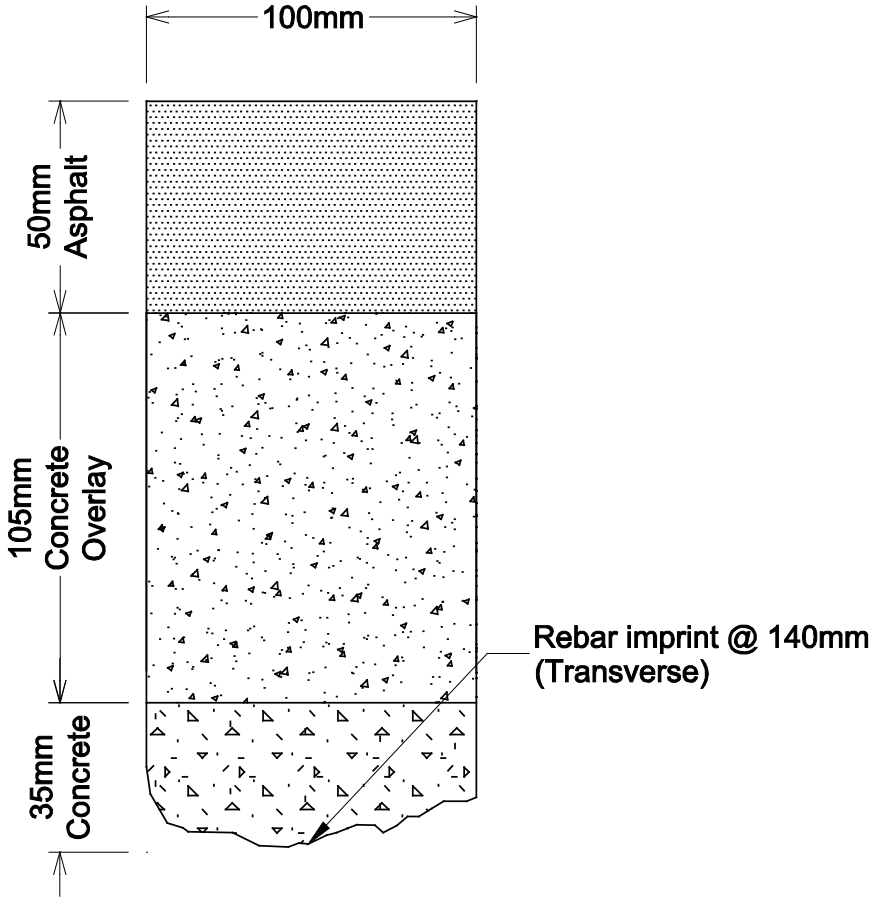
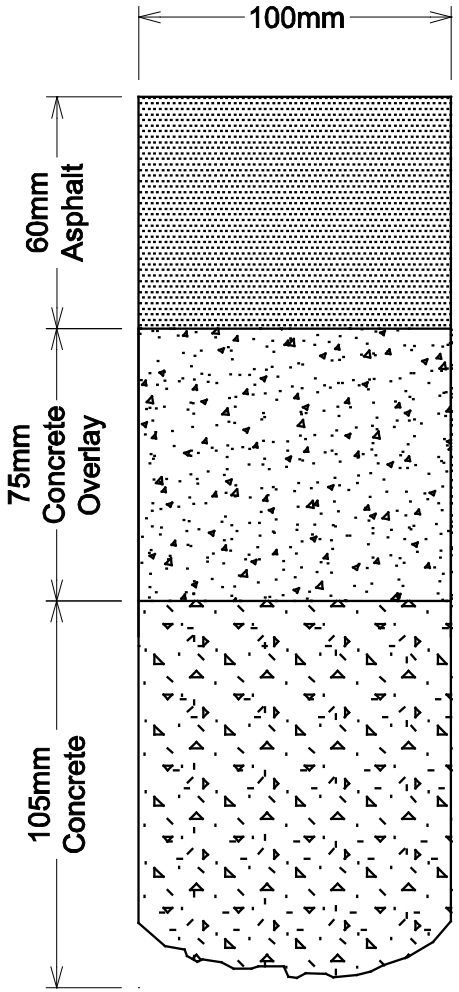
Core C10


100mm
50mm Asphalt
105mm Concrete Overlay
35mm Concrete
Rebar imprint @ 140mm (Transverse)

Core C11



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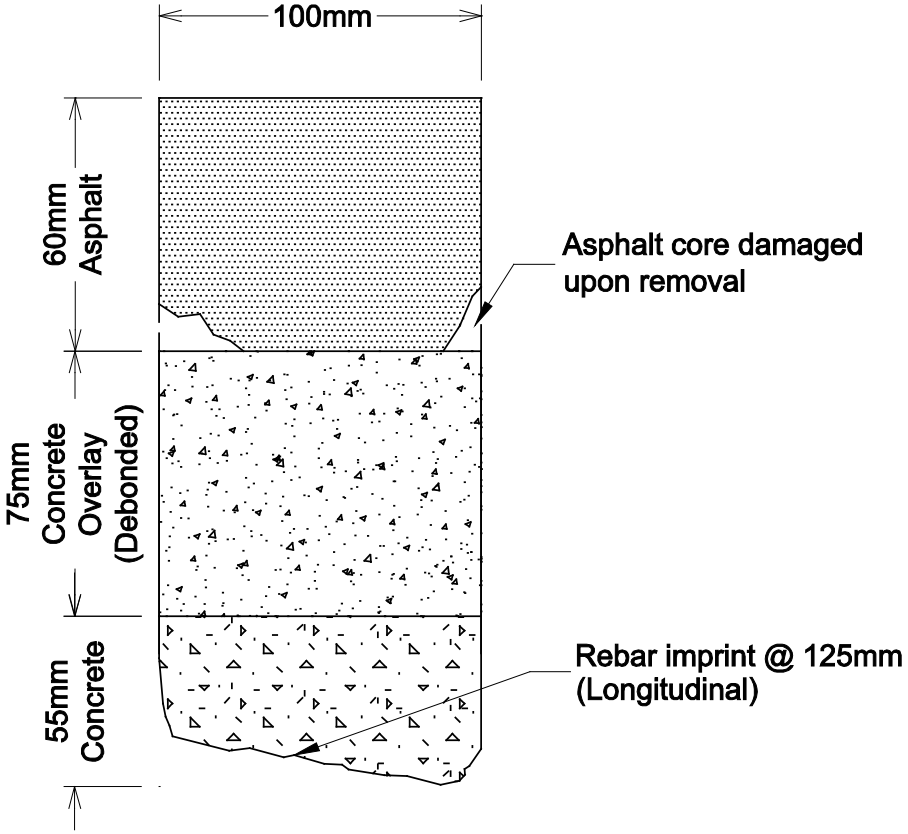
Core C12



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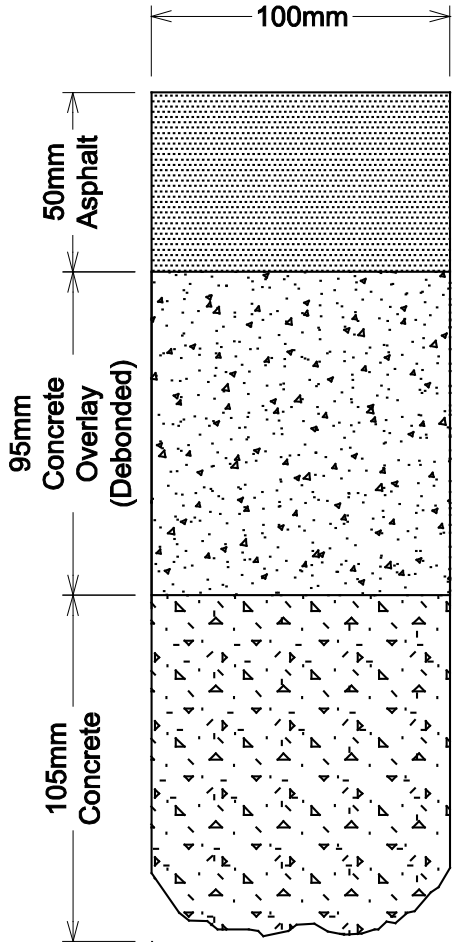
Core C13



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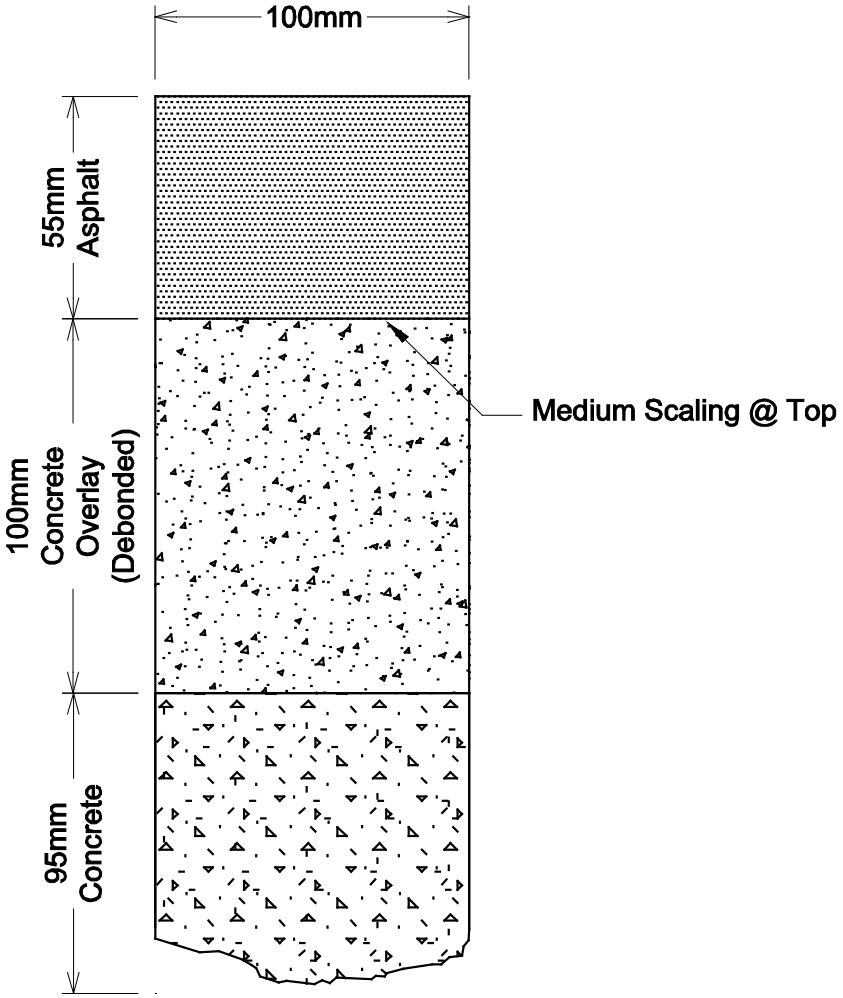
Core C14



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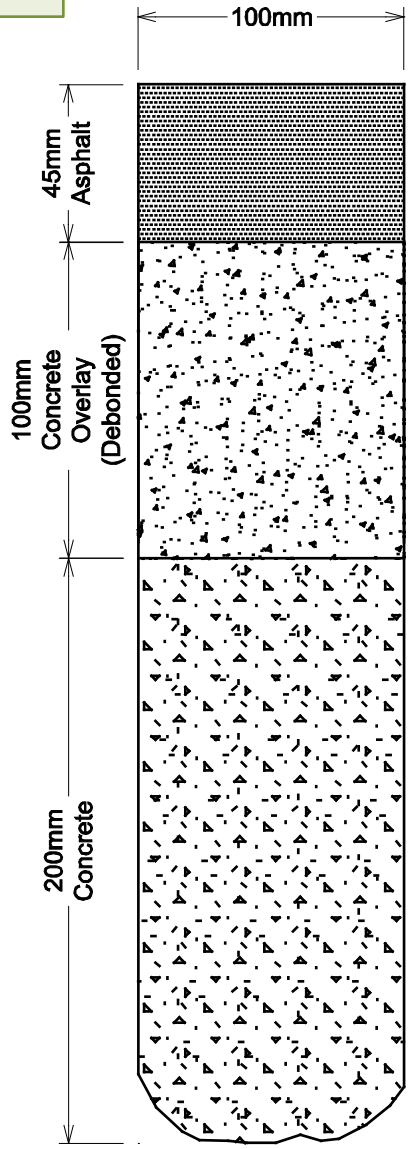
Core C15



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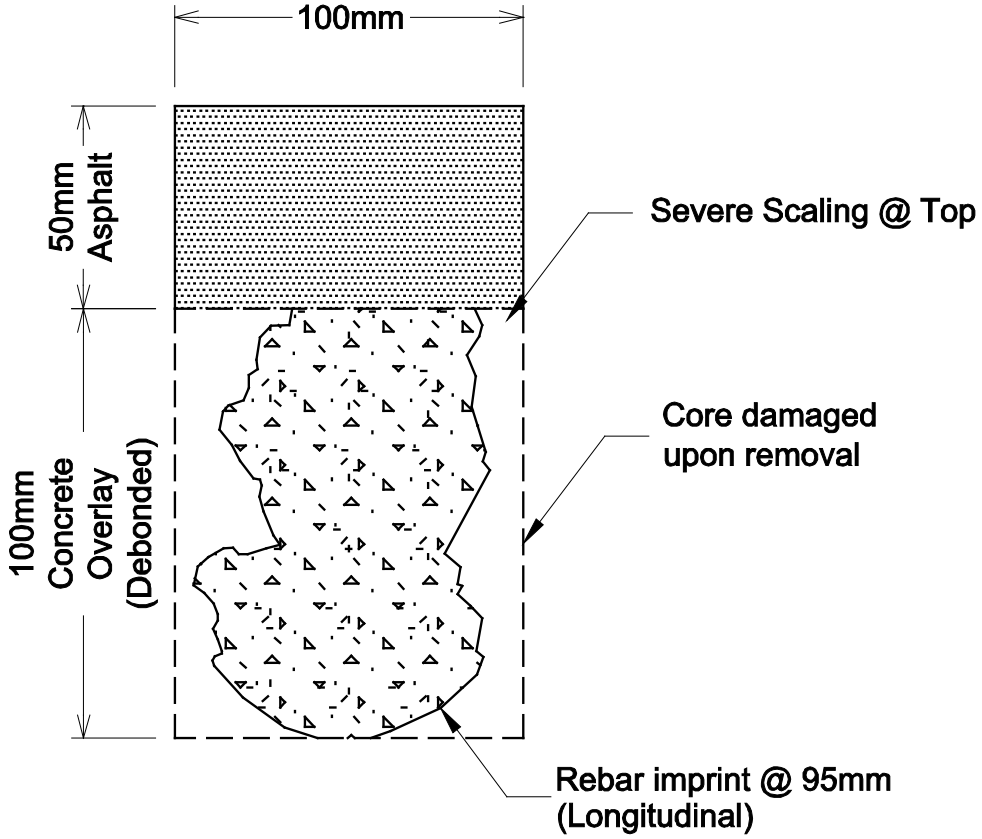
Core C16



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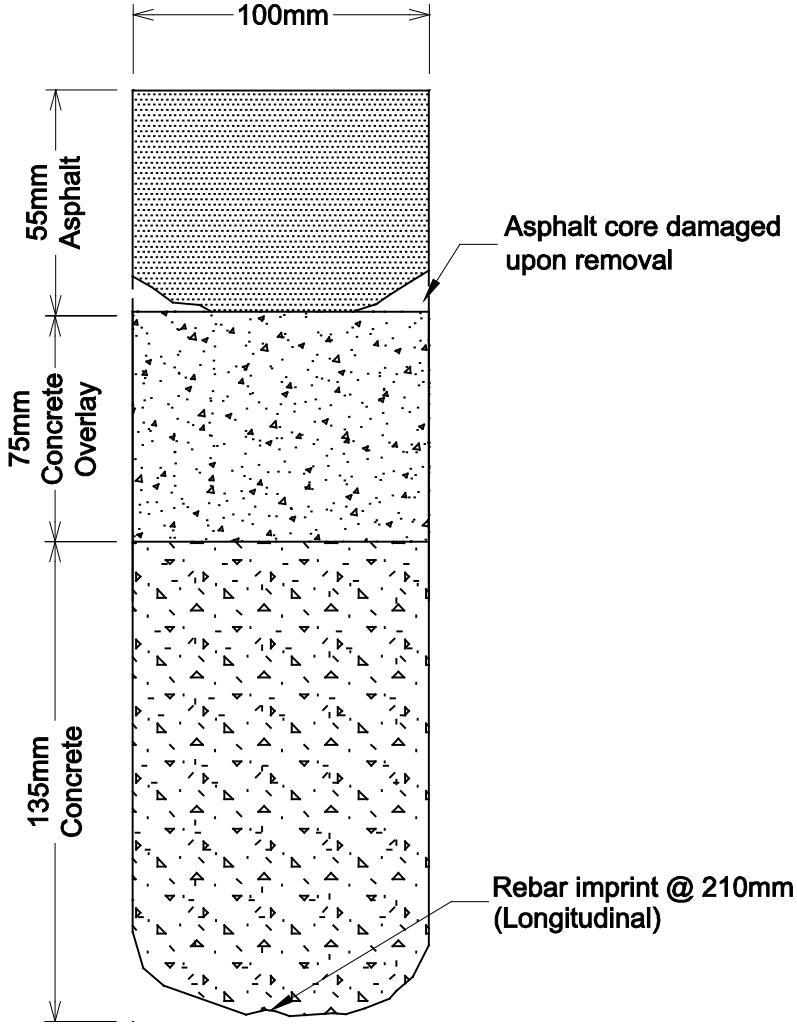
Core C17



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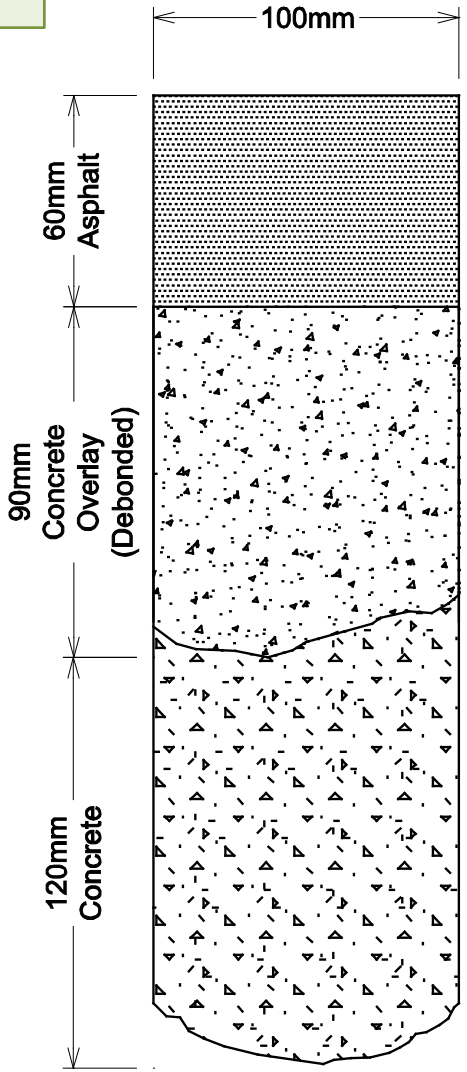
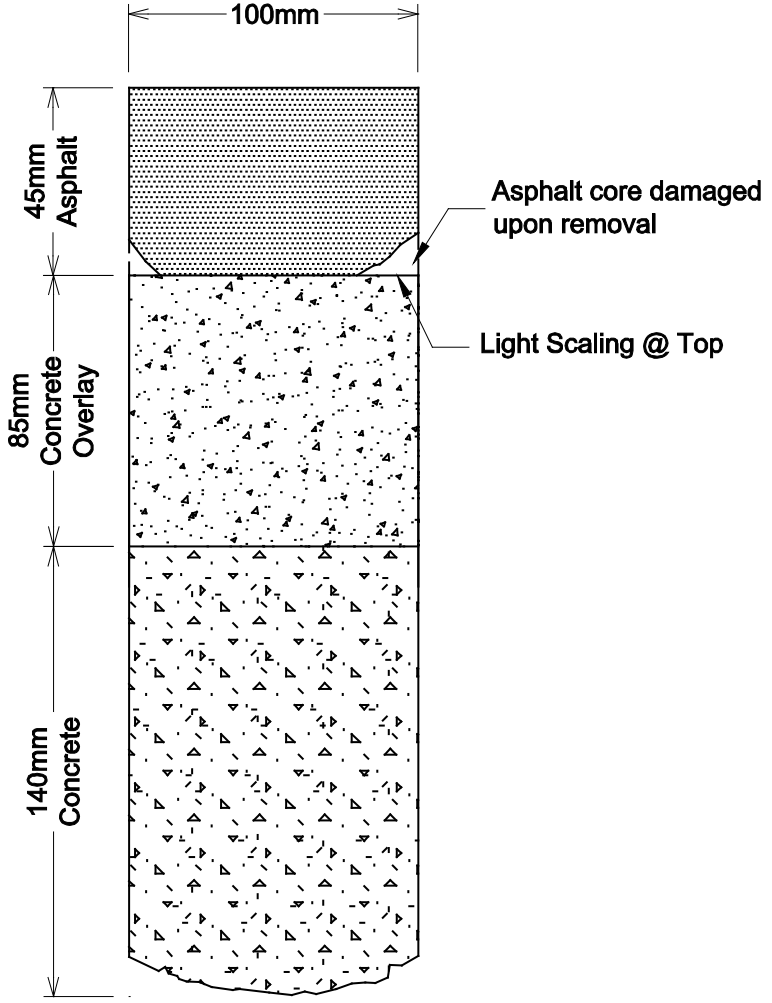
Core C18


100mm
60mm Asphalt
90mm Concrete Overlay (Debonded)
120mm Concrete

Core C19



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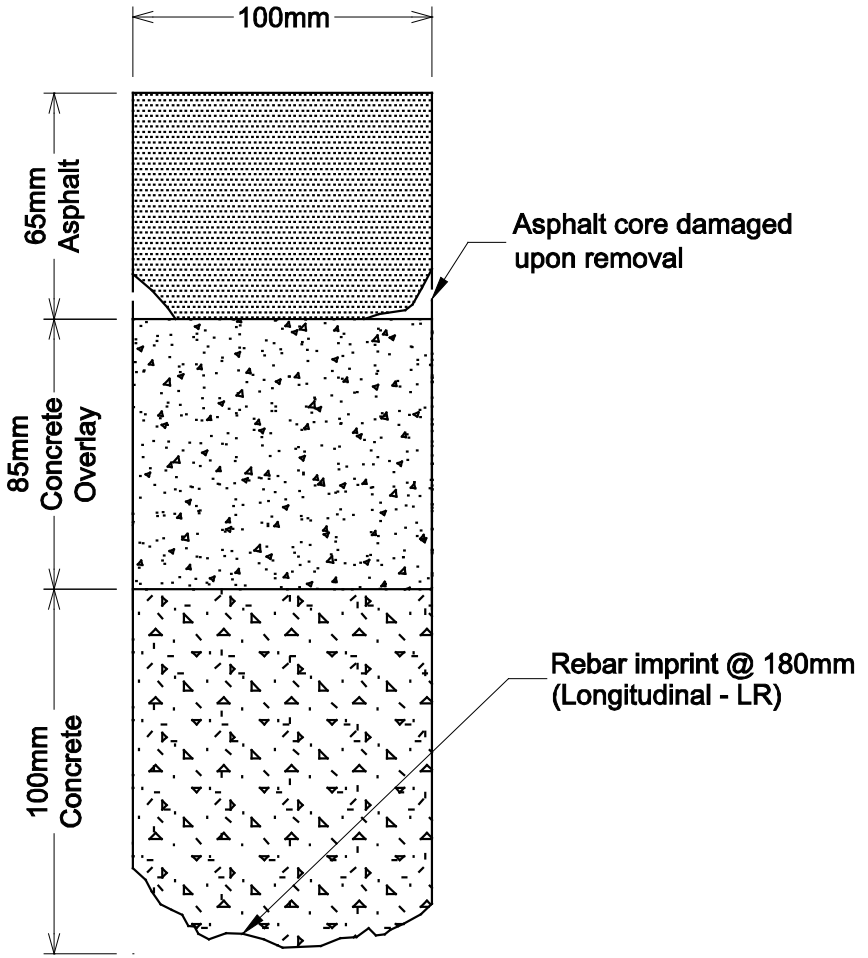
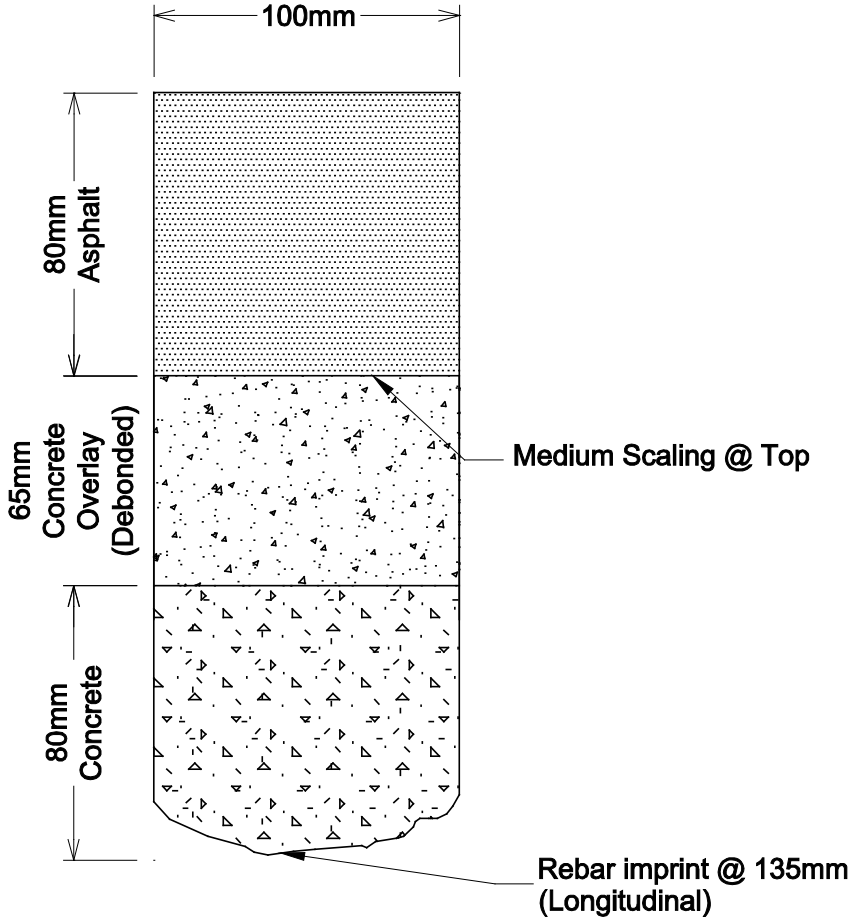
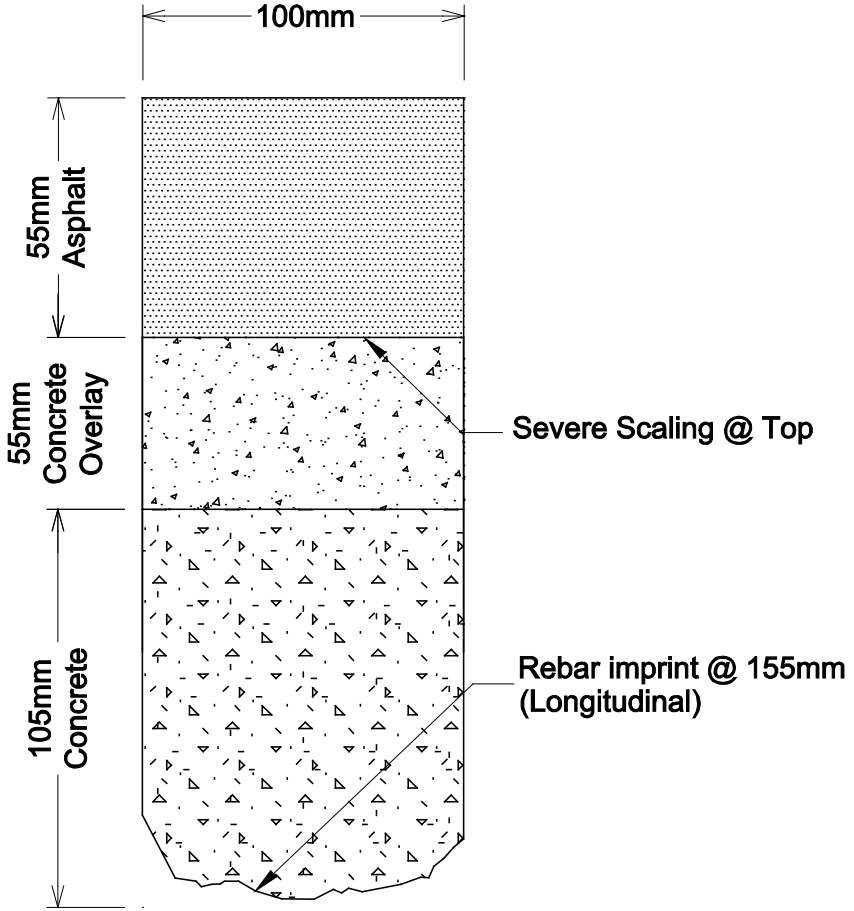
Core C20


100mm
65mm Asphalt
85mm Concrete Overlay
100mm Concrete
Asphalt core damaged upon removal
Rebar imprint @ 180mm (Longitudinal - LR)

Core C21


100mm
80mm Asphalt
65mm Concrete Overlay (Debonded)
80mm Concrete
Medium Scaling @ Top
Rebar imprint @ 135mm (Longitudinal)

Core C22


100mm
55mm Asphalt
55mm Concrete Overlay
105mm Concrete
Severe Scaling @ Top
Rebar imprint @ 155mm (Longitudinal)

Appendix D:

Core Logs

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CORE LOG ASPHALT COVERED BRIDGE DECKS

Site: 112

Core No.		C1		C2		C3	
Location (between gridlines)		West Approach		'N' and '1'		'M' and '8'	
Diameter, mm		100.0		100.0		100.0	
Thickness of Asphalt, mm		140.0		60.0		60.0	
Thickness of Asphalt @ Nearest Grid Point		N/A		60.0		60.0	
Thickness of Concrete, mm		*		175.0		120.0	
Full Depth (yes/no)		No		No		No	
Condition of Asphalt (1)		F		F		F	
Waterproofing (W/P) Type		N/A		N/A		N/A	
Condition of W/P (1)		N/A		N/A		N/A	
W/P Thickness, mm		N/A		N/A		N/A	
Bond of Asphalt or W/P to Concrete		N/A		F		F	
Defects in Concrete (2)		-		D		-	
Condition of Rebar (3)		N/A		N/A		N/A	
Corrosion Potential				-0.421		-0.397	
Compressive Strength, MPa							
Chloride Content % Chloride by Weight of Concrete	0-10 mm	Total	Corrected	Total	Corrected	Total	Corrected
	20-30 mm						
	40-50 mm						
	60-70 mm						
	80-90 mm						
AIR VOIDS	Air Content,%					4.7	
	Spec. Surf.,mm^2/mm^3					39.7	
	Spacing Factor, mm					0.139	
TEST LABORATORY						BCC	
REMARKS - orientation of rebars and cover - presence of overlay, patch and thickness - other observed defects		*Granular present.		70mm concrete overlay (debonded).		120mm concrete overlay	

1. Condition - G = Good, F = Fair, P = Poor.
2. Defects - C = Cracked, D = Delamination, R = Rough, Sc = Scaling, S = Spalling
3. Condition Rebar - G = Good, LR = Light Rust, SR = Severe Rust, N/A = No rebar exposed
   Condition of Epoxy Coating – ECG = Good, ECF = Fair, ECP = Poor-rusted & debonded areas

CORE LOG ASPHALT COVERED BRIDGE DECKS

Site: 112

Core No.		C4		C5		C6	
Location (between gridlines)		'M' and '13'		'N' and '16'		'L' and '23'	
Diameter, mm		100.0		100.0		100.0	
Thickness of Asphalt, mm		60.0		50.0		55.0	
Thickness of Asphalt @ Nearest Grid Point		60.0		50.0		55.0	
Thickness of Concrete, mm		110.0		120.0		185.0	
Full Depth (yes/no)		No		No		No	
Condition of Asphalt (1)		P		F			
Waterproofing (W/P) Type		N/A		N/A		N/A	
Condition of W/P (1)		N/A		N/A		N/A	
W/P Thickness, mm		N/A		N/A		N/A	
Bond of Asphalt or W/P to Concrete		F		F		F	
Defects in Concrete (2)		D		-		Sc	
Condition of Rebar (3)		N/A		SR		N/A	
Corrosion Potential		-0.463		-0.452		-0.425	
Compressive Strength, MPa							
		Total	Corrected	Total	Corrected	Total	Corrected
Chloride Content % Chloride by Weight of Concrete	0-10 mm					0.485	0.429
	20-30 mm					0.282	0.226
	40-50 mm					0.117	0.061
	60-70 mm					0.058	0.002
	80-90 mm					0.056	0.000
	100-110 mm					0.086	0.030
	120-130 mm					0.102	0.054
	140-150 mm					0.086	0.038
AIR VOIDS	Air Content,%						
	Spec. Surf.,mm^2/mm^3						
	Spacing Factor, mm						
TEST LABORATORY						BCC	
REMARKS - orientation of rebars and cover - presence of overlay, patch and thickness - other observed defects		110mm concrete overlay (debonded).		80mm concrete overlay (debonded). Rebar imprint @120mm (Longitudinal-SR).		105mm concrete overlay. Medium Scaling @ top. Asphalt core damaged upon removal.	

1. Condition - G = Good, F = Fair, P = Poor.
2. Defects - C = Cracked, D = Delamination, R = Rough, Sc = Scaling, S = Spalling
3. Condition Rebar - G = Good, LR = Light Rust, SR = Severe Rust, N/A = No rebar exposed
   Condition of Epoxy Coating – ECG = Good, ECF = Fair, ECP = Poor-rusted & debonded areas

CORE LOG ASPHALT COVERED BRIDGE DECKS

Site: **112**

Core No.		**C7**		**C8**		**C9**	
Location (between gridlines)		'N' and '28'		'K' and '3'		'H' and '7'	
Diameter, mm		100.0		100.0		100.0	
Thickness of Asphalt, mm		35.0		80.0		60.0	
Thickness of Asphalt @ Nearest Grid Point		35.0		80.0		60.0	
Thickness of Concrete, mm		120.0		100.0		130.0	
Full Depth (yes/no)		No		No		No	
Condition of Asphalt [1]		F to G		F		P	
Waterproofing (W/P) Type		N/A		N/A		N/A	
Condition of W/P [1]		N/A		N/A		N/A	
W/P Thickness, mm		N/A		N/A		N/A	
Bond of Asphalt or W/P to Concrete		P		F		F	
Defects in Concrete [2]		Sc		D		D	
Condition of Rebar [3]		G		N/A		N/A	
Corrosion Potential		-0.423		-0.465		-0.422	
Compressive Strength, MPa							
Chloride Content % Chloride by Weight of Concrete	**0-10 mm**	Total	Corrected	Total	Corrected	Total	Corrected
	20-30 mm						
	40-50 mm						
	60-70 mm						
	80-90 mm						
AIR VOIDS	**Air Content,%**						
	Spec. Surf.,mm^2/mm^3						
	Spacing Factor, mm						
TEST LABORATORY							
REMARKS **- orientation of rebars and cover** **- presence of overlay, patch and thickness** **- other observed defects**		55mm concrete overlay. Severe scaling @ top. Rebar imprint @120mm (Longitudinal).		100mm concrete overlay (debonded). Light scaling @top.		130mm concrete overlay. Delamination plane @ 70-130mm. Asphlat core damaged upon removal.	

1. Condition - G = Good, F = Fair, P = Poor.
2. Defects - C = Cracked, D = Delamination, R = Rough, Sc = Scaling, S = Spalling
3. Condition Rebar - G = Good, LR = Light Rust, SR = Severe Rust, N/A = No rebar exposed
   Condition of Epoxy Coating – ECG = Good, ECF = Fair, ECP = Poor-rusted & debonded areas

CORE LOG ASPHALT COVERED BRIDGE DECKS

Site: **112**

Core No.		**C10**		**C11**		**C12**	
Location (between gridlines)		'L' and '10'		'I' and '13'		'H' and '18'	
Diameter, mm		100.0		100.0		100.0	
Thickness of Asphalt, mm		50.0		60.0		60.0	
Thickness of Asphalt @ Nearest Grid Point		50.0		60.0		60.0	
Thickness of Concrete, mm		140.0		180.0		130.0	
Full Depth (yes/no)		No		No		No	
Condition of Asphalt (1)		F		F to G			
Waterproofing (W/P) Type		N/A		N/A		N/A	
Condition of W/P (1)		N/A		N/A		N/A	
W/P Thickness, mm		N/A		N/A		N/A	
Bond of Asphalt or W/P to Concrete		F		F		F	
Defects in Concrete (2)		-		-		D	
Condition of Rebar (3)		G		N/A		N/A	
Corrosion Potential		-0.457		-0.454		-0.455	
Compressive Strength, MPa							
		Total	Corrected	Total	Corrected	Total	Corrected
Chloride Content % Chloride by Weight of Concrete	**0-10 mm**	0.268	0.212				
	20-30 mm	0.170	0.114				
	40-50 mm	0.169	0.113				
	60-70 mm	0.168	0.112				
	80-90 mm	0.188	0.132				
	100-110 mm	0.158	0.102				
	120-130 mm	0.176	0.128				
AIR VOIDS	**Air Content,%**						
	Spec. Surf.,mm^2/mm^3						
	Spacing Factor, mm						
TEST LABORATORY		BCC					
REMARKS **- orientation of rebars and cover** **- presence of overlay, patch and thickness** **- other observed defects**		105mm concrete overlay. Rebar imprint @ 140mm (Transverse).		75mm concrete overlay.		75mm concrete overlay (debonded). Rebar imprint @ 125mm (Longitudinal). Asphlat core damaged upon removal.	

1. Condition - G = Good, F = Fair, P = Poor.
2. Defects - C = Cracked, D = Delamination, R = Rough, Sc = Scaling, S = Spalling
3. Condition Rebar - G = Good, LR = Light Rust, SR = Severe Rust, N/A = No rebar exposed
   Condition of Epoxy Coating – ECG = Good, ECF = Fair, ECP = Poor-rusted & debonded areas

CORE LOG ASPHALT COVERED BRIDGE DECKS

Site: **112**

Core No.		C13		C14		C15	
Location (between gridlines)		'K' and '19'		'H' and '23'		'J' and '27'	
Diameter, mm		100.0		100.0		100.0	
Thickness of Asphalt, mm		50.0		55.0		45.0	
Thickness of Asphalt @ Nearest Grid Point		50.0		55.0		45.0	
Thickness of Concrete, mm		200.0		195.0		300.0	
Full Depth (yes/no)		No		No		No	
Condition of Asphalt (1)		F		F to P		F	
Waterproofing (W/P) Type		N/A		N/A		N/A	
Condition of W/P (1)		N/A		N/A		N/A	
W/P Thickness, mm		N/A		N/A		N/A	
Bond of Asphalt or W/P to Concrete		F		F to P		F	
Defects in Concrete (2)		D		D		D	
Condition of Rebar (3)		N/A		N/A		N/A	
Corrosion Potential		-0.439		-0.451		-0.461	
Compressive Strength, MPa							
Chloride Content % Chloride by Weight of Concrete	0-10 mm	Total	Corrected	Total	Corrected	Total	Corrected
	20-30 mm						
	40-50 mm						
	60-70 mm						
	80-90 mm						
AIR VOIDS	Air Content,%						
	Spec. Surf.,mm^2/mm^3						
	Spacing Factor, mm						
TEST LABORATORY							
REMARKS - orientation of rebars and cover - presence of overlay, patch and thickness - other observed defects		95mm concrete overlay (debonded).		100mm concrete overlay (debonded). Medium scaling @ top. Asphalt core damaged upon removal.		100mm concrete overlay (debonded).	

1. Condition - G = Good, F = Fair, P = Poor.
2. Defects - C = Cracked, D = Delamination, R = Rough, Sc = Scaling, S = Spalling
3. Condition Rebar - G = Good, LR = Light Rust, SR = Severe Rust, N/A = No rebar exposed
   Condition of Epoxy Coating – ECG = Good, ECF = Fair, ECP = Poor-rusted & debonded areas

CORE LOG ASPHALT COVERED BRIDGE DECKS

Site: **112**

Core No.		**C16**		**C17**		**C18**	
Location (between gridlines)		'K' and '28'		'A' and '2'		'F' and '6'	
Diameter, mm		100.0		100.0		100.0	
Thickness of Asphalt, mm		50.0		55.0		60.0	
Thickness of Asphalt @ Nearest Grid Point		50.0		55.0		60.0	
Thickness of Concrete, mm		100.0		210.0		210.0	
Full Depth (yes/no)		No		No		No	
Condition of Asphalt (1)		P		F		F to G	
Waterproofing (W/P) Type		N/A		N/A		N/A	
Condition of W/P (1)		N/A		N/A		N/A	
W/P Thickness, mm		N/A		N/A		N/A	
Bond of Asphalt or W/P to Concrete		P		F		F	
Defects in Concrete (2)		D		-		D	
Condition of Rebar (3)		G		G		N/A	
Corrosion Potential		-0.462		-0.313		-0.394	
Compressive Strength, MPa							
		Total	Corrected	Total	Corrected	Total	Corrected
Chloride Content % Chloride by Weight of Concrete	**0-10 mm**			0.453	0.397		
	20-30 mm			0.316	0.260		
	40-50 mm			0.191	0.135		
	60-70 mm			0.099	0.043		
	80-90 mm			0.075	0.027		
	100-110 mm			0.048	0.000		
AIR VOIDS	**Air Content,%**						
	Spec. Surf.,mm^2/mm^3						
	Spacing Factor, mm						
TEST LABORATORY				BCC			
REMARKS **- orientation of rebars and cover** **- presence of overlay, patch and thickness** **- other observed defects**		100mm concrete overlay (debonded). Severe Scaling @ top. Rebar imprint @ 95mm (Longitudinal). Core damaged upon removal.		75mm concrete overlay. Rebar imprint @ 210mm (Transverse). Asphalt core damaged upon removal.		90mm concrete overlay (debonded).	

1. Condition - G = Good, F = Fair, P = Poor.
2. Defects - C = Cracked, D = Delamination, R = Rough, Sc = Scaling, S = Spalling
3. Condition Rebar - G = Good, LR = Light Rust, SR = Severe Rust, N/A = No rebar exposed
   Condition of Epoxy Coating – ECG = Good, ECF = Fair, ECP = Poor-rusted & debonded areas

CORE LOG ASPHALT COVERED BRIDGE DECKS

Site: **112**

Core No.		**C19**		**C20**		**C21**	
Location (between gridlines)		'A' and '13'		'F' and '19'		'F' and '28'	
Diameter, mm		100.0		100.0		100.0	
Thickness of Asphalt, mm		45.0		65.0		80.0	
Thickness of Asphalt @ Nearest Grid Point		45.0		65.0		80.0	
Thickness of Concrete, mm		225.0		185.0		145.0	
Full Depth (yes/no)		No		No		No	
Condition of Asphalt [1]		F		F		F	
Waterproofing (W/P) Type		N/A		N/A		N/A	
Condition of W/P [1]		N/A		N/A		N/A	
W/P Thickness, mm		N/A		N/A		N/A	
Bond of Asphalt or W/P to Concrete		F		F			
Defects in Concrete [2]		Sc		-		D	
Condition of Rebar [3]		N/A		LR		G	
Corrosion Potential		-0.397		-0.367		-0.415	
Compressive Strength, MPa		65.2					
		Total	Corrected	Total	Corrected	Total	Corrected
Chloride Content % Chloride by Weight of Concrete	**0-10 mm**			0.251	0.195		
	20-30 mm			0.193	0.137		
	40-50 mm			0.061	0.005		
	60-70 mm			0.056	0.000		
	80-90 mm			0.068	0.020		
	100-110 mm			0.070	0.022		
AIR VOIDS	**Air Content,%**						
	Spec. Surf.,mm^2/mm^3						
	Spacing Factor, mm						
TEST LABORATORY		BCC		BCC			
REMARKS **- orientation of rebars and cover** **- presence of overlay, patch and thickness** **- other observed defects**		55mm concrete overlay. Light scaling @ top.		85mm concrete overlay. Rebar imprint@ 180mm (longitudinal-LR). Asphalt core damaged upon removal.		65mm concrete overlay (debonded). Medium scaling @ top. Rebar imprint@ 135mm (longitudinal).	

1. Condition - G = Good, F = Fair, P = Poor.
2. Defects - C = Cracked, D = Delamination, R = Rough, Sc = Scaling, S = Spalling
3. Condition Rebar - G = Good, LR = Light Rust, SR = Severe Rust, N/A = No rebar exposed
   Condition of Epoxy Coating – ECG = Good, ECF = Fair, ECP = Poor-rusted & debonded areas

CORE LOG ASPHALT COVERED BRIDGE DECKS

 Site: 112

Core No.		**C22**				
Location (between gridlines)		'B' and '28'				
Diameter, mm		100.0				
Thickness of Asphalt, mm		55.0				
Thickness of Asphalt @ Nearest Grid Point		55.0				
Thickness of Concrete, mm		160				
Full Depth (yes/no)		No				
Condition of Asphalt [1]		F				
Waterproofing (W/P) Type		N/A				
Condition of W/P [1]		N/A				
W/P Thickness, mm		N/A				
Bond of Asphalt or W/P to Concrete		P				
Defects in Concrete [2]		Sc				
Condition of Rebar [3]		G				
Corrosion Potential		-0.401				
Compressive Strength, MPa						
Chloride Content % Chloride by Weight of Concrete	**0-10 mm** **20-30 mm** **40-50 mm** **60-70 mm** **80-90 mm**	Total	Corrected			
AIR VOIDS	**Air Content,%** **Spec. Surf.,mm^2/mm^3** **Spacing Factor, mm**					
TEST LABORATORY						
REMARKS **- orientation of rebars and cover** **- presence of overlay, patch and thickness** **- other observed defects**		55mm concrete overlay. Severe Scaling @ top. Rebar imprint @ 155mm (Longitudinal).				

1. Condition - G = Good, F = Fair, P = Poor.
2. Defects - C = Cracked, D = Delamination, R = Rough, Sc = Scaling, S = Spalling
3. Condition Rebar - G = Good, LR = Light Rust, SR = Severe Rust, N/A = No rebar exposed
   Condition of Epoxy Coating – ECG = Good, ECF = Fair, ECP = Poor-rusted & debonded areas

Appendix E:

Sawn Asphalt Sample Photographs

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Tel: 905-660-6608 Fax: 905-660-6609
info@bridgecheckcanada.com

Photo S1 – Sawn Sample SS1 (medium scaling)

Photo S2 – Sawn Sample SS2 (delamination, and severe scaling)

Photo S3 – Sawn Sample SS3 (medium scaling)

Photo S4 – Sawn Sample SS4 (medium scaling)

Photo S5 – Sawn Sample SS5 (severe scaling)

Photo S6 – Sawn Sample SS6 (medium scaling)

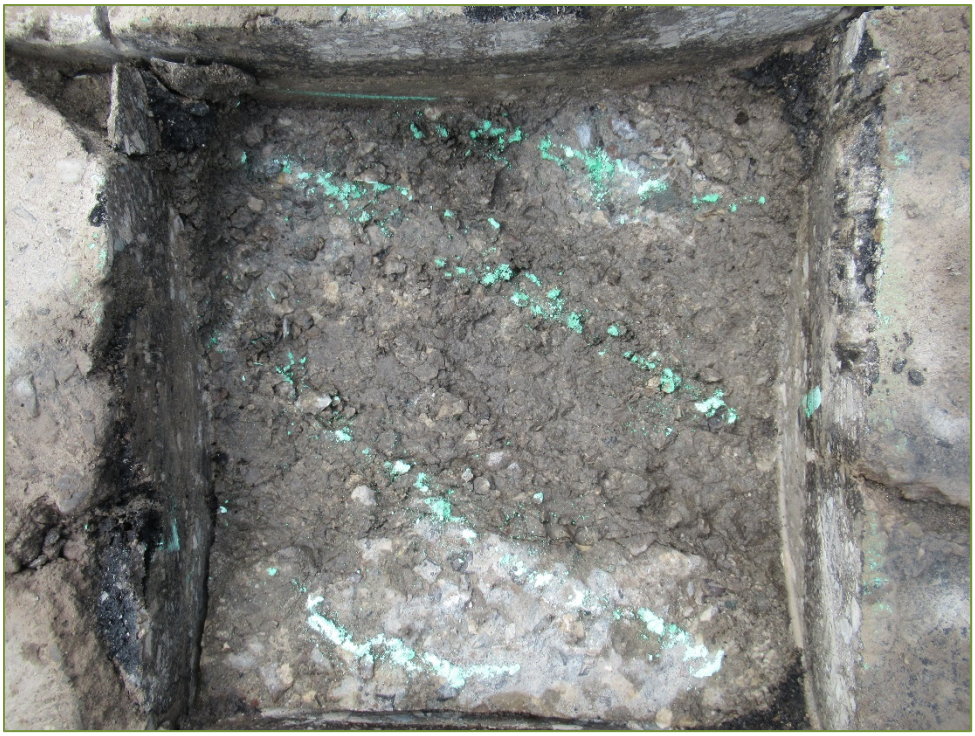

Photo S7 – Sawn Sample SS7 (delamination, and severe scaling)

Photo S8 – Sawn Sample SS8 (medium scaling)

Photo S9 – Sawn Sample SS9 (delamination, and severe scaling)

Photo S10 – Sawn Sample SS10 (crack, and medium scaling)

Photo S11 – Sawn Sample SS11 (light scaling)

Photo S12 – Sawn Sample SS12 (light scaling)

Photo S13 – Sawn Sample SS13 (severe scaling)

Photo S14 – Sawn Sample SS14 (severe scaling)

Photo S15 – Sawn Sample SS15 (light scaling)

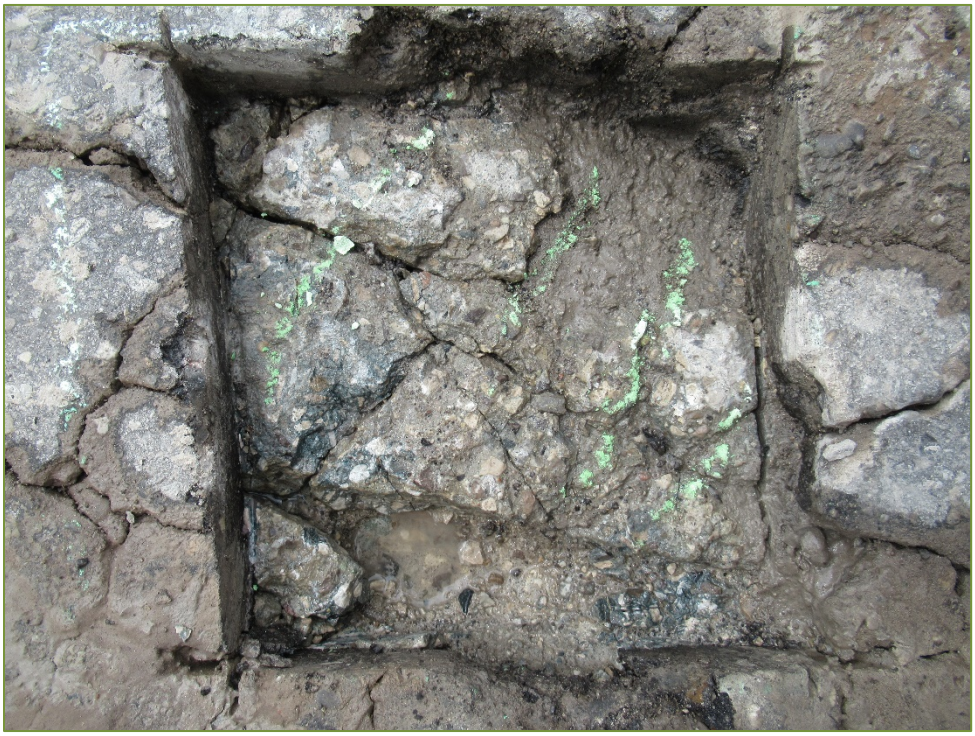

Photo S16 – Sawn Sample SS16 (cracks, delamination, and severe scaling)

Photo S17 – Sawn Sample SS17 (medium scaling)

Photo S18 – Sawn Sample SS18 (delamination, and severe scaling)

Appendix F:

Sawn Asphalt Sample Logs

SAWN ASPHALT SAMPLE LOG

Site No: **112**

Sample No.	SS1	SS2	SS3
Location (between gridlines)	'M' and '27'	'N' and '22'	'L' and '18'
Size, mm X mm	310 x 260	360 x 260	300 x 310
Thickness of Asphalt, mm	65	95	55
Thickness of Asphalt @ Nearest Grid Point	65	95	55
Condition of Asphalt (1)	F	F to P	F to P
Waterproofing (W/P) Type	N/A	N/A	N/A
W/P Thickness, mm	N/A	N/A	N/A
Condition of W/P (1)	N/A	N/A	N/A
Bond of W/P to Asphalt	N/A	N/A	N/A
Bond of Asphalt or W/P to Concrete	F to P	F to P	F to P
Concrete Cover to Reinf., mm	99	101	115
Defects in Concrete Surface (2)	Sc	D	Sc
Corrosion Potential on Concrete Surface	-0.458	-0.462	-0.458
Remarks	Medium Scaling.	Delamination Plane and Severe Scaling.	Medium Scaling.

1. Condition - G = Good, F = Fair, P = Poor.
2. Defects - C = Cracked, D = Delamination, R = Rough, Sc = Scaling, S = Spalling

SAWN ASPHALT SAMPLE LOG

Site No: **112**

Sample No.	SS4	SS5	SS6
Location (between gridlines)	'N' and '11'	'L' and '5'	'H' and '28'
Size, mm X mm	300 x 290	350 x 270	280 x 270
Thickness of Asphalt, mm	70	50	65
Thickness of Asphalt @ Nearest Grid Point	70	50	65
Condition of Asphalt (1)	F to P	P	F to P
Waterproofing (W/P) Type	N/A	N/A	N/A
W/P Thickness, mm	N/A	N/A	N/A
Condition of W/P (1)	N/A	N/A	N/A
Bond of W/P to Asphalt	N/A	N/A	N/A
Bond of Asphalt or W/P to Concrete	F to P	F to P	F to P
Concrete Cover to Reinf., mm	75	98	112
Defects in Concrete Surface (2)	Sc	Sc	Sc
Corrosion Potential on Concrete Surface	-0.454	-0.456	-0.458
Remarks	Medium Scaling.	Severe Scaling.	Medium Scaling.

1. Condition - G = Good, F = Fair, P = Poor.
2. Defects - C = Cracked, D = Delamination, R = Rough, Sc = Scaling, S = Spalling

SAWN ASPHALT SAMPLE LOG

Site No: **112**

Sample No.	SS7	SS8	SS9
Location (between gridlines)	'J' and '24'	'G' and '20'	'J' and '17'
Size, mm X mm	280 x 280	300 x 240	280 x 270
Thickness of Asphalt, mm	60	60	45
Thickness of Asphalt @ Nearest Grid Point	60	60	45
Condition of Asphalt (1)	P	F to P	P
Waterproofing (W/P) Type	N/A	N/A	N/A
W/P Thickness, mm	N/A	N/A	N/A
Condition of W/P (1)	N/A	N/A	N/A
Bond of W/P to Asphalt	N/A	N/A	N/A
Bond of Asphalt or W/P to Concrete	F to P	F to P	F to P
Concrete Cover to Reinf., mm	125	124	89
Defects in Concrete Surface (2)	D	Sc	D
Corrosion Potential on Concrete Surface	-0.463	-0.453	-0.455
Remarks	Delamination Plane, and Severe scaling.	Medium Scaling.	Delamination Plane, and Severe scaling.

1. Condition - G = Good, F = Fair, P = Poor.
2. Defects - C = Cracked, D = Delamination, R = Rough, Sc = Scaling, S = Spalling

SAWN ASPHALT SAMPLE LOG

 Site No: **112**

Sample No.	SS10	SS11	SS12
Location (between gridlines)	'G' and '15'	'L' and '13'	'I' and '11'
Size, mm X mm	270 x 250	250 x 250	250 x 240
Thickness of Asphalt, mm	55	45	65
Thickness of Asphalt @ Nearest Grid Point	55	45	65
Condition of Asphalt (1)	P	F	F to P
Waterproofing (W/P) Type	N/A	N/A	N/A
W/P Thickness, mm	N/A	N/A	N/A
Condition of W/P (1)	N/A	N/A	N/A
Bond of W/P to Asphalt	N/A	N/A	N/A
Bond of Asphalt or W/P to Concrete	F to P	F	F
Concrete Cover to Reinf., mm	99	105	98
Defects in Concrete Surface (2)	C	-	-
Corrosion Potential on Concrete Surface	-0.452	-0.454	-0.457
Remarks	Crack, and medium scaling	Light scaling	Light scaling

1. Condition - G = Good, F = Fair, P = Poor.
2. Defects - C = Cracked, D = Delamination, R = Rough, Sc = Scaling, S = Spalling

SAWN ASPHALT SAMPLE LOG

Site No: **112**

Sample No.	SS13	SS14	SS15
Location (between gridlines)	'K' and '7'	'A' and '4'	'G' and '10'
Size, mm X mm	260 x 270	320 x 270	290 x 280
Thickness of Asphalt, mm	55	70	60
Thickness of Asphalt @ Nearest Grid Point	55	70	60
Condition of Asphalt (1)	P		F to P
Waterproofing (W/P) Type	N/A	N/A	N/A
W/P Thickness, mm	N/A	N/A	N/A
Condition of W/P (1)	N/A	N/A	N/A
Bond of W/P to Asphalt	N/A	N/A	N/A
Bond of Asphalt or W/P to Concrete	F to P	F to P	F
Concrete Cover to Reinf., mm	125	124	125
Defects in Concrete Surface (2)	Sc	Sc	Sc
Corrosion Potential on Concrete Surface	-0.452	-0.372	-0.456
Remarks	Severe Scaling.	Severe Scaling.	Light Scaling.

1. Condition - G = Good, F = Fair, P = Poor.
2. Defects - C = Cracked, D = Delamination, R = Rough, Sc = Scaling, S = Spalling

SAWN ASPHALT SAMPLE LOG

 Site No: **112**

Sample No.	SS16	SS17	SS18
Location (between gridlines)	'F' and '18'	'E' and '26'	'E' and '29'
Size, mm X mm	290 x 280	400 x 350	300 x 290
Thickness of Asphalt, mm	45	35	55
Thickness of Asphalt @ Nearest Grid Point	45	35	55
Condition of Asphalt (1)	P	P	P
Waterproofing (W/P) Type	N/A	N/A	N/A
W/P Thickness, mm	N/A	N/A	N/A
Condition of W/P (1)	N/A	N/A	N/A
Bond of W/P to Asphalt	N/A	N/A	N/A
Bond of Asphalt or W/P to Concrete	P	F to P	F to P
Concrete Cover to Reinf., mm	123	121	93
Defects in Concrete Surface (2)	D	Sc	D
Corrosion Potential on Concrete Surface	-0.367	-0.402	-0.354
Remarks	Cracks, delamination plane, and severe scaling	Medium Scaling.	Delamination Plane, and Severe scaling.

1. Condition - G = Good, F = Fair, P = Poor.
2. Defects - C = Cracked, D = Delamination, R = Rough, Sc = Scaling, S = Spalling

Appendix G:

Site Photographs

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info@bridgecheckcanada.com

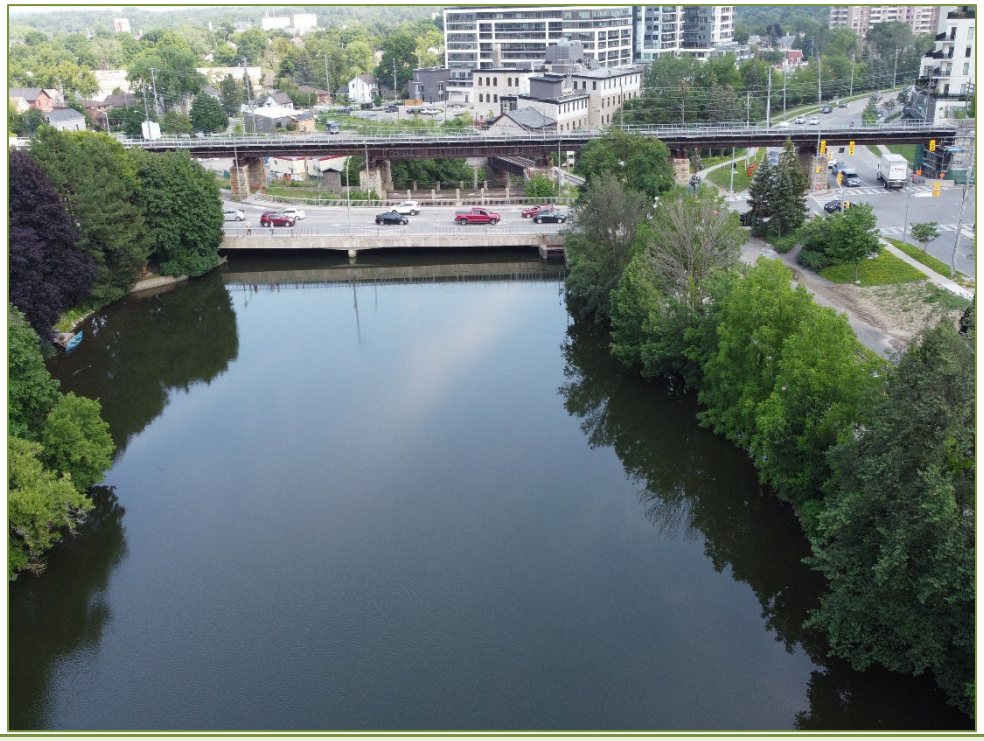


Photo P1 North Elevation

Photo P2 South Elevation

Photo P3 Deck General View, looking east

Photo P4 Deck General View, looking west

Photo P5 **Deck Wearing Surface** (fair to poor condition – unsealed cracks, alligator cracks, pot holes, ravelling and rutting)

Photo P6 **Deck Wearing Surface** (unsealed cracks)

Photo P7 **Deck Wearing Surface** (unsealed cracks, alligator cracks)

Photo P8 **Deck Wearing Surface** (unsealed cracks, alligator cracks and pot holes and rutting)

Photo P9 Deck Wearing Surface at East Abutment, south side (rutting)

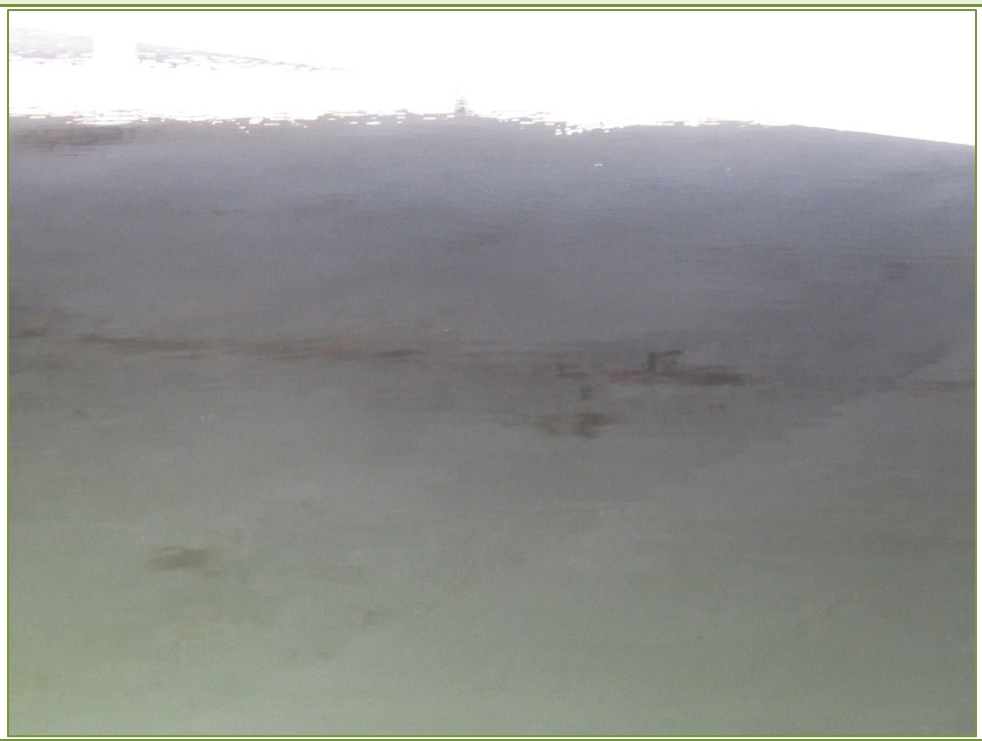


Photo P10 Soffit between West Abutment and Pier (fair condition - cracks, spall, delamination and wet area) note, Inaccessible

Photo P11 Soffit between East Abutment and Pier (fair condition – cracks, spall, delamination, light scaling, and wet area)

Photo P12 Soffit between East Abutment and Pier (cracks and light scaling)

Photo P13 Soffit between East Abutment and Pier (cracks, delamination, and wet area)

Photo P14 Soffit at Pier (cracks, spall, delamination, and wet area)

Photo P15 Soffit between East Abutment and Pier (cracks, spall, delamination, and wet area)

Photo P16 Soffit between East Abutment and Pier (cracks, spall, delamination, and wet area)

Photo P17 Soffit between East Abutment and Pier, south side (cracks, spall, delamination, and wet area) note, drain is discharging directly onto soffit

Photo P18 Soffit between East Abutment and Pier (cracks and wet area)

Photo P19 Soffit between East Abutment and Pier, south side (cracks)

Photo P20 Soffit at East Abutment (cracks, and spall)

Photo P21 Soffit at East Abutment (cracks, and spall)

Photo P22 North Elevation – Fascia (wide cracks, spall and delamination) note, exposed rebar

Photo P23 North Elevation – Fascia, east span (wide cracks, spall and delamination)

Photo P24 South Elevation – Fascia (wide cracks, spall and delamination)

Photo P25 South Elevation – Fascia (wide cracks and spall)

Photo P26 East Approach Wearing Surface (fair condition - unsealed cracks, and pot holes)

Photo P27 West Approach Wearing Surface (fair to poor condition - unsealed cracks, and pot holes)

Photo P28 Northeast Catch Basin

Photo P29 Northwest Catch Basin

Photo P30 Northwest Catch Basin

Photo P31 Southeast Catch Basin

Photo P32 Southwest Catch Basin

Photo P33 East Joint (settlement and water ponding)

Photo P34 East Joint (settlement)

Photo P35 West Joint (settlement)

Photo P36 North Sidewalk (fair to poor condition - cracks, spall, delamination, and light to severe scaling) **and Handrail** (fair condition - light corrosion)

Photo P37 North Sidewalk (cracks, delamination, and medium scaling) **and Handrail** (light corrosion)

Photo P38 North Sidewalk (cracks, spall, delamination, and severe scaling) **and Handrail** (light corrosion)

Photo P39 North Handrail (light corrosion)

Photo P40 North Sidewalk (cracks, spall, delamination, and severe scaling) **and Handrail** (light corrosion)

Photo P41 North Sidewalk (cracks, spall, delamination, and severe scaling) **and Handrail** (light corrosion)

Photo P42 South Sidewalk (fair condition – wide cracks and light to medium scaling) **and Handrail** (fair condition - light corrosion)

Photo P43 South Sidewalk (wide cracks and light to medium scaling) **and Handrail** (light corrosion)

Photo P44 South Sidewalk (cracks and light to medium scaling) **and Handrail** (light corrosion)

Photo P45 **South Sidewalk** (cracks and light to medium scaling) **and Handrail** (light corrosion)

Photo P46 **East Abutment** (fair condition – cracks, spall, light to medium scaling, and wet area)

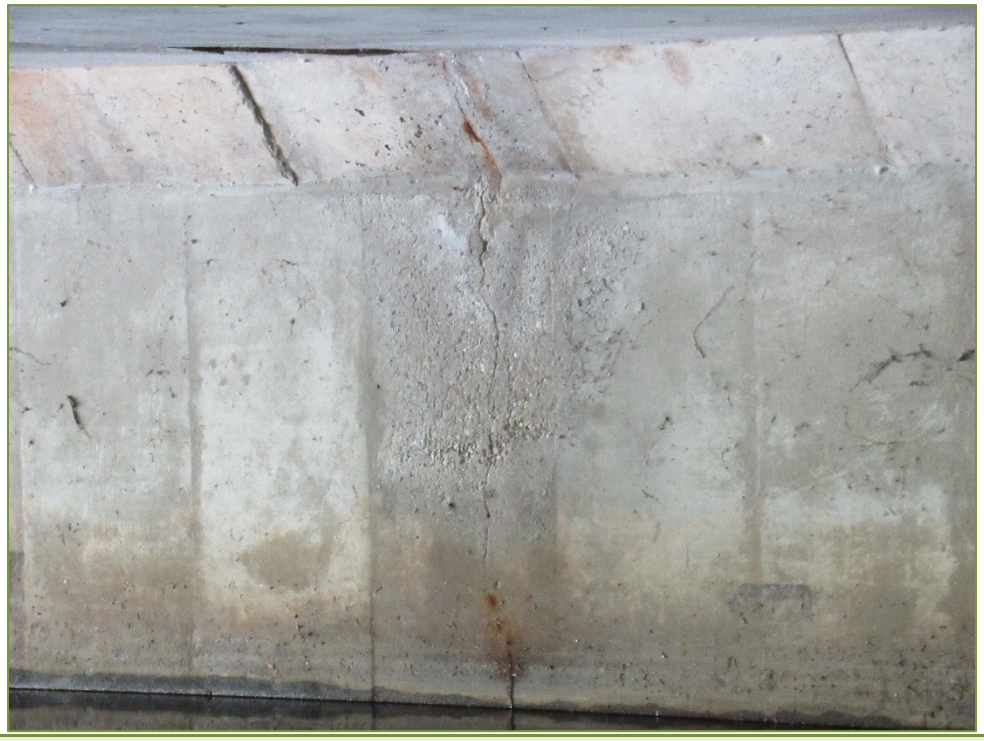


Photo P47 **East Abutment** (cracks, light to medium scaling, and wet area)

Photo P48 **East Abutment** (cracks, spall, light to medium scaling, and wet area)

Photo P49 **East Abutment** (cracks, and medium scaling) note, drain

Photo P50 **East Abutment, north side** (cracks)

Photo P51 **West Abutment** (cracks)

Photo P52 **Northeast Retaining Wall** (fair condition – wide cracks, spall, delamination, and light scaling)

Photo P53 **Northwest Retaining Wall** (fair condition – cracks, spall and light to severe scaling)

Photo P54 **Northwest Retaining Wall** (severe scaling)

Photo P55 **Southwest Retaining Wall** (good condition - cracks and light scaling)

Photo P56 **Southwest Retaining Wall** (cracks and light scaling)

Photo P57 **Pier - East Face** (fair to good condition - crack and light scaling)

Photo P58 **Pier - East Face** (light scaling)

Photo P59 **Pier - East Face** (cracks, spall, and wet area)

Photo P60 **Pier - West Face** (cracks, and light scaling)

Photo P61 **Pier - North Face** (crack)

Photo P62 **Pier - South Face** (medium scaling)

Photo P63 Typical Condition of Inside Core – C1 (west approach)

Photo P64 Typical Condition of Inside Core – C5

Photo P65 Typical Condition of Inside Core – C6

Photo P66 Typical Condition of Inside Core – C7

Photo P67 Typical Condition of Inside Core – C8

Photo P68 Typical Condition of Inside Core – C9

Photo P69 Typical Condition of Inside Core – C10

Photo P70 Typical Condition of Inside Core – C12

Photo P71 Typical Condition of Inside Core – C16

Photo P72 Typical Condition of Inside Core – C17

Photo P73 Typical Condition of Inside Core – C20

Photo P74 Typical Condition of Inside Core – C21

Photo P75 Typical Condition of Inside Core – C22

Photo P76 Upstream

Appendix H:

Laboratory Test Results

200 Viceroy Road, Unit 4, Vaughan, ON L4K 3N8
www.bridgecheckcanada.com
Tel: 905-660-6608 Fax: 905-660-6609
info@bridgecheckcanada.com

AIR VOID TEST RESULTS

(Modified Point Count – ASTM C457, Procedure B)

Project No.:	BCC21015
Site No.:	ID 112
Location:	60 m East of Woolwich Street Macdonell Bridge.

Core ID	C3	-	-
Location on Structure	Deck	-	-
Lab No.	T21-2082	-	-
Air Content (%)	4.7	-	-
Specific Surface (mm^{-1})	39.7	-	-
Spacing Factor (mm)	0.139	-	-
Position of traversed Surface	-	-	-
Orientation of Traversed Surface	-	-	-
Length of Traverse (mm)	3819.2	-	-
Dimensions of Tested Sample	125mm x 90mm	-	-
Area Traversed (mm^2)	11075.68	-	-
Average Chord Length	0.101	-	-
Number of Stops	1364	-	-
No. of Voids per mm	0.465	-	-
Paste-Air Ratio	7.30	-	-
Paste Content (%)	34.2	-	-
Aggregate Content (%)	61.1	-	-

Note: Overlay.

Tested By: Brad Wiersma
Date Tested: Sep 7, 2021

Savio DeSouza, M.A.Sc., P.Eng.
Senior Principal Engineer

TOTAL CHLORIDE ION CONTENT

(Testing Method: MTO LS-417)

Project No.:	BCC21015
Site No.:	ID#112
Location:	60 m East of Woolwich Street Macdonell Bridge

Core ID	Lab No.	Horizon from the Top of the Core (mm)	Chloride Ion Content (%)	Chloride Ion Content Corrected for Background* (%)
C6	T21-2083	0-10(overlay) 20-30(overlay) 40-50(overlay) 60-70(overlay) 80-90(overlay) 100-110(overlay) 120-130 140-150	0.485 0.282 0.117 0.058 0.056 0.086 0.102 0.086	0.429 0.226 0.061 0.002 0.000 0.030 0.054 0.038
C10	T21-2084	0-10(overlay) 20-30(overlay) 40-50(overlay) 60-70(overlay) 80-90(overlay) 100-110(overlay) 120-130	0.268 0.170 0.169 0.168 0.188 0.158 0.176	0.212 0.114 0.113 0.112 0.132 0.102 0.128
C17	T21-2085	0-10(overlay) 20-30(overlay) 40-50(overlay) 60-70(overlay) 80-90 100-110	0.453 0.316 0.191 0.099 0.075 0.048	0.397 0.260 0.135 0.043 0.027 0.000
C20	T21-2087	0-10(overlay) 20-30(overlay) 40-50(overlay) 60-70(overlay) 80-90 100-110	0.251 0.193 0.061 0.056 0.068 0.070	0.195 0.137 0.005 0.000 0.020 0.022

**Background chloride (original) = 0.048%*
**Background chloride (overlay) = 0.056%*
***The threshold of chloride ion generally regarded to be able to initiate reinforcing bar corrosion is 0.025%.*

Tested By: Vafa Pe
Date Tested: Sep 10, 2021

Savio DeSouza, M.A.Sc., P.Eng.
Senior Principal Engineer

200 Viceroy Road, Unit 4, Vaughan, ON L4K 3N8
www.bridgecheckcanada.com
Tel: 905-660-6608 Fax: 905-660-6609
info@bridgecheckcanada.com

COMPRESSIVE STRENGTH OF CONCRETE CORES

(CSA A23.2-14C)

Project No.:	**BCC21015**
Site No.:	.: **ID#112**
Location:	**60 m East of Woolwich Street Macdonell Bridge**

Core ID	**C19**
Location	Deck
Lab No.	T21-2086
Date Cast	-
Date Cored	July 24, 2021
Date Tested	Sep 14, 2021
Capped Height (mm)	115.0
Average Diameter (mm)	100.0
Density (kg/m^3)	2338
Corrected Compressive Strength (MPa)	65.2
*** Direction of Loading**	same
Moisture Contact at Time of Test	As-received
Remarks	

*Relative to the direction of original placement.

Savio DeSouza, M.A.Sc., P.Eng.
Senior Principal Engineer

Appendix I:

ACAD Drawings

200 Viceroy Road, Unit 4, Vaughan, ON L4K 3N8
www.bridgecheckcanada.com
Tel: 905-660-6608 Fax: 905-660-6609
info@bridgecheckcanada.com

CONSTRUCTION NORTH

W. ABUT. FACE

PIER ℄

E. ABUT. FACE

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29

SIDEWALK

SIDEWALK

N M L K J I H G F A

C1 C2 C3 C4 C5 C6 C7 C8 C9 C10 C11 C12 C13 C14 C15 C16 C17 C18 C19 C20 C21 C22

SS1 SS2 SS3 SS4 SS5 SS6 SS7 SS8 SS9 SS10 SS11 SS12 SS13 SS14 SS15 SS16 SS17 SS18

Macdonell St ℄

WEST APPROACH

EAST APPROACH

SC

1.50 TYP.

0.50

0.50

1.50 TYP.

SIDEWALK

SIDEWALK

DECK

KEY PLAN

SITE

Macdonell St

Woolwich St

Norfolk St

LEGEND:

Drain	Medium Scaling	Medium Concrete Cracks
C1 Core Sample Location	Severe Scaling	Wide Concrete Cracks
SS1 Sawn Sample Location	Honeycombed Areas	Medium Stained/ Efflorescence Cracks
Patched Spalls	Wet Areas	Unsealed Asphalt Cracks
Delaminations	Concrete Pattern Cracks	Sealed Asphalt Cracks
Spalls	Ravelling	Rutting Alligator Cracks
Light Scaling	Pot Hole/ Asphalt Patch	

BRIDGE CHECK CANADA

200 Viceroy Road, Unit 4
Vaughan, ON L4K 3N8
T: 905-660-6608 F: 905-660-6609

PROJECT:

60m East of Woolwich Streeet
Macdonell Bridge
Structure ID: 112
Guelph, ON

TITLE:

SURFACE DETERIORATION OF ASPHALT ON DECK AND CONCRETE SIDEWALKS

Drawing No.:	1
Project No.:	BCC21015
Date:	September 2021
Scale:	1:150
Drawn by:	MI
Checked by:	MA

CONSTRUCTION NORTH

W. ABUT. FACE

PIER

E. ABUT. FACE

SIDEWALK

SIDEWALK

Macdonell St ℄

WEST APPROACH

EAST APPROACH

SIDEWALK

SIDEWALK

DECK

LEGEND:

- Drain
- C1 Core Sample Location
- SS1 Sawn Sample Location
- 80 Asphalt Thickness-mm
- 80 Concrete cover-mm
- Cover over 60mm
- Cover from 40mm to 60mm
- Cover from 20mm to 39mm
- Cover less than 20mm

BRIDGE CHECK CANADA

200 Viceroy Road, Unit 4
Vaughan, ON L4K 3N8
T: 905-660-6608 F: 905-660-6609

PROJECT:

60m East of Woolwich Streeet
Macdonell Bridge
Structure ID: 112
Guelph, ON

TITLE:

THICKNESS OF ASPHALT ON DECK AND CONCRETE COVER OF SIDEWALKS

Drawing No.:	2
Project No.:	BCC21015
Date:	September 2021
Scale:	1:150
Drawn by:	MI
Checked by:	MA

CONSTRUCTION NORTH

W. ABUT. FACE

PIER ℄

E. ABUT. FACE

SIDEWALK

SIDEWALK

Macdonell St ℄

WEST APPROACH

EAST APPROACH

SIDEWALK

SIDEWALK

DECK

LEGEND:

- Ⓓ Drain
- C1 Core Sample Location
- SS1 Sawn Sample Location
- Ⓖ Ground Location
- ⊗ Ground Check Location
- 0.000 to -0.199 volts
- -0.200 to -0.299 volts
- -0.300 to -0.349 volts
- -0.350 to -0.449 volts
- more negative than -0.450 volts
- 460 Copper-Copper Sulphate Half-Cell Potential (negative volts x10^{-3})
- 20000 AC Test Result

BRIDGE CHECK CANADA

200 Viceroy Road, Unit 4
Vaughan, ON L4K 3N8
T: 905-660-6608 F: 905-660-6609

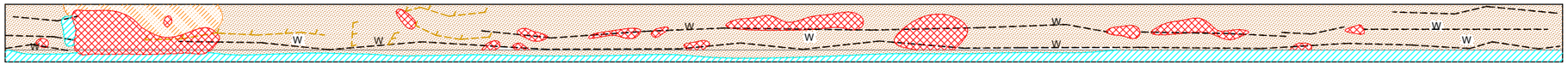
PROJECT:

60m East of Woolwich Streeet
Macdonell Bridge
Structure ID: 112
Guelph, ON

TITLE:

CORROSION POTENTIAL
ON DECK

Drawing No.:	3
Project No.:	BCC21015
Date:	September 2021
Scale:	1:150
Drawn by:	MI
Checked by:	MA

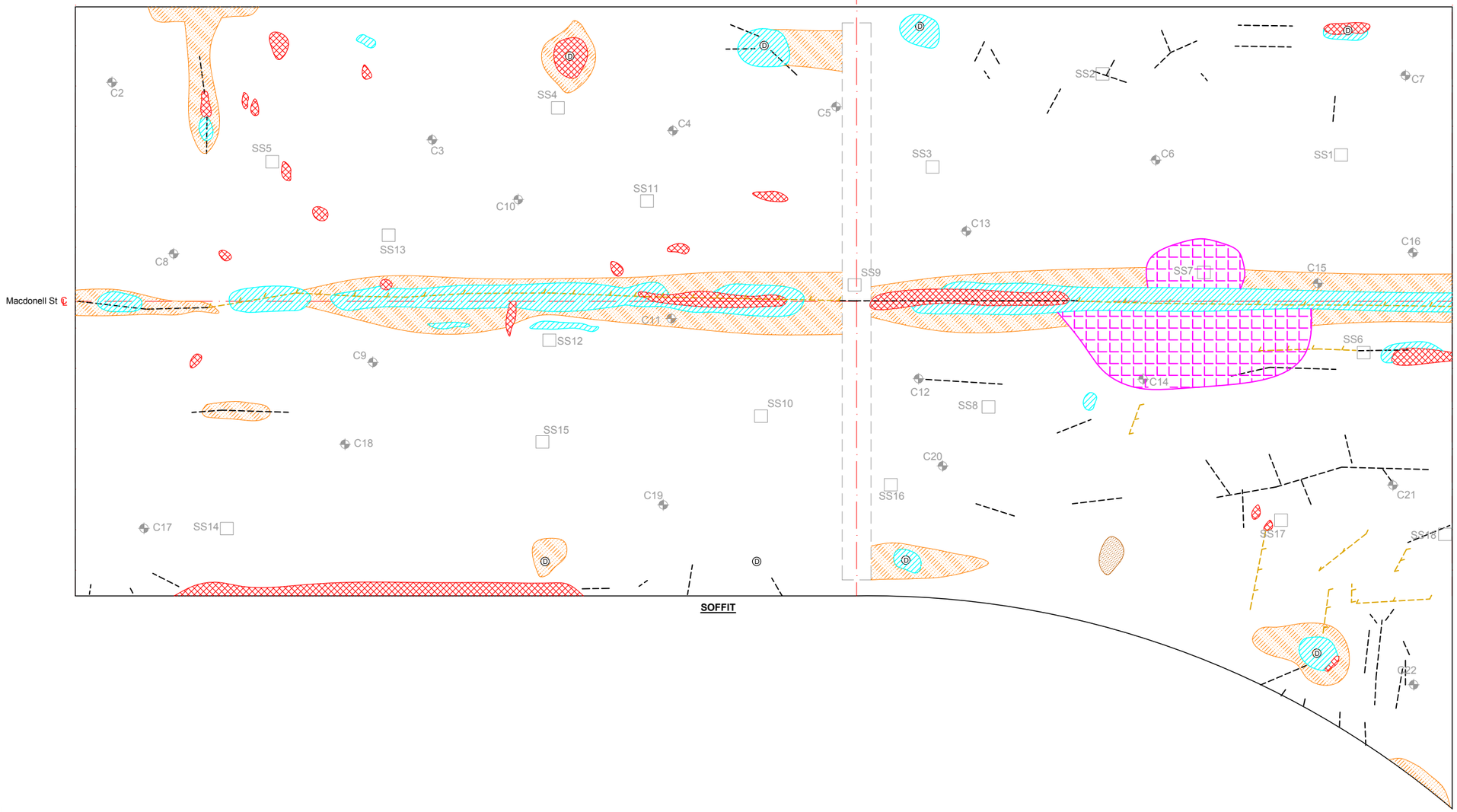


NORTH FASCIA

W. ABUT. FACE

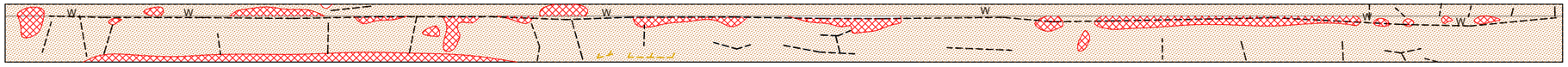
PIER ℄

E. ABUT. FACE



SOFFIT

NOTE, No access to west span



SOUTH FASCIA

CONSTRUCTION NORTH

LEGEND:

- Drain
- C1 Core Sample Location
- SS1 Sawn Sample Location
- Patched Spalls
- Delaminations
- Spalls
- Light Scaling
- Medium Scaling
- Severe Scaling
- Honeycombed Areas
- Wet Areas
- Concrete Pattern Cracks
- Medium Concrete Cracks
- W Wide Concrete Cracks
- Medium Stained/ Efflorescence Cracks

BRIDGE CHECK CANADA

200 Viceroy Road, Unit 4
Vaughan, ON L4K 3N8
T: 905-660-6608 F: 905-660-6609

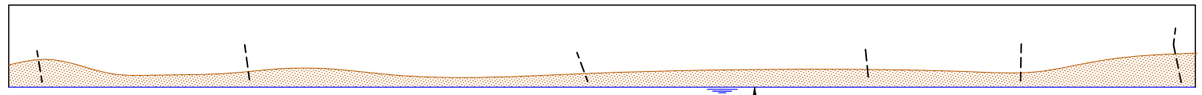
PROJECT:

60m East of Woolwich Streeet
Macdonell Bridge
Structure ID: 112
Guelph, ON

TITLE:

SURFACE DETERIORATION OF SOFFIT

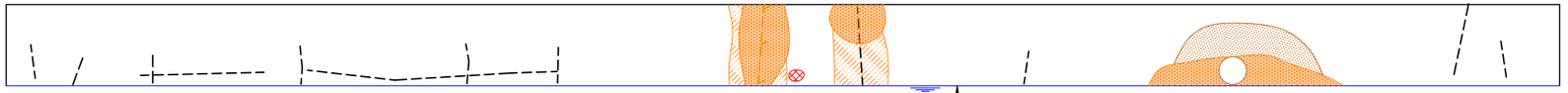
Drawing No.:	4
Project No.:	BCC21015
Date:	September 2021
Scale:	1:150
Drawn by:	MI
Checked by:	MA



NOTE, Limited access to west Abutment

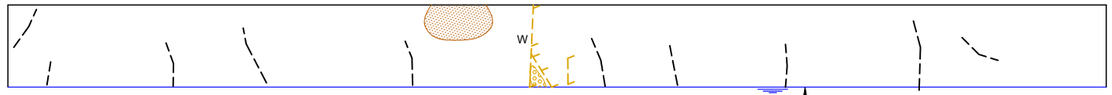
WEST ABUTMENT

Water Level



EAST ABUTMENT

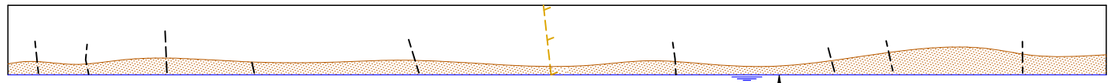
Water Level



PIER - EAST FACE

Water Level

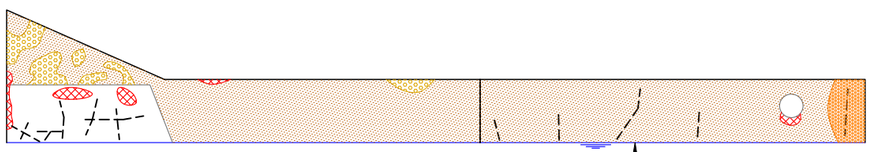
NORTH FACE



PIER - WEST FACE

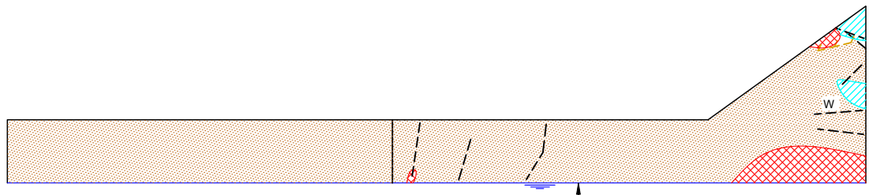
Water Level

SOUTH FACE



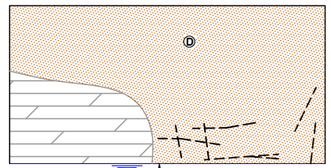
NW RETAINING WALL

Water Level



NE RETAINING WALL

Water Level



Water Level

SW RETAINING WALL

LEGEND:

- Drain
- Patched Spalls
- Delaminations
- Spalls
- Light Scaling
- Medium Scaling
- Severe Scaling
- Honeycombed Areas
- Wet Areas
- Concrete Pattern Cracks
- Masonary
- Medium Concrete Cracks
- Wide Concrete Cracks
- Medium Stained/ Efflorescence Cracks

BRIDGE CHECK CANADA

200 Viceroy Road, Unit 4
Vaughan, ON L4K 3N8
T: 905-660-6608 F: 905-660-6609

PROJECT:

60m East of Woolwich Streeet
Macdonell Bridge
Structure ID: 112
Guelph, ON

TITLE:

SURFACE DETERIORATION
OF ABUTMENTS, PIER
AND RETAINING WALLS

Drawing No.:	5
Project No.:	BCC21015
Date:	September 2021
Scale:	1:100
Drawn by:	MI
Checked by:	MA

APPENDIX A.IV:
2022 OSIM INSPECTION REPORT AND CIP MEMO

SUMMARY ACTION REPORT

City of Guelph
Macdonell Bridge
Structure No.: 112
Macdonell Street
60m E of Woolwich Street

Inspection Date:	11/23/2022	BCI:	62
Next Inspection:	2024	Current Load Limit (t):	
Structure Width (m):	43	Replacement Cost:	$4,600,000
Span Lengths (m):	24.4, 18.6		

Overall Comments

Structure in overall fair to poor condition. A Municipal Class Environmental Assesment should be completed. Consideration could be given to only a superstructure replacement.

Capital Works

Abutments - Abutment Walls	Replace structure	1-5 Years	$2,800,000
		Total Recommended Work Cost:	$2,800,000

Associated Work

Approaches	$0	Utilities	$0	Other	$300,000
Detours	$0	Right-of-Way	$0	Contingencies	$759,000
Traffic Control	$500,000	Environmental Study	$175,000	Engineering	$566,000
				Total Associated Work Cost	$2,300,000

Recommended Work	Priority	Total Recommended & Associated Work Cost	Ownership (%)	Total Shared Cost
Replace	1-5yr	$5,100,000	100%	$5,100,000

Additional Investigations

None

Maintenance Needs

Element	Need	Priority	Description
Accessories - Other	Other		Replace missing cap
Barriers - Railing Systems			Reinstall missing end caps and bolts
Decks - Drainage	Bridge Deck Drainage		Clear plugged deck drains
Embankments & Streams - Embankments	Other		Vegetation clearing/maintenance

Performance Deficiencies

Element	Deficiency Description
Barriers - Railing Systems	Other
Decks - Drainage	Deck drainage
Decks - Wearing Surface	Rough riding surface
Embankments & Streams - Embankments	Other

BluePlan ENGINEERING

Ontario Structure Inspection Manual - Inspection Form

Site Number: 112

Structure Name: Macdonell Bridge

Structure ID: 112

Inventory Data:

Structure Name:	Macdonell Bridge				
Hwy/Road Name:	Macdonell Street	Crossing Type: On:		Under:	
MTO Site Number:		Main Hwy/Road #:			
Structure Location:	60m E of Woolwich Street			LHRS:	
Latitude (decimal degrees):	43.547378	Longitude (decimal degrees):	-80.243633	LHRSOffset:	
Owner / Custodian:	City of Guelph	100%	Owner 2:		0%
MTO Region:	Southwestern	Heritage Desig.:	Not Cons ☐	Cons Not/App ☐	List/Not Desig ☐
MTO Area:				Desig Not List ☐	Desig List ☐
Old County:		Hwy Class:	Freeway ☐	Arterial ☑	Collector ☐ Local ☐
Township:	City of Guelph	No. of Lanes:	4	Posted Speed:	60 (km/h)
Structure Type:	Rigid Frame, Vertical Legs	AADT:	10,000	Trucks:	(%)
StructuralMaterial:		Travel Stream:			
Structure Type 2:		Traffic Directional Bound:			
Structural Material 2:		Inspection Route Sequence:			
Total Deck Length:	18.4 (m)	Inspection Frequency (yrs):	2		
Overall Str Width:	43.0 (m)	Inspection Year:	2022		
Culvert Length:	(m)	Inspection Duration (hrs):	1		
Total Deck Area:	791.2 (sq m)	Interchange No:			
Roadway Width:	14.6 (m)	Estimated Replacement Value:	$4,600,000		
Skew Angle:	(deg)	Replacement Value is based on like-for-like replacement using typical costs for budget purposes only.			
No. of Spans:	2				
Span Lengths:	24.4, 18.6 (m)	Min. Vertical Clearance:	(m)		
For Retaining Wall		Special Routes:	Transit ☑	Truck ☑	School ☑ Bicycle ☑
Total Wall Length (m)	0.0	Ave Wall Height (m):	0.0	Detour Length:	(km)
Total Wall Area (m²):	0.0	Angle of Backfill (deg):	0.0	Direction of Structure:	East/West
Max Wall Height (m):	0.0	Fill on Structure:	(m)		

Historical Data:

Year Built	1963	(yyyy)	Year of Last Rehab	1988	(yyyy)
Last OSIM Inspection	12/15/2020	(mm/dd/yyyy)	Last Evaluation		(mm/dd/yyyy)
Last Enhanced OSIM Inspection		(mm/dd/yyyy)	Current Load Limit		(tonnes)
Enhanced Access Equipment (ladder, boat, lift, etc)			Load Limit By Law		
			By Law expiry Date		
Last Condition Survey		(mm/dd/yyyy)	Last underwater Inspection		(mm/dd/yyyy)

Rehabilitation History:

Ontario Structure Inspection Manual - Inspection Form

Site Number: 112

Structure Name: Macdonell Bridge

Structure ID: 112

Field Inspection Information:

Date of Inspection:	11/23/2022 (mm/dd/yyyy)	Inspection Type:	OSIM
Inspector:	SG	Weather:	Clear
Others in Party:	NB	Temperature °C:	-2
Equipment Used:	Measuring Tape, Hammer, Camera		

Additional Investigations Required:

	Priority	Estimated Cost
Detailed Deck Condition Survey:	None	$0
Non-destructive Delamination Survey of Asphalt-Covered Deck:	None	$0
Concrete Substructure Condition Survey:	None	$0
Detailed Coating Condition Survey:	None	$0
Detailed Timber Investigation:	None	$0
Post-Tensioned Strand Investigation:	None	$0
Underwater Investigation:	None	$0
Fatigue Investigation:	None	$0
Seismic Investigation:	None	$0
Structure Investigation:	None	$0
Monitoring Deformations, Settlements, Movements:	None	$0
Monitoring Crack Widths:	None	$0
Monitoring RSS Horizontal Movements of Face:	None	$0
Monitoring RSS Vertical Movements of Overall Structure:	None	$0
Monitoring RSS Local Movements or Deterioriation of Facing Elements:	None	$0
Monitoring RSS Horizontal Movements within Overall Structure:	None	$0
Monitoring RSS Vertical Movements within Overall Structure:	None	$0
Monitoring RSS Lateral Earth Pressure at Back of Facing Elements:	None	$0
	Total Cost:	**$0**

Investigation Notes:

Overall Structure Notes:

Overall Comments:	Structure in overall fair to poor condition. A Municipal Class Environmental Assesment should be completed. Consideration could be given to only a superstructure replacement.		
BCI:	62	Recommended Work:	Replace
Next Inspection:	2024	Recommended Work Time:	1-5yr

Suspected Performance Deficiencies

00 None
01 Load carrying capacity
02 Excessive deformations (deflections & rotations)
03 Continuing settlement
04 Continuing movements
05 Seized bearings
06 Bearing not uniformly loaded/unstable
07 Jammed expansion joint
08 Pedestrian/vehicular hazard
09 Rough riding surface
10 Surface ponding
11 Deck drainage
12 Slippery surface
13 Flooding/channel blockage
14 Undermining of foundation
15 Unstable embankments
16 Other Performance Deficiencies

Maintenance Needs

01 N/A
02 Bridge Cleaning
03 Railing System Repair
04 N/A
05 Bridge Deck Joint Repair
06 N/A
07 Structural Steel Repair
08 Concrete Repair
09 Timber Repair
10 Works for Modular Bridges
11 Animal/Pest Control
12 Bridge Surface Repair
13 Erosion Control at Bridges
14 Concrete Sealing
15 N/A
16 Works for Drainage System
17 Scaling (Loose Concrete or ACR Steel)
18 Other Maintenance

Ontario Structure Inspection Manual - Inspection Form

Site Number: 112

Structure Name: Macdonell Bridge

Structure ID: 112

Element Group:	**Abutments**	Length:	0.00
Element Name:	**Abutment Walls**	Width:	18.80
Location:	East/West	Height:	3.50
Material:	Cast-in-Place Concrete	Count:	2.0
Element Type:	Legs of Rigid Frame	Total Quantity:	131.6
Element Subtype:		Environment:	Benign
Protection System:	None	Limited Inspection	☐

Condition Data:	Units:	Exc.:	Good:	Fair:	Poor:	Performance Deficiencies:
	sq.m.	0.0	109.6	15.0	7.0	

Comments:

Recommended Work: Replace | Timing: 1-5 Years | Details: Replace structure

Maint. Priority: | Needs: | Desc.:

Element Group:	**Abutments**	Length:	2.85
Element Name:	**Wingwalls**	Width:	0.00
Location:	Northwest	Height:	1.20
Material:	Cast-in-Place Concrete	Count:	1.0
Element Type:	Reinforced Concrete	Total Quantity:	3.4
Element Subtype:		Environment:	Moderate
Protection System:	None	Limited Inspection	☐

Condition Data:	Units:	Exc.:	Good:	Fair:	Poor:	Performance Deficiencies:
	sq.m.	0.0	2.1	1.0	0.3	

Comments: Severe spalling with exposed corroded rebar

Recommended Work: | Timing: | Details:

Maint. Priority: | Needs: | Desc.:

Element Group:	**Accessories**	Length:	0.00
Element Name:	**Other**	Width:	0.00
Location:	Light masts	Height:	0.00
Material:	Hybrid	Count:	5.0
Element Type:	-	Total Quantity:	5.0
Element Subtype:		Environment:	Severe
Protection System:	None	Limited Inspection	☐

Condition Data:	Units:	Exc.:	Good:	Fair:	Poor:	Performance Deficiencies:
	Each	0.0	5.0	0.0	0.0	

Comments: Cap to electrical housing is missing on southeast post

Recommended Work: | Timing: | Details:

Maint. Priority: | Needs: 17 | Desc.: Replace missing cap

Ontario Structure Inspection Manual - Inspection Form

Site Number: 112

Structure Name: Macdonell Bridge

Structure ID: 112

Element Group:	**Approaches**	Length:	6.00
Element Name:	**Approach Slabs**	Width:	14.60
Location:	East/West end	Height:	0.00
Material:	Cast-in-Place Concrete	Count:	2.0
Element Type:	-	Total Quantity:	175.2
Element Subtype:		Environment:	Benign
Protection System:	None	Limited Inspection	☑

Condition Data:	Units:	Exc.:	Good:	Fair:	Poor:	Performance Deficiencies:
	sq.m.	0.0	75.2	100.0	0.0	

Comments: Not visible; Assumed in fair condition based on condition of asphalt wearing surface

Recommended Work: | Timing: | Details:

Maint. Priority: | Needs: | Desc.:

Element Group:	**Approaches**	Length:	6.00
Element Name:	**Sidewalk**	Width:	1.90
Location:	East/West approach	Height:	0.00
Material:	Cast-in-Place Concrete	Count:	4.0
Element Type:	-	Total Quantity:	45.6
Element Subtype:		Environment:	Severe
Protection System:	None	Limited Inspection	☐

Condition Data:	Units:	Exc.:	Good:	Fair:	Poor:	Performance Deficiencies:
	sq.m.	0.0	28.6	12.0	5.0	

Comments: Light scaling; Narrow to wide cracking throughout; Isolated medium to severe delamination on north side; Small spalls on north side; Map cracking on North sidewalk

Recommended Work: | Timing: | Details:

Maint. Priority: | Needs: | Desc.:

Element Group:	**Approaches**	Length:	6.00
Element Name:	**Wearing Surface**	Width:	14.60
Location:	East/West ends	Height:	0.00
Material:	Asphalt	Count:	2.0
Element Type:	-	Total Quantity:	175.2
Element Subtype:		Environment:	Severe
Protection System:	None	Limited Inspection	☐

Condition Data:	Units:	Exc.:	Good:	Fair:	Poor:	Performance Deficiencies:
	sq.m.	0.0	75.2	65.0	35.0	

Comments: Narrow to medium longitudinal cracking; Isolated severe transverse and alligator cracking; Light wheel rutting

Recommended Work: | Timing: | Details:

Maint. Priority: | Needs: | Desc.:

Element Group:	**Barriers**	Length:	132.00
Element Name:	**Railing Systems**	Width:	0.00
Location:	North/South	Height:	1.07
Material:	Steel	Count:	2.0
Element Type:	Steel post and Steel Panel	Total Quantity:	264.0
Element Subtype:		Environment:	Severe
Protection System:	Hot dip galvanizing	Limited Inspection	☐

Condition Data:	Units:	Exc.:	Good:	Fair:	Poor:	Performance Deficiencies:
	m	0.0	209.0	35.0	20.0	16

Comments: Isolated deformations and impact damage; Isolated bolts are too short for nut; Discontinuity in railing at light posts; Isolated end caps missing; Isolated light to severe corrosion; Missing bolts on the north barrier at west end

Recommended Work: | Timing: | Details:

Maint. Priority: | Needs: 17 | Desc.: Reinstall missing end caps and bolts

---

Element Group:	**Decks**	Length:	0.00
Element Name:	**Drainage**	Width:	0.00
Location:	North/South sides	Height:	0.00
Material:	Cast-in-Place Concrete	Count:	10.0
Element Type:	Holes in Deck	Total Quantity:	10.0
Element Subtype:		Environment:	Severe
Protection System:	None	Limited Inspection	☐

Condition Data:	Units:	Exc.:	Good:	Fair:	Poor:	Performance Deficiencies:
	Each	0.0	0.0	0.0	10.0	11

Comments: Drainage pipes are plugged at curbs; Severe corrosion of drains on soffit

Recommended Work: | Timing: | Details:

Maint. Priority: | Needs: 16 | Desc.: Clear plugged deck drains

---

Element Group:	**Decks**	Length:	43.00
Element Name:	**Soffit - Thick Slab**	Width:	1.60
Location:	Exterior Soffit	Height:	0.00
Material:	Cast-in-Place Concrete	Count:	2.0
Element Type:	-	Total Quantity:	137.6
Element Subtype:	Exterior	Environment:	Moderate
Protection System:	None	Limited Inspection	☐

Condition Data:	Units:	Exc.:	Good:	Fair:	Poor:	Performance Deficiencies:
	sq.m.	0.0	35.6	72.0	30.0	

Comments: Narrow to wide vertical and horizontal cracking on fascia, some with efflorescence, rust and moisture stains; Medium to severe delamination and spalls with exposed corroded rebar; Medium disintegration along construction joint; Some severe spalls at base of barrier posts; No drip edge present

Recommended Work: | Timing: | Details:

Maint. Priority: | Needs: | Desc.:

Element Group:	**Decks**	Length:	43.00
Element Name:	**Soffit - Thick Slab**	Width:	17.50
Location:	West Interior Soffit	Height:	0.00
Material:	Cast-in-Place Concrete	Count:	1.0
Element Type:	-	Total Quantity:	752.5
Element Subtype:	Interior	Environment:	Benign
Protection System:	None	Limited Inspection	☐

Condition Data:	Units:	Exc.:	Good:	Fair:	Poor:	Performance Deficiencies:
	sq.m.	0.0	562.5	110.0	80.0	

Comments: Full span wide crack with active leakage, rust staining and some efflorescence; Narrow to wide longitudinal and transverse cracking with moisture staining; Medium to severe delamination; Severe delamination around deck drains on west span

Recommended Work: | Timing: | Details:

Maint. Priority: | Needs: | Desc.:

Element Group:	**Decks**	Length:	43.00
Element Name:	**Wearing Surface**	Width:	14.60
Location:	Over structure	Height:	0.00
Material:	Asphalt	Count:	1.0
Element Type:	-	Total Quantity:	627.8
Element Subtype:		Environment:	Severe
Protection System:	None	Limited Inspection	☐

Condition Data:	Units:	Exc.:	Good:	Fair:	Poor:	Performance Deficiencies:
	sq.m.	0.0	292.8	300.0	35.0	9

Comments: Light wheel rutting; Medium to severe transverse and longitudinal cracks throughout; Severe alligator cracking; Roughly patched pot holes

Recommended Work: | Timing: | Details:

Maint. Priority: | Needs: | Desc.:

Element Group:	**Embankments & Streams**	Length:	0.00
Element Name:	**Embankments**	Width:	0.00
Location:	Each Quadrant	Height:	0.00
Material:	Native	Count:	4.0
Element Type:	-	Total Quantity:	3.0
Element Subtype:		Environment:	Severe
Protection System:	None	Limited Inspection	☐

Condition Data:	Units:	Exc.:	Good:	Fair:	Poor:	Performance Deficiencies:
	Each	0.0	3.0	1.0	0.0	16

Comments: Overgrown vegetation

Recommended Work: | Timing: | Details:

Maint. Priority: | Needs: 17 | Desc.: Vegetation clearing/maintenance

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Ontario Structure Inspection Manual - Inspection Form

Site Number: 112

Structure Name: Macdonell Bridge

Structure ID: 112

Element Group:	**Embankments & Streams**	Length:	0.00
Element Name:	**Streams and Waterways**	Width:	0.00
Location:	All	Height:	0.00
Material:		Count:	1.0
Element Type:	-	Total Quantity:	1.0
Element Subtype:		Environment:	
Protection System:		Limited Inspection	☐

Condition Data:	Units:	Exc.:	Good:	Fair:	Poor:	Performance Deficiencies:
	All	0.0	1.0	0.0	0.0	

Comments: Heavy sediment and debris built up in front of dam

Recommended Work: | Timing: | Details:

Maint. Priority: | Needs: | Desc.:

Element Group:	**Foundations**	Length:	0.00
Element Name:	**Foundation (below ground level)**	Width:	0.00
Location:	All	Height:	0.00
Material:	Cast-in-Place Concrete	Count:	1.0
Element Type:	Unknown	Total Quantity:	1.0
Element Subtype:		Environment:	Benign
Protection System:	None	Limited Inspection	☑

Condition Data:	Units:	Exc.:	Good:	Fair:	Poor:	Performance Deficiencies:
	All	0.0	0.0	0.0	0.0	

Comments: Assumed in good condition based on lack of settlement defects

Recommended Work: | Timing: | Details:

Maint. Priority: | Needs: | Desc.:

Element Group:	**Piers**	Length:	0.90
Element Name:	**Shafts/Columns/Pile Bents**	Width:	17.80
Location:	Central Pier	Height:	3.50
Material:	Cast-in-Place Concrete	Count:	1.0
Element Type:	Concrete Rectangular Columns	Total Quantity:	130.9
Element Subtype:		Environment:	Benign
Protection System:	None	Limited Inspection	☐

Condition Data:	Units:	Exc.:	Good:	Fair:	Poor:	Performance Deficiencies:
	sq.m.	0.0	116.9	7.0	7.0	

Comments: Wide vertical cracks, some with efflorescence

Recommended Work: | Timing: | Details:

Maint. Priority: | Needs: | Desc.:

Ontario Structure Inspection Manual - Inspection Form

Site Number: 112

Structure Name: Macdonell Bridge

Structure ID: 112

Element Group:	**Retaining Walls**	Length:	46.10
Element Name:	**Walls**	Width:	0.00
Location:	All	Height:	2.68
Material:	Cast-in-Place Concrete	Count:	1.0
Element Type:	Reinforced Concrete	Total Quantity:	123.5
Element Subtype:	-	Environment:	Benign
Protection System:	None	Limited Inspection	☐

Condition Data:	Units:	Exc.:	Good:	Fair:	Poor:	Performance Deficiencies:
	sq.m.	0.0	103.5	10.0	10.0	

Comments: Wide vertical cracks throughout, some with efflorescence; Isolated light delamination near abutment wall on northeast retaining wall and around STM outlet; Severe scaling throughout;

Recommended Work: | Timing: | Details:

Maint. Priority: | Needs: | Desc.:

Element Group:	**Sidewalks/Curbs**	Length:	43.00
Element Name:	**Sidewalk and Medians**	Width:	1.90
Location:	Over Structure (North/South)	Height:	0.20
Material:	Cast-in-Place Concrete	Count:	2.0
Element Type:	-	Total Quantity:	180.6
Element Subtype:		Environment:	Severe
Protection System:	None	Limited Inspection	☐

Condition Data:	Units:	Exc.:	Good:	Fair:	Poor:	Performance Deficiencies:
	sq.m.	0.0	105.6	50.0	25.0	

Comments: Light scaling; Narrow to wide cracking throughout

Recommended Work: | Timing: | Details:

Maint. Priority: | Needs: | Desc.:

Ontario Structure Inspection Manual - Inspection Form

Site Number: 112

Structure Name: Macdonell Bridge

Structure ID: 112

Repair / Rehabilitation Required

Element Group	Element	Repair / Rehabilitation	Priority	Const Cost
Abutments	Abutment Walls	Replace structure	1-5 Years	2,800,000

Total Repair/Rehabilitation Cost **$2,800,000**

Associated Work

	Comments	Estimated Cost
Approaches		$0
Detours		$0
Traffic Control	*Staged construction*	$500,000
Utilities		$0
Right-of-Way		$0
Environmental Study	*Municipal Class EA*	$175,000
Other	*Mobilization, worksite isolation, etc*	$300,000

Contingencies	$759,000
Engineering	$566,000
Total Associated Work Cost	**$2,300,000**

City of Guelph	100%	$5,100,000
	0%	$0

Total Repair / Rehabilitation Cost	$2,800,000
Total Cost	**$5,100,000**

Justification

Inspection Photos

North elevation

Plan view, looking east

North soffit exterior shows severe delamination and exposed corroded rebar throughout

South soffit exterior and interior showing spalls and exposed corroded rebars

Medium full length crack with rust stains showing on east abument wall and soffit

Drainage system outlet showing spalls

Northwest embankment showing overgrown vegetation

Missing light cap

Severe alligator cracking and severe transverse and longitudinal cracks throughout wearing surface

North sidewalk should wide cracks and settlement

Date:	2/24/2023	File:	122129
To:	Tracey Lesage, City of Guelph		
From:	Jack Turner, GMBP		
Project:	2022 OSIM Bridge and Culvert Condition Assessments		
Subject:	Tech Memo #2: Updated Capital Investment Program		

This project includes the detailed visual inspections of bridge and culverts in accordance with Ontario Regulation 104/97. Our understanding of this project is that it will equip the City with the data, maintenance strategies and capital planning forecasts to ensure that capital spending and maintenance activities for bridge and culvert infrastructure are prioritized and planned to maximize service life at the determined level of service for each asset in an efficient and informed manner.

As part of this assignment the following Tasks are to be completed:

- Task 1: Project Management and Administration
- Task 2: Asset Profile Update
- Task 3: OSIM Structure Inspections
- Task 4: Update of Corrective Maintenance Plan
- Task 5: Update of Capital Investment Program
- Task 6: Update of life Costing Model Data Tables
- Task 7: Risk Scoring
- Task 8: Project Data Sheets

This document, Tech Memo #2, details the Update of Capital Investment Program, a deliverable for Task 5.

UPDATED CAPITAL INVESTEMENT PROGRAM

1. INTRODUCTION AND BACKGROUND

GM BluePlan Engineering Limited (GMBP) was retained by the City of Guelph (City) to complete the inspections of municipal structures as part of their 2022 Bridge and Culvert Condition Assessments. A total of 75 structures were inspected in 2022. We note that the following structures in the City's inventory were not inspected in 2022, as they were inspected by others:

- 104: Edinburgh Road Over Speed River
- 108: Speedvale Avenue Over Speed River
- 116: Stone Road Over Eramosa River – Pedestrian

Remedial works were recommended for each structure based on its condition at the time of inspection and were categorized according to the Ontario Structure Inspection Manual (OSIM) and format: maintenance needs, additional studies, and capital works. Our recommendations are based on visual OSIM inspections only.

2. COST ESTIMATE ASSUMPTIONS FOR CAPITAL WORKS

The capital works identified on the OSIM forms include all repair and replacement costs recommended for the identified structure. Structures that are recommended for replacement may require a Municipal Class Environmental Assessment (EA). The EA process is dependent on a number of factors that will affect both duration and cost. Additionally, various regulatory authorities may require an increase in structure size for hydraulics, traffic or other requirements. It has been assumed that all structures will be replaced with a structure of similar type and size (like for like).

The rehabilitation cost estimates contained in this report should be considered preliminary as no pre-design work has been completed to determine a specific scope of work that could include, but not limited to, changes identified through the EA process, site specific geometric changes due to current design criteria, site specific environmental mitigation and any requirements that relate to the Canadian Environmental Assessment Act (CEAA). The engineering cost estimates have been based on a percentage of the construction cost estimate and may change accordingly following pre-design.

Associated costs have also been included in the estimated costs for capital works (mobilization, insurance, dewatering, traffic control, contingencies, etc.). In instances where the scope of work is limited, these costs become difficult to

estimate and may inflate the actual costs to complete small-scale projects. The City may wish to group projects of similar scope together under a bundled design and tender approach to realize cost savings; however, the cost estimates provided assume that each project will be completed as a stand-alone assignment.

2.1. Heritage Designated Structures

The City of Guelph owns and maintains several structures that are protected under the Ontario Heritage Act. A permit application to the Guelph Heritage Committee is recommended prior to any proposed works being completed. We have attempted to account for costs associated with sympathetic repairs, as we note that these repairs can be unique and may require specialty expertise. Refer to **Table 1** for designated heritage structures that have been recommended for capital works.

Table 1: Summary of Recommended Works for Heritage Designated Structures

ID	Structure Name	Heritage Designation Description	Recommended Works Impacting Heritage Features
103	Gows	*By-law: (1990)-13471* The designation affects all elements of the south and middle spans of the bridge and the piers, all of which are of stone construction, as well as the concrete foundations, but does not include the more recent north span which is of steel beam construction.	• Concrete and masonry repairs throughout structure
119	Heffernan St. Over Speed River (Middle)	*By-law: (1990)-13541* The designation applies to the entire bridge structure including piers, arches, girders, deck and railings.	• Concrete repairs throughout structure
120	Heffernan Street (East)		
121	Heffernan Street (West) Over CNR		
123	Towne Lattice Over Speed River (Middle)	*By-law: (2014)-19812* Designated by heritage district designation	• Timber repairs throughout structure

As per the Municipal Class Environmental Assessment Act, replacement of a designated heritage structure requires a Municipal Class Environmental Assessment.

2.2. Prioritization of Work

The priorities for the specified capital works were identified on the inspection forms in the time frames of urgent, within 1 year, 1 to 5 year, and 6 to 10 year priorities. Additionally, a priority has been assigned to each structure that has capital work recommended.

Structures requiring work have been prioritized based on the inspected visual condition and review of the background information provided; however, this order may change depending on the outcome of additional investigations and other factors determined by the City. The priority rankings do not necessarily reflect the order in which capital works must be carried out. In addition to the observed condition of the structure, we have attempted to base our rankings on such factors as:

- Traffic Volumes
- Pedestrian or Cyclists Hazards or Requirements
- Load Rating Requirements

We note that, although the BCI value is a good tool for estimating the condition of a structure, it should not be relied upon solely for prioritization of capital works. BCI values can be skewed by non-critical elements, and do not take into account factors such as those listed above.

3. LIFECYCLE REQUIREMENTS: 10-YEAR OUTLOOK

Based on the 2022 visual inspections, capital works were recommended and classified in line with the OSIM guidelines. The recommended capital works were prioritized in time frames of urgent, within 1 year, 1 to 5 years and 6 to 10 years as required by OSIM. The prioritization of the capital works was further refined into a 10 Year Capital Works Program, included in **Appendix A**. The summary results of the Bridge and Culvert Inspections, using criteria set out in OSIM, are summarized in **Table 2** below.

Table 2: Summary results of 2022 Bridge and Culvert Inspections

Structure Group	Total Estimated Capital Works				
	Urgent	< 1 year	1-5 years	6-10 years	TOTAL
Bridges	-	$600,000	$9,500,000	$920,000	**$11,020,000**
Culverts	-	$860,000	$5,540,000	$1,990,000	**$8,390,000**
Stairs / Ramps	$75,000	-	$75,000	-	**$150,000**
TOTAL	**$75,000**	**$1,460,000**	**$15,115,000**	**$2,910,000**	**$19,560,000**

It should be noted that prioritization and recommended timing of works have been scheduled in accordance with OSIM guidelines. The City may wish to adjust the timing of some projects to align the construction with other anticipated capital projects (e.g., road resurfacing projects, road reconstruction projects, etc.).

All of the costs presented within this report have been estimated based on data obtained from the OSIM inspections, our experience with projects of similar size and scope. Costs do not include allowances for property acquisitions, road works beyond the structure extents, construction administration fees, agency approval fees, utility relocations, HST, or any other aspect, unless specifically noted otherwise. **All costs are presented in 2022 dollars and do not account for inflation.**

The total estimated cost to implement this work is $19.6M, which equates to an annual capital cost of approximately $2.0M per year over 10 years. As shown in **Table 2**, $15.1M of the $19.6M of capital work is recommended under the 1-5 year priority. As shown in **Appendix A**, this results in the capital costs for the first several years of capital program to be higher than the average $2.0M per year, with the latter years being less than the average.

It should also be noted that the capital work recommendations for this project are based on the results of the 2022 OSIM inspections, which are based on the condition of the structure at the time of the inspection. As structures continue to age, new deficiencies could develop, leading to new recommended capital works that are not currently included in this iteration of the capital plan. For example, a structure that has work recommended in the 6-10 year window, could potentially develop new deficiencies over the course of 6-10 years, leading to a higher capital cost for completing work at that structure in 6-10 years. Structures not currently included on the capital investment plan could also deteriorate and be included on future iterations of the plan within the 10 year horizon (2023 to 2032).

Therefore, capital work that is completed in the next 1-5 years would typically be closer in alignment to the recommendations of the OSIM inspections than capital work that is completed beyond the 1-5 year window. As such, in **Appendix A**, the “Subtotal Recommended Capital Works From 2022 OSIM Inspections” are costs based on estimates from the 2022 OSIM inspections, whereas the “Subtotal Estimated Minimum Annual Capital Program” are costs estimated based on the full lifecycle cost of each structure, as discussed in more detail in **Section 4** below.

4. LIFECYCLE REQUIREMENTS: FULL LIFECYCLE

The cost per year to maintain a structure over its lifecycle can be derived from the total lifecycle cost of the structure divided by its typical service life. Therefore, the minimum annual capital program to maintain the City’s bridge and culvert assets can be estimated by the summation of the lifecycle cost per year for each structure.

$$Annual\ Capital\ Program = \sum \frac{Current\ Structure\ Replacement\ Cost \times Total\ Lifecycle\ Percentage}{Typical\ Service\ Life\ of\ Structure}$$

As part of the City's 2018 Bridge and Structure Lifecycle Management Strategy Project, GMBP developed full lifecycle models for bridge and culvert structure assets. The models were developed based on the typical capital work cycles that a structure will go through over its lifecycle, based on the type of structure. Refer to **Table 3** below.

Table 3: Typical Capital Works Cycles Based on Structure Type

Type of Structure	Typical Service Life (Years)	Rehabilitation or Replacement Works (as % of Replacement Cost)			
		25 Years	55 Years	75 Years	Total Lifecycle Percentage
Vehicular Bridge	**75**	25%	50%	100%	**175%**
Pedestrian Bridge (steel, concrete)	**55**	30%	100%	-	**130%**
Pedestrian Bridge (wood, other)	**25**	100%	-	-	**100%**
Concrete Culvert	**75**	15%	30%	100%	**145%**
Steel Culvert	**55**	-	100%	-	**100%**

Using the abovementioned models, the estimated minimum annual capital program to maintain the Town's bridge and culvert assets inspected in 2022 is approximately $1.8M per year.

We note that this annual cost is approximately equal to the $1.9M that is currently proposed in the 10 Year Capital Works Program, discussed in **Section 3**. Therefore, an annual capital program of approximately $1.9M per year should be considered the minimum investment per year to account for future capital works over the full lifecycle of structures in the City's inventory. This has been represented in the capital program presented in **Appendix A** as the "Subtotal Estimated Minimum Annual Capital Program".

5. ATTACHMENTS

Appendix A: Recommended Capital Works and 10 Year Program

APPENDIX A

Recommended Capital Works and 10 Year Program

CITY OF GUELPH
RECOMMENDED 15 YEAR CAPITAL WORKS PROGRAM

Structure ID	Structure Name	Project Data Sheet	BCI	Schedule	Prioritization #	Description	Detailed Description	Capital Cost Estimate	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037
104	Edinburgh Road Over Speed River														STRUCTURE INSPECTED BY OTHERS IN 2022								
108	Speedvale Avenue Over Speed River														STRUCTURE INSPECTED BY OTHERS IN 2022								
116	Stone Road Over Eramosa River - Pedestrian														STRUCTURE INSPECTED BY OTHERS IN 2022								
501	Norfolk/Northumberland Stairs		69	Urgent	1	Minor Rehab	Concrete patch repairs to stairs; Concrete patch repairs to fascia	$ 75,000.00	**$ 75,000.00**														
118	Old Downey Road Over Hanlon Creek	Completed	32	<1yr	2	Replace	Replace structure	$ 600,000.00	**$ 600,000.00**														
244	Howitt Creek Culvert	Completed	71	<1yr	3	Major Rehab	Install erosion protection on south embankments; Replace masonry arch, adjacent sagged concrete barrel and repair remainder of concrete barrel	$ 860,000.00	**$ 860,000.00**														
112	Macdonell Bridge	Completed	62	1-5yr	4	Replace	Replace structure	$ 5,100,000.00	$ 500,000.00	**$ 4,600,000.00**													
207	Suburban Avenue Over Unknown		63	1-5yr	5	Minor Rehab	Concrete patch repairs; Replace guide rail	$ 290,000.00		$ 40,000.00	**$ 250,000.00**												
107	Monkey	Required for 2022	72	1-5yr	6	Major Rehab	Rout and Seal Wearing Surface; Concrete Repairs to Curb; Jack and Repair Girder Ends	$ 580,000.00	**$ 580,000.00**														
222	York Road Over Hadati Creek	Required for 2022	56	1-5yr	7	Major Rehab	Concrete patch repairs to barrel; Replace barrier; Replace retaining wall; Waterproof and repave	$ 390,000.00		$ 60,000.00	**$ 330,000.00**												
106	Woodlawn Road Over Speed River	Required for 2022	67	1-5yr	8	Major Rehab	Remove and replace curb; Remove and replace approach sidewalk; Remove and replace sidewalk; Repair poor concrete on soffit (interior and exterior); Replace deck drains; Remove and replace barriers; Concrete Patch Repairs to Abutment; Repair poor concrete on pier	$ 1,500,000.00		$ 15,000.00	$ 255,000.00	**$ 1,230,000.00**											
223	York Road @ East Over Clythe Creek	Completed	51	1-5yr	9	Replace	Replace structure	$ 800,000.00		$ 120,000.00	**$ 680,000.00**												
214	Downey Road Over Hanlon Creek	Required for 2022	63	1-5yr	10	Major Rehab	Repair poor concrete on barrel; Excavate, waterproof, repave	$ 630,000.00			$ 90,000.00	**$ 540,000.00**											
227	Elizabeth St. Over Hadati Creek		68	1-5yr	11	Minor Rehab	Concrete patch repairs to barrel	$ 80,000.00			$ 10,000.00	**$ 70,000.00**											
225	Imperial Road N @ Woodlawn Rd W	Completed	64	1-5yr	12	Replace	Replace structure	$ 700,000.00				$ 90,000.00	**$ 610,000.00**										
206	Beaumont Crescent Over Hadati Creek	Completed	69	1-5yr	13	Major Rehab	Repair poor concrete in barrel; Repair poor concrete at inlet face; Excavate, waterproof and repave; Replace guide rail; Replace retaining walls	$ 500,000.00				$ 70,000.00	**$ 430,000.00**										
119*	Heffernan St. Over Speed River (Middle)	Required for 2022	73	1-5yr	14	Major Rehab	Replace strip seals; Concrete patch repairs on arch; Concrete patch repairs on bracing; Concrete patch repairs on abutments; Concrete patch repairs on piers	$ 440,000.00					$ 65,000.00	**$ 375,000.00**									
213	Speedvale Avenue West Over UnNamed		74	1-5yr	15	Minor Rehab	Concrete patch repairs in barrel	$ 110,000.00				$ 10,000.00	**$ 100,000.00**										
419	Silvercreek Parkway at Campbell Road CPP		65	1-5yr	16	Minor Rehab	Replace guide rail; Replace masonry wall; Reset precast concrete unit	$ 220,000.00				$ 40,000.00	**$ 180,000.00**										
131	Allan's Dam Bridge	Completed	57	1-5yr	17	Replace	Remove structure	$ 480,000.00				$ 70,000.00	**$ 410,000.00**										
128	Royal Recreation Trail over Howitt Creek		73	1-5yr	18	Minor Rehab	Underpin abutment wall foundation; Replace barrier	$ 200,000.00					$ 40,000.00	**$ 160,000.00**									
224	Imperial Road N @ Imperial Rd S/Rail Line	Completed	70	1-5yr	19	Minor Rehab	Repair poor concrete on outlet; Concrete patch repairs in barrel	$ 250,000.00					$ 50,000.00	**$ 200,000.00**									
218	Wellington Street Over Silver Creek		67	1-5yr	20	Minor Rehab	Concrete patch repairs in barrel; Install headwall at inlet; Repair concrete and install headwall at outlet; Replace Substandard Approach Guiderail End Treatments	$ 260,000.00					$ 40,000.00	**$ 220,000.00**									
243	Dog Park	Required for 2022	54	1-5yr	21	Replace	Replace structure	$ 300,000.00				$ 40,000.00	**$ 260,000.00**										
503	Norfolk/Northumberland ramp		73	1-5yr	22	Minor Rehab	Concrete patch repairs to ramp; Concrete patch repairs to barrier	$ 75,000.00					$ 10,000.00	$ 65,000.00									
234	Teal Drive Over Unknown		72	1-5yr	23	Minor Rehab	Concrete patch repairs, install drains; Excavate, waterproof, repave	$ 250,000.00					$ 50,000.00	**$ 200,000.00**									
141	Woodlawn to Victoria Trail Bridge	Required for 2022	75	1-5yr	24	Major Rehab	Replace gabion walls with new foundations	$ 240,000.00						$ 30,000.00	**$ 210,000.00**								
219	Silver Creek Entrance	Completed	69	1-5yr	25	Major Rehab	Replace retaining walls	$ 150,000.00					$ 20,000.00	**$ 130,000.00**									
209	Woodlawn Road @ 348 Woodlawn Rd W		76	1-5yr	26	Minor Rehab	Concrete patch repairs in barrel	$ 150,000.00						$ 30,000.00	**$ 120,000.00**								
233	Watson Road 1 Over UnNamed	Required for 2022	61	1-5yr	27	Replace	Replace structure	$ 460,000.00						$ 60,000.00	**$ 400,000.00**								
127	Royal Recreation Trail over an Unnamed waterway	Completed	59	1-5yr	28	Major Rehab	Repair poor concrete on deck top; Replace barrier; Replace retaining wall	$ 160,000.00						$ 20,000.00	**$ 140,000.00**								
103*	Gows	Completed	70	1-5yr	29	Minor Rehab	Crack repairs to barrier wall; Rock protection at west embankments; Replace railing on SW and NW retaining walls; Concrete patch repairs to north pier; Concrete Patch Repairs on Retaining Walls; Replace approach barrier at south approach; Repair Masonry and Joint Grouting in Arch Spans; Concrete repairs to deck top	$ 800,000.00						$ 130,000.00	**$ 670,000.00**								
121*	Heffernan Street (West) Over CNR		69	6-10yr	30	Minor Rehab	Concrete patch repairs on soffit; Replace hand railing at approach; Concrete patch repair on piers; Crack injection repair on pier diaphragms	$ 210,000.00						$ 30,000.00	**$ 180,000.00**								
120*	Heffernan Street (East)		70	6-10yr	31	Minor Rehab	Replace missing section of railing; Repair poor concrete on abutment wall; Repair poor concrete on wingwalls	$ 70,000.00						$ 10,000.00	**$ 60,000.00**								
241	Watson Pkwy (North of CNR tracks)		71	6-10yr	32	Minor Rehab	Repair poor concrete in barrels	$ 140,000.00							$ 20,000.00	**$ 120,000.00**							
231	Starwood Drive Over Unknown		66	6-10yr	33	Minor Rehab	Drill and pressure inject at precast joints	$ 300,000.00							$ 55,000.00	**$ 245,000.00**							
102*	Gordon Street Over Speed River		71	6-10yr	34	Minor Rehab	Repair surface asphalt; Crack injections and concrete repairs on barrier; Crack injections and concrete repair on soffit; Concrete patch repairs	$ 210,000.00							$ 30,000.00	**$ 180,000.00**							
111	Hwy 124 (Eramosa Rd) Over Speed River		73	6-10yr	35	Minor Rehab	Concrete patch repairs to retaining wall; Rout and seal wearing surface	$ 120,000.00							$ 10,000.00	**$ 110,000.00**							
114	Wyndham Street Over Speed River		73	6-10yr	36	Minor Rehab	Waterproof and repave wearing surface	$ 110,000.00							$ 10,000.00	**$ 100,000.00**							
123*	Towne Lattice Over Speed River (Middle)	Completed	71	6-10yr	37	Minor Rehab	Repair deck top; Timber repair on split diagonals; Timber repair on split horizontal braces at verticals; Timber repairs to vertical and horizontal bracing	$ 110,000.00								$ 10,000.00	**$ 100,000.00**						
226	CNR Line @ Imperial Rd N	Required for 2022	62	6-10yr	38	Replace	Replace structure	$ 550,000.00								$ 80,000.00	**$ 470,000.00**						
113	Neeve Street Over Speed River		74	6-10yr	39	Minor Rehab	Rout and Seal wearing surface; Repair concrete around storm outlet	$ 90,000.00								$ 10,000.00	**$ 80,000.00**						
228	Silver Creek Parkway S @ between Rail Lines	Required for 2022	51	6-10yr	40	Replace	Replace structure	$ 500,000.00									$ 60,000.00	**$ 440,000.00**					
229	Silvercreek Parkway S @ between Rail Lines	Required for 2022	61	6-10yr	41	Replace	Replace structure	$ 500,000.00									$ 60,000.00	**$ 440,000.00**					
							SUBTOTAL RECOMMENDED CAPITAL WORKS FROM 2022 OSIM INSPECTIONS (10 YEAR HORIZON):	**$ 19,560,000.00**	**$ 2,615,000.00**	**$ 4,835,000.00**	**$ 1,615,000.00**	**$ 2,160,000.00**	**$ 2,435,000.00**	**$ 2,400,000.00**	**$ 995,000.00**	**$ 855,000.00**	**$ 770,000.00**	**$ 880,000.00**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**
							SUBTOTAL ESTIMATED MINIMUM ANNUAL CAPITAL PROGRAM (15 YEAR HORIZON):	**$ 27,000,000.00**	**$ 1,800,000.00**	**$ 1,800,000.00**	**$ 1,800,000.00**	**$ 1,800,000.00**	**$ 1,800,000.00**	**$ 1,800,000.00**	**$ 1,800,000.00**	**$ 1,800,000.00**	**$ 1,800,000.00**	**$ 1,800,000.00**	**$ 1,800,000.00**	**$ 1,800,000.00**	**$ 1,800,000.00**	**$ 1,800,000.00**	**$ 1,800,000.00**
							TOTAL RECOMMENDED BUDGET (15 YEAR HORIZON):	**$ 32,445,000.00**	**$ 2,615,000.00**	**$ 4,835,000.00**	**$ 1,800,000.00**	**$ 2,160,000.00**	**$ 2,435,000.00**	**$ 2,400,000.00**	**$ 1,800,000.00**	**$ 1,800,000.00**	**$ 1,800,000.00**	**$ 1,800,000.00**	**$ 1,800,000.00**	**$ 1,800,000.00**	**$ 1,800,000.00**	**$ 1,800,000.00**	**$ 1,800,000.00**

Capital Works Cost Estimate Totals:

		COUNT:
Urgent:	$75,000	1
<1yr:	$1,460,000	2
1-5yr:	$15,115,000	26
6-10yr:	$2,910,000	12
	$19,560,000	**41**

NOTES:

1. Costs are presented in 2022 dollars and do not account for inflation.
2. Costs include engineering and contingencies as a percentage of the capital cost as noted on the 2022 OSIM Inspection Forms.
3. Bolded costs under specific years in the capital plan indicate capital costs for construction activities.
4. Heritage designated structure noted with a " * "

APPENDIX B:
INSPECTION PHOTOS

Photograph 1: North elevation

Photograph 2: North soffit exterior showing severe delamination and exposed corroded rebar

Photograph 3: West span soffit interior showing longitudinal wide crack along centerline

Photograph 4: Northwest deck drain hole showing delamination and spalls

Photograph 5: Wide crack with rust staining and efflorescence continuing into north abutment

Photograph 6: Underside of southwest fascia showing delamination, spalls and exposed corroded rebar

Photograph 7: South fascia showing severe spalls and exposed corroded rebar

Photograph 8: South fascia showing severe spalls and exposed corroded rebar

Photograph 9: South soffit interior showing spalls and exposed corroded rebars

Photograph 10: Southwest soffit interior showing spalls and corroded rebars near bottom edge of fascia

Photograph 11: Centerline wide cracking w/ efflorescence and rut staining along western span deck soffit

Photograph 12: Northeast drain on west span showing delamination and moisture staining around opening

Photograph 13: Southwest drain hole showing spalls around opening

Photograph: 14 East span soffit showing wide crack w/ efflorescence, rust and moisture staining along centerline

Photograph 15: East span centerline crack continue into east abutment wall

Photograph 16: Chainage 00+110 to 00+111

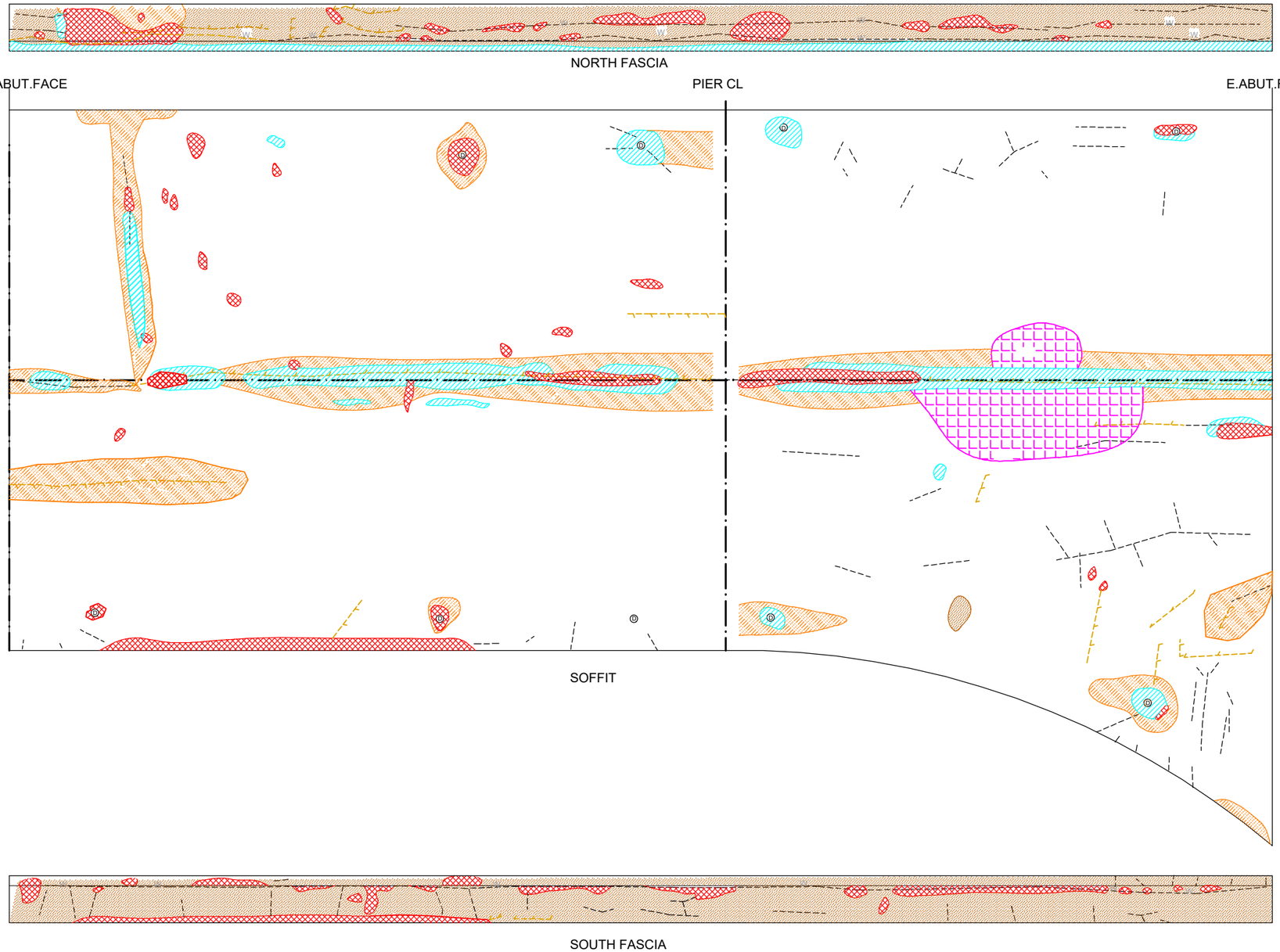
Photograph 17: East span soffit showing pattern cracking near midspan

Photograph 18: Southwest deck drain on east span showing delamination around opening

Photograph 19: Nort fascia, looking south

Photograph 20: East span deck soffit showing wide longitudinal crack along centerline

APPENDIX C:
DECK SOFFIT SURFACE DETERIORATION FIGURE



N

LEGEND

- PATCHED SPALLS
- DELAMINATIONS
- SPALLS
- LIGHT SCALING
- MEDIUM SCALING
- SEVERE SCALING
- HONEYCOMBED AREAS
- WET AREAS
- CONCRETE PATTERN CRACKS
- Ⓓ DRAIN
- MEDIUM CONCRETE CRACKS
- WIDE CONCRETE CRACKS
- MEDIUM STAINED/ EFFLORESCENCE CRACKS

CITY OF GUELPH
STRUCTURE 112,
MACDONELL STREET OVER SPEED RIVER

SURFACE DETERIORATION ON SOFFIT

Figure No. 1

BluePlan ENGINEERING

123117
NOVEMBER 2023
Scale: AS SHOWN

SUMMARY ACTION REPORT

City of Guelph
Allan's Dam Bridge
Structure No.: 131

Closed Pedestrian Pathway
5m south of Macdonell Bridge

Inspection Date:	11/23/2022	BCI:	57
Next Inspection:	2024	Current Load Limit (t):	Closed
Structure Width (m):	7.3	Replacement Cost:	$1,500,000
Span Lengths (m):	12.35, 12.35		

Overall Comments

Overall structure in fair to locally poor condition. Structure is currently closed to pedestrian and vehicular traffic. Maintenance work required. A municipal Class Envronmental Assestment should be completed in conjunction with Structure 112 as structure could be considered for removal. Additional investigations recommended.

Capital Works

Abutments - Abutment Walls	Remove structure	1-5 Years	$300,000
		Total Recommended Work Cost:	$300,000

Associated Work

Approaches	$0	Utilities	$0	Other	$30,000
Detours	$0	Right-of-Way	$0	Contingencies	$66,000
Traffic Control	$15,000	Environmental Study	$0	Engineering	$69,000
				Total Associated Work Cost	$180,000

Recommended Work	Priority	Total Recommended & Associated Work Cost	Ownership (%)	Total Shared Cost
Replace	1-5yr	$480,000	100%	$480,000

Additional Investigations

None

Maintenance Needs

Element	Need	Priority	Description
Approaches - Barriers	Other		Replace fence barricading structure
Embankments & Streams - Embankments			Vegetation clearing/maintenance

Performance Deficiencies

Element	Deficiency Description
Approaches - Barriers	Pedestrian/vehicular hazard
Embankments & Streams - Embankments	Other

Ontario Structure Inspection Manual - Inspection Form

Site Number: 131

Structure Name: Allan's Dam Bridge

Structure ID: 131

Inventory Data:

Structure Name:	Allan's Dam Bridge				
Hwy/Road Name:	Closed Pedestrian Pathway	Crossing Type: On:		Under:	
MTO Site Number:		Main Hwy/Road #:			
Structure Location:	5m south of Macdonell Bridge			LHRS:	
Latitude (decimal degrees):	43.547305	Longitude (decimal degrees):	-80.243439	LHRSOffset:	
Owner / Custodian:	City of Guelph	100%	Owner 2:		0%
MTO Region:	Southwestern	Heritage Desig.:	Not Cons ☑	Cons Not/App ☐	List/Not Desig ☐
MTO Area:				Desig Not List ☐	Desig List ☐
Old County:		Hwy Class:	Freeway ☐	Arterial ☐	Collector ☐ Local ☑
Township:	City of Guelph	No. of Lanes:		Posted Speed:	(km/h)
Structure Type:	I-Beam or Girders	AADT:		Trucks:	(%)
StructuralMaterial:		Travel Stream:			
Structure Type 2:		Traffic Directional Bound:			
Structural Material 2:		Inspection Route Sequence:			
Total Deck Length:	24.7 (m)	Inspection Frequency (yrs):	2		
Overall Str Width:	7.3 (m)	Inspection Year:	2022		
Culvert Length:	(m)	Inspection Duration (hrs):	1		
Total Deck Area:	180.3 (sq m)	Interchange No:			
Roadway Width:	6.5 (m)	Estimated Replacement Value:	$1,500,000		
Skew Angle:	(deg)	Replacement Value is based on like-for-like replacement using typical costs for budget purposes only.			
No. of Spans:	2				
Span Lengths:	12.35, 12.35 (m)	Min. Vertical Clearance:		(m)	
For Retaining Wall		Special Routes:	Transit ☐	Truck ☐	School ☐ Bicycle ☐
Total Wall Length (m)	0.0	Ave Wall Height (m):	0.0	Detour Length:	(km)
Total Wall Area (m²):	0.0	Angle of Backfill (deg):	0.0	Direction of Structure:	
Max Wall Height (m):	0.0			Fill on Structure:	(m)

Historical Data:

Year Built	1938	(yyyy)	Year of Last Rehab		(yyyy)
Last OSIM Inspection	12/15/2020	(mm/dd/yyyy)	Last Evaluation		(mm/dd/yyyy)
Last Enhanced OSIM Inspection		(mm/dd/yyyy)	Current Load Limit	Closed	(tonnes)
Enhanced Access Equipment (ladder, boat, lift, etc)			Load Limit By Law		
			By Law expiry Date		
Last Condition Survey		(mm/dd/yyyy)	Last underwater Inspection		(mm/dd/yyyy)

Rehabilitation History:

Ontario Structure Inspection Manual - Inspection Form

Site Number: 131

Structure Name: Allan's Dam Bridge

Structure ID: 131

Field Inspection Information:

Date of Inspection:	11/23/2022 (mm/dd/yyyy)	Inspection Type:	OSIM
Inspector:	SG	Weather:	Clear
Others in Party:	NB	Temperature °C:	-2
Equipment Used:	Measuring Tape, Hammer, Camera		

Additional Investigations Required:

	Priority	Estimated Cost
Detailed Deck Condition Survey:	None	$0
Non-destructive Delamination Survey of Asphalt-Covered Deck:	None	$0
Concrete Substructure Condition Survey:	None	$0
Detailed Coating Condition Survey:	None	$0
Detailed Timber Investigation:	None	$0
Post-Tensioned Strand Investigation:	None	$0
Underwater Investigation:	None	$0
Fatigue Investigation:	None	$10,000
Seismic Investigation:	None	$0
Structure Investigation:	None	$0
Monitoring Deformations, Settlements, Movements:	None	$0
Monitoring Crack Widths:	None	$0
Monitoring RSS Horizontal Movements of Face:	None	$0
Monitoring RSS Vertical Movements of Overall Structure:	None	$0
Monitoring RSS Local Movements or Deterioriation of Facing Elements:	None	$0
Monitoring RSS Horizontal Movements within Overall Structure:	None	$0
Monitoring RSS Vertical Movements within Overall Structure:	None	$0
Monitoring RSS Lateral Earth Pressure at Back of Facing Elements:	None	$0
	Total Cost:	**$10,000**

Investigation Notes: Investigate potential undermining of southeast foundation

Overall Structure Notes:

Overall Comments: Overall structure in fair to locally poor condition. Structure is currently closed to pedestrian and vehicular traffic. Maintenance work required. A municipal Class Envronmental Assestment should be completed in conjunction with Structure 112 as structure could be considered for removal. Additional investigations recommended.

BCI:	57	Recommended Work:	Replace
Next Inspection:	2024	Recommended Work Time:	1-5yr

Suspected Performance Deficiencies

00 None
01 Load carrying capacity
02 Excessive deformations (deflections & rotations)
03 Continuing settlement
04 Continuing movements
05 Seized bearings
06 Bearing not uniformly loaded/unstable
07 Jammed expansion joint
08 Pedestrian/vehicular hazard
09 Rough riding surface
10 Surface ponding
11 Deck drainage
12 Slippery surface
13 Flooding/channel blockage
14 Undermining of foundation
15 Unstable embankments
16 Other Performance Deficiencies

Maintenance Needs

01 N/A
02 Bridge Cleaning
03 Railing System Repair
04 N/A
05 Bridge Deck Joint Repair
06 N/A
07 Structural Steel Repair
08 Concrete Repair
09 Timber Repair
10 Works for Modular Bridges
11 Animal/Pest Control
12 Bridge Surface Repair
13 Erosion Control at Bridges
14 Concrete Sealing
15 N/A
16 Works for Drainage System
17 Scaling (Loose Concrete or ACR Steel)
18 Other Maintenance

Ontario Structure Inspection Manual - Inspection Form

Site Number: 131

Structure Name: Allan's Dam Bridge

Structure ID: 131

Element Group:	**Abutments**	Length:	0.00
Element Name:	**Abutment Walls**	Width:	7.30
Location:	East/West	Height:	3.00
Material:	Masonry	Count:	2.0
Element Type:	Gravity Wall	Total Quantity:	43.8
Element Subtype:		Environment:	Benign
Protection System:	None	Limited Inspection	☐

Condition Data:	Units:	Exc.:	Good:	Fair:	Poor:	Performance Deficiencies:
	sq.m.	0.0	33.8	5.0	5.0	

Comments: Narrow to wide cracking; Light loss of mortar; Evidence of previous patch repairs to wall

Recommended Work: Replace Timing: 1-5 Years Details: Remove structure

Maint. Priority: Needs: Desc.:

Element Group:	**Accessories**	Length:	0.00
Element Name:	**Utilities**	Width:	0.00
Location:	Pipe on Underside	Height:	0.00
Material:	Steel	Count:	1.0
Element Type:	-	Total Quantity:	1.0
Element Subtype:		Environment:	Benign
Protection System:	None	Limited Inspection	☐

Condition Data:	Units:	Exc.:	Good:	Fair:	Poor:	Performance Deficiencies:
	Each	0.0	0.0	1.0	0.0	

Comments: Medium to severe corrosion of utility pipe

Recommended Work: Timing: Details:

Maint. Priority: Needs: Desc.:

Element Group:	**Approaches**	Length:	9.00
Element Name:	**Approach Slabs**	Width:	6.50
Location:	East/West	Height:	0.00
Material:	Cast-in-Place Concrete	Count:	2.0
Element Type:	-	Total Quantity:	117.0
Element Subtype:		Environment:	Benign
Protection System:	None	Limited Inspection	☑

Condition Data:	Units:	Exc.:	Good:	Fair:	Poor:	Performance Deficiencies:
	sq.m.	0.0	67.0	50.0	0.0	

Comments: Not visible; Assumed in good to fair condition based on age of structure and condition of wearing surface

Recommended Work: Timing: Details:

Maint. Priority: Needs: Desc.:

Ontario Structure Inspection Manual - Inspection Form

Site Number: 131

Structure Name: Allan's Dam Bridge

Structure ID: 131

Element Group:	**Approaches**	Length:	18.00
Element Name:	**Barriers**	Width:	0.00
Location:	Northeast barrier	Height:	0.90
Material:	Steel	Count:	1.0
Element Type:	Steel Post and Lattice	Total Quantity:	18.0
Element Subtype:		Environment:	Severe
Protection System:	None	Limited Inspection	☐

Condition Data:	Units:	Exc.:	Good:	Fair:	Poor:	Performance Deficiencies:
	m	0.0	13.0	5.0	0.0	

Comments: Light to medium corrosion throughout

Recommended Work: | Timing: | Details:

Maint. Priority: | Needs: | Desc.:

Element Group:	**Approaches**	Length:	6.50
Element Name:	**Barriers**	Width:	0.00
Location:	East/West Approach Fence	Height:	0.00
Material:	Steel	Count:	2.0
Element Type:	Steel Post and Lattice	Total Quantity:	13.0
Element Subtype:		Environment:	Severe
Protection System:	Hot dip galvanizing	Limited Inspection	☐

Condition Data:	Units:	Exc.:	Good:	Fair:	Poor:	Performance Deficiencies:
	m	0.0	0.0	0.0	13.0	8

Comments: Chain-link fence present at each end of deck closing the structure to vehicular and pedestrian traffic; Fence post plates at each approach are not anchored to ground; Horizontal fence rail is dislodged at each approach; Fence on west approach has collapsed; Chain-link on east was removed

Recommended Work: | Timing: | Details:

Maint. Priority: | Needs: 17 | Desc.: Replace fence barricading structure

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Element Group:	**Approaches**	Length:	9.00
Element Name:	**Wearing Surface**	Width:	6.50
Location:	East/West	Height:	0.00
Material:	Asphalt	Count:	2.0
Element Type:	-	Total Quantity:	117.0
Element Subtype:		Environment:	Severe
Protection System:	None	Limited Inspection	☑

Condition Data:	Units:	Exc.:	Good:	Fair:	Poor:	Performance Deficiencies:
	sq.m.	0.0	0.0	50.0	67.0	

Comments: Significant buildup of soil on top of wearing surface; Severe cracking of asphalt where exposed

Recommended Work: | Timing: | Details:

Maint. Priority: | Needs: | Desc.:

Element Group:	**Barriers**	Length:	3.40
Element Name:	**Railing Systems**	Width:	0.00
Location:	North/South Steel Panels	Height:	1.10
Material:	Steel	Count:	12.0
Element Type:	Concrete Post and Steel Panel	Total Quantity:	40.8
Element Subtype:		Environment:	Severe
Protection System:	None	Limited Inspection	☐

Condition Data:	Units:	Exc.:	Good:	Fair:	Poor:	Performance Deficiencies:
	m	0.0	0.0	35.8	5.0	

Comments: Medium to severe corrosion throughout steel railing, with isolated perforations

Recommended Work: | Timing: | Details:

Maint. Priority: | Needs: | Desc.:

Element Group:	**Barriers**	Length:	0.60
Element Name:	**Railing Systems**	Width:	0.30
Location:	North/South Concrete Posts	Height:	1.30
Material:	Steel	Count:	14.0
Element Type:	Concrete Post and Steel Panel	Total Quantity:	8.4
Element Subtype:		Environment:	Severe
Protection System:	None	Limited Inspection	☐

Condition Data:	Units:	Exc.:	Good:	Fair:	Poor:	Performance Deficiencies:
	m	0.0	8.4	0.0	0.0	

Comments: Severe delamination and spalling with exposed corroded rebar throughout concrete posts and curb

Recommended Work: | Timing: | Details:

Maint. Priority: | Needs: | Desc.:

Element Group:	**Beams**	Length:	0.00
Element Name:	**Diaphragms**	Width:	0.00
Location:	Cross Bracing	Height:	0.00
Material:	Steel	Count:	20.0
Element Type:	Rectangular Solid	Total Quantity:	20.0
Element Subtype:		Environment:	Benign
Protection System:	None	Limited Inspection	☐

Condition Data:	Units:	Exc.:	Good:	Fair:	Poor:	Performance Deficiencies:
	Each	0.0	10.0	10.0	0.0	

Comments: Light to medium corrosion

Recommended Work: | Timing: | Details:

Maint. Priority: | Needs: | Desc.:

Element Group:	**Beams**	Length:	1.00
Element Name:	**Girders**	Width:	0.23
Location:	Girders - Ends	Height:	0.60
Material:	Steel	Count:	24.0
Element Type:	I-Type	Total Quantity:	45.4
Element Subtype:	Ends	Environment:	Moderate
Protection System:	None	Limited Inspection	☐

Condition Data:	Units:	Exc.:	Good:	Fair:	Poor:	Performance Deficiencies:
	sq.m.	0.0	11.4	20.0	14.0	

Comments: Light to severe corrosion, with severe corrosion and section loss in the bottom flange isolated immediately at the pier/abutment; Southern girder in east span has complete section loss through the bottom flange and into the web

Recommended Work: | Timing: | Details:

Maint. Priority: | Needs: | Desc.:

Element Group:	**Beams**	Length:	20.47
Element Name:	**Girders**	Width:	0.23
Location:	Girders - Middle	Height:	0.60
Material:	Steel	Count:	12.0
Element Type:	I-Type	Total Quantity:	464.3
Element Subtype:	Middle	Environment:	Moderate
Protection System:	None	Limited Inspection	☐

Condition Data:	Units:	Exc.:	Good:	Fair:	Poor:	Performance Deficiencies:
	sq.m.	0.0	310.3	154.0	0.0	

Comments: Light to medium corrosion throughout

Recommended Work: | Timing: | Details:

Maint. Priority: | Needs: | Desc.:

Element Group:	**Decks**	Length:	24.70
Element Name:	**Deck Top**	Width:	7.30
Location:	Under Wearing Surface	Height:	0.00
Material:	Cast-in-Place Concrete	Count:	1.0
Element Type:	Cast-in-place Concrete on Supports	Total Quantity:	180.3
Element Subtype:		Environment:	Benign
Protection System:	None	Limited Inspection	☑

Condition Data:	Units:	Exc.:	Good:	Fair:	Poor:	Performance Deficiencies:
	sq.m.	0.0	80.3	100.0	0.0	

Comments: Not visible; Assumed in fair condition based on condition of wearing surface

Recommended Work: | Timing: | Details:

Maint. Priority: | Needs: | Desc.:

Element Group:	**Decks**	Length:	0.00
Element Name:	**Drainage**	Width:	0.00
Location:	North/South Barrier	Height:	0.00
Material:	Steel	Count:	8.0
Element Type:	Metal Drain Pipes	Total Quantity:	8.0
Element Subtype:		Environment:	Severe
Protection System:	None	Limited Inspection	☐

Condition Data:	Units:	Exc.:	Good:	Fair:	Poor:	Performance Deficiencies:
	Each	0.0	0.0	8.0	0.0	

Comments: Medium to severe corrosion of drain pipes; Several drains clogged or blocked by overgrown vegetation

Recommended Work: | Timing: | Details:

Maint. Priority: | Needs: | Desc.:

Element Group:	**Decks**	Length:	24.70
Element Name:	**Soffit - Thin Slab**	Width:	5.50
Location:	Interior Soffit	Height:	0.00
Material:	Cast-in-Place Concrete	Count:	1.0
Element Type:	-	Total Quantity:	135.9
Element Subtype:		Environment:	Benign
Protection System:	None	Limited Inspection	☐

Condition Data:	Units:	Exc.:	Good:	Fair:	Poor:	Performance Deficiencies:
	sq.m.	0.0	105.9	15.0	15.0	

Comments: Medium cracking approximately 1m on each side of pier; Medium bugholes; Isolated light to medium spalling with exposed corroded rebar; Wood forms still present in east span soffit near pier

Recommended Work: | Timing: | Details:

Maint. Priority: | Needs: | Desc.:

Element Group:	**Decks**	Length:	24.70
Element Name:	**Soffit - Thin Slab**	Width:	0.90
Location:	North/South Exterior Soffit	Height:	0.00
Material:	Cast-in-Place Concrete	Count:	2.0
Element Type:	-	Total Quantity:	44.5
Element Subtype:		Environment:	Moderate
Protection System:	None	Limited Inspection	☐

Condition Data:	Units:	Exc.:	Good:	Fair:	Poor:	Performance Deficiencies:
	sq.m.	0.0	18.5	15.0	11.0	

Comments: Narrow to wide vertical and horizontal cracking, some with efflorescence; Isolated medium to severe delamination and spalling

Recommended Work: | Timing: | Details:

Maint. Priority: | Needs: | Desc.:

Element Group:	**Decks**	Length:	24.70
Element Name:	**Wearing Surface**	Width:	7.30
Location:	Over Structure	Height:	0.00
Material:	Asphalt	Count:	1.0
Element Type:	-	Total Quantity:	180.3
Element Subtype:		Environment:	Severe
Protection System:	None	Limited Inspection	☐

Condition Data:	Units:	Exc.:	Good:	Fair:	Poor:	Performance Deficiencies:
	sq.m.	0.0	0.0	150.3	30.0	

Comments: Severe longitudinal and transverse cracking with vegetation growing through; Severe rippling

Recommended Work: | Timing: | Details:

Maint. Priority: | Needs: | Desc.:

Element Group:	**Embankments & Streams**	Length:	0.00
Element Name:	**Embankments**	Width:	0.00
Location:	Each Quadrant	Height:	0.00
Material:	Native	Count:	4.0
Element Type:	-	Total Quantity:	4.0
Element Subtype:		Environment:	Severe
Protection System:	None	Limited Inspection	☐

Condition Data:	Units:	Exc.:	Good:	Fair:	Poor:	Performance Deficiencies:
	Each	0.0	0.0	0.0	4.0	16

Comments: Overgrown vegetation

Recommended Work: | Timing: | Details:

Maint. Priority: | Needs: 17 | Desc.: Vegetation clearing/maintenance

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Element Group:	**Embankments & Streams**	Length:	0.00
Element Name:	**Streams and Waterways**	Width:	0.00
Location:	All	Height:	0.00
Material:	Cast-in-Place Concrete	Count:	1.0
Element Type:	-	Total Quantity:	1.0
Element Subtype:		Environment:	
Protection System:		Limited Inspection	☐

Condition Data:	Units:	Exc.:	Good:	Fair:	Poor:	Performance Deficiencies:
	All	0.0	0.0	1.0	0.0	

Comments: Sluiceway open at time of inspection - no flow over the dam; Wide transverse and longitudinal cracks throughout; Severe spalls observed on concrete pad

Recommended Work: | Timing: | Details:

Maint. Priority: | Needs: | Desc.:

Element Group:	**Foundations**	Length:	0.00
Element Name:	**Foundation (below ground level)**	Width:	0.00
Location:	All	Height:	0.00
Material:		Count:	1.0
Element Type:	-	Total Quantity:	1.0
Element Subtype:		Environment:	Benign
Protection System:		Limited Inspection	☑

Condition Data:	Units:	Exc.:	Good:	Fair:	Poor:	Performance Deficiencies:
	All	0.0	0.0	0.0	0.0	

Comments: Not visible; Severe erosion of foundation in the vicinity of the sluiceway outlet, potentially undermining the foundation

Recommended Work: | Timing: | Details:

Maint. Priority: | Needs: | Desc.:

Element Group:	**Piers**	Length:	1.50
Element Name:	**Shafts/Columns/Pile Bents**	Width:	7.30
Location:	Central Pier	Height:	3.00
Material:	Cast-in-Place Concrete	Count:	1.0
Element Type:	Concrete Rectangular Columns	Total Quantity:	52.8
Element Subtype:		Environment:	Severe
Protection System:	None	Limited Inspection	☐

Condition Data:	Units:	Exc.:	Good:	Fair:	Poor:	Performance Deficiencies:
	sq.m.	0.0	16.8	24.0	12.0	

Comments: Severe delamination, spalling and disintegration on north and south faces of pier; Narrow to wide cracking with efflorescence; Light to medium scaling throughout

Recommended Work: | Timing: | Details:

Maint. Priority: | Needs: | Desc.:

Element Group:	**Retaining Walls**	Length:	16.00
Element Name:	**Walls**	Width:	0.00
Location:	Southeast Retaining Wall	Height:	1.20
Material:	Cast-in-Place Concrete	Count:	1.0
Element Type:	Reinforced Concrete	Total Quantity:	19.2
Element Subtype:		Environment:	Severe
Protection System:	None	Limited Inspection	☐

Condition Data:	Units:	Exc.:	Good:	Fair:	Poor:	Performance Deficiencies:
	sq.m.	0.0	16.2	1.5	1.5	

Comments: Narrow to wide vertical cracking

Recommended Work: | Timing: | Details:

Maint. Priority: | Needs: | Desc.:

Repair / Rehabilitation Required

Element Group	Element	Repair / Rehabilitation	Priority	Const Cost
Abutments	Abutment Walls	Remove structure	1-5 Years	$300,000

Total Repair/Rehabilitation Cost **$300,000**

Associated Work

	Comments	Estimated Cost
Approaches		$0
Detours		$0
Traffic Control	*Rail permit*	$15,000
Utilities		$0
Right-of-Way		$0
Environmental Study	*Municipal Class EA (Cost Included Under Structure 112)*	$0
Other	*Mobilization, worksite isolation, disposal, etc.*	$30,000

Contingencies	$66,000
Engineering	$69,000
Total Associated Work Cost	**$180,000**
Total Repair / Rehabilitation Cost	$300,000
Total Cost	**$480,000**

City of Guelph	100%	$480,000
	0%	$0

Justification

Inspection Photos

South elevation, showing possible undermining under southeast foundation

Looking east

Severe spalls and exposed corroded steel on barrier posts

Removed chainlink fence on east approach

Very severe deterioration of concrete on top of pier cap, north side of structure

Spalls and exposed corroded rebar on soffit interior on east abutment

Concrete surface beneath bridge shows wide cracks and disintegration

Deck drain and spalls on soffit exterior

South barrier showing section loss on top rail

Southwest girder ends shoing section loss at the flange

Underside of structure

Medium to severe corrosion on deck drains

Ontario Structure Inspection Manual - Inspection Form

MTO Site Number: 320

Structure Name: Allan's Dam Sluiceway

Structure ID: 320

Summary Action Report

Inspection Date: 10/23/2018

Next Biennial Inspection: 10/16/2020

Bridge Condition Value (BCI) 3

Performance Deficiencies

Element Group	Element Name	Performance Deficiency
Embankments & Streams	Streams and Waterways	Other

Maintenance Needs

Element Group	Element Name	Maintenance Need
Embankments & Streams	Streams and Waterways	Other

Repair/Rehabilitation

Element Group	Element Name	Repair/Rehabilitation	Priority	Est. Cost
Retaining Walls	Walls	Concrete curb wall in front of masonry wall	1-5 Years	$40,000
			Total Repair/Rehabilitation Cost	$40,000
			Total Associated Work Cost	$40,000
			Total Cost	$80,000

Overall Comments

Limited inspection of structure completed. Visible elements appear to be in fair to good condition. Minor rehabilitation recommended. A Municipal Class Environmental Assessment should be completed in conjunction with Structure 112 and Structure 131. Consideration should be given to completion of a Dam Safety Review under the Lakes and Rivers Improvement Act. Maintenance work required.

Additional Investigations

Structure investigation for dam safety review and Enhanced OSIM Inspection $60,000.00

Ontario Structure Inspection Manual - Inspection Form

MTO Site Number: 320

Structure Name: Allan's Dam Sluiceway

Structure ID: 320

Inventory Data:

Structure Name	Allan's Dam Sluiceway		
Main Hwy/Road #		On ☑ Under ☐	Crossing Type: Nav Water ☐ Non Nav Water ☑
Hwy/Road Name			Rail ☐ Road ☐ Ped ☐ Other ☐
Structure Location	20m South of Macdonnel Street Bridge		
Latitude (decimal degrees)	43.547399	Longitude (decimal degrees)	-80.243217
Owner(s)	City of Guelph	Heritage:	Not Cons ☐ Cons Not/App ☐ List/Not Desig ☐
Region	Southwestern	Designation:	Desig Not List ☐ Desig List ☐
District		Road Class:	Freeway ☐ Arterial ☐ Collector ☐ Local ☐
Old County		No. of Lanes	Posted Speed (km/h)
Geographic Twp	City of Guelph	AADT	Trucks (%)
Structure Type	Hybrid		
Total Deck Length	(m)		
Overall Str Width	(m)		
Total Deck Area	(sq m)	Min. Vertical Clearance	(m)
Roadway Width		Special Routes:	Transit ☐ Truck ☐ School ☐ Bicycle ☐
Skew Angle	(deg)	Detour Length	(km)
No. of Spans	0	Direction of Structure	
Span Lengths	(m)	Fill on Structure	(m)

Historical Data:

Year Built		Year of Last Rehab	
Last OSIM Inspection		Last Evaluation	
Last Enhanced OSIM Inspection		Current Load Limit	(tonnes)
Enhanced Access Equipment (ladder, boat, lift, etc)		Load Limit By Law	
		By Law expiry Date	
Last Condition Survey		Last underwater Inspection	

Rehabiliation History:

Ontario Structure Inspection Manual - Inspection Form

MTO Site Number: 320

Structure Name: Allan's Dam Sluiceway

Structure ID: 320

Field Inspection Information:

Date of Inspection: (mm/dd/yyyy)	10/23/2018	Inspection Type:	OSIM
Inspector:	SG		
Others in Party:	RW		
Equipment Used:	Measuring Tape, Hammer, Camera		
Weather:	Overcast		
Temperature °C:	10		

Additional Investigations Required:

	Priority			Estimated Cost
	None	Normal	Urgent	
Detailed Deck Condition Survey	☑	☐	☐	$0
Non-destructive Delam. Survey of Asphalt-Covered Deck	☑	☐	☐	$0
Concrete Substructure Condition Survey	☑	☐	☐	$0
Detailed Coating Condition Survey	☑	☐	☐	$0
Detailed Timber Investigation	☑	☐	☐	$0
Post-Tensioned Strand Investigation	☑	☐	☐	$0
Underwater Investigation	☑	☐	☐	$0
Fatigue Investigation	☑	☐	☐	$0
Seismic Investigation	☑	☐	☐	$0
Structure Investigation	☐	☑	☐	$60,000
Monitoring Deformations, Settlements, Movements	☑	☐	☐	$0
Monitoring Crack Widths	☑	☐	☐	$0
			Total Cost:	**$60,000**

Investigation Notes: Structure investigation for dam safety review and Enhanced OSIM Inspection

Overall Structure Notes:

Overall Comments: Limited inspection of structure completed. Visible elements appear to be in fair to good condition. Minor rehabilitation recommended. A Municipal Class Environmental Assessment should be completed in conjunction with Structure 112 and Structure 131. Consideration should be given to completion of a Dam Safety Review under the Lakes and Rivers Improvement Act. Maintenance work required.

Recommended Work: Minor Rehab

Next Inspection: 10/16/2020

Recommended Work Time: 1-5yr

Suspected Performance Deficiencies
00 None
01 Load carrying capacity
02 Excessive deformations (deflections & rotations)
03 Continuing settlement
04 Continuing movements
05 Seized bearings
06 Bearing not uniformly loaded/unstable
07 Jammed expansion joint
08 Pedestrian/vehicular hazard
09 Rough riding surface
10 Surface ponding
11 Deck drainage
12 Slippery surface
13 Flooding/channel blockage
14 Undermining of foundation
15 Unstable embankments
16 Other

Maintenance Needs
01 Lift & Swing Bridge Maintenance
02 Bridge Cleaning
03 Bridge Handrail Maintenance
04 Painting Steel Bridge Structures
05 Bridge Deck Joint Repair
06 Bridge Bearing Maintenance
07 Repair to Structural Steel
08 Repair to Bridge Concrete
09 Repair to Bridge Timber
10 Bailey Bridges - Maintenance
11 Animal/Pest Control
12 Bridge Surface Repair
13 Erosion Control at Bridges
14 Concrete Sealing
15 Rout and Seal
16 Bridge Deck Drainage
17 Scaling (Loose Concrete or ACR Steel)
18 Other

Ontario Structure Inspection Manual - Inspection Form

MTO Site Number: 320

Structure Name: Allan's Dam Sluiceway

Structure ID: 320

Element Data:

Element Group:	**Accessories**	Length:	0.00
Element Name:	**Other**	Width:	0.00
Location:	Sluice Gate	Height:	0.00
Material:	Steel	Count:	1.0
Element Type:	-	Total Quantity:	1.0
Environment:	Benign	Limited Inspection	☐
Protection System:	None		

Condition Data:	Units:	Exc.	Good:	Fair:	Poor:	Performance Deficiencies:
	Each	0.0	1.0	0.0	0.0	

Comments: Open at time of inspection

Recommended Work:		Maint. Needs:		Maint. Priority:	
Recommended Timing:		Maint. Desc.:			
Work Details:					

Element Group:	**Barriers**	Length:	4.10
Element Name:	**Railing Systems**	Width:	0.00
Location:	At Sluice Gate	Height:	1.10
Material:	Steel	Count:	1.0
Element Type:	Steel post and Steel Panel	Total Quantity:	4.1
Environment:	Benign	Limited Inspection	☐
Protection System:	Hot dip galvanizing		

Condition Data:	Units:	Exc.	Good:	Fair:	Poor:	Performance Deficiencies:
	m	0.0	4.1	0.0	0.0	

Comments:

Recommended Work:		Maint. Needs:		Maint. Priority:	
Recommended Timing:		Maint. Desc.:			
Work Details:					

Ontario Structure Inspection Manual - Inspection Form

MTO Site Number: 320

Structure Name: Allan's Dam Sluiceway

Structure ID: 320

Element Group:	**Culverts**	Length:	0.00
Element Name:	**Barrels**	Width:	0.00
Location:	Larger Arch Under Approach to Structure 131	Height:	0.00
Material:	Cast-in-Place Concrete	Count:	1.0
Element Type:	Arch	Total Quantity:	1.0
Environment:	Benign	Limited Inspection	☑
Protection System:	None		

Condition Data:

Units:	Exc.	Good:	Fair:	Poor:	Performance Deficiencies:
All	0.0	1.0	0.0	0.0	

Comments: Dimensions of structure could not be confirmed

Recommended Work: | Maint. Needs: | Maint. Priority:

Recommended Timing: | Maint. Desc.:

Work Details:

Element Group:	**Culverts**	Length:	0.00
Element Name:	**Barrels**	Width:	0.00
Location:	Smaller Arch Under Approach to Structure 131	Height:	0.00
Material:	Cast-in-Place Concrete	Count:	1.0
Element Type:	Arch	Total Quantity:	1.0
Environment:	Benign	Limited Inspection	☑
Protection System:	None		

Condition Data:

Units:	Exc.	Good:	Fair:	Poor:	Performance Deficiencies:
All	0.0	1.0	0.0	0.0	

Comments: Dimensions of structure could not be confirmed

Recommended Work: | Maint. Needs: | Maint. Priority:

Recommended Timing: | Maint. Desc.:

Work Details:

Ontario Structure Inspection Manual - Inspection Form

MTO Site Number: 320

Structure Name: Allan's Dam Sluiceway

Structure ID: 320

Element Group:	**Decks**	Length:	2.37
Element Name:	**Deck Top**	Width:	4.10
Location:	Steel Grating (North and South Ends)	Height:	0.00
Material:	Steel	Count:	2.0
Element Type:	Metal Grid	Total Quantity:	19.4
Environment:	Benign	Limited Inspection	☐
Protection System:	Hot dip galvanizing		

Condition Data:	Units:	Exc.	Good:	Fair:	Poor:	Performance Deficiencies:
	sq.m.	0.0	11.4	8.0	0.0	

Comments: Medium corrosion of north grating

Recommended Work:		Maint. Needs:		Maint. Priority:	
Recommended Timing:		Maint. Desc.:			
Work Details:					

Element Group:	**Embankments & Streams**	Length:	0.00
Element Name:	**Streams and Waterways**	Width:	0.00
Location:	All	Height:	0.00
Material:		Count:	1.0
Element Type:	-	Total Quantity:	1.0
Environment:		Limited Inspection	☑
Protection System:			

Condition Data:	Units:	Exc.	Good:	Fair:	Poor:	Performance Deficiencies:
	All	0.0	1.0	0.0	0.0	16

Comments: Sluiceway open at time of inspection; Debris built up in sluiceway

Recommended Work:		Maint. Needs:	17	Maint. Priority:	
Recommended Timing:		Maint. Desc.:	Clear debris in sluiceway		
Work Details:					

Ontario Structure Inspection Manual - Inspection Form

MTO Site Number: 320

Structure Name: Allan's Dam Sluiceway

Structure ID: 320

Element Group:	**Foundations**	Length:	0.00
Element Name:	**Foundation (below ground level)**	Width:	0.00
Location:	All	Height:	0.00
Material:		Count:	1.0
Element Type:	-	Total Quantity:	1.0
Environment:		Limited Inspection	☑
Protection System:			

Condition Data:

Units:	Exc.	Good:	Fair:	Poor:	Performance Deficiencies:
All	0.0	0.0	0.0	0.0	

Comments: Not visible, assumed in good condition based on lack of settlement defects

Recommended Work:		Maint. Needs:		Maint. Priority:	
Recommended Timing:		Maint. Desc.:			
Work Details:					

Element Group:	**Retaining Walls**	Length:	0.00
Element Name:	**Walls**	Width:	0.00
Location:	Each Side (Northern Extents)	Height:	0.00
Material:	Masonry	Count:	2.0
Element Type:	Masonry	Total Quantity:	2.0
Environment:	Moderate	Limited Inspection	☑
Protection System:	None		

Condition Data:

Units:	Exc.	Good:	Fair:	Poor:	Performance Deficiencies:
Each	0.0	2.0	0.0	0.0	

Comments: Dimensions of wall could not be confirmed; Assumed light loss of mortar

Recommended Work:	Rehab	Maint. Needs:		Maint. Priority:	
Recommended Timing:	1-5 Years	Maint. Desc.:			
Work Details:	Concrete curb wall in front of masonry wall				

Ontario Structure Inspection Manual - Inspection Form

MTO Site Number: 320

Structure Name: Allan's Dam Sluiceway

Structure ID: 320

Element Group:	**Retaining Walls**	Length:	25.00
Element Name:	**Walls**	Width:	0.40
Location:	Each Side (Southern Extents)	Height:	4.10
Material:	Cast-in-Place Concrete	Count:	2.0
Element Type:	Reinforced Concrete	Total Quantity:	246.0
Environment:	Moderate	Limited Inspection	☑
Protection System:	None		

Condition Data:

Units:	Exc.	Good:	Fair:	Poor:	Performance Deficiencies:
sq.m.	0.0	0.0	0.0	0.0	

Comments: Length of wall could not be confirmed; Light bugholes; Evidence of construction joint; Medium cracking with efflorescence, delamination and spalling at southwest corner; Severe erosion at base of wall

Recommended Work: | Maint. Needs: | Maint. Priority:

Recommended Timing: | Maint. Desc.:

Work Details:

Ontario Structure Inspection Manual - Inspection Form

MTO Site Number: 320

Structure Name: Allan's Dam Sluiceway

Structure ID: 320

Repair / Rehabilitation Required

Element Group	Element	Repair / Rehabilitation	Priority	Const Cost
Retaining Walls	Walls	Concrete curb wall in front of masonry wall	1-5 Years	$40,000

Total Repair/Rehabilitation Cost **$40,000**

Associated Work

	Comments	Estimated Cost
Approaches		$0
Detours		$0
Traffic Control		$0
Utilities		$0
Right-of-Way		$0
Environmental Study		$0
Other	*Mobilization, dewatering, ect.*	$25,000

Contingencies	10.00%	$6,000
Engineering	14.00%	$9,000
Total Associated Work Cost		**$40,000**
Total Repair / Rehabilitation Cost		$40,000
Total Cost		**$80,000**

Justification

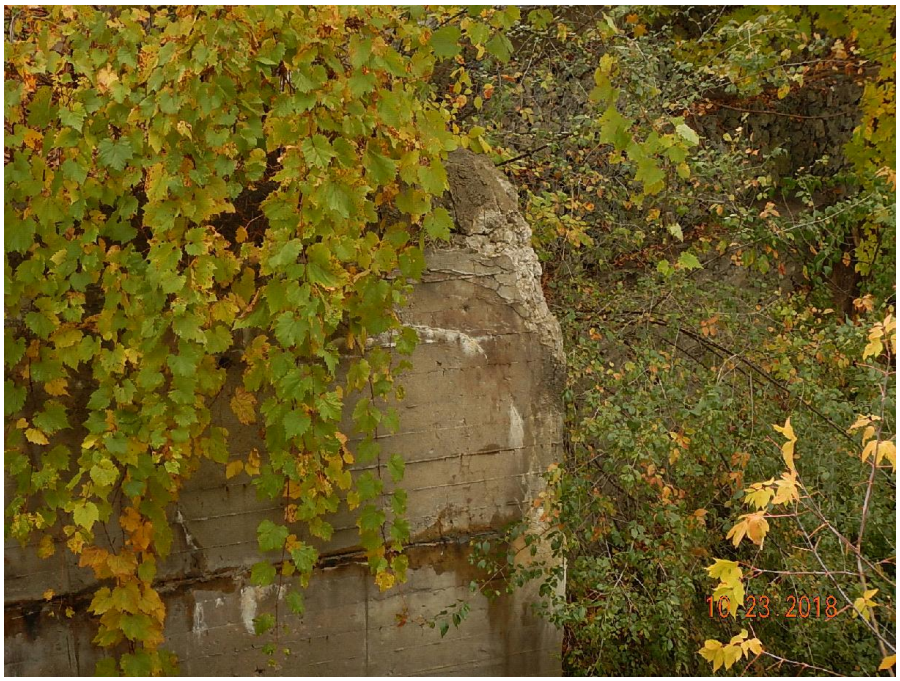
Inspection Photos

South elevation

Sluiceway inlet (north)

North deck and sluice gate

South deck



Southwest corner of retaining wall

Sluiceway outlet

Sluiceway at gate, looking upstream

Masonry wall at north extents of sluiceway