



Hamilton

The City of Hamilton

**Consulting Engineering Services for
Bridges and Culverts OSIM Inspections
(2020)**

OVERALL SUMMARY REPORT

1805361.11

June 2021



FOREWORD

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The inspection observations, comments, ratings, priorities, and the like, reflect the best judgment of Morrison Hershfield and its employees. As with any such work, there may be some subjectivity, and priorities may vary depending on mitigating perspectives or criteria.

Cost estimates are preliminary indicative costs for long-range budgeting purposes only. The difficulties involved in estimating future construction costs without a detailed analysis and final engineering design are well established. This must be taken into account when considering the preliminary costs contained herein.

Actual maintenance, repair, and rehabilitation choices made by the City will depend on many parameters and constraints, such as: available funding, best practices, life-cycle cost minimization, minimum condition standards, and the like.



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A. Bridge List with Associated Works





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1. EXECUTIVE SUMMARY

The City of Hamilton (City) maintains a comprehensive inventory of all its bridge and culvert structures. In accordance with the Ontario Regulation 104/97, the City has an ongoing program for the regular inspections of all its structures. The City uses the data collected from these inspections to assist in the development of bridge and culvert maintenance and rehabilitation programs. The ongoing inspections are intended to monitor deterioration and to identify potential structural and safety issues before they become a problem.

A total of ninety-four (94) structures were inspected in accordance with the Ontario Structure Inspection Manual (OSIM), including: twenty-nine (29) for Batch 1A – Railway structures, forty-seven (47) for Batch 1B – Expressway structures, and eighteen (18) for 2020 Additional structures. This report presents the results of the 2020 inspection of these structures. Based on a review of our inspection findings, recommendations were developed for structures that require maintenance, rehabilitation, or replacement. Cost estimates were only considered for structures that require rehabilitation or replacement.

The majority of the inspected structures were found to be in fair to good condition requiring only minor repair or maintenance in the short term.

Bridges and culverts, like all capital assets, require ongoing maintenance, as well as periodic repair and rehabilitation. The timing of such work should be coordinated such that the overall life cycle costs are minimized within the framework of acceptable performance criteria. It is neither necessary, practical, nor financially prudent to insist that all structures be in “pristine” condition at all times.



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2. INTRODUCTION

Morrison Hershfield Limited (MH) was retained by The City of Hamilton (City) to inspect a total of ninety-four (94 structures) for the City of Hamilton's 2020 Structure Inspection Program. A list of the structures inspected including time, weather, date of inspection, and type of structures, can be found in the Bridge List with Associated Works spreadsheet in Appendix "A".

Scope of Work

The scope of work, as defined in The City's Terms of Reference, and the MH proposal dated June 25, 2020, is generally as follows:

- 1) Perform detailed visual inspections of all the structures in accordance with OSIM, noting any defects, deteriorations and/or deficiencies.
- 2) Compile field observations of all relevant structural data into an OSIM style report for each structure via Stantec's BMS database software, including:
 - Verifying inventory data.
 - Assessing the individual condition state (including criticality ratings) of each structural element, in addition to an overall Bridge Condition Index (BCI) for each structure.
 - Identify bridges and culverts that are underperforming (in terms of condition, capacity, and level of service).
 - Identify any public safety concerns and recommend immediate actions required by the City.
 - Identifying maintenance needs and additional investigations.
 - Recommending rehabilitation improvements and estimated costs to bring the existing structure to an improved or desirable level of service, where appropriate.
 - Compiling visual records using digital photographs.
- 3) Prepare an Overall Summary Report summarizing the findings presented in the individual OSIM reports (e.g., list of urgent and critical works to be completed now or within one year, maintenance and rehabilitation needs, etc.).
- 4) Verify and update the City's Master Bridge List, based on the inspection findings.

Basic Information

Information on the structures was obtained from data provided by the City of Hamilton and supplemented by site measurements/investigations.



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3. QUALIFICATIONS & EXPERIENCES OF PROJECT MANAGER & PROJECT TEAM

3.1. Staff Experience

The Project Manager or, **Scott Quach, P. Eng.**, is a Principal and Project Manager of Morrison Hershfield. Scott is a Senior Structural Engineer with over 32 years' experience in structural inspection and rehabilitation design of bridges and culverts. His inspection experience includes managing and performing detailed visual inspections, condition surveys, and structural inspections on more than 1000 bridges, 700 culverts, and 20 overhead sign support structures for the Ministry of Transportation, City of Toronto, Toronto Transit Commission, and various government agencies and authorities. Scott is the engineer of record and served as one of the Lead Inspectors for this project.

Randy Yu, P. Eng. was responsible for Quality Control and served as the Quality Verification Engineer (QVE) for this project. Randy is the Department Manager for Transportation Structures Department at MH and brings over 38 years of transportation structures experience to the project.

Paul Locham, C.E.T. was a Lead Field Inspector for this project. Paul is a Principal of Morrison Hershfield and brings over 22 years' experience to the project. He has been involved in numerous projects as Construction Administrator and Site Inspector, having worked in projects for various municipalities such as the City of Mississauga, City of Toronto, and TTC.

Tien Nguyen, G.E.I.T was a **Site Inspector** for this project. Tien joined the Transportation Structures Department at MH in 2015. He assisted the team assigned to this project with various tasks including field inspection and report preparation.

Nerujan Sivanesan, E.I.T. was a **Site Inspector** for this project. Nerujan joined the Transportation Structures Department at MH in 2016. He assisted the team assigned to this project with various tasks including field inspection and report preparation.

Eugene Tu, G.E.I.T. was a **Site Inspector** for this project. Eugene joined the Transportation Structures Department at MH in 2017. He assisted the team assigned to this project with various tasks including field inspection and report preparation.



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4. DETAILED VISUAL INSPECTIONS

4.1. General

Detailed visual inspections were performed in accordance with element and condition classifications as prescribed in the Ontario Structure Inspection Manual (OSIM), May 2018 Revision. Non-destructive means were used to establish the scale of deterioration (e.g., by hammer sounding), where possible and all site observations were noted and recorded. Field measurements were taken on all structures where no drawings were available and used to verify measurements from previous OSIM inspection reports. Each element of the listed structures was inspected and quantified in accordance with the procedures and format set out in the OSIM.

4.2. Summary of Observations and Recommendations

Detailed field observations and remedial recommendations are identified per individual site in individual OSIM reports, as well as the Bridge List with Associated Works spreadsheet, attached in Appendix "A". Appraisal summaries identifying maintenance and repair needs are as described in the ensuing sections of this report.



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5. STRUCTURE APPRAISALS AND IDENTIFICATION OF URGENT AND CRITICAL WORKS

A total of ninety-four (94) sites, seventy-two (72) bridges and twenty-two (22) culverts, were inspected. Based on a review of the inspection findings, recommendations and/or cost estimates were developed for structures that require maintenance, rehabilitation, or replacement.

5.1. Urgent and Critical Works

The structures recommended with urgent and/or critical work(s) are to be completed “now” or within one year based on the observed site conditions noted during the visual inspection and assessment by the Engineer of Record. Urgent and critical works for the recommended structures are assigned a Critical Risk Rating of High, Medium, or Low and the recommended structures are ranked overall by a Critical Risk Ranking. Structures recommended with urgent and critical works shall include items such as structures with pedestrian and/or vehicular hazards, structures believed to have a Load Carrying Capacity deficiency for single-unit and two-unit vehicles under normal traffic as defined in Section 14 of the Canadian Highway Bridge Design Code (CHBDC), any deficiencies if left unattended for more than one year, may trigger a structural failure/ collapse, full/partial bridge closure, or repairs/rehabilitation works equivalent to 20% of the total bridge replacement cost, etc.

A total of twelve (12) sites, ten (10) bridges and two (2) culverts, are recommended with urgent and/or critical works as shown in Table 2 below and can be seen under recommended maintenance and recommended rehabilitation/replacement in Appendix “A”.



Table 1: Urgent and Critical Works

Struct. No.	Batch	Structure Name	Element	Type of Work	Description of Work	Performance Deficiency	Timing (Years)	Critical Risk Rating	Critical Risk Ranking
289*	1B	UPPER SHERMAN AVE	Barrier Walls	17 – Scaling (Loose Concrete/ACR steel)	Scale delaminated concrete over LINC traffic lanes.	Pedestrian/vehicular Hazard	Now	High	1
			Deck Top	Minor Rehab	Repair deteriorated concrete on both barrier walls.	None	<1	High	
159*	Additional	REGIONAL 56 RD	Barrels	Minor Rehab	Installation of temporary support struts.	4 – Continuing Movements	1	High	2
216	1B	Red Hill Valley Pkwy SB Off-Ramp to King St	Hand Railings Interior	3 – Railing System Repair	Replace north hand railing at east approach.	None	1	High	3
			Barrier Wall	8 – Concrete Repair	Repair damaged section at northeast corner.	None	1	High	
224	1B	Pedestrian Bridge over QEW (Red Hill Creek Expressway)	Approach Slabs	18 – Other Maintenance	Rectify trip hazard.	Pedestrian/vehicular Hazard	1	High	4
			Embankments	13 – Erosion Control at Bridges	Repair scour at east approach slab.	Pedestrian/vehicular Hazard	1	High	
299	1A	Sydenham Rd	Barrier/Railing Systems	18 – Other Maintenance	Remove trip hazard at NE & SE app sidewalks.	Pedestrian/vehicular Hazard	1	High	5
			Approach Sidewalk/curb	3 – Railing System Repair	Extend NE SBGR to close gap on railing at North end.	Pedestrian/vehicular Hazard	1	High	



Struct. No.	Batch	Structure Name	Element	Type of Work	Description of Work	Performance Deficiency	Timing (Years)	Critical Risk Rating	Critical Risk Ranking
294	Additional	Rousseaux St	Embankments	13 – Erosion Control at Bridges	Fill scour between end of SE concrete post & south sidewalk.	Pedestrian/vehicular Hazard	1	High	6
			Sidewalk & medians	18 – Other Maintenance	Remove trip hazard at east end.	Pedestrian/vehicular Hazard	1	Medium	
307	1A	Main St W	Beams/MLE's-Girders	17 – Scaling (Loose Concrete/ACR steel)	Scale delaminated concrete on 1st & 3rd girder from north.	Pedestrian/vehicular Hazard	1	Medium	7
288	1B	Upper Wentworth St.	Approach Sidewalk/curb	18 – Other Maintenance	Remove pedestrian trip hazard at end of SW approach sidewalk.	Pedestrian/vehicular Hazard	1	Medium	8
210	1B	Mount Albion Rd (West Structure)	Approach Sidewalk/curb	18 – Other Maintenance	Remove trip hazard on NW approach sidewalk.	Pedestrian/vehicular Hazard	1	Medium	9
			Hand Railings	3 – Railing System Repair	Replace missing railing bolts & secure south railing.	Pedestrian/vehicular Hazard	1	Medium	
211	1B	Mount Albion Rd (central Structure)	Hand Railings	3 – Railing System Repair	Secure north & south railing at east approach & repair broken post at SE corner.	Pedestrian/vehicular Hazard	1	Medium	10
287	1B	Upper Wellington St	Approach Sidewalk/curb	18 – Other Maintenance	Repair trip hazard @ SE & fill void @ SW	Pedestrian/vehicular Hazard	1	Low	11
184	1A	Macnab St N	Approach Sidewalk/curb	18 – Other Maintenance	Eliminate trip hazard at NW & NE approach sidewalks.	Pedestrian/vehicular Hazard	1	Low	12

*For Site 289, Loose concrete areas over the traffic lanes were reported to the City of Hamilton on September 18, 2020.

*For Site 159, 2019 OSIM report stated: “Structure planned for replacement within two years” (2021). If the structure is not being replace, then install temporary struts.



5.2. Recommended Regular Maintenance

The structures recommended for maintenance are based on the observed site conditions noted during the visual inspections. Routine maintenance needs include items such as: cleaning debris from structure elements, patching small/shallow potholes, scaling (loose concrete or ACR steel), repairing scours, removing vegetation from streams, etc.

A total of twenty-one (21) bridges in Batch A, thirty-three (33) bridges and three (3) culverts in Batch B, and three (3) bridges and nine (9) culverts in Additional are recommended for maintenance as shown in Table 2 below and in Appendix "A". It should be noted that maintenance work presented previously in Table 1 under section 5.1 Urgent and Critical Works of the Report are not repeated in Table 2.



Table 2: Recommended Regular Maintenance

Struct. No.	Structure Name	Maintenance Description	Timing (Year(s))
BATCH A			
036	MIDDLETOWN RD	Monitor rotation of end panels at all corners of retaining walls.	2
037	WEIRS LN	Repair/replace damaged hazard signs.	1
153	RED HILL VALLEY PKWY CPR OVERHEAD	Tight loose nut on bearing plate anchor bolts.	2
		Repair disconnected conduit at northeast quadrant.	2
164	KENILWORTH AV S	Repair loose connection at north end of railing.	2
174	MAIN STREET NORTH BRIDGE	Remove debris on abutment bearing seats.	2
		Reconnect utility casing.	2
177	CHATHAM ST	Remove debris from seals.	2
180	PEDESTRIAN BRIDGE OVER CNR TRACKS (MARY ST)	Replace junction box cover at south abutment.	2
		Tighten and replacing missing nuts.	1
184	MACNAB ST N	Replace missing bolt and end caps.	2
		Secure railing at north staircase.	2
186	PEDESTRIAN BRIDGE OVER CNR TRACKS (EMERALD ST N)	Replace missing bolts on diagonal bracings.	2
		Cleaning & re-coating railing.	2
		Replace nails in wood with wood screws.	2
245	RIDGE RD	Remove debris from seals.	2
		Repair trip hazard at east approach.	2
273	SHERATON HOTEL JACKSON SQUARE PEDESTRIAN BRIDGE	Reset a few false ceiling panels.	2
		Replace torn and damaged roof sections.	2
276	NEWMAN RD	Replace end cap at north end of west railing.	2
299	SYDENHAM RD	Replace missing bolt on railing post.	2
		Remove debris from seals.	2
307	MAIN ST W	Patch potholes.	1
310	YORK BV	Remove debris from drains.	2
		Remove debris from seals.	2
315	CLAREMONT AC	Reconnect/secure railing at south end.	2
		Repair scour at southwest corner.	2
332	BIRCH AV	Replace wood at northeast corner.	2
391	GOVERNOR'S RD	Remove debris from seals.	2



Struct. No.	Structure Name	Maintenance Description	Timing (Year(s))
449	HIGHWAY NO. 52	Clean and Coat SE Abutment bearing.	2
		Replace missing bolt @ 6 th post from south, on west rail.	2
		Repair scour in front of north abutment.	2
		Remove debris from seals.	2
451	HIGHWAY NO. 5 E	Repair scour at west embankment.	2
474	FERGUSON AV N	Repair trip hazard on approach sidewalks.	2
BATCH B			
201	RHVP SB OFF-RAMP TO STONE CHURCH RD	Repair West barrier wall on North approach at impact damage section.	1
204 – NB	RHVP TWIN VIA DUCT NORTHBOUND BRIDGE	Extend asphalt drainage pipe away from abutment	2
		Remove debris from seals under maintenance	2
204 – SB	RHVP TWIN VIA DUCT SOUTHBOUND BRIDGE	Extend asphalt drainage pipe away from abutment.	2
		Repair scour at southeast embankment.	2
		Remove debris from joints under maintenance.	2
205	GREENHILL AV	Repair scour at southeast embankment.	2
		Replace missing armouring at northwest corner.	2
		Remove debris from seals.	2
212	MOUNT ALBION RD (EAST STRUCTURE)	Monitor longitudinal cracks at northeast corner of deck.	2
216	COLTER STREET FOOTBRIDGE	Remove debris as part of maintenance.	2
		Repair damaged section at north east approach guiderail.	1
217	QUEENSTON RD ON-RAMP TO SB RHVP	Replace missing railing bolt.	2
		Repair drainage tube at southwest.	2
		Repair scour at north embankment.	2
		Remove debris from seals.	2
218	RED HILL VALLEY PKWY SB OFF-RAMP TO QUEENSTON RD	Replace missing bolts on hand railings.	2
		Repair scour at northwest corner.	2
220	RHVP SOUTHBOUND BRIDGE	Remove debris from abutment bearing seats.	2
		Repair scour in front of north abutment.	2
		Remove debris from seals.	2
221	RHVP NORTHBOUND STRUCTURE 1	Repair scour at north abutment and piers.	2
222	RHVP NORTHBOUND STRUCTURE 2	Close box girder hatch and install new bolts.	1
		Repair scours in front of south abutment and southeast embankment.	2



Struct. No.	Structure Name	Maintenance Description	Timing (Year(s))
		Clean/remove debris from joint seals.	2
283	UPPER PARADISE RD	Patch pothole on south approach on SBL.	2
		Replace broken box cover on west barrier wall at north end.	2
		Remove debris from EJ.	2
		Repair broken section of retaining wall.	2
284	GARTH ST	Repair pedestrian trip hazard on SW approach sidewalk.	1
		Replace broken junction box covers and missing bolts.	2
		Patch potholes.	1
		Remove debris from seals.	2
285	WEST 5 TH ST	Replace missing railing bolts on barrier walls.	2
		Replace missing railing bolts on SBGR.	2
286	UPPER JAMES ST	Remove/clean bird droppings behind bearings.	2
287	UPPER WELLINGTON ST	Replace missing cover plate at NE light pole.	2
		Replace damaged wooden post.	2
		Clean joint seals.	2
288	UPPER WENTWORTH ST	Remove debris from seals	2
289	UPPER SHERMAN AV	Patch pothole on north approach.	2
		Remove debris from seals.	2
290	UPPER GAGE AV	Replace missing cover on light pole.	2
		Replace missing bolts on east and west hand railings.	2
		Remove debris from seals.	2
		Eliminate trip hazard at north and south end of east approach sidewalk.	2
291	UPPER OTTAWA ST	Replace missing railing bolts and broken end cap.	2
		Clear tree branches that encroach bridge at southwest embankment.	2
		Remove debris from seals.	2
		Replace leaking seals.	2
293	MOHAWK RD	Replace missing bolts on south junction box.	2
		Replace bolt on 3rd post from north at east rail.	2



Struct. No.	Structure Name	Maintenance Description	Timing (Year(s))
		Reset broken south concrete slope paving.	2
		Remove debris from seals.	2
324	KING ST E	Patch pothole at west approach.	2
		Remove debris from north deck drain.	2
		Remove debris from joint seals.	2
		Remove trip hazard on northeast sidewalk.	2
		Remove debris atop west abutment seat.	2
325	QUEENSTON RD	Replace missing bolts on junction box.	2
		Replace damaged section at NE SBGR.	2
		Replace missing bolts on railings.	2
		Remove debris from deck drains under maintenance.	2
		Patch potholes on bridge deck under maintenance.	1
		Replace missing bolt on west joint armoring at southwest approach.	2
		Remove debris from joint seals.	2
377	KING ST E	Patch potholes at east approach under maintenance.	1
		Remove tree debris from south inlet.	2
378	BARTON ST E	Replace missing bolts on railings.	2
		Replace missing section on north railing and secure rail to posts.	2
		Remove debris from joint seals.	2
		Patch core hole on north sidewalk.	2
459	PEDESTRIAN TUNNEL UNDER LINCOLN M. ALEXANDER PY (GREENCEDAR DR)	Replace broken fence cap on north fence (EB Bridge) at west end.	2
460	PEDESTRIAN BRIDGE OVER LINCOLN M. ALEXANDER PY (FIONA CRES)	Replace missing junction box cover on north lamp post.	2
461	LINCOLN M. ALEXANDER PY CULVERT	Repair pothole under maintenance.	2
462	DARTNALL ON-RAMP TO WB LINC	Repair scour southwest and northeast embankments.	2
465*	PEDESTRIAN BRIDGE OVER HWY 403	Scale loose concrete on North girder over Hwy 403 WB Lane 2 & West Shoulder Area at Hwy 403 WB	Now
		Eliminate pedestrian trip hazard at east end of deck.	1
467	PRITCHARD RD	Replace outward leaning posts on damaged section at northeast approach guiderail.	2
		Repair damaged steel beam section at northeast.	2



Struct. No.	Structure Name	Maintenance Description	Timing (Year(s))
468	DARTNALL RD	Replace missing bolts on east railing.	2
		Tighten loose bolt on northwest approach guiderail.	2
		Remove debris from joint seals.	2
475	PEDESTRIAN BRIDGE OVER LINCOLN M. ALEXANDER PY (ARBOUR RD)	Replace missing timber section on east railing.	2
		Replace missing screws at centre pier steel plate.	2
ADDITIONAL			
008	Wilson St W	Reconnect post & replace damaged sections.	1
		Fix leaning sign.	1
108	Indian TL	Install hazard sign at SW corner & replace NW sign.	1
		Replace/ repair locally damage sections of SBGR.	1
111	MINERAL SPRINGS RD	Patch potholes on approach and deck wearing surface.	1
		Trim tree branches on east railing at north end.	2
		Repair scour at northeast exposed end of culvert.	2
113	SULPHUR SPRINGS RD	Smoothen uneven gravel surface.	1
		Repack bottom of gabion wall.	1
151	PEDESTRIAN BRIDGE OVER CREEK (PARKSIDE DR)	Repair scour and replace broken gabion baskets.	2
159	REGIONAL 56 RD	Replace sign at northwest corner.	2
		Replace missing post on east railing at south approach road.	2
261	UPPER JAMES ST	Repair torn steel section of SBGR at northwest end.	1
277	OLD DUNDAS RD	Repair scour at southwest and southeast corners of railing.	2
294	ROUSSEAU ST	Replace damaged hazard sign at end of northeast SBGR.	1
		Replace damaged steel offset post and missing bolt.	2
346	CENTRE RD	Remove all loose stone facing off railing posts.	2
350	CENTRE RD	Repair steel beam guiderail.	2
397	GLANCASTER RD	Repair scour at west embankment.	2

*For Site 465, Loose concrete areas over the traffic lanes were reported to the City of Hamilton on October 2nd, 2020 and removed as of Fall 2020.



5.3. Recommended Rehabilitation & Replacement

Based on the results of the structural inspections, a list has been developed for the thirty-two (32) structures, twenty-two (22) bridges and ten (10) culverts, requiring major or minor rehabilitation work as shown below in Table 3 and in Appendix "A". The rehabilitation/replacement recommendations are listed with a priority rating from 1 to 32 (1 being the top priority), which are based on the severity of the observed conditions and the work required for each structure. Prioritization of work for each structure considers the extent of deterioration, particularly those items that relate to safety issues. Higher priority is generally assigned to items that are directly related to public safety. An estimate of the repair/replacement costs for each of the structures in this list has been completed for budgeting purposes. Additional remarks are included for sites with ongoing or upcoming work under separate assignments.

The following cost estimates for the recommended rehabilitation/replacement works were based on the extent of deterioration, required traffic control, and access protection as well as the unit costs provided in Stantec's BMS software. A detailed inspection (including a detailed bridge deck condition survey) and detailed engineering designs, as well as site specific requirements for staging, detours, etc. would be required to determine more accurate rehabilitation work scope and pricing. Furthermore, it is well known that future estimating of project costs are difficult due to the unique conditions of each individual contract and the influence of local and global markets on labour and construction materials. It is not possible to predict future construction cost escalation with any certainty in the estimate, which can also intensify depending on the lag time between the design and advertised period.



Table 3: Recommended Work Priority Ranking

Work Priority Ranking	Struct. No.	Batch	Structure Name	Work Category	Timing	Recommended Work Description	Cost (\$)	Remarks
1	289	1B	UPPER SHERMAN AVE	Minor Rehab	< 1 year	Repair deteriorated concrete on both east and west barriers walls.	45,600.00	
2	159	Additional	REGIONAL 56 RD	Replacement	1 – 5 years	<p>Replace culvert barrel. If culvert is not replaced, installation of temporary support struts is recommended.</p> <p>Repave asphalt wearing surface atop culvert and approaches.</p> <p>Replace Northwest & Southwest gabions walls.</p> <p>Install gabions at Northeast and Southeast ends.</p>	590,420.00	2019 OSIM Report stated: "Structure planned for replacement within two years" (2021). Significant increase in north and south wall rotation from 2019 to 2020.
3	346	Additional	CENTRE RD	Major Rehab	1 – 5 years	<p>Replace girder 5 and 6 from east.</p> <p>Patch repair girders 1 to 4 and 7 to 10 from east.</p> <p>Repave asphalt wearing surface.</p> <p>Replace overlay with new structural slab.</p> <p>Replace railing system & sidewalk.</p>	551,575.00	Structural evaluation and load posting have been completed under a separate assignment.
4	451	1A	HIGHWAY NO. 5 E	Major Rehab	1 – 5 years	<p>Replace bridge deck, expansion joint systems, abutment bearings, sidewalks and curbs, and barrier railing systems.</p> <p>Patch repair on girders, abutments, and piers.</p> <p>Repave wearing surface and install new waterproofing system.</p>	3,142,005.00	Emergency remedial repair of deck is ongoing. Bridge is scheduled for replacement in 2024.



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Work Priority Ranking	Struct. No.	Batch	Structure Name	Work Category	Timing	Recommended Work Description	Cost (\$)	Remarks
5	452	1A	CENTENNIAL PY	Major Rehab	1 – 5 years	<p>Replace Expansion Joint systems.</p> <p>Repair deteriorated concrete on deck top, soffit, piers, beams, diaphragms, abutments, ballast walls, wingwalls, barrier, approach curb, and sidewalks.</p> <p>Repave deck and approach wearing surface</p>	907,262.00	Bridge scheduled for rehabilitation (1-5 years).
6	108	Additional	INDIAN TL	Replacement	1 – 5 years	Replace culvert barrel, headwall and wingwalls.	250,200.00	Pending temporary shoring scheduled to be installed in 2021.
7	282	1B	LONGWOOD RD S	Major Rehab	1 – 5 years	<p>Patch repair on abutment, pier, soffit, approach slab, sidewalk/curbs, and barrier wall.</p> <p>Repave approach and deck wearing surface.</p> <p>Construct concrete overlay on deck.</p> <p>Replace barrier railings and Expansion Joint system.</p> <p>Recoat end girder and diaphragms.</p>	3,055,080.00	Temporary Holding Strategy Design is ongoing. Scheduled to be rehabilitated in 2021-2022.
8	113	Additional	SULPHUR SPRINGS RD	Major Rehab	1 – 5 years	<p>Replace timber post delineators with a steel beam guard rail system.</p> <p>Replace Northeast gabion retaining wall.</p> <p>Repair deteriorated concrete in culvert barrel & inlet components.</p> <p>Excavate and reconnect dislodged CSP on south wall near west end.</p>	569,700.00	



Work Priority Ranking	Struct. No.	Batch	Structure Name	Work Category	Timing	Recommended Work Description	Cost (\$)	Remarks
9	350	Additional	CENTRE RD	Major Rehab	1 – 5 years	Patch repair deck and soffit. Repave asphalt and replace waterproof system. Repave approach road. Replace railings.	170,350.00	
10	111	Additional	MINERAL SPRINGS RD	Major Rehab	1 – 5 years 6–10 years	Repave deck and approach wearing surfaces. Repair deteriorated concrete on barrier posts, curbs, barrel, & Retaining wall. Repair deteriorated steel on railings.	77,211.00	
11	307	1A	MAIN ST W	Major Rehab	1 – 5 years	Patch repair on deck top, approach slabs & retaining walls. Repave deck & approach wearing surface. Replace railing system, barrier posts, damaged section of SBGRs, sidewalk & curbs. Recoat structural steel.	602,362.00	
12	177	1A	CHATHAM ST	Minor Rehab	6-10 years	Repair deteriorated concrete on end soffit and pier caps/shafts.	53,615.00	



Work Priority Ranking	Struct. No.	Batch	Structure Name	Work Category	Timing	Recommended Work Description	Cost (\$)	Remarks
13	324	1B	KING ST E	Minor Rehab	6-10 years	<p>Repair deteriorated concrete on sidewalks, centre median, and barrier walls.</p> <p>Repair/reconstruct EJ at Northwest Corner on Curb and Sidewalk.</p> <p>Resurface asphalt wearing surface.</p>	193,278.00	
14	274	1A	YORK BV	Major Rehab	6-10 years	<p>Replace existing concrete overlay with asphalt and w/p system.</p> <p>Repair deteriorated concrete on soffit, deck top, abutment wall, pier, barriers, sidewalk, median, approach slabs & approach sidewalk.</p> <p>Replace longitudinal seal.</p>	1,308,300.00	
15	186	1A	PEDESTRIAN BRIDGE OVER CNR TRACKS (EMERALD ST N)	Major Rehab	6-10 years	Clean and recoat truss members and connections, steel floor beams, bracing, steel pier and steel staircases.	243,400.00	
16	277	Additional	OLD DUNDAS RD	Major Rehab	6-10 years	Recommend repair deteriorated concrete areas in culvert barrel.	32,950.00	
17	459	1B	PEDESTRIAN TUNNEL UNDER LINCOLN M. ALEXANDER PY (GREENCEDAR DR)	Minor Rehab	1 - 5 years	Repair deteriorated concrete on interior and exterior barrier walls.	34,820.00	



Work Priority Ranking	Struct. No.	Batch	Structure Name	Work Category	Timing	Recommended Work Description	Cost (\$)	Remarks
18	201	1B	RHVP SB OFF-RAMP to STONE CHURCH RD	Minor Rehab	1 – 5 years	Patch repair west barrier wall at north end (impact damage location).	6,240.00	
19	164	1A	KENILWORTH AV S	Minor Rehab	1 – 5 years	Repair deteriorated concrete on abutment walls, wingwalls, piers, retaining walls, approach curbs and sidewalk. Replace railing along center median. Recoat/repair areas of loss coating on girders.	117,890.00	
20	294	Additional	ROUSSEAU ST	Major Rehab	1 – 5 years	Repair deteriorated concrete in culvert barrel.	70,000.00	
21	007	Additional	CONCESSION 7 W	Replacement	6–10 years	Replace culvert. Install new guiderail, gabion retaining walls and riprap. Repave approach road and roadway atop culvert.	243,890.00	Temporary shoring installed in 2019.
22	008	Additional	WILSON ST W	Major Rehab	6–10 years	Repair deteriorated concrete in barrel. Construct a headwall at the inlet/out.	201,500.00	
23	332	1A	BIRCH AV	Minor Rehab	1 – 5 years	Rehab the soffit, girders, stringers, abutment walls and retaining walls. Replace lower bracings. Clean, repair/reinforce and coat piers.	192,305.00	



Work Priority Ranking	Struct. No.	Batch	Structure Name	Work Category	Timing	Recommended Work Description	Cost (\$)	Remarks
24	403	Additional	HARRISON RD	Replacement	6-10 years	Replace culvert, inlet & outlet components, wearing surface. Temporarily remove & salvage new SBGR.	568,125.00	
25	150	Additional	TAPLEYTOWN RD	Major Rehab	6-10 years	Repair/replace deteriorated steel girders. Repair structural steel coating. Repair deteriorated concrete on deck and soffit.	261,650.00	Additional girder supports installed 2018-19.
26	117	1A	OLD GUELPH RD	Major Rehab	1 - 5 years	Repair concrete deterioration on abutment walls, wingwalls, piers, retaining walls, approach curbs and sidewalk. Replace railing along center median. Recoat/repair areas of loss coating on girders.	266,775.00	
27	397	Additional	GLANCASTER RD	Minor Rehab	1 - 5 years	Install new barrier system at east and west end and new gabion baskets at all four quadrants	32,000.00	
28	330	1A	BIRCH AV	Minor Rehab	6-10 years	Repair deteriorated concrete on abutment walls, ballast walls, curbs, retaining walls and west pier. Repair steel at east pier and north and south girders. Coat bottom section of east pier within splash zone.	102,030.00	



Work Priority Ranking	Struct. No.	Batch	Structure Name	Work Category	Timing	Recommended Work Description	Cost (\$)	Remarks
29	245	1A	RIDGE RD	Minor Rehab	1 – 5 years	Repave asphalt at ponding areas. Rectify water ponding area on sidewalk.	17,176.00	
30	036	1A	MIDDLETOWN RD	Minor Rehab	1 – 5 years	Recommend fill gap with grout between bottom of precast retaining wall and top of gravity stone retaining wall.	13,420.00	
31	325	1B	QUEENSTON RD	Major Rehab	1 – 5 years	Patch repair on soffit, sidewalks & curbs. Replace longitudinal seal and barrier railings Repave asphalt wearing surface & replace waterproofing on deck Repave approach roads	809,888.00	
32	331	1A	BIRCH AV	Replacement	1 – 5 years	Remove bridge with abandoned railway track.	100,000.00	



5.4. Recommended Further Investigations

A total of twelve (12) sites, seven (7) bridges and five (5) culverts, are recommended for further investigations based on their current condition, as shown in Table 4 below.

Table 4: Recommended Further Investigations

Struct. No.	Batch	Structure Name	Investigation Description	Timing
007	Additional	CONCESSION 7 W	Monitoring of Deformations, Settlements and Movements as part of Biennial Inspection	2 years
108	Additional	INDIAN TL	Monitoring of Deformations, Settlements and Movements annually pending rehabilitation	1 year
111	Additional	MINERAL SPRINGS RD	Monitoring of Deformations, Settlements and Movements as part of Biennial Inspection	2 years
113	Additional	SULPHUR SPRINGS RD	Monitoring of Deformations, Settlements and Movements as part of Biennial Inspection	2 years
212	1B	MOUNT ALBION RD (EAST STRUCTURE)	Monitoring Crack Widths as part of Biennial Inspection	2 years
274	1A	YORK BV	Detailed Deck Condition Survey	Within 2 Years
294	Additional	ROUSSEAU ST	Monitoring of Deformations, Settlements and Movements as part of Biennial Inspection	2 years
307	1A	MAIN ST W	Detailed Deck Condition Survey	Within 4 Years
346	Additional	CENTRE RD	Close-up inspection of beam underside	Within 2 Years
350	Additional	CENTRE RD	Detailed Deck Condition Survey	1 to 5 Years
			Structure Evaluation	Within 1 Years
449	1A	HIGHWAY NO. 52	Monitoring Crack Widths as part of Biennial Inspection	2 years
451	1A	Highway NO. 5E	Structure Evaluation	Within 1 to 2 Years



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6. CONCLUSIONS

The main objective of the Bridges and Culverts OSIM Inspections Program is to identify all current functional, structural, and safety deficiencies and/or defects of the structures that are evident from visual inspections, and to propose a remedial strategy for each structure, with a preliminary timeframe for the remedial work.

The vast majority of the inspected structures were found to be in fair to good condition requiring only minor maintenance or repairs in the short term.

It is recognized that one of the main purposes of regular inspections is to identify changes in the condition of the structure; therefore, the importance of having a qualified inspector assess the condition of the structures cannot be over-emphasized. The rehabilitation/replacement prioritizations presented in this report are primarily based on the assessed overall condition, as well as the condition of specific elements and their relationship to functional performance and safety.

It should be noted that the inspection results, recommendations, and cost estimates presented in this report are based on the visual field assessments as well as normal engineering judgment and practice at the time of the inspection and report. As such, the findings and recommendations should be considered preliminary; a more detailed engineering investigation (detailed condition surveys, etc.) would be required to furtherly assess the condition, yielding a more precise cost estimate and rehabilitation work scope.

It is recommended that the structures be re-appraised by a qualified structural engineer every two years. This inspection along with regular appraisals of structures will help to facilitate the establishment of an efficient capital improvement and maintenance program, which provides good serviceability, adequate safety, and a cost effective use of available capital improvement and maintenance funds.

Bridges and culverts, like all capital assets, require ongoing maintenance, as well as periodic repair and rehabilitation. The timing of such work should be coordinated such that the overall life cycle costs are minimized within the framework of acceptable performance criteria. It is neither necessary, practical, nor financially prudent to insist that all structures be in "pristine" condition at all times.



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The City of Hamilton's pro-active bridge and culvert management plans will ensure that appropriate preventative and rehabilitation measures are carried out to provide safe, acceptable service, in a cost-effective manner, making the best use of limited resources.



Scott S. Quach, P.Eng.

Project Manager



APPENDIX A

Bridge List with Associated Works



STRUCTURE ID	STREET NAME	BRIDGE OR CULVERT	OSIM INSPECTION (DATE)	Time	Weather	Temp. (°C)	RECOMMENDED MAINTENANCE	TIMING	RECOMMENDED REHAB./REPLACEMENT	TIMING	ESTIMATED COST
Batch A											
36	MIDDLETOWN RD	Bridge	2020-09-11	1 hr	Sunny	16	Monitor rotation of end panels at all corners of retaining walls.	2 years	Recommend fill gap with grout between bottom of precast retaining wall and top of gravity stone retaining wall.	1 - 5 year	\$13,240.00
37	WEIRS LN	Bridge	2020-09-11	1 hr	Sunny	26	Repair/replace damaged hazard signs.	1 year			
117	OLD GUELPH RD	Bridge	2020-09-03	1 hr	Sunny	26			Replace expansion joints. Clean and coat girder ends. Repair deck soffit, approach slabs and diaphragms. Repave deck and approach wearing surface.	1 - 5 year	\$266,775.00
152	RED HILL VALLEY PKWY CNR OVERHEAD	Bridge	2020-09-24	1 hr 15min	Partly Sunny	26					
153	RED HILL VALLEY PKWY CPR OVERHEAD	Bridge	2020-09-23	1 hr 15min	Sunny	25	Tight loose nut on bearing plate anchor bolts. Repair disconnected conduit at northeast quadrant.	2 years 2 years			
164	KENILWORTH AV S	Bridge	2020-09-10	1 hr	Cloudy	20	Repair loose connection at north end of railing.	2 years	Repair concrete deterioration on abutment walls, wingwalls, piers, retaining walls, approach curbs and sidewalk. Replace railing along center median. Recoat/repair areas of loss coating on girders.	1 - 5 year	\$117,890.00
174	PEDESTRIAN BRIDGE OVER CPR TRACKS (PEARL ST S)	Bridge	2020-09-29	1hr 15min	Sunny	17	Remove debris on abutment bearing seats. Reconnect utility casing.	2 years 2 years			
177	CHATHAM ST	Bridge	2020-09-29	1hr	Sunny	17	Remove debris from seals	2 years	Repair deteriorated concrete on end soffit and pier caps/shafts.	6 - 10 year	\$53,615.00
180	PEDESTRIAN BRIDGE OVER CNR TRACKS (MARY ST)	Bridge	2020-09-30	1hr	Sunny	17	Replace junction box cover at south abutment Tighten and replacing missing nuts.	2 years 1 year			
184	MACNAB ST N	Bridge	2020-09-30	1hr	Sunny	17	Replace missing bolt and end caps. Eliminate trip hazard at northwest and northeast sidewalks.	2 years 1 year			
185	BAY ST N	Bridge	2020-09-29	1hr 15 min	Sunny	17					
186	PEDESTRIAN BRIDGE OVER CNR TRACKS (EMERALD ST N)	Bridge	2020-09-30	1hr	Sunny	17	Secure railing at north staircase. Replace missing bolts on diagonal bracings. Cleaning & re-coating railing. Replace nails in wood with wood screws.	2 years 2 years 2 years 2 years	Clean and recoat truss members and connections, steel floor beams, bracing, steel pier and steel staircases.	6 - 10 year	\$243,400.00

STRUCTURE ID	STREET NAME	BRIDGE OR CULVERT	OSIM INSPECTION (DATE)	Time	Weather	Temp. (°C)	RECOMMENDED MAINTENANCE	TIMING	RECOMMENDED REHAB./REPLACEMENT	TIMING	ESTIMATED COST
Batch A											
245	RIDGE RD	Bridge	2020-09-10	1hr	Cloudy	20	Remove debris from seals. Repair trip hazard at east approach.	2 years 2 years	Repave asphalt at ponding areas and rectify water ponding area on sidewalk.	1 - 5 year	\$17,176.00
272	CITY CENTRE PEDESTRIAN BRIDGE	Bridge	2020-09-29	1hr	Sunny	17					
273	SHERATON HOTEL JACKSON SQUARE PEDESTRIAN BRIDGE	Bridge	2020-09-29	1hr	Sunny	17	Reset a few false ceiling panels. Replace torn and damaged roof sections.	2 years 2 years			
274	YORK BV	Bridge	2020-09-03	1hr 15 min	Sunny	26			Replace existing concrete overlay with asphalt and w/p system. Replace longitudinal seal. Repair deteriorated concrete on soffit, decktop, abutment wall, pier, barriers, sidewalk, median, approach slabs & approach sidewalk.	6 - 10 year	\$1,308,300.00
276	NEWMAN RD	Bridge	2020-09-03	1hr	Sunny	26	Replace end cap at north end of west railing	2 years			
299	SYDENHAM RD	Bridge	2020-09-01	1hr 30min	Partly Sunny	25	Replace missing bolt on railing post. Close gap between northeast SBGR and north railing. Remove debris from seals. Remove trip hazard at northeast and southeast approach.	2 years 1 year 2 years 1 year			
307	MAIN ST W	Bridge	2020-09-29	1hr	Sunny	17	Scale delaminated concrete on 1st and 3rd girder from north Patch potholes.	1 year 1 year	Repair deck top, approach slabs & retaining walls. Replace railing system, barrier posts, damaged section of SBGRs, sidewalk & curbs. Recoat structural steel. Repave deck & approach wearing surface.	1 - 5 year	\$602,362.00
310	YORK BV	Bridge	2020-09-03	2hr 15min	Sunny	26	Remove debris from drains. Remove debris from seals.	2 years 2 years			
315	CLAREMONT AC	Bridge	2020-08-31	1hr 30min	Partly Sunny	28	Reconnect/secure railing at south end. Repair scour at southwest corner.	2 years 2 years			
330	BIRCH AV	Bridge	2020-09-30	1 hr	Sunny	17			Repair deteriorated concrete on abutment walls, ballast walls, curbs, retaining walls and west pier. Repair steel at east pier and north and south girders. Coat bottom section of east pier within splash zone.	6 - 10 year	\$102,030.00
331	BIRCH AV	Bridge	2020-09-30	1hr 30min	Sunny	17			Replacement.	1 - 5 year	\$100,000.00

STRUCTURE ID	STREET NAME	BRIDGE OR CULVERT	OSIM INSPECTION (DATE)	Time	Weather	Temp. (°C)	RECOMMENDED MAINTENANCE	TIMING	RECOMMENDED REHAB./REPLACEMENT	TIMING	ESTIMATED COST
Batch A											
332	BIRCH AV	Bridge	2020-09-30	1 hr	Sunny	17	Replace wood at northeast corner.	2 years	Rehab soffit, girders, stringers, abutment walls and retaining walls. Replace lower bracings. Clean, repair/reinforce and coat piers.	1 - 5 year	\$192,305.00
391	GOVERNOR'S RD	Bridge	2020-09-04	1hr 30min	Partly Sunny	23	Remove debris from seals	2 years			
449	HIGHWAY NO. 52	Bridge	2020-09-11	1hr 30min	Sunny	16	Clean and Coat SE Abutment bearing Replace missing bolt @ 6th post from south, on west rail. Repair scour in front of north abutment Remove debris from seals	2 years 2 years 2 years 2 years			
451	HIGHWAY NO. 5 E	Bridge	2020-09-04	1 hr	Partly Sunny	23	Repair scour at west embankment.	2 years	Replace deck top, sidewalks and curbs , barrier railing systems, expansion joint systems, and bearings. Repave wearing surface and install new waterproofing system. Patch repair on girders, abutments and piers.	1 - 5 year	\$3,142,005.00
452	CENTENNIAL PY	Bridge	2020-09-10	1 hr 20min	Cloudy	20			Replace EJ systems. Repave deck and approach wearing surface. Repair deteriorated concrete on decktop, soffit, piers, beams, diaphragms, abutments, ballast walls, wingwalls , barrier, approach curb, and sidewalks.	1 - 5 year	\$907,262.00
474	FERGUSON AV N	Bridge	2020-09-30	1 hr 15min	Sunny	17	Repair trip hazard on approach sidewalks	2 years			

STRUCTURE ID	STREET NAME	BRIDGE OR CULVERT	OSIM INSPECTION (DATE)	Time	Weather	Temp. (°C)	RECOMMENDED MAINTENANCE	TIMING	RECOMMENDED REHAB./REPLACEMENT	TIMING	ESTIMATED COST
Batch B											
134	KING ST ON-RAMP TO NB RHVP (CULVERT)	Culvert	2020-09-22	45min	Partly Sunny	22					
200	STONE CHURCH RD ON-RAMP TO NB/SB RHVP	Bridge	2020-09-17	1 hr	Sunny	19					
201	RHVP SB OFF-RAMP to STONE CHURCH RD	Bridge	2020-09-17	1 hr 5min	Sunny	19	Repair west barrier wall at impact damage section.	1 year	Patch repair west barrier wall at north end (impact damage location).	1 - 5 year	\$6,240.00
202	RHVP SB OFF-RAMP to STONE CHURCH RD	Bridge	2020-09-17	2 hrs	Sunny	19					
203	MUD ST/STONE CHURCH RD ON-RAMP TO SB RHVP	Bridge	2020-09-17	1 hr 30min	Sunny	19					
204 - NB	RHVP TWIN VIA DUCT NORTHBOUND BRIDGE	Bridge	2020-09-21	2hrs	Sunny	20	Extend asphalt drainage pipe away from abutment.	2 years			
							Remove debris from seals under maintenance.	2 years			
204 - SB	RHVP TWIN VIA DUCT SOUTHBOUND BRIDGE	Bridge	2020-09-21	2hrs	Sunny	20	Extend asphalt drainage pipe away from abutment.	2 years			
							Repair scour at southeast embankment.	2 years			
							Remove debris from joints under maintenance.	2 years			
205	GREENHILL AV	Bridge	2020-09-17	1 hr 10min	Sunny	19	Repair scour at southeast embankment.	2 years			
							Replace missing armouring at northwest corner.	2 years			
							Remove debris from seals.	2 years			
210	MOUNT ALBION RD (WEST STRUCTURE)	Bridge	2020-09-21	1 hr 10min	Sunny	20	Remove trip hazard at NW.	2 years			
							Replace missing railing bolts & secure south railing.	2 years			
211	MOUNT ALBION RD (CENTRAL STRUCTURE)	Bridge	2020-09-21	1 hr 35min	Sunny	20	Secure north and south railing at east approach and repair broken at southeast.	1 year			
212	MOUNT ALBION RD (EAST STRUCTURE)	Bridge	2020-09-22	1 hr 15min	Partly Sunny	22	Monitor longitudinal cracks at northeast corner of deck.	2 years			
							Remove debris as part of maintenance.	2 years			
213	RED HILL VALLEY PKWY CULVERT	Culvert	2020-09-22	1 hr 20min	Partly Sunny	22					
214	KING ST ON-RAMP TO NB RHVP (CULVERT)	Culvert	2020-09-22	1 hr 15min	Partly Sunny	22					
215	KING ST ON-RAMP TO SB RHVP	Bridge	2020-09-22	1 hr	Partly Sunny	22					
216	RED HILL VALLEY PKWY SB OFF-RAMP TO KING ST	Bridge	2020-09-22	1 hr	Partly Sunny	22	Repair damaged section on barrier wall at northeast corner.	1 year			
							Replace north hand railing at east approach.	1 year			
							Repair damaged section at north east approach guiderail.	1 year			

STRUCTURE ID	STREET NAME	BRIDGE OR CULVERT	OSIM INSPECTION (DATE)	Time	Weather	Temp. (°C)	RECOMMENDED MAINTENANCE	TIMING	RECOMMENDED REHAB./REPLACEMENT	TIMING	ESTIMATED COST
Batch B											
217	QUEENSTON RD ON-RAMP TO SB RHVP	Bridge	2020-09-23	1 hr	Sunny	25	Replace missing railing bolt. Repair drainage tube at southwest. Repair scour at north embankment. Remove debris from seals.	2 years 2 years 2 years 2 years			
218	RED HILL VALLEY PKWY SB OFF-RAMP TO QUEENSTON RD	Bridge	2020-09-23	1 hr	Sunny	25	Replace missing bolts on hand railings. Repair scour at northwest corner.	2 years 2 years			
219	RED HILL VALLEY PKWY CULVERT	Bridge	2020-09-23	1 hr	Sunny	25					
220	RHVP SOUTHBOUND BRIDGE	Bridge	2020-09-24	1 hr 50min	Partly Sunny	26	Replace missing anchor bolts and realign displaced bearing plate at SE corner. Repair scour in front of north abutment. Remove debris from seals.	2 years 2 years 2 years			
221	RHVP NORTHBOUND STRUCTURE 1	Bridge	2020-09-24	1 hr 30min	Partly Sunny	26	Repair scour at north abutment and piers.	2 years			
222	RHVP NORTHBOUND STRUCTURE 2	Bridge	2020-09-24	2hr 30min	Partly Sunny	26	Close box girder hatch and install new bolts. Repair scours in front of south abutment and southeast embankment. Clean/remove debris from joint seals.	1 year 2 years 2 years			
224	PEDESTRIAN BRIDGE OVER QEW (RED HILL CREEK EXPRESSWAY TRAIL)	Bridge	2020-09-24	2hr 20min	Partly Sunny	26	Repair scour at east approach slab. Rectify trip hazard at east approach sidewalk	1 year 1 year			
282	LONGWOOD RD S	Bridge	2020-10-01	1 hr	Sunny	26			Patch repair on abutment, pier, soffit, approach slab, sidewalk/curbs and barrier wall. Repave approach and deck wearing surface. Construct concrete overlay on deck. Recoat end girder and diaphragms. Replace barrier railings and EJ system.	1 - 5 year	\$3,055,080.00
283	UPPER PARADISE RD	Bridge	2020-09-08	1 hr 30min	Cloudy	17	Patch pothole on south approach on SBL. Replace broken box cover on west barrier wall at north end. Remove debris from EJ. Repair broken section of retaining wall.	2 years 2 years 2 years 2 years			

STRUCTURE ID	STREET NAME	BRIDGE OR CULVERT	OSIM INSPECTION (DATE)	Time	Weather	Temp. (°C)	RECOMMENDED MAINTENANCE	TIMING	RECOMMENDED REHAB./REPLACEMENT	TIMING	ESTIMATED COST
Batch B											
284	GARTH ST	Bridge	2020-09-08	1 hr 15min	Cloudy	17	Replace broken junction box covers and missing bolts. Patch potholes. Remove debris from seals. Repair pedestrian trip hazard on SW approach sidewalk.	2 years 1 year 2 years 1 year			
285	WEST 5TH ST	Bridge	2020-09-09	1 hr 15min	Cloudy	16	Replace missing railing bolts on barrier walls. Replace missing railing bolts on SBGR.	2 years 2 years			
286	UPPER JAMES ST	Bridge	2020-09-09	1 hr 15min	Cloudy	16	Remove/clean bird droppings behind bearings.	2 years			
287	UPPER WELLINGTON ST	Bridge	2020-09-09	1 hr 15min	Cloudy	16	Repair trip hazard @ SE & fill void @ SW. Replace missing cover plate at NE light pole. Replace damaged wooden post. Clean joint seals.	1 year 2 years 2 years 2 years			
288	UPPER WENTWORTH ST	Bridge	2020-09-09	1 hr 20min	Cloudy w/ precipitation	16	Remove debris from seals. Remove pedestrian trip hazard at end of SW approach sidewalk.	2 years 1 year			
289	UPPER SHERMAN AV	Bridge	2020-09-18	2 hrs	Sunny	15	Patch pothole on north approach. Remove debris from seals. Scale delam on east barrier wall over LINC traffic lanes.	2 years 2 years NOW	Repair deteriorated concrete on both east and west barriers walls.	< 1 year	\$45,600.00
290	UPPER GAGE AV	Bridge	2020-09-18	1 hr 15min	Sunny	15	Replace missing cover on light pole. Replace missing bolts. Remove debris from seals. Eliminate trip hazard at north and south end of east approach sidewalk.	2 years 2 years 2 years 2 years			
291	UPPER OTTAWA ST	Bridge	2020-09-18	1 hr 15min	Sunny	15	Replace missing railing bolts and broken end cap. Clear tree branches that encroach bridge at southwest embankment. Remove debris from seals. Replace leaking seals.	2 years 2 years 2 years 2 years			

STRUCTURE ID	STREET NAME	BRIDGE OR CULVERT	OSIM INSPECTION (DATE)	Time	Weather	Temp. (°C)	RECOMMENDED MAINTENANCE	TIMING	RECOMMENDED REHAB./REPLACEMENT	TIMING	ESTIMATED COST
Batch B											
293	MOHAWK RD	Bridge	2020-09-03	1 hr 30min	Sunny	26	Replace missing bolts on south junction box. Replace bolt on 3rd post from north at east rail. Reset broken south concrete slope paving. Remove debris from seals.	2 years 2 years 2 years 2 years			
324	KING ST E	Bridge	2020-09-23	1 hr 30min	Sunny	25	Patch pothole at west approach. Remove debris from north deck drain. Remove debris from joint seals. Remove trip hazard on northeast sidewalk.	2 years 2 years 2 years 2 years	Repair deteriorated concrete on sidewalks, centre median, and barrier walls, and resurface asphalt wearing surface. Repair/reconstruct EJ at Northwest Corner on Curb and Sidewalk.	6 - 10 year	\$193,278.00
325	QUEENSTON RD	Bridge	2020-09-23	1 hr 45min	Sunny	25	Remove debris atop west abutment seat. Replace missing bolts on junction box. Replace damaged section at NE SBGR. Replace missing bolts on railings. Remove debris from deck drains under maintenance. Patch potholes on bridge deck under maintenance. Replace missing bolt on west joint armoring at southwest approach. Remove debris from joint seals. Patch potholes at east approach under maintenance.	2 years 2 years 2 years 2 years 2 years 1 year 1 year 2 years 1 year	Patch repair on sidewalks & curbs, & soffit. Replace longitudinal seal and barrier railings. Repave asphalt & replace waterproofing on deck. Repave approach roads.	1 - 5 year	\$809,888.00
373	STONE CHURCH RD	Culvert	2020-09-16	1 hr 10min	Partly Sunny	23					
377	KING ST E	Culvert	2020-09-22	1 hr 45min	Partly Sunny	22	Remove tree debris from south inlet.	2 years			
378	BARTON ST E	Bridge	2020-09-23	2 hrs 10min	Sunny	25	Replace missing bolts on railings. Replace missing section on north railing and secure rail to posts. Remove debris from joint seals. Patch core hole on north sidewalk.	2 years 2 years 2 years 2 years			
459	PEDESTRIAN TUNNEL UNDER LINCOLN M. ALEXANDER PY (GREENCEDAR DR)	Bridge	2020-09-08	1 hr 40min	Cloudy	17	Replace broken fence cap on north fence (EB Bridge) at west end.	2 years	Repair deteriorated concrete on interior and exterior barrier walls.	1 - 5 year	\$34,820.00

STRUCTURE ID	STREET NAME	BRIDGE OR CULVERT	OSIM INSPECTION (DATE)	Time	Weather	Temp. (°C)	RECOMMENDED MAINTENANCE	TIMING	RECOMMENDED REHAB./REPLACEMENT	TIMING	ESTIMATED COST
Batch B											
460	PEDESTRIAN BRIDGE OVER LINCOLN M. ALEXANDER PY (FIONA CRES)	Bridge	2020-09-09	1 hr 15min	Cloudy	16	Replace missing junction box cover on north lamp post.	2 years			
461	LINCOLN M. ALEXANDER PY CULVERT	Culvert	2020-09-16	1 hr	Partly Sunny	23	Repair pothole under maintenance.	2 years			
462	DARTNALL ON-RAMP TO WB LINC	Culvert	2020-09-16	1 hr	Partly Sunny	23	Repair scour southwest and northeast embankments.	2 years			
463	DARTNALL ON-RAMP TO WB LINC	Culvert	2020-09-16	1 hr	Partly Sunny	23					
465	PEDESTRIAN BRIDGE OVER HWY 403	Bridge	2020-10-01	2 hrs 50min	Sunny	26	Scale loose concrete on girders over Hwy 403 WB. Eliminate pedestrian trip hazard at east end.	NOW 1 year			
467	PRITCHARD RD	Bridge	2020-09-16	1 hr 40min	Partly Sunny	23	Replace outward leaning posts on damaged section at northeast approach guiderail. Repair damaged steel beam section at northeast.	2 years 2 years			
468	DARTNALL RD	Bridge	2020-09-18	1 hr 15min	Sunny	15	Replace missing bolts on east railing. Tighten loose bolt on northwest approach guiderail. Remove debris from joint seals.	2 years 2 years 2 years			
475	PEDESTRIAN BRIDGE OVER LINCOLN M. ALEXANDER PY (ARBOUR RD)	Bridge	2020-09-18	1 hr 30min	Sunny	15	Replace missing timber section. Replace missing screws at centre pier steel plate.	2 years 2 years			

STRUCTURE ID	STREET NAME	BRIDGE OR CULVERT	OSIM INSPECTION (DATE)	Time	Weather	Temp. (°C)	RECOMMENDED MAINTENANCE	TIMING	RECOMMENDED REHAB./REPLACEMENT	TIMING	ESTIMATED COST
Additional											
7	CONCESSION 7 W	Culvert	2020-09-04	1 hr	Partly Sunny	23			Replace culvert. Install new guiderail, gabion retaining walls and riprap. Repave approach road and roadway atop culvert.	6 - 10 year	\$243,890.00
8	WILSON ST W	Culvert	2020-09-04	35min	Partly Sunny	23	Fix leaning sign. Reconnect post and replace damaged sections.	1 year 1 year	Repair deteriorated concrete in barrel. Construct a headwall at the inlet/out.	6 - 10 year	\$201,500.00
108	INDIAN TL	Culvert	2020-09-04	1 hr	Partly Sunny	23	Replace hazard marker signs at NE and SW corners. Replace/repair locally damaged sections.	1 year 1 year	Replace culvert barrel, headwall and wingwalls.	1 - 5 year	\$250,200.00
111	MINERAL SPRINGS RD	Culvert	2020-09-11	35min	Sunny	16	Patch potholes on approach and deck wearing surface. Trim tree branches on east railing at north end. Repair scour at northeast exposed end of culvert.	1 year 2 years 2 years	Repave approach and deck wearing surface. Repair deteriorated concrete on barrier posts, curbs, barrel, and retaining wall. Repair deteriorated steel on railings.	1 - 5 year 6 - 10 year	\$77,211.00
113	SULPHUR SPRINGS RD	Culvert	2020-09-11	1 hr	Sunny	16	Smoothen uneven gravel surface. Repack bottom of gabion wall.	1 year 1 year	Replace timber post delineators with SBGR. Replace NE gabion RW & repair deteriorated concrete in culvert barrel & inlet components, & excavate and reconnect dislodged CSP on south wall.	1 - 5 year	\$569,700.00
150	TAPLEYS TOWN RD	Bridge	2020-09-10	1 hr	Cloudy	16			Repair/replace deteriorated steel girders. Repair structural steel coating and deteriorated concrete on deck interior and exterior soffit.	6 - 10 year	\$261,650.00
151	PEDESTRIAN BRIDGE OVER CREEK (PARKSIDE DR)	Bridge	2020-09-04	1 hr	Partly Sunny	23	Repair scour and replace broken gabion baskets.	2 years			
159	REGIONAL 56 RD	Culvert	2020-10-01	40min	Sunny	26	Replace sign at northwest corner. Replace missing post.	2 years 2 years	Replace culvert barrel. If culvert is not replaced, installation of temporary supports struts is recommended. Repave asphalt wearing surface atop culvert and approaches. Replace Northwest & Southwest gabions walls. Install gabions at Northeast and Southeast ends.	1 - 5 year	\$590,420.00
258	WINDWOOD DR	Culvert	2020-10-01	35min	Sunny	26					
259	WHITWELL WAY	Culvert	2020-10-01	45min	Sunny	26					
260	GREAT OAK TRAIL	Culvert	2020-10-01	30min	Sunny	26					
261	UPPER JAMES ST	Culvert	2020-09-25	1 hr 10min	Sunny	26	Repair torn steel section of SBGR at northwest end.	1 year			
277	OLD DUNDAS RD	Culvert	2020-09-01	1 hr 30min	Partly Sunny	25	Repair scour at southwest and southeast corners of railing.	2 years	Repair deteriorated concrete areas in culvert barrel.	6 - 10 year	\$32,950.00

STRUCTURE ID	STREET NAME	BRIDGE OR CULVERT	OSIM INSPECTION (DATE)	Time	Weather	Temp. (°C)	RECOMMENDED MAINTENANCE	TIMING	RECOMMENDED REHAB./REPLACEMENT	TIMING	ESTIMATED COST
Additional											
294	ROUSSEAU ST	Culvert	2020-09-01	1 hr	Partly Sunny	25	Replace damaged hazard sign at end of northeast SBGR. Replace damaged steel offset post and missing bolt. Fill scour between end of concrete post and south sidewalk.	1 year 2 years 1 year	Repair deteriorated concrete in culvert barrel.	1 - 5 year	\$70,000.00
346	CENTRE RD	Bridge	2020-09-04	1 hr 20min	Partly Sunny	23	Remove all loose stone facing off railing posts.	2 years	Replace girder 5 and 6 from east & patch repair remaining girders, repave asphalt , replace overlay with new structural slab, replace railing system & sidewalk.	1 - 5 year	\$551,575.00
350	CENTRE RD	Bridge	2020-09-04	1 hr	Partly Sunny	23	Repair steel beam guiderail.	2 years	Patch repair deck, repave asphalt and replace waterproof system. Repave approach road. Replace railings Repair soffit.	1 - 5 year	\$170,350.00
397	GLANCASTER RD	Culvert	2020-09-25	40 min	Sunny	26	Repair scour at west embankment.	2 years	Install new barrier system at east and west end and new gabion baskets at all four quadrants.	1 - 5 year	\$32,000.00
403	HARRISON RD	Culvert	2020-09-25	30 min	Sunny	26			Replace culvert, inlet & outlet components, wearing surface. Temporarily remove & salvage new SBGR.	6 - 10 year	\$568,125.00