# Appendix “A”

# Detailed Condition Survey Report



BRIDGE CHECK CANADA

*Your Bridge & Concrete Inspection Specialists*

# DETAILED CONDITION SURVEY REPORT

**Site No. 1-0049-00, Johnson Bridge**
**County of Brant, ON**

**Prepared for: County of Brant**

**BCC Project No.: BCC17049**
**Report Date: February 28, 2018**



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# Structure Identification Sheet

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## STRUCTURE IDENTIFICATION SHEET

**GENERAL INFORMATION**

| | | | |
|---|---|---|---|
| **STRUCTURE NAME** | Johnson Bridge | | |
| **SITE NUMBER** | 1-0049-00 | **DISTRICT NUMBER** | N/A |
| **HIGHWAY above** | Lynden Road | **Below** | N/A |
| **TYPE OF STRUCTURE** | Reinforced cast-in-place concrete slab over conrcete T-beams | | |
| **NUMBER OF SPANS** | 3 | **SPAN LENGTHS** | 3.66m, 7.32m, 3.66m |
| **ROADWAY WIDTH** | 9.14m (overall width=10.2m) | **YEAR BUILT** | 1953 |
| **DIRECTION OF STRUCTURE** | East-to-West | | |
| **SEQUENCE NUMBER** | N/A | **TOWNSHIP NUMBER** | N/A |
| **LHRS NUMBER** | N/A | **MUNICIPAL BRIDGE NUMBER** | N/A |
| **LOCATION** | 2.2km East of Garden Ave | **JURISDICTION** | County of Brant |
| **INSPECTOR'S NAME** | Alireza Keramati, P.Eng. | | |
| **PARTY MEMBERS** | M.Abdollahi, M.Mahyar, A.Bahrampour, J.Murray, JP.Basto | | |
| **DATE OF INSPECTION** | 1-Nov-17 | | |
| **TEMPERATURE** | 8 °C | **WEATHER** | sunny |
| **MTO REGION** | Southwestern | **AADT** | 2550 |
| **DECK RIDING SURFACE** | Asphalt with waterproofing | | |
| **YEAR LAST REHABILITATED** | N/A | | |

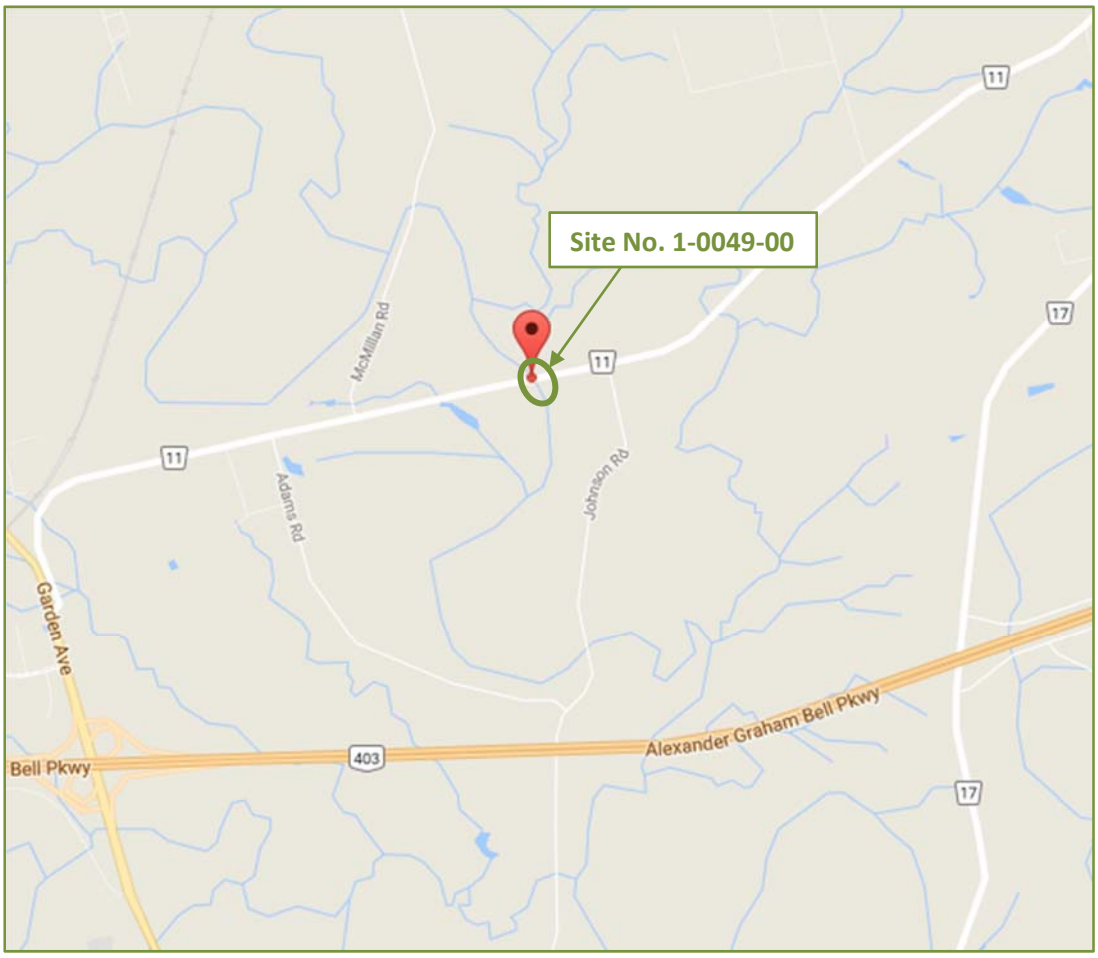
**ENGINEER'S STAMP**



# Key Plan

## KEY PLAN

**Site No. 1-0049-00, Johnson Bridge**
**County of Brant, ON**






# Summary of Significant Findings

## SUMMARY OF SIGNIFICANT FINDINGS
### *Site No. 1-0049-00, Johnson Bridge, County of Brant, Ontario*

### 1.0 INTRODUCTION

*Bridge Check Canada Ltd.* was retained by the County of Brant under Quote No. PW-RFQ-17-17 to carry out detailed bridge condition surveys for a total of four structures. This report presents *Bridge Check Canada Ltd.*'s findings, through the field investigations and laboratory testing, for Johnson Bridge (Site No. 1-0049-00). The site is located on Lynden Road, 2.6 km east of Garden Avenue in County of Brant, ON. First-time field investigations were carried out on November 1, 2017.

This structure, constructed in 1953, is a three-span reinforced cast-in-place concrete slab over precast concrete T-beams, overlain with asphalt wearing surface and carries one traffic lane per direction of Lynden Road. The bridge cross section consists of nine concrete T-beams.

The span length of the bridge is 14.64 m and the roadway width is 9.14 m (overall width=10.2m). The structure has an east-to-west orientation. Outer limits of the structure have concrete curbs and handrails. Photo P1 shows a view of the south elevation; and Photo P2 shows the north elevation.



**South Elevation of Site No. 1-0049-00, Johnson Bridge**

Rehabilitated history of the bridge was not available.

## 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.

Delaminations in the concrete were detected by striking the surface with a heavy hammer and noting the type of sound being emitted. It should be mentioned 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, concrete curbs and concrete handrails. 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.

Ten (10) cores {nine cores from the deck and one core in the west approach} and nine (9) sawn asphalt samples were extracted from this 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 Covered Deck

The width of the asphalt covered bridge deck at abutments was 9.14 m, with a total surveyed area of 133.81 $m^2$. 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 deterioration as well as the location of the cores and sawn asphalt samples. The general pavement surface condition is shown in Photos P3 to P6. The asphalt wearing surface on the concrete deck was generally in fair condition with unsealed cracks (44.0 m), sealed cracks (82.0 m), potholes/patches (1.20 $m^2$) and ravelling. Minor rutting was noted on the surface. The total asphalt thickness, measured in the drilled holes, coreholes, and sawn asphalt samples, varied from 25 mm to 60 mm with an average thickness of 47 mm (refer to Drawing 2).

Three asphalt samples (from Cores C1, C3, C8) were tested for asbestos content. The testing was conducted according to US EPA 600 R93-116 test method using Polarized Light Microscopy. Results indicated that the asphalt samples did not contain asbestos.

### 3.2 Waterproofing

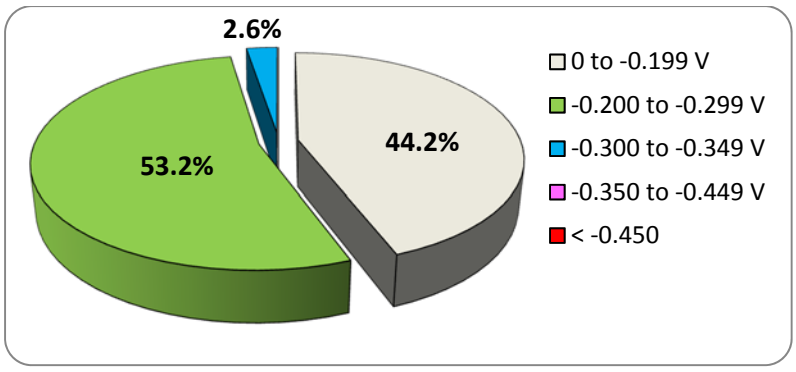
Evidence of a hot rubberized asphalt waterproofing system with protection board was detected over the concrete deck, ranging in thickness from 2 to 4 mm and an average thickness of 3 mm. The condition of the waterproofing membrane encountered in the test locations was generally fair. The bond of waterproofing to the concrete was generally fair-to-pour.

### 3.3 Concrete Deck

The concrete deck consists of a three-span reinforced cast-in-place concrete slab over precast concrete T-beams, supported by abutments and steel piers. The condition of the concrete deck was observed at nine (9) core locations and nine (9) sawn asphalt sample locations. The inside of the coreholes and the exposed concrete surface at the sawn asphalt sample locations were examined carefully for cracks and other defects. Photos P62 to P70 show the inside of the coreholes. A review of the concrete cores revealed light scaling on the surface of Core C3. Visual review of the exposed concrete surface at the sawn asphalt samples revealed narrow cracking in SS1 and SS2; and light scaling was noted in SS3 and SS5. Refer to the core and sawn asphalt sample logs and photos.

The concrete cover to the upper rebar layer measured in the cores and sawn asphalt samples ranged from 40 to 110 mm with an average cover of 78 mm. Light rusting of the reinforcing steel was found in Core C5.

Corrosion potential values obtained from the half-cell test carried out on the asphalt covered deck ranged from -0.122 V to -0.323 V with an average value of -0.209 V. The half-cell survey indicated that 44.2% of the deck area likely had no corrosion activity, with corrosion potential values between 0.000 V and -0.199 V. The half-cell survey indicated uncertain low corrosion activity for 55.8% (53.2%+2.6%) of the deck area, with values ranging from -0.200 V to -0.349 V. Drawing 2 shows the corrosion potential readings in deck.




**Corrosion Potential Distribution in Deck**

Core C2 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 62.1 MPa. This value is significantly higher than the minimum strength of 30 MPa specified on the GA drawing.

The chloride ion content was determined for four (4) 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. high corrosion potential areas, 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. | C3 | C4 | C5 | C7 |
|---|---|---|---|---|
| **Corrected Chloride Content (%)*** | 0.010 | 0.004 | 0.016 | 0.018 |
| **Corrosion Potential (V)** | -0.170 | -0.24 | -0.296 | -0.181 |

* Background chloride ion content was estimated to be 0.037% (lowest value from all horizons tested).

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 below the chloride threshold level of 0.025% in all tested cores. Overall, the results indicate that chloride contamination has not yet extended to the upper rebar level in deck.

Based on the concrete removal policy outlined in the Structure Rehabilitation Manual, the following comments can be made:

- Since less than 10% of the deck area is more negative than -0.350 V, the average chloride content at the reinforcing level is calculated using all the cores. Therefore, the average adjusted chloride content at the reinforcing steel level is 0.012%.
- Based on the above, since the average adjusted chloride content at the top reinforcement level is less than 0.05% by mass of concrete, concrete deck removal is recommended to include delaminated areas only.

Since the bridge was constructed prior to 1958, it is assumed that the concrete was not air-entrained and therefore air void testing was not conducted.

### 3.4 Deck Soffit and Girders

Inspection of the deck soffit and girders was carried out visually. The deterioration is shown on Drawing 3 and in Photos P7 to P20.

The bridge deck soffit, with a total surveyed area of 139.13 $m^2$, was in fair condition with clean/stained medium width cracks (62.0 m), narrow pattern cracks (49.2 $m^2$), delaminations (2.80 $m^2$), spalls (0.85 $m^2$),

and wet areas (1.75 $m^2$). Narrow pattern cracking and light rust staining from the reinforcing chairs were noted on the soffit. Severe corrosion was observed on deck drains.

The concrete girders, with a total surveyed area of 89.37 $m^2$, were in fair condition with clean medium width cracks (26.0 m), narrow pattern cracks (24.1 $m^2$), spalls (0.10 $m^2$), and wet areas (1.20 $m^2$). Narrow pattern cracking and light rust staining from the reinforcing chairs were noted on the soffit.

### 3.5 Bridge Approaches

Photos P21 and P22 show the general condition of the bridge approaches. The asphalt on the approaches was in fair condition with unsealed/sealed cracks, patches/potholes and ravelling. Core C1 was taken from the west approach. Photo P61 shows the inside of corehole C1. Granular material was encountered beneath the asphalt in Core C1 (i.e. no concrete approach slab). Asphalt thickness in C1 was 140 mm.

### 3.6 Deck Drainage

Four deck drains were located on the bridge, each having a 250 mm ø and a 1,000 mm length (Photos P23 to P26). Catch basins were observed at NW and SW quadrants outside structure limits (Photos P27 and P28). Severe corrosion was observed on deck drains.

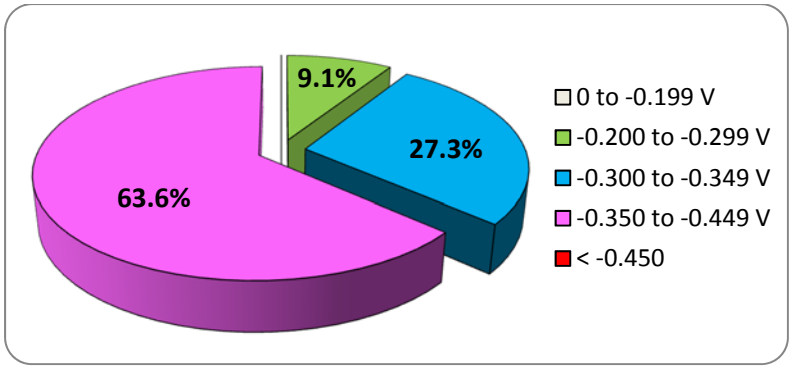
### 3.7 Deck Joints

The joints were paved over. Photos P29 and P30 show the pavement condition over the joints, exhibiting sealed/unsealed cracks and patches/potholes.

### 3.8 Concrete Handrails

The interior face of the concrete handrails, with a total surveyed area of 19.00 $m^2$, was in fair condition with clean medium width cracks (10.0 m), delaminations (0.23 $m^2$), spalls (0.10 $m^2$) and light scaling (0.45 $m^2$). The surface deterioration is shown on Drawing 1 and in Photos P31 to P38. The concrete cover ranged from 51 mm to 71 mm with an average cover of 62 mm, as shown on Drawing 2.

Corrosion potential values obtained from the half-cell test carried out on the concrete handrails ranged from -0.254 V to -0.413 V with an average value of -0.358 V. The half-cell survey indicated uncertain low corrosion activity for 36.4% (9.1%+27.3%) of the handrail area, with values ranging from -0.200 V to -0.349 V. Probable active corrosion was detected for 63.6% (63.6%+0.0%) of the handrail area with corrosion potential values more negative than -0.350 V. Drawing 2 shows the corrosion potential readings in the concrete handrails.

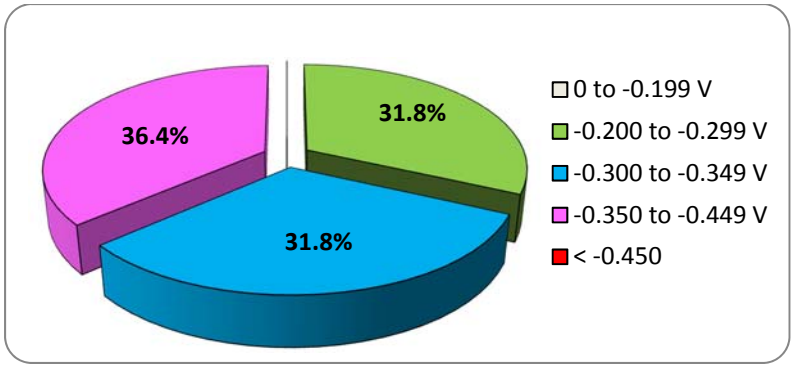



**Corrosion Potential Distribution in the Concrete Handrails**

### 3.9 Concrete Curbs

The concrete curbs, with a total surveyed area of 23.72 $m^2$, were in fair condition with clean medium width cracks (9.0 m), spalls (0.10 $m^2$) and light scaling (0.48 $m^2$). The surface deterioration is shown on Drawing 1 and in Photos P31 to P38. The concrete cover ranged from 69 mm to 92 mm with an average cover of 82 mm, as shown on Drawing 2.

Corrosion potential values obtained from the half-cell test carried out on the concrete curbs ranged from -0.205 V to -0.375 V with an average value of -0.312 V. The half-cell survey indicated uncertain low corrosion activity for 63.6% (31.8%+31.8%) of the curb area, with values ranging from -0.200 V to -0.349 V. Probable active corrosion was detected for 36.4% (36.4%+0.0%) of the curb area with corrosion potential values more negative than -0.350 V. Drawing 2 shows the corrosion potential readings in the concrete curbs.




**Corrosion Potential Distribution in the Concrete Curbs**

### 3.10 Steel Guiderails

The steel beam guiderails were in good condition (Photos P39 to P42).

## 4.0 SUBSTRUCTURE COMPONENTS

The abutment walls, wingwalls, and retaining walls were inspected and hammer sounded, where accessible, to check for delaminations. 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. The total surveyed area for the east and west abutments were 39.90 $m^2$ and 27.40 $m^2$, respectively. The deterioration is shown on Drawing 4. General views of the abutment walls are shown in Photos P43 to P48. The abutment walls were generally in fair-to-poor condition. The field investigation of the east abutment wall revealed clean/stained medium width cracks (51.0 m), delaminations (2.10 $m^2$), spalls (0.25 $m^2$), patches (0.45 $m^2$), light scaling (0.65 $m^2$), medium scaling (0.45 $m^2$), honeycombing (0.85 $m^2$) and wet areas (5.40 $m^2$). The field investigation of the west abutment wall revealed clean/stained medium width cracks (19.0 m), stained wide width cracks (1.0 m), delaminations (1.20 $m^2$), light scaling (0.10 $m^2$), medium scaling (0.25 $m^2$), honeycombing (0.35 $m^2$) and wet areas (1.45 $m^2$).

### 4.2 Wingwalls

A detailed visual inspection of the NE and NW wingwalls was carried out. The deterioration is shown on Drawing 4 and in Photos P49 to P52.

The wingwalls, with a total surveyed area of 22.78 $m^2$, were in fair-to-poor condition with clean/stained medium width cracks (25.0 m), stained wide width cracks (1.0 m), pattern cracks (0.91 $m^2$), delaminations (0.25 $m^2$), spalls (0.15 $m^2$), severe scaling (1.99 $m^2$), light scaling (0.11 $m^2$), honeycombing (0.15 $m^2$) and wet areas (3.81 $m^2$).

### 4.3 Retaining Walls

A detailed visual inspection of the SW and SE retaining walls was carried out. The deterioration is shown on Drawing 4 and in Photos P53 and P54.

The retaining walls, with a total surveyed area of 15.86 $m^2$, were in fair condition with clean/stained medium width cracks (3.0 m), delaminations (0.20 $m^2$), light scaling (1.18 $m^2$) and honeycombing (0.65 $m^2$).

### 4.4 Steel Piers

The steel piers were in fair-to-good condition exhibiting light-to-medium corrosion, as shown in Photos P55 and P56.

One paint sample, of west steel pier, was tested for Lead content. The testing was analysis by ASTM D3335-85a by AAS. Results (% by Weight) for the sample tested is reported as 2.7.

### 4.5 Slopes

The embankment slopes were in fair condition with evidence of soil erosion (Photos P57 to P60).

## 5.0 RECOMMENDATIONS

A structural engineer should be engaged to complete preliminary design report before preparing contract documents.

The structure was generally found to be in fair condition. No asbestos was detected in the asphalt. Light scaling was observed in one concrete core. Cracking and light scaling were noted in four sawn asphalt samples. The compressive strength result was significantly above the minimum specified compressive strength. Active corrosion was not detected in deck. The corrected chloride content, at the rebar level, was below the chloride threshold level of 0.025% in all tested cores. The air voids system was assumed to be non-air entrained. Light rusting of the reinforcing was found in one core only. Concrete deck removal is recommended to include delaminated areas only.

The waterproofing system was in fair-to-poor condition. New waterproofing and paving are recommended.

The concrete curbs and barrier walls, though substandard, were in fair condition. They should be repaired in 5 years.

The deteriorated, delaminated and spalled areas of the soffit, girders, abutments, wingwalls, and retaining walls should be repaired in 3-5 years as part of the routine maintenance.

Routine maintenance should be considered for the structure.

# Appendix A:

## Detailed Condition Survey Summary Sheets

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

ASPHALT COVERED DECK

DECK RIDING SURFACE

**Site No. 1-0049-00**

## 1. Dimensions and Area of Survey

| | | | |
|---|---|---|---|
| Width between E abutment curbs | 9.14 m | Width between W abutment curbs | 9.14 m |
| Length between abutment joints | 14.64 m | Area of deck riding surface | 133.81 m² |

**Remarks**

Deck dimensions were taken from the structural drawings

## 2. Asphalt Surface Cracks

| Orientation | Unsealed | Sealed | |
|---|---|---|---|
| **Transverse** | 10.0 | 22.0 | **m** |
| **Longitudinal** | 12.0 | 11.0 | **m** |
| **Random** | 22.0 | 49.0 | **m** |

* Asphalt potholes/patches = 1.20 m²
* Asphalt Alligator Cracks = 0.00 m²
* Asphalt Ravelling = 0.00 m²

## 3. Asphalt Depth

**Remarks**

| Condition * | Depth | | | |
|---|---|---|---|---|
| | Min | Max | Avg | |
| F | 25 | 60 | 47 | **mm** |

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

**Remarks**

## 4. Waterproofing

| Type | Condition * | Conc. Bond * | Thickness (mm) ** | | | |
|---|---|---|---|---|---|---|
| | | | Min | Max | Avg | |
| Hot rubberized asphalt with protection board | F | F to P | 2 | 4 | 3 | **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. 1-0049-00**

## 5. Concrete Cover – Cores and Sawn Samples

**Remarks**

| Minimum | Maximum | Average | |
|---|---|---|---|
| 40 | 110 | 78 | mm |

Note: Only include covers for upper layer of rebars.

## 6. Corrosion Activity

**Remarks**

| Minimum | Maximum | Average | |
|---|---|---|---|
| -0.122 | -0.323 | -0.209 | V |

| 0 to -0.20 | -0.20 to -0.30 | -0.30 to -0.35 | -0.35 to -0.45 | < -0.45 | V |
|---|---|---|---|---|---|
| 59.1 | 71.2 | 3.5 | 0.0 | 0.0 | $m^2$ |
| 44.2 | 53.2 | 2.6 | 0.0 | 0.0 | % |

**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** | 5 | 1 | 11.8 | 8.8 | 0 | 0.0 | 0.0 |
| **-0.20 to -0.30** | 12 | 2 | 11.9 | 8.9 | 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** | 0 | 0 | 0.0 | 0.0 | 0 | 0.0 | 0.0 |
| **<-0.45** | 0 | 0 | 0.0 | 0.0 | 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. 1-0049-00**

## 8. Adjusted Chloride Content Profile

*Background chloride content = 0.037

**Remarks**

| Corrosion Activity at Core Location | | 0 to -0.20 | -0.20 to -0.35 | ≤-0.35 |
|---|---|---|---|---|
| Chloride Content* | 0-10 mm | 0.120 | 0.060 | - |
| | 20-30 mm | 0.088 | 0.032 | - |
| | 40-50 mm | 0.034 | 0.018 | - |
| | 60-70 mm | 0.016 | 0.013 | - |
| | 80-90 mm | 0.010 | 0.016 | - |
| | 100-110 mm | - | 0.007 | |
| | 120-130 mm | - | 0.000 | - |

* 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. | C3 | C4 | C5 | C7 | | | |
|---|---|---|---|---|---|---|---|
| Chloride Content* | 0.010 | 0.004 | 0.016 | 0.018 | | | |
| Corrosion Potential | -0.170 | -0.24 | -0.296 | -0.181 | | | |
| 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. 1-0049-00**

**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

Concrete Air Entrained? not tested

## 13. Compressive Strength

Average Compressive Strength **62.1 MPa**

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

**Site No:** 1-0049-00

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

## 1. Dimensions and Area

| | | | | | |
|---|---|---|---|---|---|
| Width | 10.20 m | Length | 13.64 m | Height | - |
| Diameter | - | Total Area Surveyed | | 139.13 m² | |

**Remarks**
Dimensions were taken from the structural drawings & site measurements

## 2. Cracks (medium and wide)

| Type | | Transverse | Longitudinal | Other | Total | |
|---|---|---|---|---|---|---|
| Medium Width | Clean | 5.0 | 18.0 | 30.0 | 62.0 | m |
| | Stained | 2.0 | 6.0 | 1.0 | | |
| Wide Width | Clean | 0.0 | 0.0 | 0.0 | 0.0 | m |
| | Stained | 0.0 | 0.0 | 0.0 | | |

Pattern cracks= 49.2 m²

## 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:** 1-0049-00

**Component Type & Location: Soffit** **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 ($m^2$) | 2.80 | 0.85 | 0.00 |
| Total Delaminations and Spalls | | Total Delaminations and Spalls in Areas ≤-0.35 V | |
| 3.65 m² | 2.6 % | N/A | N/A |

*Wet areas = 1.75 m²

## 7. Scaling

**Remarks**

| Light | Medium | Severe to Very Severe | |
|---|---|---|---|
| 0.00 | 0.00 | 0.00 | $m^2$ |
| 0.0 | 0.0 | 0.0 | % |

## 8. Honeycombing

Total Area 0.00 m²

**Site No:** **1-0049-00**

**Component Type & Location: Soffit** **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 #2 | | | | | |
| Connection #1 | 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:** **1-0049-00**

**Component Type & Location: Soffit**

**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:** 1-0049-00

**Component Type & Location: Girders** **OSIM Identifier: Beams**

## 1. Dimensions and Area

| | | | | | |
|---|---|---|---|---|---|
| Width | 0.50 m | Length | 6.62 m x 9 | Height | 0.50 m x 2 |
| Diameter | - | Total Area Surveyed | | 89.37 m² | |

**Remarks**

Dimensions were taken from the structural drawings & site measurements

## 2. Cracks (medium and wide)

| Type | | Vertical | Horizontal | Diagonal | Total | |
|---|---|---|---|---|---|---|
| Medium Width | Clean | 22.0 | 0.0 | 2.0 | 26.0 | m |
| | Stained | 0.0 | 1.0 | 1.0 | | |
| Wide Width | Clean | 0.0 | 0.0 | 0.0 | 0.0 | m |
| | Stained | 0.0 | 0.0 | 0.0 | | |

Pattern cracks= 24.1 m²

## 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:** 1-0049-00

**Component Type & Location: Girders** **OSIM Identifier: Beams**

**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 | 0.10 | 0.00 |
| Total Delaminations and Spalls | | Total Delaminations and Spalls in Areas ≤-0.35 V | |
| 0.10 m² | 0.1 % | N/A | N/A |

*Wet areas = 1.20 m²

**Remarks**

## 7. Scaling

| Light | Medium | Severe to Very Severe | |
|---|---|---|---|
| 0.00 | 0.00 | 0.00 | $m^2$ |
| 0.0 | 0.0 | 0.0 | % |

## 8. Honeycombing

Total Area 0.00 m²

**Site No:** **1-0049-00**

**Component Type & Location: Girders** **OSIM Identifier: Beams**

**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 #2 | | | | | |
| Connection #1 | 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:** **1-0049-00**

**Component Type & Location: Girders** **OSIM Identifier: Beams**

**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:** **1-0049-00**

**Component Type & Location: North & South Curbs** **OSIM Identifier: Sidewalks/curbs**

## 1. Dimensions and Area

| | | | | | |
|---|---|---|---|---|---|
| Width | 0.53 m | Length | 14.64 m x 2 | Height | 0.28 m |
| Diameter | - | Total Area Surveyed | | 23.72 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 | 0.0 | 1.0 | 9.0 | **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

**Remarks**

| Minimum | Maximum | Average | |
|---|---|---|---|
| 69 | 92 | 82 | **mm** |

| | | | | |
|---|---|---|---|---|
| **0 – 20 mm** | 0.0 | **40 – 60 mm** | 0.0 | $m^2$ |
| | 0.0 | | 0.0 | % |
| **20 – 40 mm** | 0.0 | **over 60 mm** | 23.7 | $m^2$ |
| | 0.0 | | 100.0 | % |

**Site No:** 1-0049-00

**Component Type & Location: North & South Curbs** **OSIM Identifier: Sidewalks/curbs**

**Remarks**

## 5. Corrosion Activity

| Minimum | Maximum | Average | |
|---|---|---|---|
| -0.205 | -0.375 | -0.312 | 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 | 7.5 | 7.5 | 8.6 | 0.0 | $m^2$ |
| 0.0 | 31.8 | 31.8 | 36.4 | 0.0 | % |

**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 | 0.4 % | N/A | N/A |

*Wet areas = 0.00 m²

## 7. Scaling

**Remarks**

| Light | Medium | Severe to Very Severe | |
|---|---|---|---|
| 0.48 | 0.00 | 0.00 | $m^2$ |
| 2.0 | 0.0 | 0.0 | % |

## 8. Honeycombing

Total Area 0.00 m²

**Site No:** **1-0049-00**

**Component Type & Location: North & South Curbs** **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:** 1-0049-00

**Component Type & Location: North & South Curbs**

**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:** 1-0049-00

**Component Type & Location: North & South Handrails** **OSIM Identifier: Barriers**

## 1. Dimensions and Area

| | | | | | |
|---|---|---|---|---|---|
| Width | 0.25 m | Length | 14.64 m x 2 | Height | - |
| Diameter | - | Total Area Surveyed | | 19.00 m² | |

**Remarks**

Dimensions were taken from the structural drawings & site measurements

## 2. Cracks (medium and wide)

| Type | | Vertical | Horizontal | Diagonal | Total | |
|---|---|---|---|---|---|---|
| **Medium Width** | **Clean** | 4.0 | 2.0 | 4.0 | 10.0 | **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

**Remarks**

| Minimum | Maximum | Average | |
|---|---|---|---|
| 51 | 71 | 62 | **mm** |

| | | | | |
|---|---|---|---|---|
| **0 – 20 mm** | 0.0 | **40 – 60 mm** | 9.5 | $m^2$ |
| | 0.0 | | 50.0 | % |
| **20 – 40 mm** | 0.0 | **over 60 mm** | 9.5 | $m^2$ |
| | 0.0 | | 50.0 | % |

**Site No:** **1-0049-00**

**Component Type & Location: North & South Handrails** **OSIM Identifier: Barriers**

**Remarks**

## 5. Corrosion Activity

| Minimum | Maximum | Average | |
|---|---|---|---|
| -0.254 | -0.413 | -0.358 | V |

| 0 to -0.20 | -0.20 to -0.30 | -0.30 to -0.35 | -0.35 to -0.45 | < -0.45 | |
|---|---|---|---|---|---|
| 0.0 | 1.7 | 5.2 | 12.1 | 0.0 | $m^2$ |
| 0.0 | 9.1 | 27.3 | 63.6 | 0.0 | % |

## 6. Delaminations and Spalls

**Remarks**

| Defect Type | Delaminations | Spalls | Patches |
|---|---|---|---|
| Area ($m^2$) | 0.23 | 0.10 | 0.00 |
| Total Delaminations and Spalls | | Total Delaminations and Spalls in Areas ≤-0.35 V | |
| 0.33 m² | 1.7 % | 0.2 m² | 0.8 % |

*Wet areas = 0.00 m²

## 7. Scaling

**Remarks**

| Light | Medium | Severe to Very Severe | |
|---|---|---|---|
| 0.45 | 0.00 | 0.00 | $m^2$ |
| 2.4 | 0.0 | 0.0 | % |

## 8. Honeycombing

Total Area 0.00 m²

**Site No:** **1-0049-00**

**Component Type & Location: North & South Handrails** **OSIM Identifier: Barriers**

**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:** **1-0049-00**

**Component Type & Location: North & South Handrails** **OSIM Identifier: Barriers**

**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:** **1-0049-00**

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

**1. Dimensions and Area**

| | | | | | |
|---|---|---|---|---|---|
| Width | 9.80 m | Length | - | Height | - |
| Diameter | - | Total Area Surveyed | | 27.40 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 | 7.0 | 7.0 | 19.0 | m |
| | Stained | 0.0 | 1.0 | 1.0 | | |
| Wide Width | Clean | 0.0 | 0.0 | 0.0 | 1.0 | m |
| | Stained | 0.0 | 0.0 | 1.0 | | |

**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 | - | m² |
| | - | | - | % |
| 20 – 40 mm | - | over 60 mm | - | m² |
| | - | | - | % |

**Remarks**

Table # 4 is Not Applicable.

**Site No:** **1-0049-00**

**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 ($m^2$) | 1.20 | 0.00 | 0.00 |
| Total Delaminations and Spalls | | Total Delaminations and Spalls in Areas ≤-0.35 V | |
| 1.20 $m^2$ | 4.4 % | N/A | N/A |

*Wet areas = 1.45 $m^2$

## 7. Scaling

**Remarks**

| Light | Medium | Severe to Very Severe | |
|---|---|---|---|
| 0.10 | 0.25 | 0.00 | $m^2$ |
| 0.4 | 0.9 | 0.0 | % |

## 8. Honeycombing

Total Area 0.35 $m^2$

**Site No:** **1-0049-00**

**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:** **1-0049-00**

**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: 1-0049-00**

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

## 1. Dimensions and Area

| | | | | | |
|---|---|---|---|---|---|
| Width | 9.80 m | Length | - | Height | - |
| Diameter | - | Total Area Surveyed | | 39.90 m² | |

**Remarks**
Dimensions were taken from the structural drawings & site measurements

## 2. Cracks (medium and wide)

| Type | | Vertical | Horizontal | Diagonal | Total | |
|---|---|---|---|---|---|---|
| Medium Width | Clean | 9.0 | 13.0 | 10.0 | 51.0 | m |
| | Stained | 3.0 | 9.0 | 7.0 | | |
| 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:** **1-0049-00**

**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 ($m^2$) | 2.10 | 0.25 | 0.45 |
| **Total Delaminations and Spalls** | | **Total Delaminations and Spalls in Areas ≤-0.35 V** | |
| 2.35 m² | 5.9 % | N/A | N/A |

*Wet areas = 5.40 m²

## 7. Scaling

**Remarks**

| Light | Medium | Severe to Very Severe | |
|---|---|---|---|
| 0.65 | 0.45 | 0.00 | $m^2$ |
| 1.6 | 1.1 | 0.0 | % |

## 8. Honeycombing

Total Area 0.85 m²

**Site No:** **1-0049-00**

**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 #2 | | | | | |
| Connection #1 | 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:** **1-0049-00**

**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:** 1-0049-00

**Component Type & Location: Wingwalls** **OSIM Identifier: Abutments**

## 1. Dimensions and Area

| | | | | | |
|---|---|---|---|---|---|
| Width | - | Length | 4.52 m x 2 | Height | Avg. 2.52 m |
| Diameter | - | Total Area Surveyed | | 22.78 m² | |

**Remarks**
Dimensions were taken from the structural drawings & site measurements

## 2. Cracks (medium and wide)

| Type | | Vertical | Horizontal | Diagonal | Total | |
|---|---|---|---|---|---|---|
| Medium Width | Clean | 2.0 | 3.0 | 13.0 | 25.0 | m |
| | Stained | 2.0 | 1.0 | 4.0 | | |
| Wide Width | Clean | 0.0 | 0.0 | 0.0 | 1.0 | m |
| | Stained | 0.0 | 0.0 | 1.0 | | |

Pattern cracks= 0.91 m²

## 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:** **1-0049-00**

**Component Type & Location: Wingwalls** **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 ($m^2$) | 0.25 | 0.15 | 0.00 |
| Total Delaminations and Spalls | | Total Delaminations and Spalls in Areas ≤-0.35 V | |
| 0.40 m² | 1.8 % | N/A | N/A |

*Wet areas = 3.81 m²

## 7. Scaling

**Remarks**

| Light | Medium | Severe to Very Severe | |
|---|---|---|---|
| 0.11 | 0.00 | 1.99 | $m^2$ |
| 0.5 | 0.0 | 8.7 | % |

## 8. Honeycombing

Total Area 0.15 m²

**Site No:** **1-0049-00**

**Component Type & Location: Wingwalls** **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 #2 | | | | | |
| Connection #1 | 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:** **1-0049-00**

**Component Type & Location: Wingwalls** **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:** 1-0049-00

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

## 1. Dimensions and Area

| | | | | | |
|---|---|---|---|---|---|
| Width | - | Length | 3.36 m x 2 | Height | Avg. 2.36 m |
| Diameter | - | Total Area Surveyed | | 15.86 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 | 1.0 | 3.0 | 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

| 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:** 1-0049-00

**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 | |
|---|---|---|---|---|---|
| - | - | - | - | - | $m^2$ |
| - | - | - | - | - | % |

## 6. Delaminations and Spalls

**Remarks**

| Defect Type | Delaminations | Spalls | Patches |
|---|---|---|---|
| Area ($m^2$) | 0.20 | 0.00 | 0.00 |
| Total Delaminations and Spalls | | Total Delaminations and Spalls in Areas ≤-0.35 V | |
| 0.20 m² | 1.3 % | N/A | N/A |

*Wet areas = 0.00 m²

## 7. Scaling

**Remarks**

| Light | Medium | Severe to Very Severe | |
|---|---|---|---|
| 1.18 | 0.00 | 0.00 | $m^2$ |
| 7.4 | 0.0 | 0.0 | % |

## 8. Honeycombing

Total Area 0.65 m²

**Site No:** **1-0049-00**

**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 #2 | | | | | |
| Connection #1 | 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:** **1-0049-00**

**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

## CONDITION SURVEY SUMMARY SHEET - EXPANSION JOINTS

**Site No. 1-0049-00**

| Dimension | Abutments | | Intermediate | | Remarks |
|---|---|---|---|---|---|
| | Joint 1 | Joint 2 | Joint 3 | Joint 4 | |
| | E | W | | | |
| a (mm) | *250/530 | *250/530 | - | - | *Top face of concrete / handrails / curb width. |
| b (mm) | 270 | 270 | - | - | |
| b' (mm) | 280 | 280 | - | - | |
| c (mm) | 9140 | 9140 | | - | |
| d (mm) | 270 | 270 | - | - | |
| d' (mm) | 280 | 280 | - | - | |
| e (mm) | *250/530 | *250/530 | - | - | |

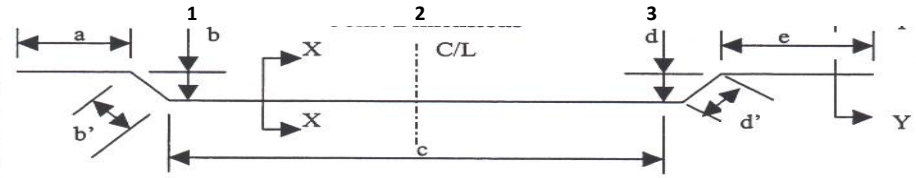
| Depth of Asphalt @ Deck Side | | | N/E | S/E | N/E | S/W |
|---|---|---|---|---|---|---|
| 1 (mm) | 40 | 55 | - | - | - | - |
| 2 (mm) | 50 | 55 | - | - | - | - |
| 3 (mm) | 55 | 50 | - | - | - | - |

| 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 | Yes | Yes | - | - |
| Fixed | - | - | - | - |
| Type | Paved over | | | - |
| Leaking | Yes | Yes | - | - |
| Angle size | - | - | - | - |
| Temp °C | Deck | 8˚C | Ambient | 8˚C |

**N** **JOINT DIMENSIONS** **S**




**Typical Sections at Joints:**

## DRAINAGE

**Site No.** 1-0049-00

| | Number | Type | Length | Angle | Depth * |
|---|---|---|---|---|---|
| **Deck Drains** | 4 | 250mm ø steel pipe | 1000mm | N/A | 50mm |

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

| | | |
|---|---|---|
| **Catch Basins** | YES | N/W x 1,<br>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 @ South-West



Typical Condition of Deck Drain @ North-East

# Appendix B:

## Survey Equipment and Calibration Procedures

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

# SURVEY EQUIPMENT AND CALIBRATION PROCEDURES

**Component Type:** Asphalt Covered Bridge Deck **Site Number:** 1-0049-00

**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:** | @ 'SS2' |
| | **Actual Depth and Rebar Diameter:** | - |
| | **Reading Before Test:** | 85 mm |
| | **Readings Each 30 minutes During Test:** | 85 mm |
| | **Reading at End of Test:** | 85 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:** | 8 | **°C** | **End of Test:** | 8 | **°C** |
| **Ambient Temperature:** | **Start of Test:** | 8 | **°C** | **End of Test:** | 8 | **°C** |

**Battery Check:** O.K.

| | | | | |
|---|---|---|---|---|
| **Ground Check:** | **Method of Connection:** | self-tapping screw | | |
| | **Ground Location:** | @ Core C3 | **Check Location:** | @ Core C7 |
| | **Lead Resistance:** | 1.8 Ω | **Voltage Drop (mV's):** | 0.9 |
| | **Resistance [c]:** | 1.8 Ω | **Resistance Reversed:** | 1.8 Ω |

**Grid Point Potential Readings Check – See Table Below**

| Location | Initial Reading | Check Reading [a] | Check Reading – Latex Concrete Overlay [b] |
|---|---|---|---|
| G1 | -0.229 | -0.229 | - |
| G2 | -0.232 | -0.232 | - |
| G3 | -0.232 | -0.233 | - |
| G4 | -0.223 | -0.224 | - |
| G5 | -0.240 | -0.240 | - |

[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.

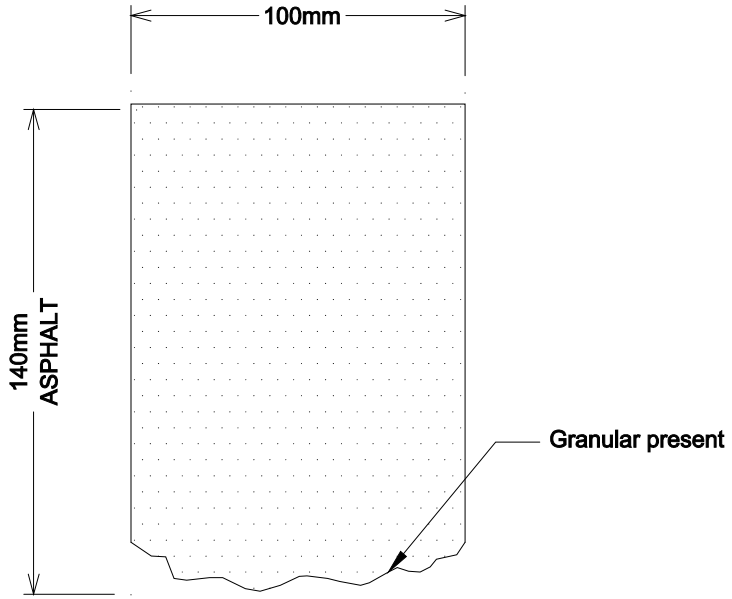
# Appendix C:

## Core Photographs and Sketches

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

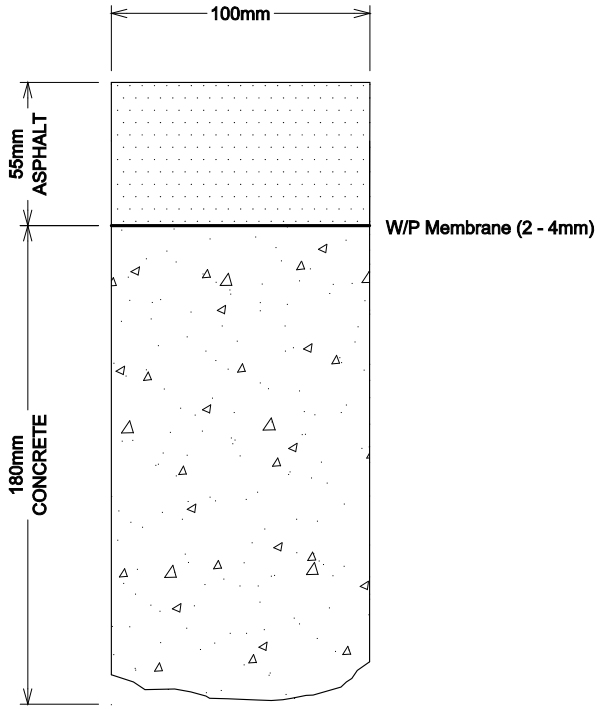
## Core C1





## Core C2

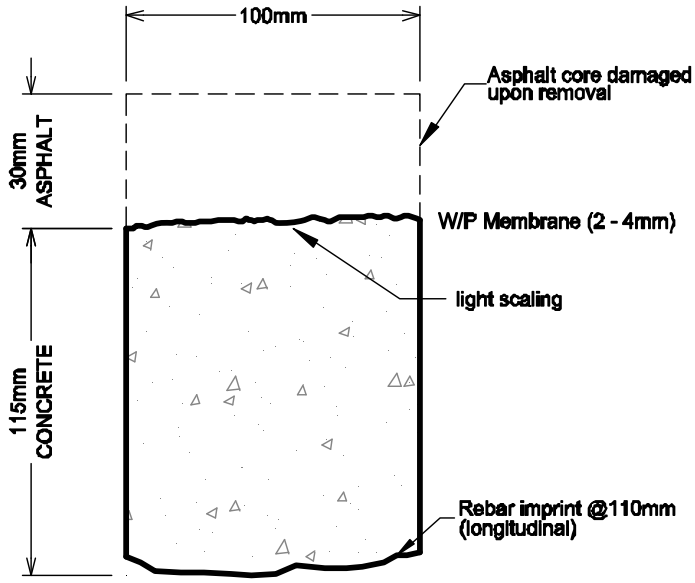





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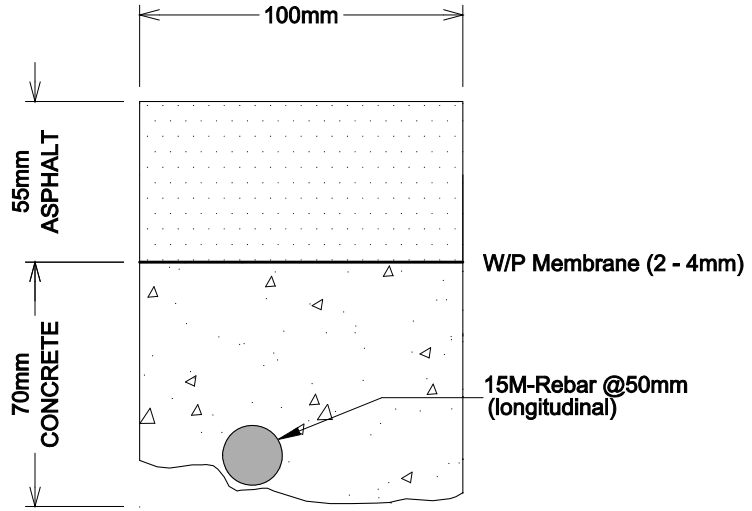
## Core C3




100mm
Asphalt core damaged upon removal
30mm ASPHALT
W/P Membrane (2 - 4mm)
light scaling
115mm CONCRETE
Rebar imprint @110mm (longitudinal)

## Core C4

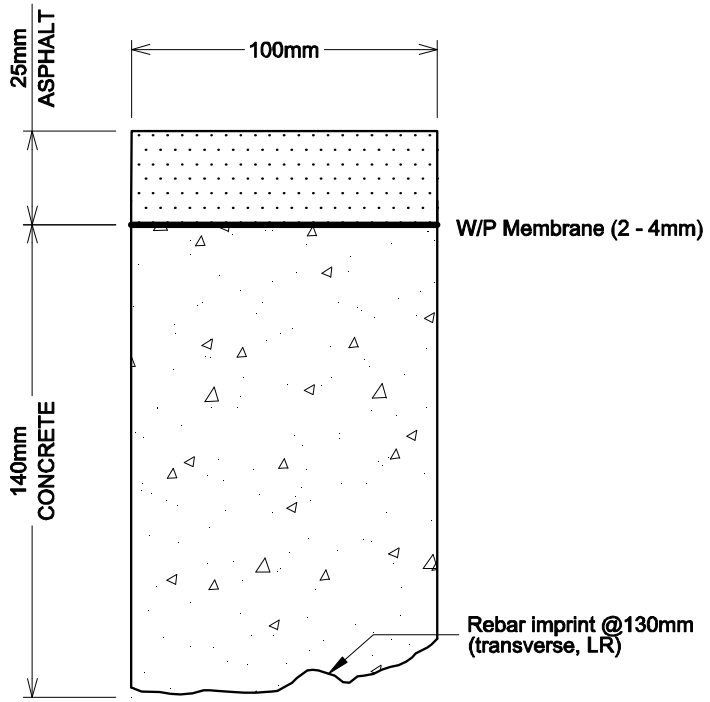





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## Core C5

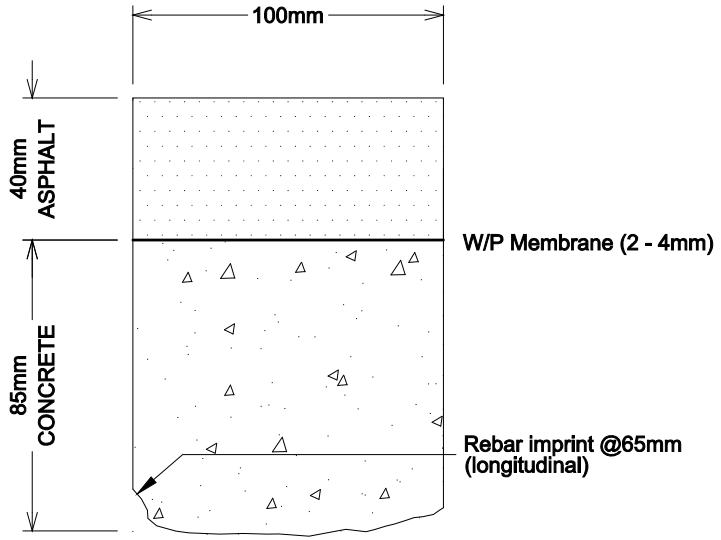





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## Core C6

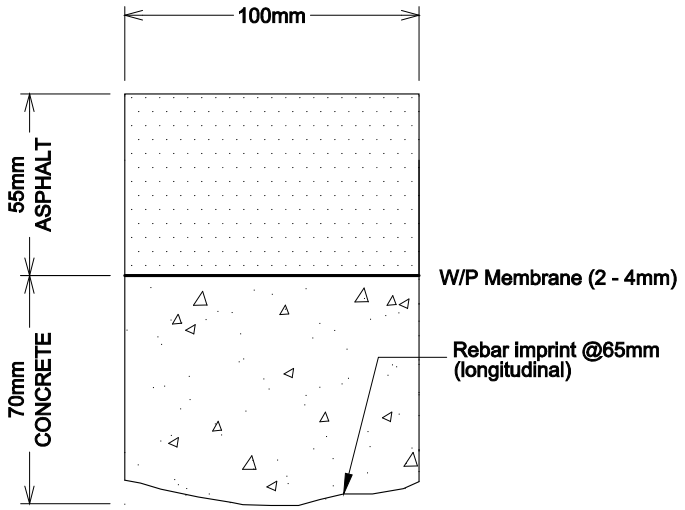





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## Core C7

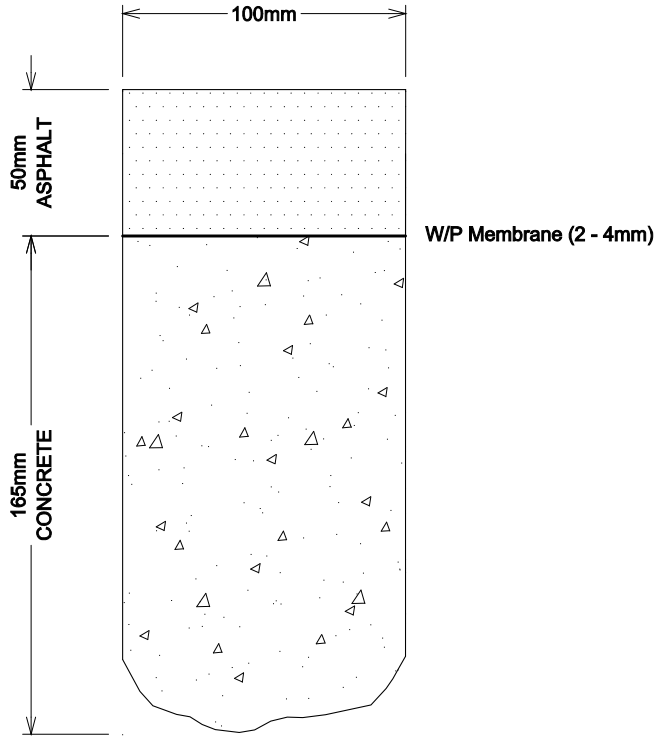





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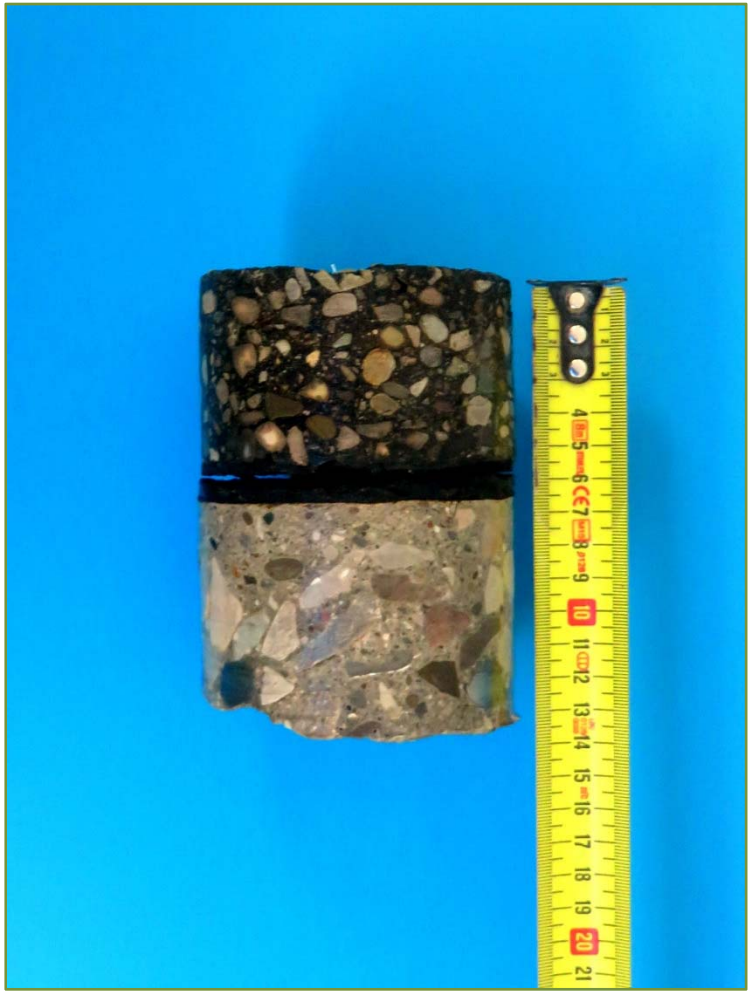
## Core C8

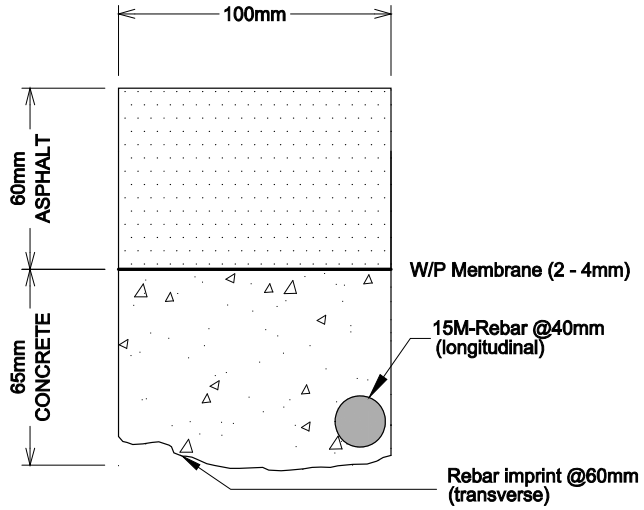





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## Core C9

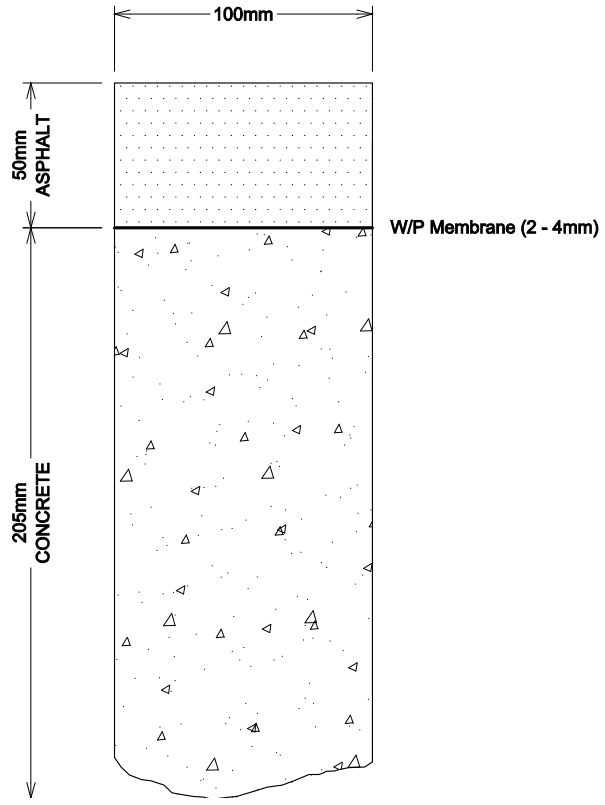





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## Core C10






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# Appendix D:

## Core Logs

200 Viceroy Road, Unit 4, Vaughan, ON L4K 3N8
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## CORE LOG ASPHALT COVERED BRIDGE DECKS



**Site: 1-0049-00**

| **Core No.** | | **C1** | | **C2** | | **C3** | |
|---|---|---|---|---|---|---|---|
| **Location (between gridlines)** | | West Approach | | 'G' and '1' | | 'E' and '3' | |
| **Diameter, mm** | | 100.0 | | 100.0 | | 100.0 | |
| **Thickness of Asphalt, mm** | | 140.0 | | 55.0 | | 30.0 | |
| **Thickness of Asphalt @ Nearest Grid Point** | | N/A | | 55.0 | | 30.0 | |
| **Thickness of Concrete, mm** | | N/A | | 180.0 | | 115.0 | |
| **Full Depth (yes/no)** | | Yes | | No | | No | |
| **Condition of Asphalt** (1) | | F | | F | | F | |
| **Waterproofing (W/P) Type** | | N/A | | Hot rubberized asphalt with protection board | | Hot rubberized asphalt with protection board | |
| **Condition of W/P** (1) | | N/A | | F to G | | F to G | |
| **W/P Thickness, mm** | | N/A | | 2 to 4 mm | | 2 to 4 mm | |
| **Bond of Asphalt or W/P to Concrete** | | N/A | | F to G | | P | |
| **Defects in Concrete** (2) | | - | | - | | Sc | |
| **Condition of Rebar** (3) | | N/A | | N/A | | G | |
| **Corrosion Potential** | | | | -0.229 | | -0.170 | |
| **Compressive Strength, MPa** | | | | 62.1 | | | |
| | | Total | Corrected | Total | Corrected | Total | Corrected |
| **Chloride Content % Chloride by Weight of Concrete** | **0-10 mm** | | | | | 0.201 | 0.164 |
| | **20-30 mm** | | | | | 0.162 | 0.125 |
| | **40-50 mm** | | | | | 0.077 | 0.040 |
| | **60-70 mm** | | | | | 0.051 | 0.014 |
| | **80-90 mm** | | | | | 0.047 | 0.010 |
| **AIR VOIDS** | **Air Content,%** | | | | | | |
| | **Spec. Surf.,$mm^2/mm^3$** | | | | | | |
| | **Spacing Factor, mm** | | | | | | |
| **TEST LABORATORY** | | | | BCC | | BCC | |
| **REMARKS**<br>**- orientation of rebars and cover**<br>**- presence of overlay, patch and thickness**<br>**- other observed defects** | | Granular present below asphalt - no concrete approach slab. | | | | Light scaling on surface.<br>Rebar imprint @ 110mm (longitudinal).<br>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: 1-0049-00**

| **Core No.** | | **C4** | | **C5** | | **C6** | |
|---|---|---|---|---|---|---|---|
| **Location (between gridlines)** | | 'G' and '5' | | 'D' and '8' | | 'G' and '11' | |
| **Diameter, mm** | | 100.0 | | 100.0 | | 100.0 | |
| **Thickness of Asphalt, mm** | | 55.0 | | 25.0 | | 40.0 | |
| **Thickness of Asphalt @ Nearest Grid Point** | | 55.0 | | 25.0 | | 40.0 | |
| **Thickness of Concrete, mm** | | 70.0 | | 140.0 | | 85.0 | |
| **Full Depth (yes/no)** | | No | | No | | No | |
| **Condition of Asphalt** (1) | | F | | F | | F | |
| **Waterproofing (W/P) Type** | | Hot rubberized asphalt with protection board | | Hot rubberized asphalt with protection board | | Hot rubberized asphalt with protection board | |
| **Condition of W/P** (1) | | F to G | | F to G | | F to G | |
| **W/P Thickness, mm** | | 2 to 4 mm | | 2 to 4 mm | | 2 to 4 mm | |
| **Bond of Asphalt or W/P to Concrete** | | F to G | | F to G | | F to G | |
| **Defects in Concrete** (2) | | - | | - | | - | |
| **Condition of Rebar** (3) | | G | | LR | | G | |
| **Corrosion Potential** | | -0.240 | | -0.296 | | -0.317 | |
| **Compressive Strength, MPa** | | | | | | | |
| | | Total | Corrected | Total | Corrected | Total | Corrected |
| **Chloride Content % Chloride by Weight of Concrete** | **0-10 mm** | 0.076 | 0.039 | 0.117 | 0.080 | | |
| | **20-30 mm** | 0.063 | 0.026 | 0.075 | 0.038 | | |
| | **40-50 mm** | 0.046 | 0.009 | 0.064 | 0.027 | | |
| | **60-70 mm** | 0.041 | 0.004 | 0.059 | 0.022 | | |
| | **80-90 mm** | | | 0.053 | 0.016 | | |
| | **100-110 mm** | | | 0.044 | 0.007 | | |
| | **120-130 mm** | | | 0.037 | 0.000 | | |
| **AIR VOIDS** | **Air Content,%** | | | | | | |
| | **Spec. Surf.,$mm^2/mm^3$** | | | | | | |
| | **Spacing Factor, mm** | | | | | | |
| **TEST LABORATORY** | | BCC | | BCC | | | |
| **REMARKS**<br>**- orientation of rebars and cover**<br>**- presence of overlay, patch and thickness**<br>**- other observed defects** | | 15M-rebar @ 50mm (longitudinal). | | Rebar imprint @ 130m (transverse, LR). | | Rebar imprint @ 65mm (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: 1-0049-00**

| **Core No.** | | **C7** | | **C8** | | **C9** | |
|---|---|---|---|---|---|---|---|
| **Location (between gridlines)** | | 'A' and '10' | | 'C' and '7' | | 'A' and '5' | |
| **Diameter, mm** | | 100.0 | | 100.0 | | 100.0 | |
| **Thickness of Asphalt, mm** | | 55.0 | | 50.0 | | 60.0 | |
| **Thickness of Asphalt @ Nearest Grid Point** | | 55.0 | | 50.0 | | 60.0 | |
| **Thickness of Concrete, mm** | | 70.0 | | 165.0 | | 65.0 | |
| **Full Depth (yes/no)** | | No | | No | | No | |
| **Condition of Asphalt** [1] | | F | | P | | F | |
| **Waterproofing (W/P) Type** | | Hot rubberized asphalt with protection board | | Hot rubberized asphalt with protection board | | Hot rubberized asphalt with protection board | |
| **Condition of W/P** [1] | | F to G | | F to G | | F to G | |
| **W/P Thickness, mm** | | 2 to 4 mm | | 2 to 4 mm | | 2 to 4 mm | |
| **Bond of Asphalt or W/P to Concrete** | | G | | F to G | | G | |
| **Defects in Concrete** [2] | | - | | - | | - | |
| **Condition of Rebar** [3] | | G | | N/A | | G | |
| **Corrosion Potential** | | -0.181 | | -0.206 | | -0.186 | |
| **Compressive Strength, MPa** | | | | | | | |
| | | Total | Corrected | Total | Corrected | Total | Corrected |
| **Chloride Content % Chloride by Weight of Concrete** | **0-10 mm** | 0.113 | 0.076 | | | | |
| | **20-30 mm** | 0.087 | 0.050 | | | | |
| | **40-50 mm** | 0.064 | 0.027 | | | | |
| | **60-70 mm** | 0.055 | 0.018 | | | | |
| | **80-90 mm** | | | | | | |
| **AIR VOIDS** | **Air Content,%** | | | | | | |
| | **Spec. Surf.,$mm^2/mm^3$** | | | | | | |
| | **Spacing Factor, mm** | | | | | | |
| **TEST LABORATORY** | | BCC | | | | | |
| **REMARKS**<br>**- orientation of rebars and cover**<br>**- presence of overlay, patch and thickness**<br>**- other observed defects** | | Rebar imprint @ 65mm (longitudinal). | | | | 15M-rebar @ 40mm (longitudinal).<br>Rebar imprint @ 60mm (transverse). | |

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: 1-0049-00**

| | | | | | | |
|---|---|---|---|---|---|---|
| **Core No.** | | **C10** | | | | |
| **Location (between gridlines)** | | 'A' and '1' | | | | |
| **Diameter, mm** | | 100.0 | | | | |
| **Thickness of Asphalt, mm** | | 50.0 | | | | |
| **Thickness of Asphalt @ Nearest Grid Point** | | 50.0 | | | | |
| **Thickness of Concrete, mm** | | 205.0 | | | | |
| **Full Depth (yes/no)** | | No | | | | |
| **Condition of Asphalt** [1] | | F | | | | |
| **Waterproofing (W/P) Type** | | Hot rubberized asphalt with protection board | | | | |
| **Condition of W/P** [1] | | F to G | | | | |
| **W/P Thickness, mm** | | 2 to 4 mm | | | | |
| **Bond of Asphalt or W/P to Concrete** | | G | | | | |
| **Defects in Concrete** [2] | | - | | | | |
| **Condition of Rebar** [3] | | N/A | | | | |
| **Corrosion Potential** | | -0.220 | | | | |
| **Compressive Strength, MPa** | | | | | | |
| **Chloride Content % Chloride by Weight of Concrete** | **0-10 mm**<br>**20-30 mm**<br>**40-50 mm**<br>**60-70 mm**<br>**80-90 mm** | Total | Corrected | | | |
| **AIR VOIDS** | **Air Content,%**<br>**Spec. Surf.,$mm^2/mm^3$**<br>**Spacing Factor, mm** | | | | | |
| **TEST LABORATORY** | | | | | | |
| **REMARKS**<br>**- orientation of rebars and cover**<br>**- presence of overlay, patch and thickness**<br>**- other observed defects** | | | | | | |

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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**Photo S1 – Sawn Sample SS1** (narrow cracks)



**Photo S2 – Sawn Sample SS2** (narrow cracks)



**Photo S3 – Sawn Sample SS3** (light scaling)



**Photo S4 – Sawn Sample SS4**



**Photo S5 – Sawn Sample SS5** (light scaling)



**Photo S6 – Sawn Sample SS6**



**Photo S7 – Sawn Sample SS7**



**Photo S8 – Sawn Sample SS8**



**Photo S9 – Sawn Sample SS9**

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# Appendix F:

## Sawn Asphalt Sample Logs

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info@bridgecheckcanada.com

## SAWN ASPHALT SAMPLE LOG



**Site No: 1-0049-00**

| **Sample No.** | SS1 | SS2 | SS3 |
|---|---|---|---|
| **Location (between gridlines)** | 'D' and '1' | 'G' and '3' | 'D' and '4' |
| **Size, mm X mm** | 270x270 | 270x270 | 270x270 |
| **Thickness of Asphalt, mm** | 55.0 | 40.0 | 45.0 |
| **Thickness of Asphalt @ Nearest Grid Point** | 55.0 | 40.0 | 45.0 |
| **Condition of Asphalt** (1) | F | F | F |
| **Waterproofing (W/P) Type** | Hot rubberized asphalt with protection board | Hot rubberized asphalt with protection board | Hot rubberized asphalt with protection board |
| **W/P Thickness, mm** | 2 to 4 mm | 2 to 4 mm | 2 to 4 mm |
| **Condition of W/P** (1) | F to G | F to G | F to G |
| **Bond of W/P to Asphalt** | F to G | F to G | F |
| **Bond of Asphalt or W/P to Concrete** | F to G | F to G | P |
| **Concrete Cover to Reinf., mm** | 101L | 85L | 77T |
| **Defects in Concrete Surface** (2) | C | C | Sc |
| **Corrosion Potential on Concrete Surface** | -0.235 | -0.232 | -0.283 |
| **Remarks** | Narrow cracks. | Narrow cracks. | 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:** **1-0049-00**

| **Sample No.** | SS4 | SS5 | SS6 |
|---|---|---|---|
| **Location (between gridlines)** | 'E' and '6' | 'G' and '8' | 'D' and '11' |
| **Size, mm X mm** | 270x270 | 280x270 | 270x270 |
| **Thickness of Asphalt, mm** | 45.0 | 30.0 | 50.0 |
| **Thickness of Asphalt @ Nearest Grid Point** | 45.0 | 30.0 | 50.0 |
| **Condition of Asphalt** (1) | F | F | F |
| **Waterproofing (W/P) Type** | Hot rubberized asphalt with protection board | Hot rubberized asphalt with protection board | Hot rubberized asphalt with protection board |
| **W/P Thickness, mm** | 2 to 4 mm | 2 to 4 mm | 2 to 4 mm |
| **Condition of W/P** (1) | F to G | F to G | F to G |
| **Bond of W/P to Asphalt** | F to G | F to G | F to G |
| **Bond of Asphalt or W/P to Concrete** | F to G | P | F to G |
| **Concrete Cover to Reinf., mm** | 70L | 90L | 108L |
| **Defects in Concrete Surface** (2) | - | Sc | - |
| **Corrosion Potential on Concrete Surface** | -0.179 | -0.254 | -0.288 |
| **Remarks** | | 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: 1-0049-00**

| **Sample No.** | SS7 | SS8 | SS9 |
|---|---|---|---|
| **Location (between gridlines)** | 'B' and '8' | 'B' and '6' | 'A' and '3' |
| **Size, mm X mm** | 280x280 | 270x270 | 290x290 |
| **Thickness of Asphalt, mm** | 45.0 | 55.0 | 30.0 |
| **Thickness of Asphalt @ Nearest Grid Point** | 45.0 | 55.0 | 30.0 |
| **Condition of Asphalt** (1) | F | F | F |
| **Waterproofing (W/P) Type** | Hot rubberized asphalt with protection board | Hot rubberized asphalt with protection board | Hot rubberized asphalt with protection board |
| **W/P Thickness, mm** | 2 to 4 mm | 2 to 4 mm | 2 to 4 mm |
| **Condition of W/P** (1) | F to G | F to G | F to G |
| **Bond of W/P to Asphalt** | F to G | F to G | F to G |
| **Bond of Asphalt or W/P to Concrete** | F to G | F to G | F to G |
| **Concrete Cover to Reinf., mm** | 96L | 68T | 65T |
| **Defects in Concrete Surface** (2) | - | - | - |
| **Corrosion Potential on Concrete Surface** | -0.220 | -0.201 | -0.122 |
| **Remarks** | | | |

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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**Photo P1 – South Elevation**



**Photo P2 – North Elevation**



**Photo P3 – Deck General View, looking east**



**Photo P4 – Deck General View, looking west**



**Photo P5 – Deck Wearing Surface** (fair condition – sealed/unsealed cracks, patches and rutting)



**Photo P6 – Deck Wearing Surface** (sealed/unsealed cracks, patches and ravelling)



**Photo P7 – Soffit between East Abutment and East Pier** (fair-to-good condition – cracks and staining) note severe corrosion on all deck drains



**Photo P8 – Soffit at East Abutment, north edge** (cracks and wet areas) note severe corrosion on deck drain



**Photo P9 – Soffit at East Abutment, south edge** (cracks and wet area) note severe corrosion on deck drain

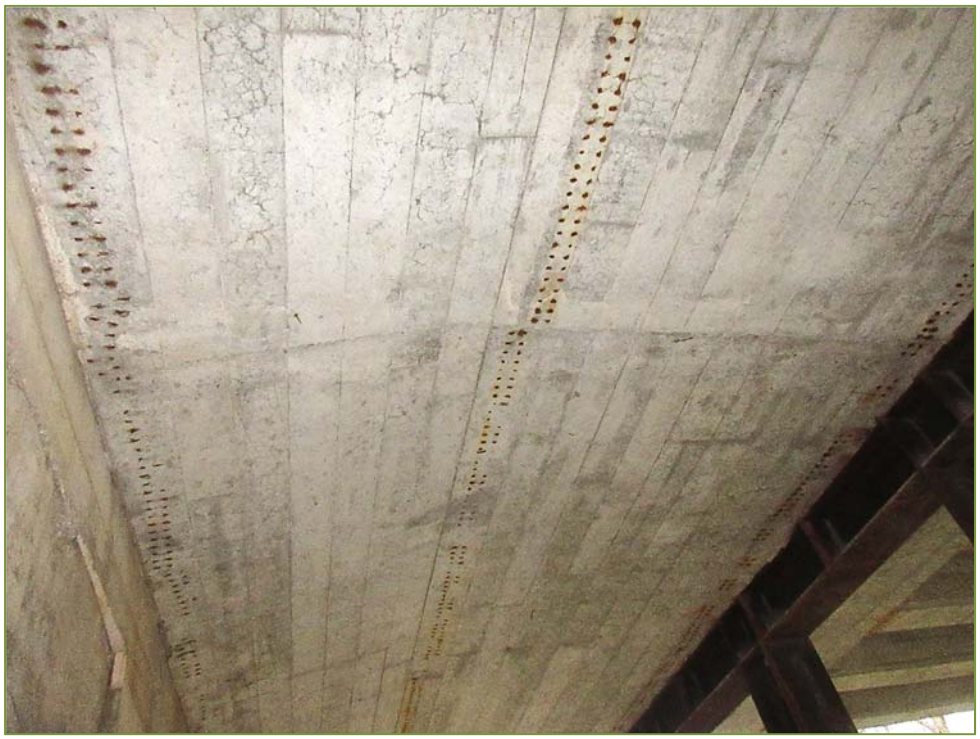


**Photo P10 – Soffit between East Abutment and East Pier** (narrow cracks) note rust staining



**Photo P11– Soffit between East Pier and West Pier** (fair condition – cracks, delamination and wet staining) **and Girders** (fair condition – cracks and wet area) note rust staining and narrow pattern cracks



**Photo P12 – Soffit at East Pier, north edge** (cracks) **and Girders** (cracks) note rust staining



**Photo P13 – Soffit between East Pier and West Pier** (cracks and delamination) **and Girders** (cracks)



**Photo P14 – Soffit at West Pier** (cracks) **and Girders** (cracks and wet area)



**Photo P15 – Soffit between West Abutment and West Pier** (fair condition – cracks, spall, delamination and wet area) note rust staining



**Photo P16 – Soffit at West Pier, north edge** (cracks, spall and delamination) note rust staining



**Photo P17 – Soffit at West Pier** (cracks and spall) note staining



**Photo P18 – Soffit at West Abutment** (cracks, spall and delamination)



**Photo P19 – Soffit at West Abutment, south edge** (cracks, delamination and wet area) note severe corrosion on deck drains



**Photo P20 – North Elevation, Fascia** (cracks, spall and delamination)



**Photo P21 – East Approach Wearing Surface** (fair condition – unsealed/sealed cracks, patches/potholes and ravelling at joint)



**Photo P22 – West Approach Wearing Surface** (fair condition – unsealed/sealed cracks, patches/potholes and ravelling at joint



**Photo P23 – North-East Deck Drainage**



**Photo P24 – North-West Deck Drainage**



**Photo P25 – South-East Deck Drainage**



**Photo P26 – South-West Deck Drainage**



**Photo P27 – North-West Catch Basin**



**Photo P28 – South-West Catch Basin**



**Photo P29 – Paved-over Joint at East Abutment** (sealed/unsealed cracks, patches/potholes and ravelling)

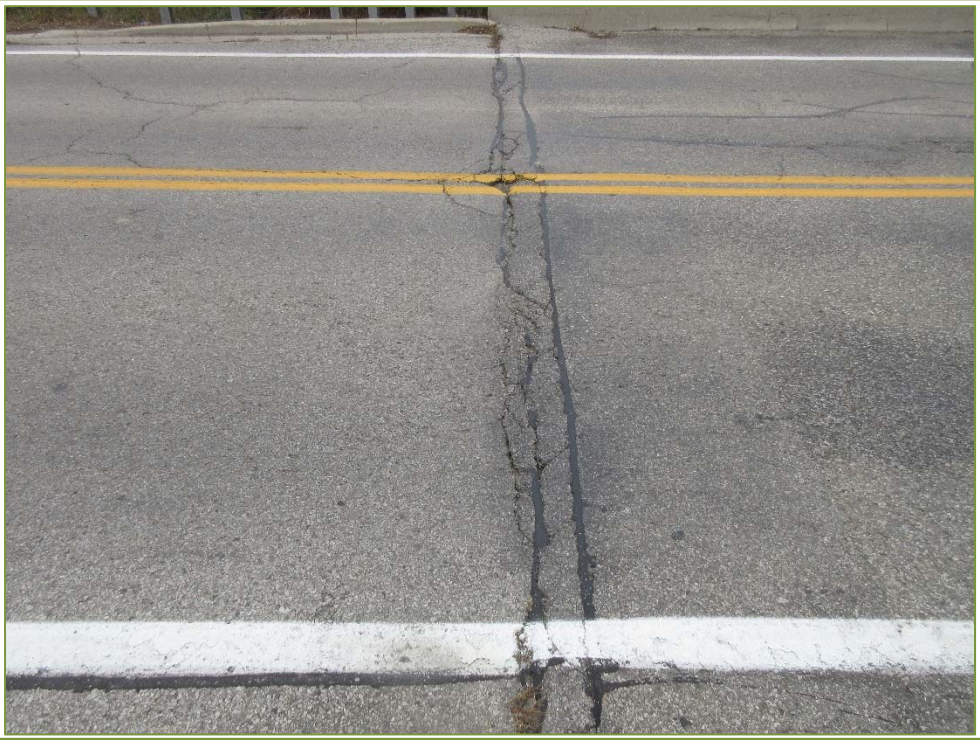


**Photo P30 – Paved-over Joint at West Abutment** (sealed/unsealed cracks, patches/potholes and ravelling)



**Photo P31 – North Curb** (fair-to-good condition - cracks) **and Concrete Handrails** (fair-to-good condition – cracks, delamination and spall)



**Photo P32 – North Curb** (cracks) **and Concrete Handrails** (spall) note exposed and corroded rebar



**Photo P33 – North Curb** (cracks) **and Concrete Handrails** (light scaling and cracks)



**Photo P34 – North Curb** (cracks and spall) **and Concrete Handrails** (cracks and delamination)



**Photo P35 – South Curb** (fair-to-good condition - cracks) **and Concrete Handrails** (fair-to-good condition – cracks and delamination)



**Photo P36 – South Curb** (cracks) **and Concrete Handrails** (cracks and delamination)



**Photo P37 – South Curb** (cracks) **and Concrete Handrails** (light scaling and cracks)



**Photo P38 – South Curb** (cracks) **and Concrete Handrails** (light scaling)



**Photo P39 – North-East Guiderail** (good condition)



**Photo P40 – North-West Guiderail** (good condition)



**Photo P41 – South-East Guiderail** (good condition)



**Photo P42 – South-West Guiderail** (good condition)



**Photo P43 – East Abutment** (poor condition – cracks, spall, delamination, honeycombing, light/medium scaling, patches and wet areas)



**Photo P44 – East Abutment** (cracks, spall, delamination, honeycombing, light/medium scaling and wet areas)



**Photo P45 – East Abutment** (cracks, delamination, light scaling and patched area)



**Photo P46 – West Abutment** (fair condition – cracks, delamination, honeycombing, light/medium scaling and wet areas)



**Photo P47 – West Abutment** (cracks, delamination, light/medium scaling and wet area)



**Photo P48 – West Abutment** (cracks, delamination, honeycombing and light/medium scaling)



**Photo P49 – North-East Wingwall** (poor condition – crack, spall, delamination, honeycombing, light-to-severe scaling and wet areas)



**Photo P50 – North-East Wingwall** (severe scaling, delamination and honeycombing)



**Photo P51 – North-West Wingwall** (fair condition – cracks, isolated delamination and spall



**Photo P52 – North-West Wingwall** (cracks, spall, severe scaling)



**Photo P53 – South-East Retaining Wall** (fair-to-good condition – honeycombing and light scaling)



**Photo P54 – South-West Retaining Wall** (fair condition – crack, honeycombing and light scaling)



**Photo P55 – East Pier, West Face** (fair condition – light-to-medium corrosion)



**Photo P56 – West Pier, East Face** (fair condition – light-to-medium corrosion)



**Photo P57 – North-East Embankment**



**Photo P58 – North-West Embankment**



**Photo P59 – South-East Embankment**



**Photo P60 – South-West Embankment**



**Photo P61 – Typical Condition of Inside Core C1** (west approach, granular material below asphalt)



**Photo P62 – Typical Condition of Inside Core C2**



**Photo P63 – Typical Condition of Inside Core C3**



**Photo P64 – Typical Condition of Inside Core C4**



**Photo P65 – Typical Condition of Inside Core C5** (light corrosion)



**Photo P66 – Typical Condition of Inside Core C6**



**Photo P67 – Typical Condition of Inside Core C7**



**Photo P68 – Typical Condition of Inside Core C8**



**Photo P69 – Typical Condition of Inside Core C9**



**Photo P70 – Typical Condition of Inside Core C10**



**Photo P71 – Upstream**



**Photo P72 – Downstream**

# 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

# COMPRESSIVE STRENGTH OF CONCRETE CORES

**(CSA A23.2-14C)**

| | |
|---|---|
| **Project No.:** | BCC17049 |
| **Site No.:** | 1-0049-00 |
| **Location:** | Johnson Bridge, County of Brant, ON |

| | |
|---|---|
| **Core ID** | C2 |
| **Location** | *Deck* |
| **Lab No.** | L17-1717 |
| **Date Cast** | - |
| **Date Cored** | Nov. 1, 2017 |
| **Date Tested** | Nov. 12, 2017 |
| **Capped Height (mm)** | 160.0 |
| **Average Diameter (mm)** | 100.0 |
| **Density (kg/m$^3$)** | 2380 |
| **Corrected Compressive Strength (MPa)** | 62.1 |
| *** Direction of Loading** | Same as |
| **Moisture Contact at Time of Test** | Moist |
| **Remarks** | |

*Relative to the direction of original placement.

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

200 Viceroy Road, Unit 4, Vaughan, ON L4K 3N8
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info@bridgecheckcanada.com

# TOTAL CHLORIDE ION CONTENT

**(Testing Method: MTO LS – 417)**

| | |
|---|---|
| **Project No.:** | BCC17049 |
| **Site No.:** | 1-0049-00 |
| **Location:** | Johnson Bridge, County of Brant, ON |

| Core ID | Lab No. | Horizon from the Top of the Core (mm) | Chloride Ion Content (%) | Chloride Ion Content Corrected for Background* (%) |
|---|---|---|---|---|
| **C3** | L17-1718 | 0-10<br>20-30<br>40-50<br>60-70<br>80-90 | 0.201<br>0.162<br>0.077<br>0.051<br>0.047 | 0.164<br>0.125<br>0.040<br>0.014<br>0.010 |
| **C4** | L17-1719 | 0-10<br>20-30<br>40-50<br>60-70 | 0.076<br>0.063<br>0.046<br>0.041 | 0.039<br>0.026<br>0.009<br>0.004 |
| **C5** | L17-1720 | 0-10<br>20-30<br>40-50<br>60-70<br>80-90<br>100-110<br>120-130 | 0.117<br>0.075<br>0.064<br>0.059<br>0.053<br>0.044<br>0.037 | 0.080<br>0.038<br>0.027<br>0.022<br>0.016<br>0.007<br>0.000 |
| **C7** | L17-1721 | 0-10<br>20-30<br>40-50<br>60-70 | 0.113<br>0.087<br>0.064<br>0.055 | 0.076<br>0.050<br>0.027<br>0.018 |

**Background chloride = 0.037%*
***The threshold of chloride ion generally regarded to be able to initiate reinforcing bar corrosion is 0.025%.*

**Tested By:** Sukhjinder Singh
**Date Tested:** Dec. 6, 2017

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

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Mt. Laurel, New Jersey 08054
Telephone: 856-231-9449
Email: customerservice@iatl.com

CERTIFICATE OF ANALYSIS

Client: Bridge Check Canada Ltd.
200 Viceroy Rd Unit 4
Vaughan ON L4K3N8

Client: BRI780

Report Date: 11/8/2017
Report No.: 551517 - PLM
Project:
Project No.: BCC17049

# PLM BULK SAMPLE ANALYSIS SUMMARY

**Lab No.:** 6383368
**Client No.:** 1
**Analyst Observation:** Grey/Black Asphalt
**Client Description:** Asphalt On Approach (C1)
**Location:** Site No. 1-0047-00
**Facility:** Powerline Road Bridge

Percent Asbestos: *None Detected*
Percent Non-Asbestos Fibrous Material: None Detected
Percent Non-Fibrous Material: 100

---

**Lab No.:** 6383369
**Client No.:** 2
**Analyst Observation:** Grey/Black Asphalt
**Client Description:** Asphalt On Approach (C1)
**Location:** Site No. 1-0047-00
**Facility:** Powerline Road Bridge

Percent Asbestos: *None Detected*
Percent Non-Asbestos Fibrous Material: None Detected
Percent Non-Fibrous Material: 100

---

**Lab No.:** 6383370
**Client No.:** 3
**Analyst Observation:** Grey/Black Asphalt
**Client Description:** Asphalt On Approach (C1)
**Location:** Site No. 1-0047-00
**Facility:** Powerline Road Bridge

Percent Asbestos: *None Detected*
Percent Non-Asbestos Fibrous Material: None Detected
Percent Non-Fibrous Material: 100

---

**Lab No.:** 6383371
**Client No.:** 1
**Analyst Observation:** Grey/Black Asphalt
**Client Description:** Asphalt On Approach (C1)
**Location:** Site No. 1-0049-00
**Facility:** Johnson Bridge

Percent Asbestos: *None Detected*
Percent Non-Asbestos Fibrous Material: None Detected
Percent Non-Fibrous Material: 100

---

**Lab No.:** 6383372
**Client No.:** 2
**Analyst Observation:** Grey/Black Asphalt
**Client Description:** Asphalt On Deck (C8)
**Location:** Site No. 1-0049-00
**Facility:** Johnson Bridge

Percent Asbestos: *None Detected*
Percent Non-Asbestos Fibrous Material: None Detected
Percent Non-Fibrous Material: 100

---

**Lab No.:** 6383373
**Client No.:** 3
**Analyst Observation:** Grey/Black Asphalt
**Client Description:** Asphalt On Deck (C3)
**Location:** Site No. 1-0049-00
**Facility:** Johnson Bridge

Percent Asbestos: *None Detected*
Percent Non-Asbestos Fibrous Material: None Detected
Percent Non-Fibrous Material: 100

Analytical Method -**US EPA 600, R93-116**. Please refer to the Appendix of this report for further information regarding your analysis.

Date Received: 11/8/2017
Date Analyzed: 11/08/2017
Signature: Becky Hargrove
Analyst: Rebecca Hargrove

Approved By: Frank Ehrenfeld
Frank E. Ehrenfeld, III
Laboratory Director

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Email: customerservice@iatl.com

CERTIFICATE OF ANALYSIS

Client: Bridge Check Canada Ltd.
200 Viceroy Rd Unit 4
Vaughan ON L4K3N8

Client: BRI780

Report Date: 11/8/2017
Report No.: 551517 - PLM
Project:
Project No.: BCC17049

# PLM BULK SAMPLE ANALYSIS SUMMARY

---

**Lab No.:** 6383374
**Client No.:** 1
**Analyst Observation:** Grey/Black Asphalt
**Client Description:** Asphalt On Approach (C1)
**Location:** Site No. 1-077-00
**Facility:** Flanner Bridge

Percent Asbestos: *None Detected*
Percent Non-Asbestos Fibrous Material: None Detected
Percent Non-Fibrous Material: 100

---

**Lab No.:** 6383375
**Client No.:** 2
**Analyst Observation:** Grey/Black Asphalt
**Client Description:** Asphalt On Deck (C10)
**Location:** Site No. 1-077-00
**Facility:** Flanner Bridge

Percent Asbestos: *None Detected*
Percent Non-Asbestos Fibrous Material: None Detected
Percent Non-Fibrous Material: 100

---

**Lab No.:** 6383376
**Client No.:** 3
**Analyst Observation:** Grey/Black Asphalt
**Client Description:** Asphalt On Deck (C9)
**Location:** Site No. 1-077-00
**Facility:** Flanner Bridge

Percent Asbestos: *None Detected*
Percent Non-Asbestos Fibrous Material: None Detected
Percent Non-Fibrous Material: 100

---

**Lab No.:** 6383377
**Client No.:** 1
**Analyst Observation:** Grey/Black Asphalt
**Client Description:** Asphalt On Approach (C1)
**Location:** Site No. 1-0127-00
**Facility:** Anderson Bridge

Percent Asbestos: *None Detected*
Percent Non-Asbestos Fibrous Material: None Detected
Percent Non-Fibrous Material: 100

---

**Lab No.:** 6383378
**Client No.:** 2
**Analyst Observation:** Grey/Black Asphalt
**Client Description:** Asphalt On Deck (C4)
**Location:** Site No. 1-0127-00
**Facility:** Anderson Bridge

Percent Asbestos: *None Detected*
Percent Non-Asbestos Fibrous Material: None Detected
Percent Non-Fibrous Material: 100

---

**Lab No.:** 6383379
**Client No.:** 3
**Analyst Observation:** Grey/Black Asphalt
**Client Description:** Asphalt On Deck (C7)
**Location:** Site No. 1-0127-00
**Facility:** Anderson Bridge

Percent Asbestos: *None Detected*
Percent Non-Asbestos Fibrous Material: None Detected
Percent Non-Fibrous Material: 100

---

Analytical Method -**US EPA 600, R93-116**. Please refer to the Appendix of this report for further information regarding your analysis.

Date Received: 11/8/2017
Date Analyzed: 11/08/2017
Signature: Becky Hargrove
Analyst: Rebecca Hargrove

Approved By: Frank Ehrenfeld
Frank E. Ehrenfeld, III
Laboratory Director

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CERTIFICATE OF ANALYSIS

Client: Bridge Check Canada Ltd.
200 Viceroy Rd Unit 4
Vaughan ON L4K3N8

Client: BRI780

Report Date: 11/8/2017
Report No.: 551517 - PLM
Project:
Project No.: BCC17049

# Appendix to Analytical Report

**Customer Contact:** Moe Abdollahi
**Analysis:** US EPA 600, R93-116

This appendix seeks to promote greater understanding of any observations, exceptions, special instructions, or circumstances that the laboratory needs to communicate to the client concerning the above samples. The information below is used to help promote your ability to make the most informed decisions for you and your customers. Please note the following points of contact for any questions you may have.

**iATL Customer Service:** customerservice@iatl.com
**iATL Office Manager:** cdavis@iatl.com
**iATL Account Representative**: Shirley Clark
**Sample Login Notes:** See Batch Sheet Attached
**Sample Matrix:** Bulk Building Materials
**Exceptions Noted:** See Following Pages

## General Terms, Warrants, Limits, Qualifiers:

General information about iATL capabilities and client/laboratory relationships and responsibilities are spelled out in iATL policies that are listed at www.iATL.com and ir our Quality Assurance Manual per ISO 17025 standard requirements. The information therein is a representation of iATL definitions and policies for turnaround times, sample submittal, collection media, blank definitions, quantification issues and limit of detection, analytical methods and procedures, sub-contracting policies, results reporting options, fees, terms, and discounts, confidentiality, sample archival and disposal, and data interpretation.

iATL warrants the test results to be of a precision normal for the type and methodology employed for each sample submitted. iATL disclaims any other warrants, expressed or implied, including warranty of fitness for a particular purpose and warranty of merchantability. iATL accepts no legal responsibility for the purpose for which the client uses test results. Any analytical work performed must be governed by our Standard Terms and Conditions. Prices, methods and detection limits may be changed without notification. Please contact your Customer Service Representative for the most current information.

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## Information Pertinent to this Report:

Analysis by US EPA 600 93-116: Determination of Asbestos in Bulk Building Materials by Polarized Light Microscopy (PLM).

Certifications:

- NIST-NVLAP No. 101165-0
- NY-DOH No. 11021
- AIHA-LAP, LLC No. 100188

Quantification at <0.25% by volume is possible with this method. (PC) Indicates Stratified Point Count Method performed. (PC-Trace) means that asbestos was detected but is not quantifiable under the Point Counting regimen. Analysis includes all distinct separable layers in accordance with EPA 600 Method. If not reported or otherwise noted, layer is either not present or the client has specifically requested that it not be analyzed (ex. analyze until positive instructions). Small asbestos fibers may be missed by PLM due to resolution limitations of the optical microscope. Therefore, PLM is not consistently reliable in detecting asbestos in non-friable organically bound (NOB) materials. Quantitative transmission electron microscopy (TEM) is currently the only method that can pronounce materials as non-asbestos containing.

Analytical Methodology Alternatives: Your initial request for analysis may not have accounted for recent advances in regulatory requirements or advances in technology that are routinely used in similar situations for other qualified projects. You may have the option to explore additional analysis for further information. Below are a few options, listed as the matrix followed by the appropriate methodology. Also included are links to more information on our website.

Bulk Building Materials that are Non-Friable Organically Bound (NOB) by Gravimetric Reduction techniques employing PLM and TEM: ELAP 198.6 (PLM-NOB), ELAP 198.4 (TEM-NOB)

Loose Fill Vermiculite Insulation, Attic Insulation, Zonolite (copyright), etc.: US EPA 600 R-4/004 (multi-tiered analytical process)
Sprayed On Insulation/Fireproofing with Vermiculite (SOF-V): ELAP 198.8 (PLM-SOF-V)>

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CERTIFICATE OF ANALYSIS

Client: Bridge Check Canada Ltd.
200 Viceroy Rd Unit 4
Vaughan ON L4K3N8

Client: BRI780

Report Date: 11/8/2017
Report No.: 551517 - PLM
Project:
Project No.: BCC17049

Soil, sludge, sediment, aggregate, and like materials analyzed for asbestos or other elongated mineral particles (ex. erionite, etc.): ASTM D7521, CARB 435, and other options available

Asbestos in Surface Dust according to one of ASTM's Methods (very dependent on sampling collection technique – by TEM): ASTM D 5755, D5756, or D6480

Various other asbestos matrices (air, water, etc.) and analytical methods are available.

## Disclaimers / Qualifiers:

There may be some samples in this project that have a "NOTE:" associated with a sample result. We use added disclaimers or qualifiers to inform the client about something that requires further explanation. Here is a list with highlighted disclaimers that may be pertinent to this project. For a full explanation of these and other disclaimers, please inquire at **customerservice@iatl.com**.

1) Note: No mastic provided for analysis.
2) Note: Insufficient mastic provided for analysis.
3) Note: Insufficient material provided for analysis.
4) Note: Insufficient sample provided for QC reanalysis.
5) Note: Different material than indicated on Sample Log / Description.
6) Note: Sample not submitted.
7) Note: Attached to asbestos containing material.
8) Note: Received wet.
9) Note: Possible surface contamination.
10) Note: Not building material. 1% threshold may not apply.
11) Note: Recommend TEM-NOB analysis as per EPA recommendations.
12) Note: Asbestos detected but not quantifiable.
13) Note: Multiple identical samples submitted, only one analyzed.
14) Note: Analyzed by EPA 600/R-93/116. Point Counting detection limit at 0.080%.
15) Note: Analyzed by EPA 600/R-93/116. Point Counting detection limit at 0.125%.

## Recommendations for Vermiculite Analysis:

Several analytical protocols exist for the analysis of asbestos in vermiculite. These analytical approaches vary depending upon the nature of the vermiculite mineral being tested (e.g. un-processed gange, homogeneous exfoliated books of mica, or mixed mineral composites).Please contact your client representative for pricing and turnaround time options available.

iATL recommends initial testing using the EPA 600/R-93/116 method. This method is specifically designed for the analysis of asbestos in bulk building materials. It provides an acceptable starting point for primary screening of vermiculite for possible asbestos.

Results from this testing may be inconclusive. EPA suggests proceeding to a multi-tiered analysis involving wet separation techniques in conjunction with PLM and TEM gravimetric analysis (EPA 600/R-04/004).

Further information on this method and other vermiculite and asbestos issues can be found at the following: Agency for Toxic Substances and Disease Registry (ATSDR) www.atsdr.cdc.gov, United States Geological Survey (USGS) www.minerals.usgs.gov/minerals/, US EPA www.epa.gov/asbestos. The USEPA also has an informative brochure "Current Best Practices for Vermiculite Attic Insulation" EPA 747F03001 May 2003, that may assist the health and remediation professional.

The following is a summary of the analytical process outlines in the EPA 600/R-04/004 Method:

1)**Analytical Step/Method:** Initial Screening by PLM, EPA 600R-93/116
**Requirements/Comments:** Minimum of 0.1 g of sample. ~0.25% LOQ for most samples.

2)**Analytical Step/Method:** Wet Separation by PLM Gravimetric Technique, EPA R-04/004
**Requirements/Comments:** Minimum 50g** of dry sample. Analysis of "Sinks" only.

3)**Analytical Step/Method:** Wet Separation by PLM Gravimetric Technique, EPA R-04/004
**Requirements/Comments:** Minimum 50g** of dry sample. Analysis of "Floats" only.

4)**Analytical Step/Method:** Wet Separation by TEM Gravimetric Technique, EPA R-04/004
**Requirements/Comments:** Minimum 50g** of dry sample. Analysis of "Sinks" only.

5)**Analytical Step/Method:** Wet Separation by TEM Gravimetric Technique, EPA R-04/004

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Email: customerservice@iatl.com

CERTIFICATE OF ANALYSIS

Client: Bridge Check Canada Ltd.
200 Viceroy Rd Unit 4
Vaughan ON L4K3N8

Client: BRI780

Report Date: 11/8/2017
Report No.: 551517 - PLM
Project:
Project No.: BCC17049

**Requirements/Comments:** Minimum 50g** of dry sample. Analysis of "Suspension" only.

LOQ, Limit of Quantitation estimates for mass and volume analyses.
*With advance notice and confirmation by the laboratory.
**Approximately 1 Liter of sample in double-bagged container (~9x6 inch bag of sample).

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Email: customerservice@iatl.com

CERTIFICATE OF ANALYSIS

Client: Bridge Check Canada Ltd.
200 Viceroy Rd Unit 4
Vaughan ON L4K3N8

Client: BRI780

Report Date: 2/28/2018
Report No.: 557927 - Lead Paint
Project:
Project No.: BCC17049

# LEAD PAINT SAMPLE ANALYSIS SUMMARY

**Lab No.:** 6450827 **Description:** **Result (% by Weight):** 45
**Client No.:** 1 **Location:** Powerline Road Bridge-Site No. 1-0047-00 **Result (ppm):** 450000
**Comments:**

---

**Lab No.:** 6450828 **Description:** **Result (% by Weight):** 2.7
**Client No.:** 2 **Location:** Johnson Bridge-Site No. 1-0049-00 **Result (ppm):** 27000
**Comments:**

Please refer to the Appendix of this report for further information regarding your analysis.

Date Received: 2/21/2018
Date Analyzed: 02/28/2018
Signature: Chad Shaffer
Analyst: Chad Shaffer

Approved By: Frank E. Ehrenfeld, III
Laboratory Director

9000 Commerce Parkway Suite B
Mt. Laurel, New Jersey 08054
Telephone: 856-231-9449
Email: customerservice@iatl.com

CERTIFICATE OF ANALYSIS

Client: Bridge Check Canada Ltd.
200 Viceroy Rd Unit 4
Vaughan ON L4K3N8

Client: BRI780

Report Date: 2/28/2018
Report No.: 557927 - Lead Paint
Project:
Project No.: BCC17049

# Appendix to Analytical Report:

**Customer Contact:** Moe Abdollahi
**Method:** ASTM D3335-85a, US EPA SW846 3050B:7000B

This appendix seeks to promote greater understanding of any observations, exceptions, special instructions, or circumstances that the laboratory needs to communicate to the client concerning the above samples. The information below is used to help promote your ability to make the most informed decisions for you and your customers. Please note the following points of contact for any questions you may have.

**iATL Customer Service:** customerservice@iatl.com
**iATL Office Manager:** cdavis@iatl.com
**iATL Account Representative:** Shirley Clark
**Sample Login Notes:** See Batch Sheet Attached
**Sample Matrix:** Paint
**Exceptions Noted:** See Following Pages

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General information about iATL capabilities and client/laboratory relationships and responsibilities are spelled out in iATL policies that are listed at www.iATL.com and ir our Quality Assurance Manual per ISO 17025 standard requirements. The information therein is a representation of iATL definitions and policies for turnaround times, sample submittal, collection media, blank definitions, quantification issues and limit of detection, analytical methods and procedures, sub-contracting policies, results reporting options, fees, terms, and discounts, confidentiality, sample archival and disposal, and data interpretation.

iATL warrants the test results to be of a precision normal for the type and methodology employed for each sample submitted. iATL disclaims any other warrants, expressed or implied, including warranty of fitness for a particular purpose and warranty of merchantability. iATL accepts no legal responsibility for the purpose for which the client uses test results. Any analytical work performed must be governed by our Standard Terms and Conditions. Prices, methods and detection limits may be changed without notification. Please contact your Customer Service Representative for the most current information.

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## Information Pertinent to this Report:

Analysis by ASTM D3335-85a by AAS

Certification:
- National Lead Laboratory Program (NLLAP): AIHA-LAP, LLC No. 100188
- NYSDOH-ELAP No. 11021

Regulatory limit is 0.5% lead by weight (EPA/HUD guidelines). Recommend multiple sampling for all samples less than regulatory limit for confirmation.
All results are based on the samples as received at the lab. iATL assumes that appropriate sampling methods have been used and that the data upon which these results are based have been accurately supplied by the client.
Method Detection Limit (MDL) per EPA Method 40CFR Part 136 Apendix B.
Reporting Limit (RL) based upon Lowest Standard Determined (LSD) in accordance with AIHA-ELLAP policies.
LSD=0.2 ppm MDL=0.005% by weight. RL= 0.010% by weight (based upon 100 mg sampled).

## Disclaimers / Qualifiers:

There may be some samples in this project that have a "NOTE:" associated with a sample result. We use added disclaimers or qualifiers to inform the client about something that requires further explanation. Here is a complete list with highlighted disclaimers pertinent to this project. For a full explanation of these and other disclaimers, please inquire at **customerservice@iatl.com.**

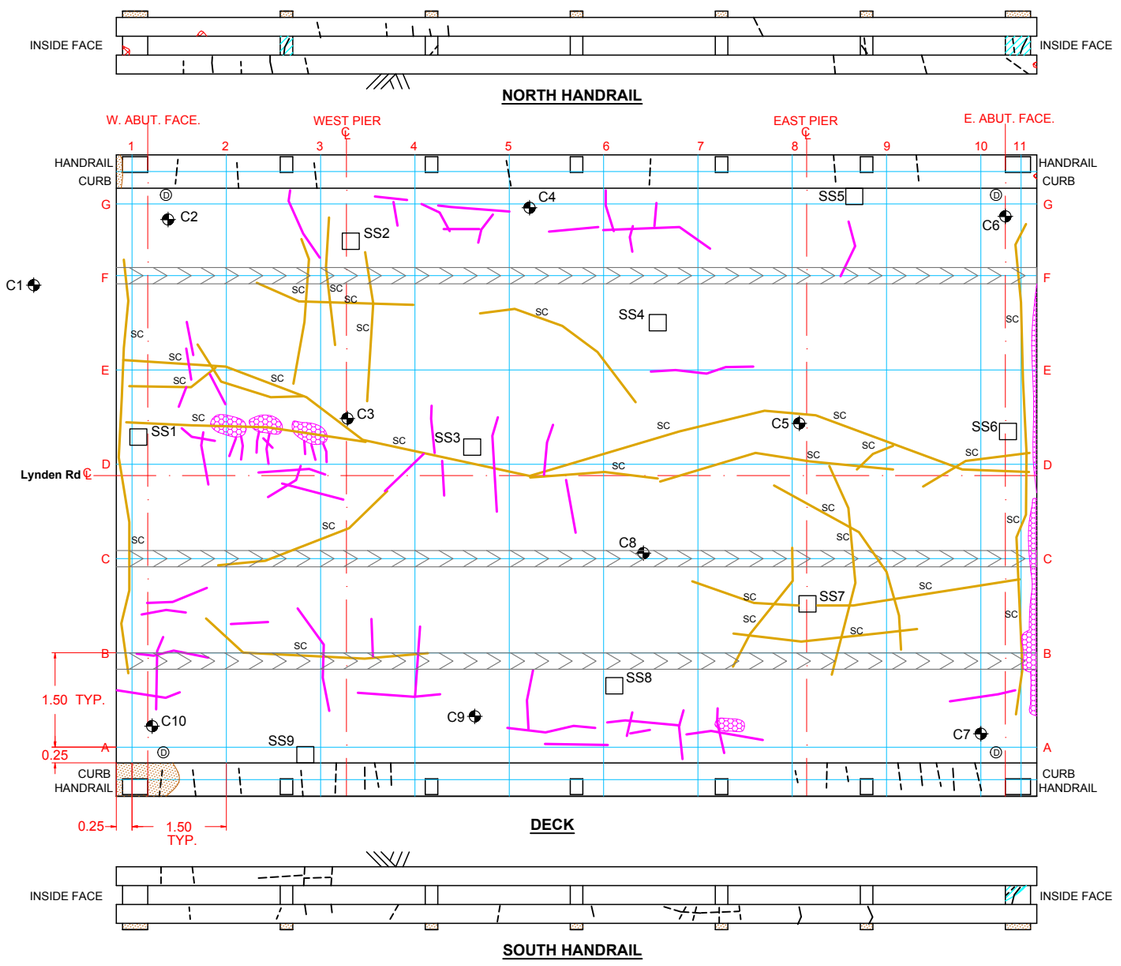
* Insufficient sample provided to perform QC reanalysis (<200 mg)
** Not enough sample provided to analyze (<50 mg)
*** Matrix / substrate interference possible.

# Appendix J:

## 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




KEY PLAN




LEGEND:

| | | |
|---|---|---|
| Ⓓ Drain | Medium Scaling | Medium Concrete Cracks |
| C1 Core Sample Location | Severe Scaling | W Wide Concrete Cracks |
| SS1 Sawn Sample Location | Honeycombed Areas | Medium Stained/ Efflorescence Cracks |
| Patched Spalls | Wet Areas | Unsealed Asphalt Cracks |
| Delaminations | Concrete Pattern cracks | SC Sealed Asphalt Cracks |
| Spalls | Raveling | Rutting |
| 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:

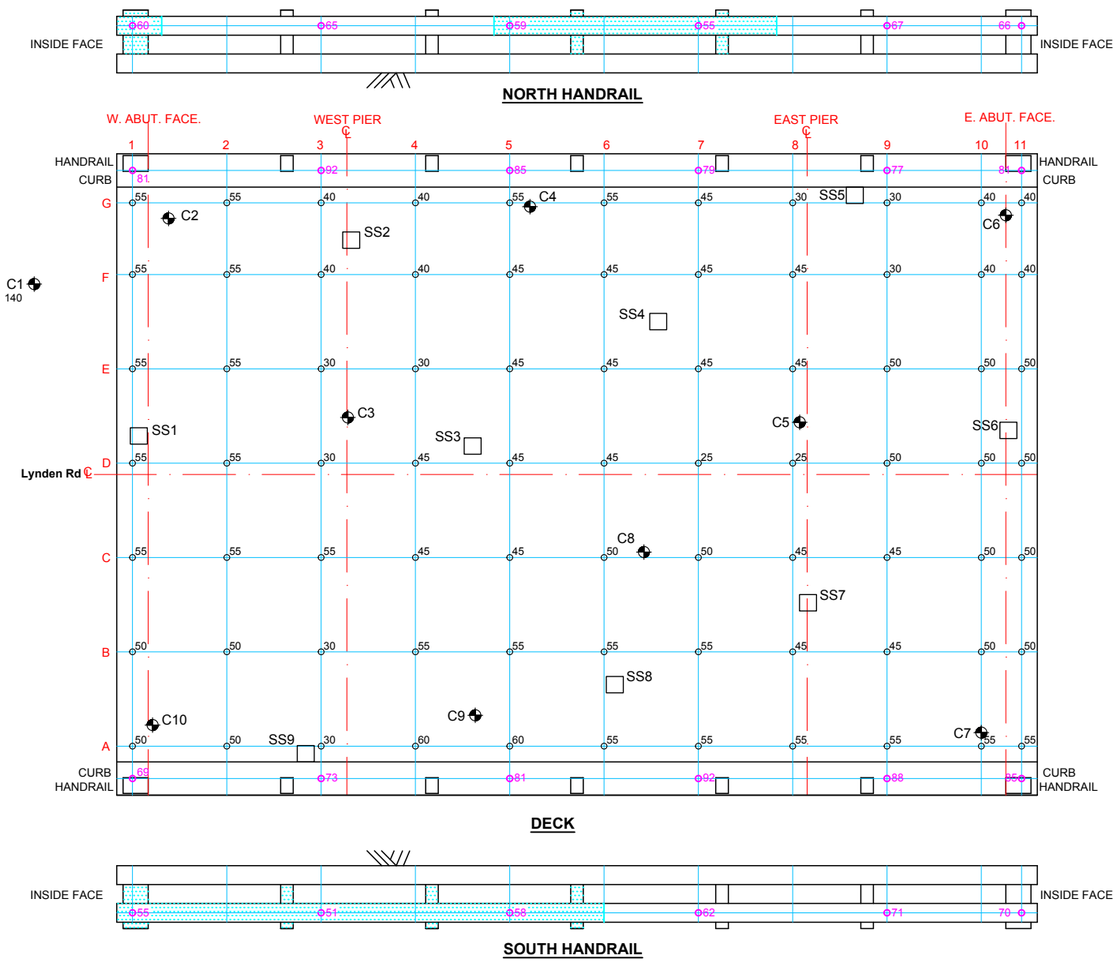
Johnson Bridge
Site No. 1-0049-00
County of Brant, ON

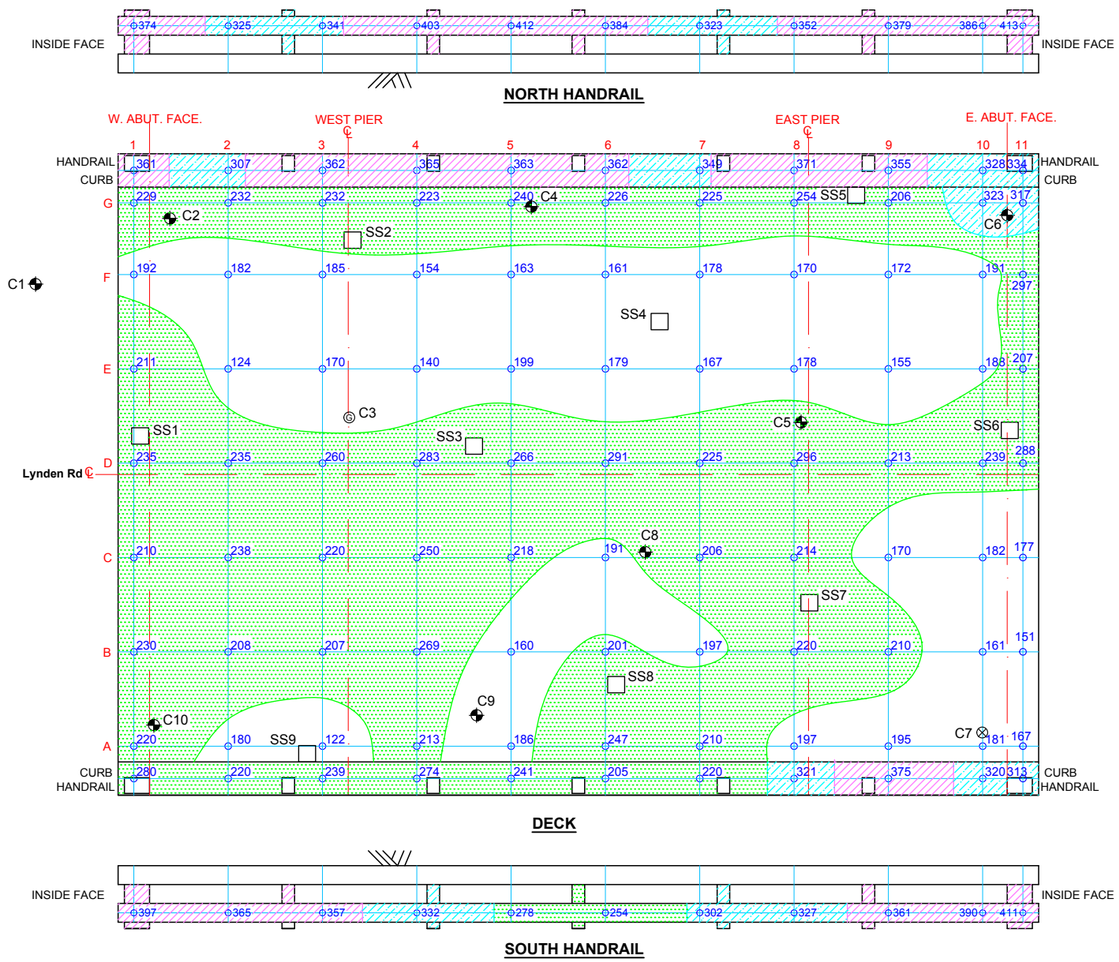
TITLE:

SURFACE DETERIORATION OF ASPHALT ON DECK, CONCRETE CURBS AND HANDRAILS

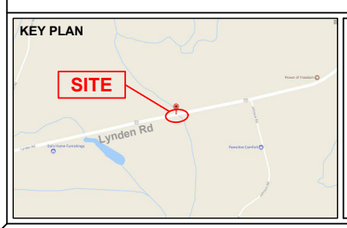
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|---|---|
| Drawing No.: | 1 |
| Project No.: | BCC17049 |
| Date: | December 2017 |
| Scale: | 1:100 |
| Drawn by: | JL |
| Checked by: | MA |

CONSTRUCTION NORTH




KEY PLAN




**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
- G1 AC Resistance test 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 x$10^{-3}$)


BRIDGE CHECK CANADA

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

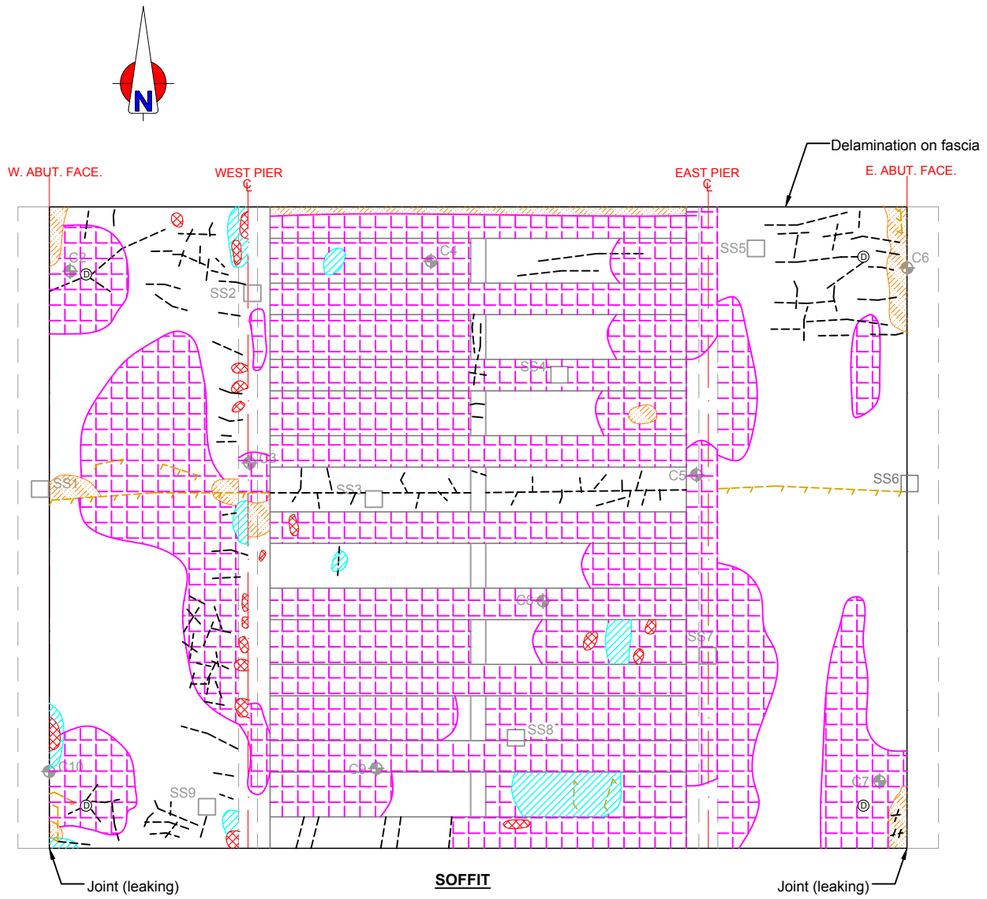

**PROJECT:**

Johnson Bridge
Site No. 1-0049-00
County of Brant, ON

**TITLE:**

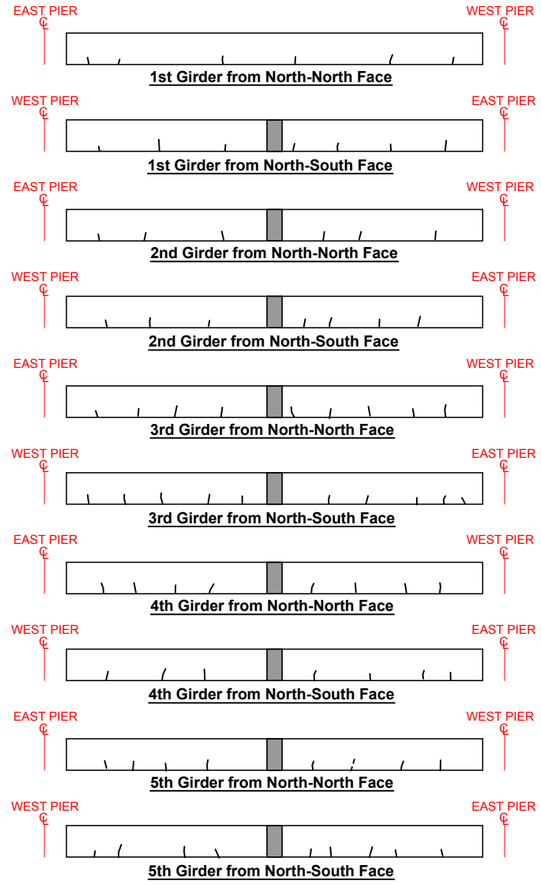
ASPHALT THICKNESS OF DECK AND CORROSION POTENTIAL OF DECK, CONCRETE CURBS AND HANDRAILS

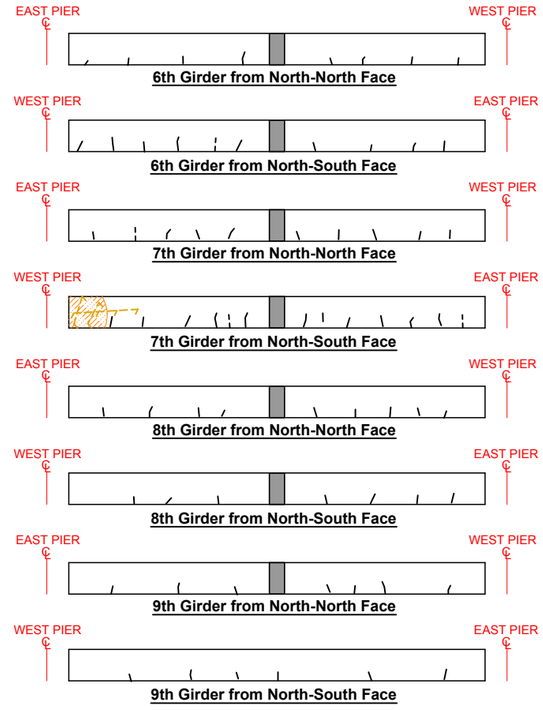
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|---|---|
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| Checked by: | MA |



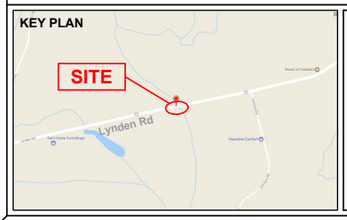

**SOFFIT**

Note: Narrow pattern cracking and light rust staining from reinforcing chairs on soffit girders




KEY PLAN




LEGEND:

- Drain
- C1 Core Sample Location
- SS1 Sawn Sample Location
- Delaminations
- Spalls
- Light Scaling
- Medium Scaling
- Severe Scaling
- Honeycombed Areas
- Wet Areas
- Concrete Pattern cracks
- Patched Spalls
- 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

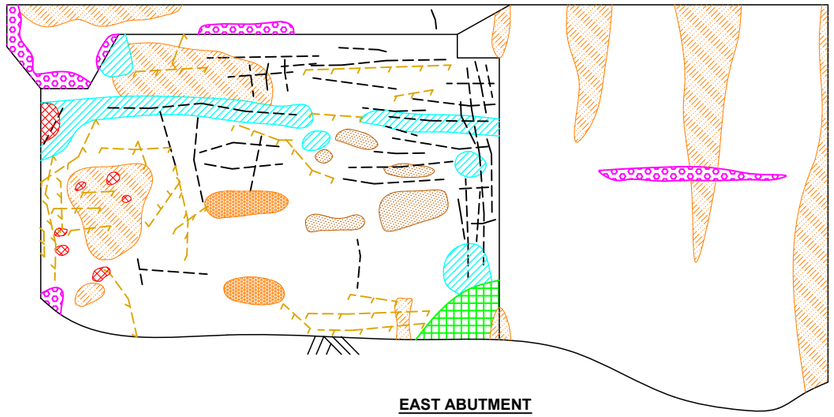
PROJECT:

Johnson Bridge
Site No. 1-0049-00
County of Brant, ON

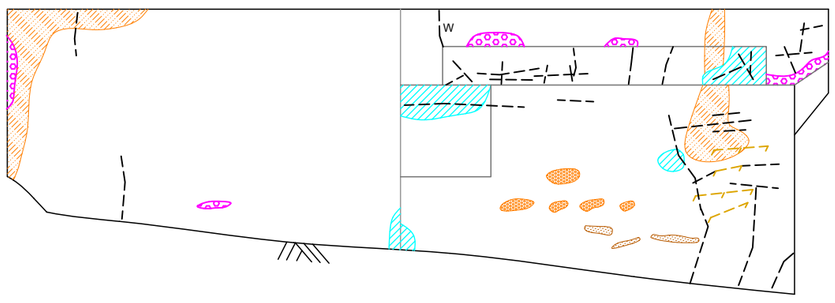
TITLE:

SURFACE DETERIORATION OF SOFFIT AND GIRDERS

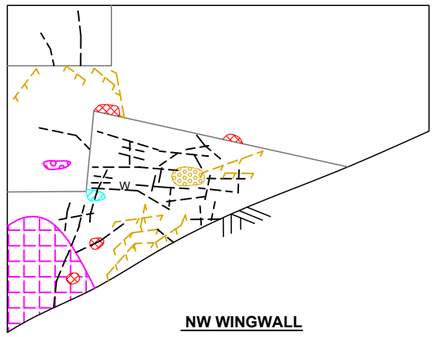
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|---|---|
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| Date: | December 2017 |
| Scale: | 1:100 |
| Drawn by: | JL |
| Checked by: | MA |



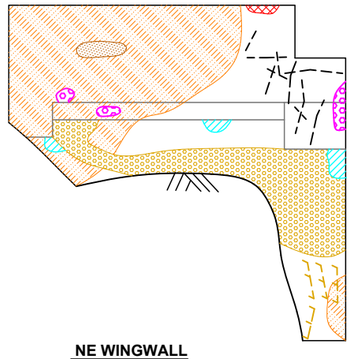
EAST ABUTMENT



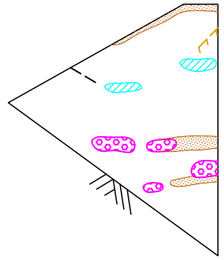

WEST ABUTMENT



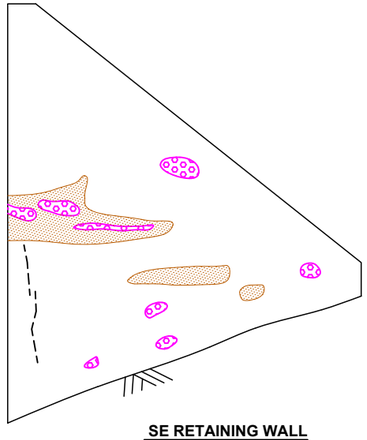

NW WINGWALL



NE WINGWALL



SW RETAINING WALL



SE RETAINING WALL

KEY PLAN




LEGEND:

- Drain
- 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:

Johnson Bridge
Site No. 1-0049-00
County of Brant, ON

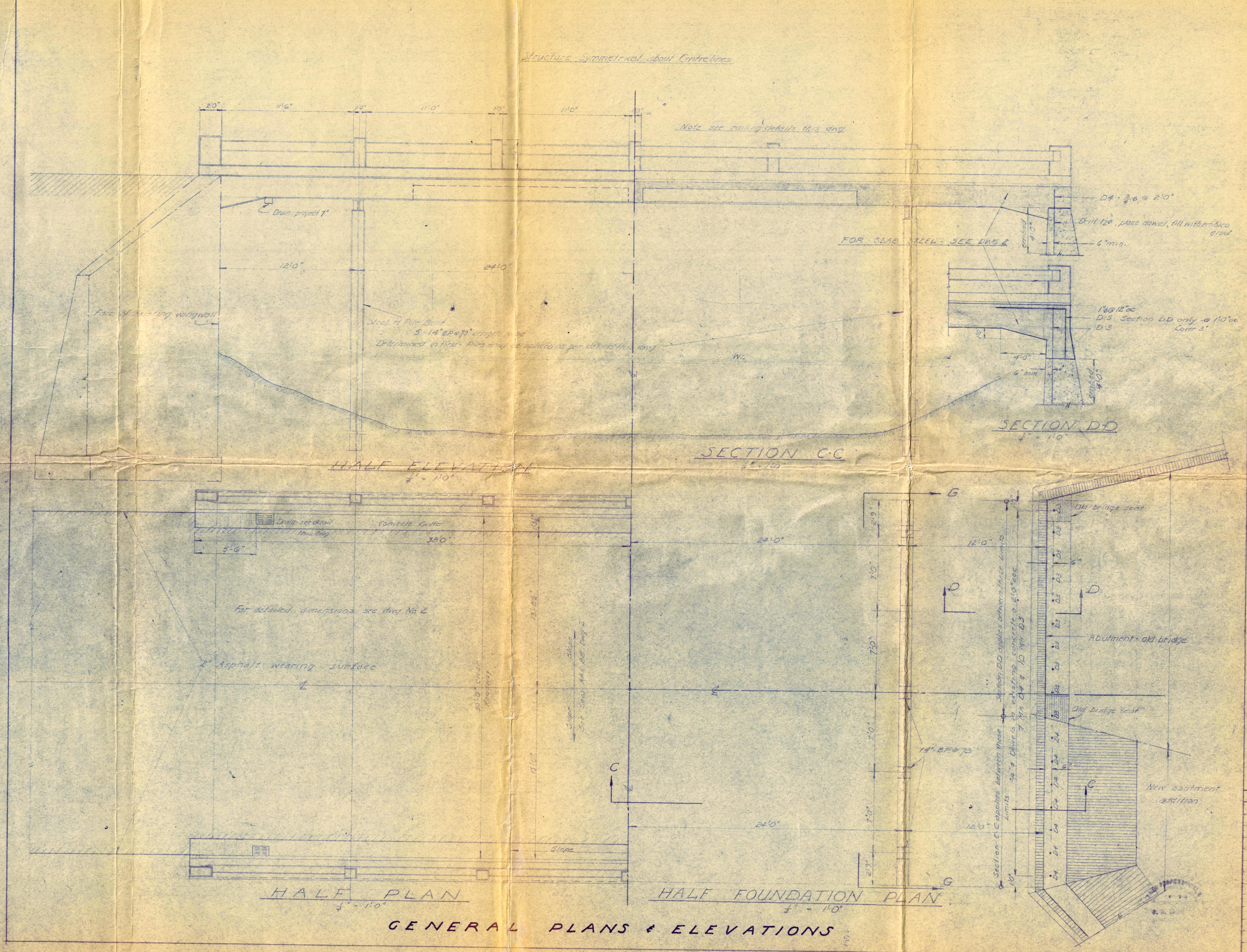
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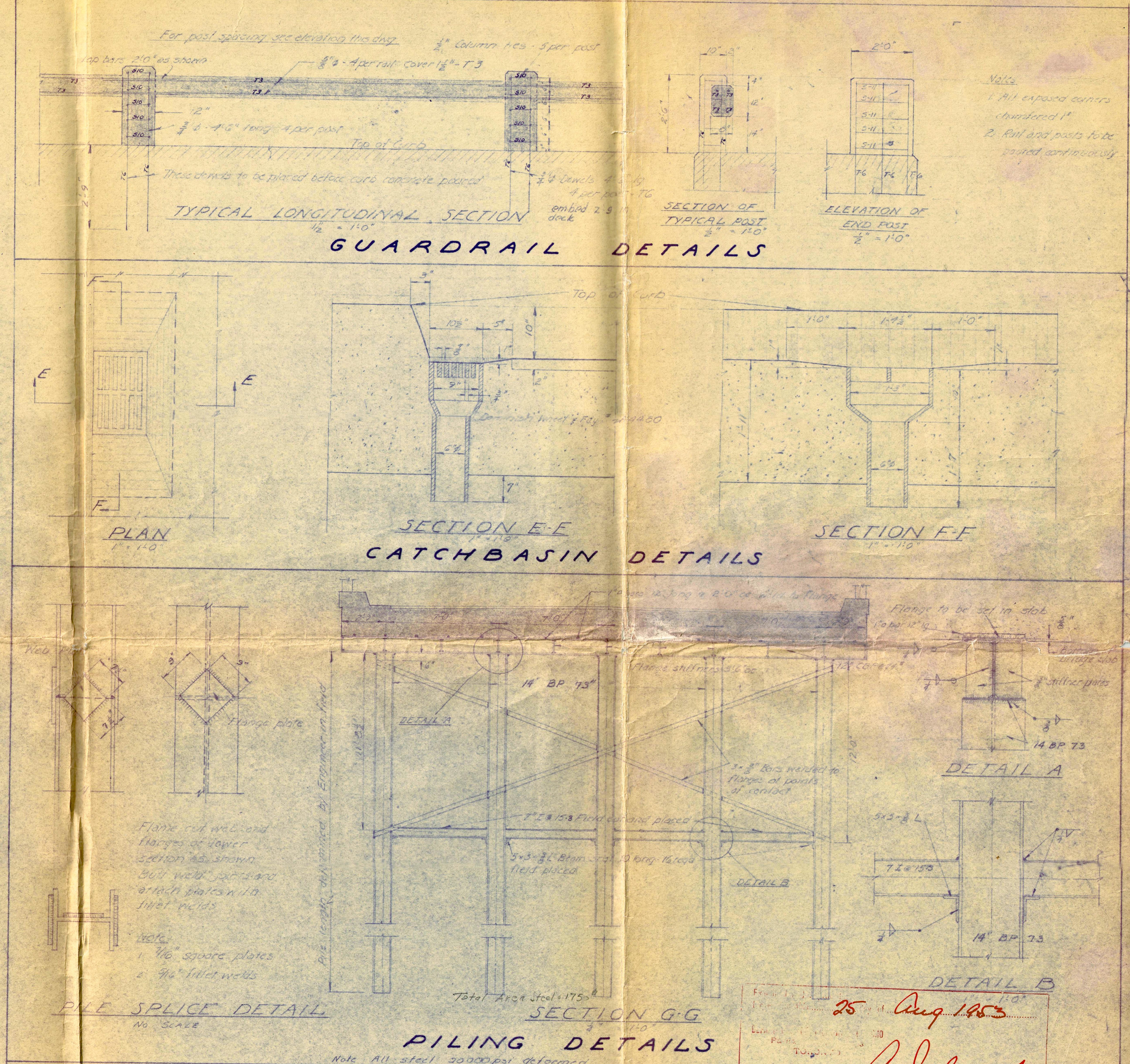
SURFACE DETERIORATION OF ABUTMENTS, WINGWALLS AND RETAINING WALLS

| | |
|---|---|
| Drawing No.: | 4 |
| Project No.: | BCC17049 |
| Date: | December 2017 |
| Scale: | 1:75 |
| Drawn by: | JL |
| Checked by: | MA |

# Appendix “B”

# Existing Bridge Drawings




Note All steel 20000 psi deformed

**BILL OF MATERIAL**

| ITEM | NO. | NOTES |
|---|---|---|
| Catchbasins | 4 | Dom Wheel & Fdy. # A 4480 |
| H. Piles | 10 | 14 BP 73 |
| Pile Caps | 2 | Shop Fabricated |
| Cross Braces | 4 | 3" x 3/8" x 31'-6" For piles |
| Beam Seats | 16 | 5 x 3 x 3/8 L 10" Long |
| Stiffner Beams | 8 | 7 I @ 15.3 field cut btwn piles |

**BILL OF REINFORCING BARS**

| MARK | SIZE | NO | LENGTH | SHAPE |
|---|---|---|---|---|
| D3 | 3/4 ø | 20 | 8'-6" | Straight |
| D4 | 3/4 ø | 14 | 5'-10" | Straight |
| D5 | 1" ø | 32 | 10'-3" | |
| T3 | 5/8 | 48 | 15'-0" | Straight |
| T4 | 1/2 | 44 | 18'-6" | Straight |
| S-9 | 1/2 | 20 | 4'-6" | |
| T6 | 3/4 | 56 | 5'-0" | Straight |
| T-7 | 3/4 | 16 | 6'-0" | Straight |
| S10 | 1/2 ø | 70 | 2'-8" | |
| | | WEIGHT | | 4230 # |

D-5 6'-0" 4'-3"
S-9 1'-8" 7" 7"
S-10 9" 7"

# JOHNSON BRIDGE

ROAD 11

## COUNTY OF BRANT

COUNTY ENGINEER R. M. LEE

## GENERAL DETAILS

25 Aug 1953
A. Sedgwick
CHIEF BRIDGE ENGINEER

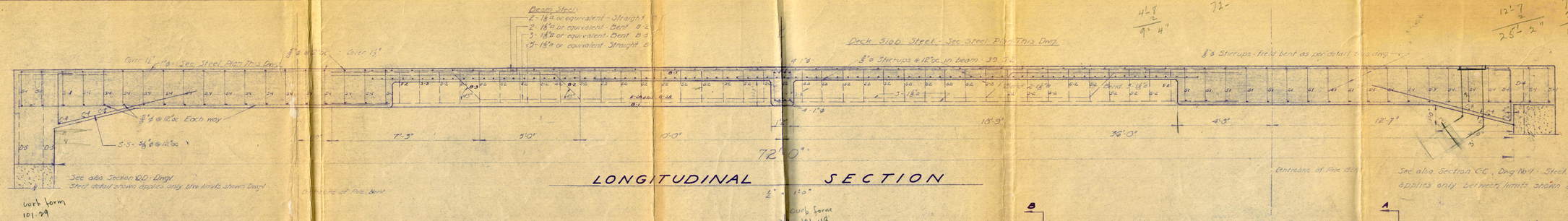
| NO. | DATE | BY | REMARKS |
|---|---|---|---|
| 1 | 8/4/53 | NOJ | General revision at abutments |

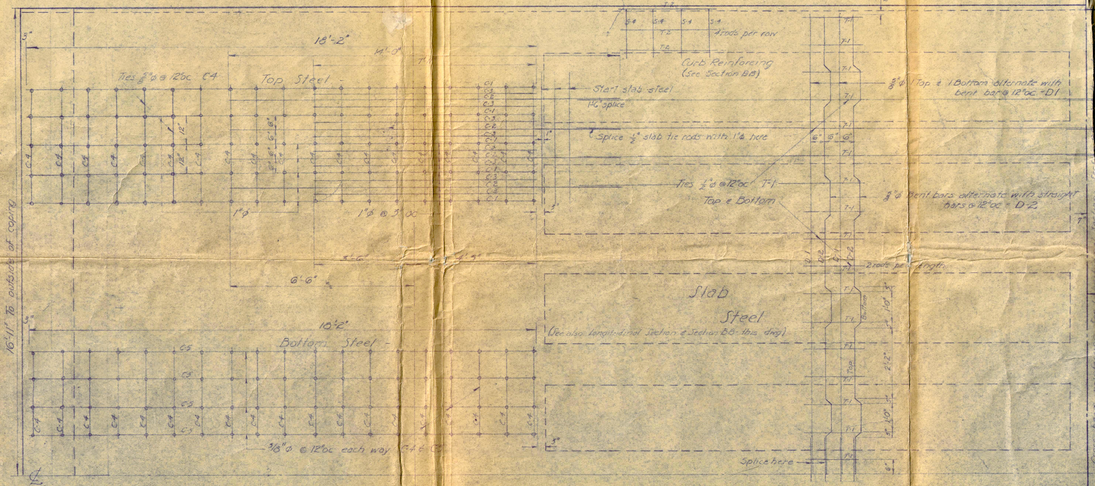
REVISIONS

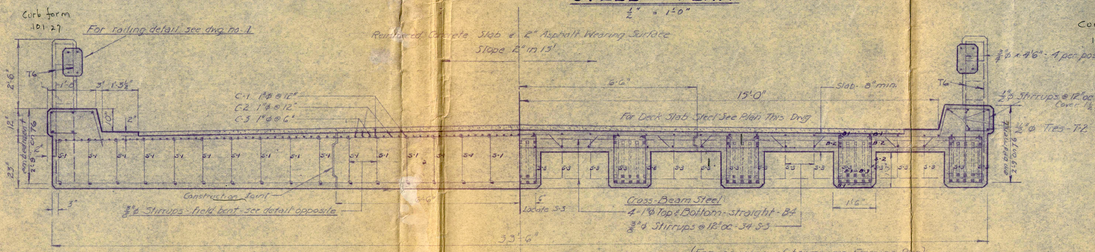
LEE AND BROOKS - CONSULTING ENGINEERS
KINGSTON - ONTARIO

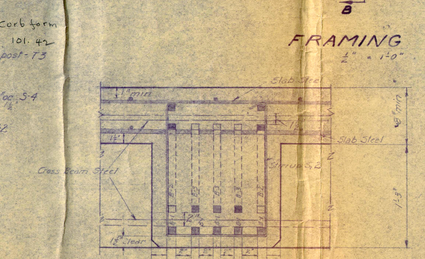
SCALE As Shown | DATE Feb. 2-53
DWN. NOJ | APPROVED JWB | DRAWING 1
TCD. NOJ
CHKD. JWB | FILE 72-361-C

NO 277







Examined and approved for design this 25 day of Aug 1953
DEPARTMENT OF HIGHWAYS, ONTARIO
Parliament Buildings
TORONTO
A. Dadquick
DEPUTY MINISTER

Notes:
1. All concrete to have 3000 psi compressive strength at 28 days.
2. No other construction joints than those shown will be permitted.
3. Reinforcing steel shall have 1½" minimum cover.

BILL OF REINFORCING BARS

| MARK | SIZE | NO. | LENGTH | SHAPE |
|---|---|---|---|---|
| C1 | 1⅛ | 66 | 18'2" | Straight |
| C2 | 1⅛ | 66 | 14'0" | Straight |
| C3 | 1⅛ | 132 | 7'1" | Straight |
| C4 | ⅝ | 166 | 17'6" | Straight |
| C5 | ⅝ | 66 | 18'2" | Straight |
| D1 | ⅝ | 231 | 11'6" | Straight |
| D2 | ⅝ | 77 | - | Straight |
| T1 | ½ | 196 | 22'0" | Straight |
| T2 | ½ | 40 | 20'0" | Straight |
| B4 | 1⅛ | 63 | 44'6" | Straight |
| B2 | 1⅛ | 18 | - | - |
| B3 | 1⅛ | 27 | - | - |

| MARK | SIZE | NO. | LENGTH | SHAPE |
|---|---|---|---|---|
| S1 | ⅝ | 6 | 19'0" | Straight |
| S2 | ⅝ | 1070 | 2'2" | Straight |
| S3 | ⅝ | 321 | - | Straight |
| S4 | ⅝ | 34 | - | Straight |
| S5 | ⅝ | 190 | - | Straight |
| S6 | ⅝ | 66 | - | Straight |

All dimensions out to out.
All steel deformed except plain.
WEIGHT

| APPROXIMATE CONCRETE | QUANTITIES Cubic Yards |
|---|---|
| Centre Deck Pour | 120 |
| North Deck Pour | 130 |
| South Deck Pour | 80 |
| Guardrail and Posts | 60 |
| Total | 390 |

# JOHNSON BRIDGE
ROAD 11
COUNTY OF BRANT
COUNTY ENGINEER R.M. LEE
REINFORCING DETAILS

LEE AND BROOKS - CONSULTING ENGINEERS
KINGSTON - ONTARIO
SCALE ½" = 1'0" DATE Jan 1953
DRN. NDS APPROVED
TCH. NDS
CHKD. JWB FILE 72-382-C
DRAWING 2

| No. | DATE | BY | REMARKS |
|---|---|---|---|
| 1 | 11/10/53 | NDS | General revision of detailing |

REVISIONS

# Appendix “C”

# Ecological Mitigation Plan

BioLogic Incorporated
AQUATIC AND TERRESTRIAL ECOSYSTEM PLANNERS

Jamie Smith
G. Douglas Vallee Limited
2 Talbot St. North
Simcoe, ON N3Y 3W4

March 5, 2018

Dear Jamie,

**Re: Final Mitigation Plan - Johnson Bridge Rehabilitation over Fairchild Creek**

BioLogic has been retained by G. Douglas Vallee Limited for the Johnson Bridge Rehabilitation located on Lynden Road, east of the city of Brantford, Ontario [Figure 1], to assist with the projects natural heritage components.

BioLogic completed a Natural Heritage Report outlining relevant legislation including the Endangered Species Act, Migratory Birds Act, Fisheries Act and Grand River Conservation Authority (GRCA) Regulation Limit requirements and related environmental considerations for the project.

Since the Natural Heritage Report, MNRF has been contacted to update any additional Threatened or Endangered species that require consideration and none were identified.

Further to the review of the above noted report and construction requirements and timing, the following Final Mitigation Plan should be followed for the Johnson Bridge Rehabilitation project.

Should you wish to clarify any questions or require additional information as part of this Final Mitigation Plan, do not hesitate to contact us.

Yours truly,
BioLogic

Dave Hayman, M.Sc.
Johnson Bridge - Final Mitigation PlanCR.wpd

**Attachments**
Figure 1: Site Location
Figure 2 - Butternut Locations
Appendix A - Bird Nesting Prevention Measures
Appendix B - Requirements for Compensation Butternut Seedlings

**BioLogic Incorporated**
110 Riverside Drive, Suite 201
London, Ontario N6H 4S5
Telephone: 519-434-1516
Fax: 519-434-0575

www.biologic.ca

**Windsor Office**
2280 Ambassador Drive
Windsor, Ontario N9G 4E4
Telephone: 519-966-1645
Fax: 519-966-1645

# JOHNSON BRIDGE MITIGATION PLAN

## In-water Work

1. A DFO Request for Review (approximately one month turnaround time) is required if there is:
    1. a temporary or permanent increase in existing footprint below the high water mark;
    2. temporary or permanent fill placed below the high water mark (ie. cofferdam etc.)

2. A permit from GRCA is required for work proposed within the Regulation Limit.

3. To respect the spring spawning fish timing window, **NO** in-water work should occur between **March 15th - July** 15th unless an adjustment to the window is approved by DFO.

4. If in-water work is planned, a Licence to Collect Fish for Scientific Purposes should be obtained from the MNRF in order to conduct a fish salvage within the isolated work area. This is best done ahead of the tender process to limit startup delays.

    Timing

    i. The duration of in-water work will be minimized.

    ii Undertake all in-water activities in isolation of open or flowing water to maintain the natural flow of water downstream and avoid introducing sediment into the watercourse.

    iii Work will be scheduled to avoid wet, windy and rainy periods that may increase erosion and sedimentation.

    Fish Protection

    i. Ensure that all in-water activities, or associated in-water structures, do not interfere with fish passage, constrict the channel width, or reduce flows.

    ii. Retain a qualified environmental professional to ensure applicable permits for relocating fish are obtained and to capture any fish trapped within an isolated/enclosed area at the work site and safely relocate them to an appropriate location in the same waters. Fish may need to be relocated again, should flooding occur on the site.

    iii. If using pumps instead of bypass channel, screen any water intakes or outlet pipes to prevent entrainment or impingement of fish. Entrainment occurs when a fish is drawn into a water intake and cannot escape. Impingement occurs when an entrapped fish is held in contact with the intake screen and is unable to free itself.

## Bridge Deck Work

Endangered Species Act & Migratory Birds Act - Barn Swallow & Cliff Swallow

1. ESA Project Registration with the MNRF is required for the removal of Barn Swallow habitat.

2. Barn Swallow and Cliff Swallow nests were confirmed on the bridge in 2017. To avoid the active Barn Swallow and migratory bird seasons, bridge work should **NOT** occur between **late March - mid to late August.**

3. However, the bridge should be inspected by a qualified biologist around July 15th to determine stage of use and to estimate likely time when young will leave the nests.

4. Conversely, bridge work within the Barn Swallow and migratory bird seasons is possible if bird nesting prevention measures [Appendix A] are installed between September 1st and late March. It is recommended that a qualified biologist inspect the bird nesting prevention measures to ensure proper installation. In addition, any Barn Swallow nest would need to be removed and a compensation nest provided before May 1st. The details and requirements of this compensation are provided below:

Barn Swallow Habitat Compensation

i.) The nest must be replaced with one nest cup in either: i) the building or structure that was the object of the activity and in any area of the building or structure that continues to provide conditions that are suitable for barn swallow nesting; ii) in any building or structure that exists within one kilometre of the building or structure that was the object of the activity if it provides conditions that are suitable for barn swallow nesting; or iii) in any building or structure that the person constructs within one kilometre of the building or structure that was the object of the activity, that: i) provides horizontal ledges or rough vertical surfaces with a sheltered overhang; ii) provides surface areas suitable for nest attachment at a height that minimizes disturbances to barn swallow and in a location that minimizes predation; iii) allow barn swallow to freely enter and exit nests; iv) provides suitable area to accommodate appropriate spacing between nests; and v) be structurally sound and capable of providing habitat for barn swallow on a long term basis.

Watercourse Protection

5. A tarp or mesh blanket will be installed under the bridge to prevent any debris from entering the watercourse during all work on the bridge deck.

**Site Grading and Work Around Bridge**

Endangered Species Act - Butternut & Migratory Birds Act - all species

1. To avoid the migratory bird season, vegetation removal and/or associated work around the bridge should **NOT** occur between **late March - August 31st**. However, vegetation surrounding the bridge should be inspected for nesting birds and if no nesting is occurring, vegetation removal can proceed.

2. On the northwest side of the bridge, tree B1 is a Category 2, retainable Butternut with a 4cm dbh [Figure 2]. This tree will be removed, therefore ESA Project Registration with MNRF is required. In addition, the proponent will need to plant at least five compensation Butternut seedlings following all ESA requirements in Appendix B related to timing, seed origin and site/soil condition, among others.

4. On the south side of the bridge there are three Butternut trees [Figure 2]. Tree B2 is not retainable and tree B4 is a hybrid, therefore neither tree is protected by the ESA. However, tree B3 is a Category 2, retainable Butternut, with a 4cm dbh. Work is proposed within 25m of the tree which constitutes harm, and therefore ESA Project Registration with MNRF is required. In addition, the proponent will need to plant at least three compensation Butternut seedlings following all ESA requirements in Appendix B related to timing, seed origin and site/soil condition, among others. Furthermore, tree protection fencing will be installed at either the tree dripline or south work limit, whichever distance is greater, to avoid any direct impacts.

5. A permit from GRCA is required for work proposed within the Regulation Limit.

## Mitigation Measures

In addition to the recommended timing windows, approvals and compensation outlined above, the following mitigation measures are provided to protect Barn Swallow, migratory birds, Fairchild Creek, Butternut and vegetation within the work area.

Contaminant and Spill Management

6. An emergency spill kit should be on-site at all time in the event of a spill. All workers should be trained the proper spill procedure (i.e., containment, clean-up and reporting) which should also be completed in accordance with provincial standards.

Operation of Machinery

7. Ensure that machinery arrives on site in a clean condition and is maintained free of fluid leaks, invasive species and noxious weeds.

8. Whenever possible, operate machinery on land above the high water mark, in a manner that minimizes disturbance to the banks and bed of the waterbody.

9. Wash, refuel and service machinery and store fuel and other materials for the machinery in such a way as to prevent any deleterious substances from entering the water. Non-mobile equipment within the construction area should have a permanent drip pan.

Sediment and Erosion Control

10. Sediment and erosion control measures will be installed where appropriate prior to construction to minimize risk of sedimentation of the waterbody during all phases of the project. Sediment and erosion control measures should be installed according to the Guidelines for Erosion and Sediment Control for Urban Construction Sites (OMNR, 2006) and the applicable standards established in the Ontario Provincial Standard Specification/Ontario Provincial Standard Drawings (OPSS/OPSD) documents.

11. Sediment and erosion control measures will be multi-purpose and also act as tree protection and wildlife barrier fencing to protect Butternut trees and adjacent vegetation and keep incidental wildlife outside of the work area.

12. Sediment and erosion control measures will be maintained during construction and until all disturbed ground has been re-vegetated. Sediment and erosion control measures will be inspected frequently during construction to ensure that they are maintained and functioning properly.

13. Any excavated material that will be stockpiled on site for the project will be placed above the high water mark and protected with silt fencing on the down-gradient side to prevent re-entry into the watercourse.

Shoreline Re-Vegetation and Stabilization

14. The extent of vegetation removal, clearing and grubbing will be minimized to the smallest area possible.

15. Clearing of riparian vegetation should be kept to a minimum: use existing trails, roads or cut lines wherever possible to avoid disturbance to the riparian vegetation and prevent soil compaction. When practicable, prune or top the vegetation instead of grubbing/uprooting.

16. Minimize the removal of natural woody debris, rocks, sand or other materials from the banks, the

shoreline or the bed of the waterbody below the ordinary high water mark. If material is removed from the waterbody, set it aside and return it to the original location once construction activities are completed.

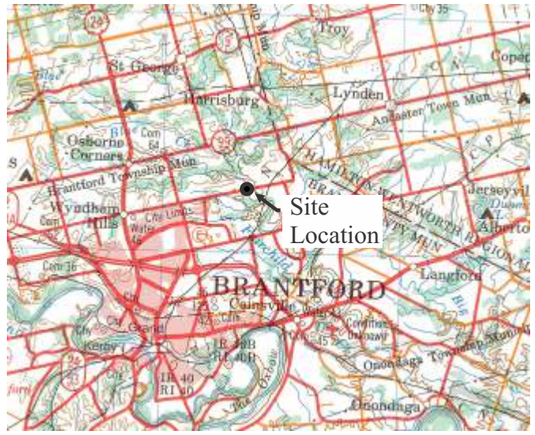
17. Immediately stabilize shoreline or banks disturbed by any activity associated with the project to prevent erosion and/or sedimentation, preferably through re-vegetation with native species suitable for the site.

18. Restore bed and banks of the waterbody to their original contour and gradient; if the original gradient cannot be restored due to instability, a stable gradient that does not obstruct fish passage should be restored.




# Figure 1: Site Location

(2017 Google Air Photo)




0 1,000

Scale 1:50,000

Key Plan

Print on 11X17, Landscape Orientation

0 40

Scale 1:2000

January 2018

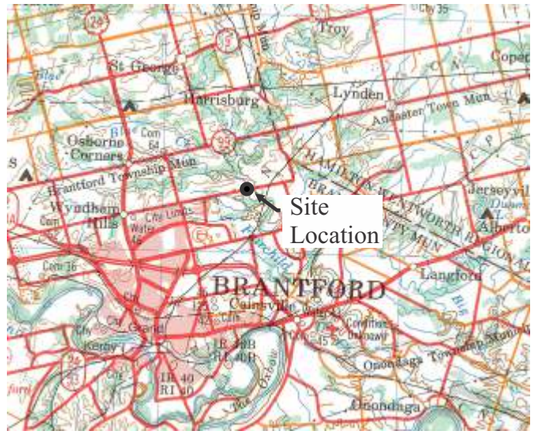
BioLogic

AQUATIC AND TERRESTRIAL ECOSYSTEM PLANNERS

# Figure 2: Butternut Locations

(2017 Google Air Photo)




0 1,000

Scale 1:50,000

Key Plan

assessed Butternut with 25m Setback (canopies shown to scale)

unassessed Butternut with 25m Setback (canopies shown to scale)

B1 - Retainable (protected)
B2 - unassessed
B3 - unassessed
B4 - unassessed

Print on 11X17, Landscape Orientation

0 20

Scale 1:1000

January 2018

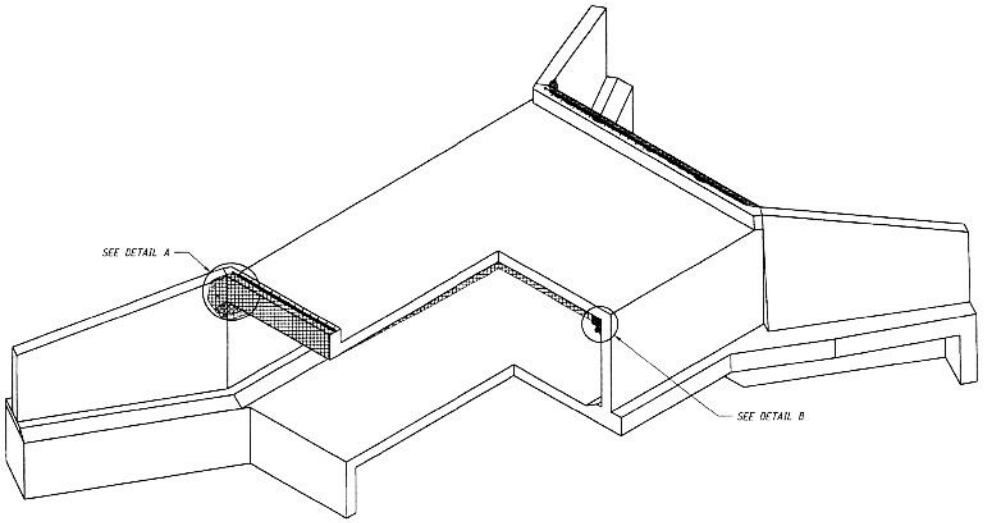
BioLogic

AQUATIC AND TERRESTRIAL ECOSYSTEM PLANNERS

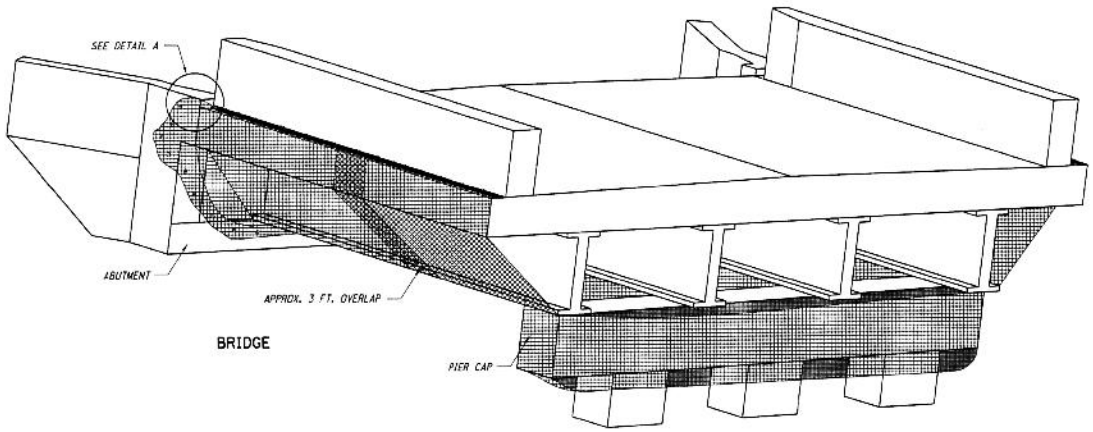
# Appendix A

Bird Nesting Prevention Measures

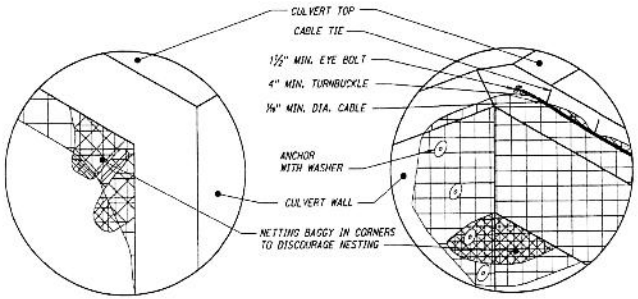
Roadway Design Division




BOX CULVERT




BRIDGE




DETAIL B DETAIL A

NOTES:

MAY BE USED ON OTHER STRUCTURES SUCH AS LARGE CORRUGATED METAL PIPES.

THE CONTRACTOR SHALL USE NETTING CONSISTING OF OPENINGS NO LARGER THAN ½" WIDE. THE NETTING MATERIAL WILL BE CONSTRUCTED OF EXTRUDED POLYPROPYLENE OR NYLON MESH.

THE CONTRACTOR SHALL INSTALL NETTING IN A MANNER THAT GAPS BETWEEN THE NETTING AND THE BRIDGE/CULVERT ARE LESS THAN ½" AT THE POINT OF ATTACHMENT. LOOSE FITTING NETTING IS DESIRABLE FOR STRUCTURES SUCH AS BOX CULVERTS. WHERE NETTING FITTED TIGHT TO THE STRUCTURE MAY ALLOW NESTING.

NETTING SHOULD OVERLAP IN END AREAS OF BRIDGE PIERS BY APPROXIMATELY 3 FT. AND SHOULD EXTEND TO THE BOTTOM OF THE PIER CAP, IF PRESENT. FOR SLAB BRIDGES, NETTING SHOULD BE PULLED TAUT NOT BE TIGHT AGAINST THE STRUCTURE AT INSIDE CORNER AREAS BETWEEN THE UNDERSIDE OF A BRIDGE DECK AND PIER CAP AND MAINTAINED TO MINIMIZE SAGGING.

DEVICES SUCH AS STEEL CABLES AND EYE BOLTS USED TO SECURE NETTING TO THE STRUCTURE SHOULD BE OF ADEQUATE NUMBER AND STRENGTH TO ACCOUNT FOR THE WEIGHT OF THE NET AND SUBSEQUENT STRETCHING, AND SHALL MEET THE SPECIFICATIONS OUTLINED IN SECTION 1057 AND 1062 OF THE STANDARD SPECIFICATION FOR HIGHWAY CONSTRUCTION.

PLASTIC CABLE OR "ZIP" TIES SHOULD BE USED TO SECURE TO THE STEEL CABLES AND TO BUNCH EXCESS NETTING WHERE NEEDED.

STANDARD DIMENSIONAL LUMBER SECURELY ATTACHED TO THE STRUCTURE MAY BE SUBSTITUTED FOR THE CABLE AND EYE BOLT METHOD OF SECURING THE NETTING TO THE STRUCTURE.

THE CONTRACTOR SHALL INSTALL THE NETTING IN A MANNER THAT WILL MINIMIZE THE OBSTRUCTION TO WATERCOURSES DURING PERIODS OF HIGH FLOW BY KEEPING THE NETTING TAUT TO THE TOP OF THE CULVERT.

FURTHER GUIDANCE FOR PLACEMENT IS AVAILABLE FROM THE NDOR ENVIRONMENTAL SECTION IN PLANNING AND PROJECT DEVELOPMENT.

| REV. NO. | DATE | DESCRIPTION OF REVISION |
|---|---|---|
| | | |

NEBRASKA DEPARTMENT OF ROADS

STANDARD PLAN NO. 490

# BIRD EXCLUSION NETTING

PROFESSIONAL CIVIL ENGINEER — JAMES J. SCOTT E-6035 — STATE OF NEBRASKA

FHWA APPROVED:

3/30/2011
DATE

ORIGINAL:
JULY 1, 2011
DATE

1
1

DGN: us-units
DATE: 18-MAR-2011 14:56

d8000400.dgn
1001

Example Photo of Bird Nesting Prevention Measures



# Appendix B

Requirements for Compensation Butternut Seedlings

3. Every butternut seedling that is planted must have been grown from seed that originated from the seed zone in which it is planted.

4. All butternut seedlings must be planted within three years of the person submitting the relevant notice of butternut impact form under subparagraph 4 i of subsection (4).

5. Butternut seedlings must be planted in an area with the following characteristics:

i. the soil must be greater than one metre deep, moist but well-drained and have a fine to medium texture with a recognizable organic layer and with a pH ranging from 6.8 to 7.2, and

ii. the area must provide full sunlight conditions to the butternut seedlings.

6. In order to avoid a monoculture of butternut, the person shall plant deciduous trees and shrubs that are not butternut seedlings and that are native to the area in which the seedlings are planted in such numbers to ensure that there are an equal number of butternut trees and other native Ontario species in the area.

7. Every butternut seedling and companion tree or shrub referred to in paragraph 6 must be planted either between March 1 and May 15 or between September 20 and October 30 of any year, except for a butternut seedling or companion tree or shrub that was grown in a container which may be planted between May 16 and May 25 of any year.

8. No more than 200 butternut seedlings shall be planted in a hectare.

9. Butternut seedlings must be planted at least,

i. three metres from other planted butternut seedlings,

ii. two metres from other trees or shrubs that are likely to be the same height or shorter than the butternut tree at full growth,

iii. four metres from other trees or shrubs that are likely to be taller than the butternut tree at full growth,

iv. five metres from the canopy drip line of trees that are greater than four metres in heights at the time of planting, and

v. 100 metres from a highway consisting of two or more lanes in either direction.

10. Every butternut seedling that is planted under this subsection must be monitored once annually between May 15 and September 20 for two years after it is planted to assess the health of the tree and its habitat conditions.

11. In order to ensure the good growth and health of the butternut tree, every butternut seedling that is planted under this subsection must be tended to in accordance with the following rules:

i. tending activities shall take place once a week from May 15 to September 20 during the first growing season after the butternut seedling is planted,

ii. tending activities during the first growing season after the butternut seedling is planted will include,

A. maintenance of tree guards to protect the lower stem from rodents,

B. vegetation control 60 centimetres around the base of the tree until the tree is above the herbaceous vegetation, and

C. watering during drought or low rainfall periods, and

iii. tending activities shall take place during the second growing season after the butternut seedling is planted as required to ensure that,

A. vegetation is controlled 60 centimetres around the base of the tree until the tree is above the herbaceous vegetation, and

B. the tree is watered during drought or low rainfall periods.

12. The person must plant a butternut seedling to replace any butternut seedling planted under this subsection that dies within two years of the planting of the seedling and must do so in accordance with the planting requirements of this subsection.

13. For each butternut seedling planted under this subsection, the person must maintain a record of the planting, monitoring and tending activities required under this subsection, which record shall include,

i. the date the butternut seedling was planted,

ii. the date of each time a person attended to monitor or tend to the butternut tree,

iii. a description of every monitoring and tending activity,

iv. an assessment of the health status of the butternut seedling every time it is monitored or tended to to indicate if its health is good, poor or whether it is dead, and

v. whether the butternut tree shows evidence of butternut canker and, if so, a description of the extent to which the tree is affected by butternut canker.

14. Within 14 days of receiving a request from the Ministry, the person shall provide the record maintained under paragraph 13. O. Reg. 176/13, s. 14; O. Reg. 323/13, s. 4.

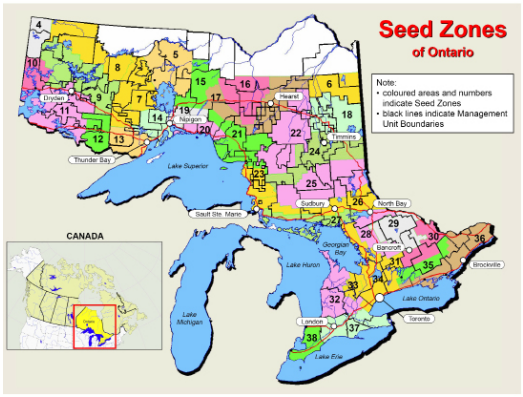
# Appendix “D”

# Ontario Native Roadside Seed Mix

# Ontario Native Roadside Mix

## Description

A robust seed mix designed for single pass application to establish a native meadow suitable for the general road side environment in Southern Ontario. Application of this native seed mix for conservation is appropriate in Seed Zone 34, 37 & 38. The vegetation mix is quick to establish and will succeed to later successional species that will provide good erosion control, having good drought and salt tolerance. The mix includes a quick establishing grass combined with attractive persistent native grasses and wildflowers once common throughout this region of Ontario.




## Application

For all roadside areas including uplands, slopes, and lower ditched (periodically wet) areas as a single mix.



## Application Rate

20kg/hectare

## Maintenance

Well adapted for occasional mowing, or can be left alone for a more natural appearance; periodic mowing once every couple of years, in early to mid summer, can help to rejuventate native meadow if burning is not possible, but may only be necessary if weedy or shrubby species become a problem.

Can be established by hydroseeding, drilling or broadcast application; seed should be on the surface with good seed soil contact for best results. Spring or Fall seeding recommended.

**Prices and components are subject to change without notice.**
**Please call for pricing and availability.**

**To order, please call toll-free 1 866 640 8733 or email sales@stwilliamsnursery.com**

**www.stwilliamsnursery.com**

# Ontario Native Roadside Seed Mix

| Common Name | Scientific Name | Quantity/Hectare (kg PLS*) | % Mix by Weight | Zone 34 | Zone 37 | Zone 38 |
|---|---|---|---|---|---|---|
| **Grasses** | | | | | | |
| Big Bluestem | *Andropogon gerardii* | 2.00 | 10.00 | x | x | x |
| Canada Wild Rye | *Elymus canadensis* | 1.00 | 5.00 | x | x | x |
| Slender Wheatgrass | *Elymus trachycaulus* | 0.50 | 2.50 | x | x | x |
| Virginia Wild Rye | *Elymus virginicus* | 1.00 | 5.00 | x | x | x |
| Switch Grass | *Panicum virgatum* | 2.00 | 10.00 | x | x | x |
| Little Bluestem | *Schizachyrium scoparium* | 1.00 | 5.00 | x | x | x |
| Indian Grass (savanna) | *Sorghastrum nutans* | 1.00 | 5.00 | x | x | x |
| Sand Dropseed | *Sporobolus cryptandrus* | 0.55 | 2.75 | x | x | x |
| Annual Ryegrass | *Lolium multiflorum* | 10.00 | 50.00 | x | x | x |
| | **Subtotal Grasses** | **19.05** | | | | |
| **Sedges and other graminoids** | | | | | | |
| Grain Sedge | *Carex granularis* | 0.05 | 0.25 | x | x | x |
| Fox Sedge | *Carex vulpinoidea* | 0.05 | 0.25 | x | x | x |
| Dark Green Bulrush | *Scirpus atrovirens* | 0.05 | 0.25 | x | x | x |
| Wool-grass | *Scirpus cyperinus* | 0.05 | 0.25 | x | x | x |
| | **Subtotal Sedges & Other graminoids** | **0.20** | | | | |
| **Forbs** | | | | | | |
| Showy Tick Trefoil | *Desmodium canadense* | 0.10 | 0.50 | x | x | x |
| Sweet Ox-eye | *Heliopsis helianthoides* | 0.10 | 0.50 | x | x | x |
| Round-headed Bushclover | *Lespedeza capitata* | 0.10 | 0.50 | x | x | x |
| Wild Bergamot | *Monarda fistulosa* | 0.02 | 0.10 | x | x | x |
| Evening Primrose | *Oenothera biennis* | 0.10 | 0.50 | x | x | x |
| Tall Cinquefoil | *Potentilla arguta* | 0.05 | 0.25 | x | x | x |
| Brown-eyed Susan | *Rudbeckia hirta* | 0.10 | 0.50 | x | x | x |
| Early Goldenrod** | *Solidago juncea* | 0.01 | 0.05 | x | x | x |
| Grey Goldenrod** | *Solidago nemoralis* | | | | | |
| Heath Aster*** | *Symphyotrichum ericoides* | 0.01 | 0.05 | x | x | x |
| New England Aster*** | *Symphyotrichum novae-angliae* | | | x | x | x |
| Sky Blue Aster*** | *Symphyotrichum oolentangiense* | 0.01 | 0.05 | x | x | x |
| Frost Aster*** | *Symphyotrichum pilosum* | | | x | x | x |
| Blue Vervain | *Verbena hastata* | 0.10 | 0.50 | x | x | x |
| Hoary Vervain | *Verbena stricta* | 0.05 | 0.25 | x | | x |
| Foxglove Beardtongue | *Penstemon digitalis* | 0.05 | 0.25 | | x | |
| | **Subtotal Forbs** | **0.75** | **3.75** | | | |

* Pure Live Seed
** Goldenrod species may be a mix of all Goldenrod species listed
*** Asters may be a mix of all Aster species listed