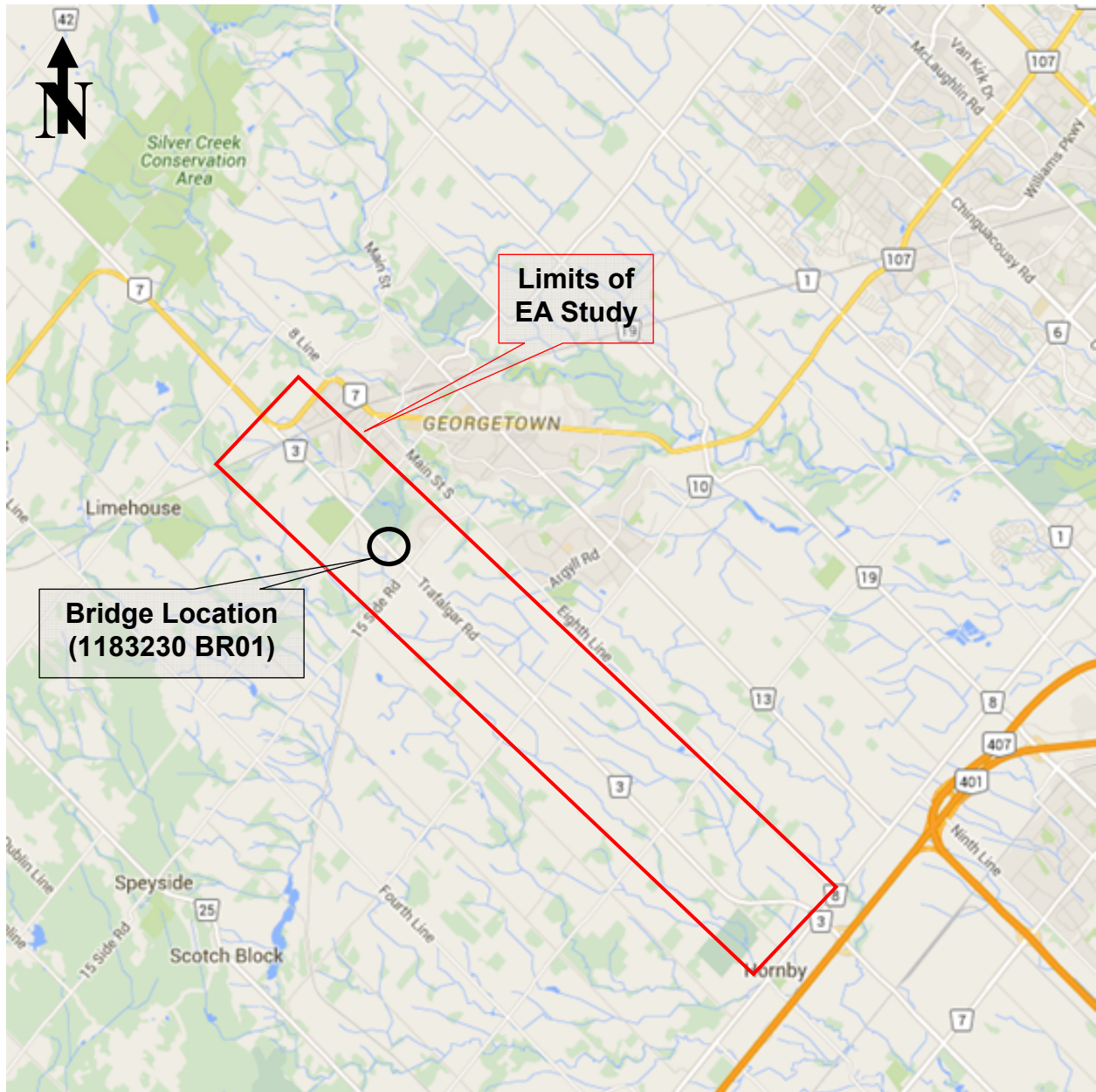


To: MMM Design Team Date: May 19th, 2016
 From: MMM Structural Department Job No.: 3214006
 Subject: Trafalgar Road Improvement Study - Structural Site Visit

STRUCTURE IDENTIFICATION SHEET

STRUCTURE NAME <u>1183230 BR01</u>	
SITE NUMBER <u>1183230 BR01</u>	MTO DISTRICT <u>N/A</u>
HIGHWAY <u>Above</u> <u>Unknown Stream</u>	Below <u>N/A</u>
TYPE OF STRUCTURE <u>Reinforced CIP Concrete Rigid Frame Box Culvert</u>	
NUMBER OF SPANS <u>1</u>	SPAN LENGTHS <u>9.0 m</u>
ROADWAY WIDTH <u>10.3 m</u>	YEAR BUILT <u>Unknown</u>
DIRECTION OF STRUCTURE <u>East-West</u>	
SEQUENCE NUMBER <u>N/A</u>	TOWNSHIP NUMBER <u>N/A</u>
LHRS NUMBER <u>N/A</u>	BRIDGE NUMBER (MUNIC.) <u>N/A</u>
LOCATION <u>Trafalgar Road</u> <u>(0.4km N. of 15 Side Road)</u>	JURISDICTION <u>Halton Region</u>
INSPECTOR'S NAME <u>William Van Ruyven, P.Eng</u>	
PARTY MEMBERS <u>Colin Smyth</u>	
DATE OF INSPECTION <u>November 5, 2015</u>	
TEMPERATURE <u>12 °C</u>	WEATHER <u>Overcast</u>
MTO REGION <u>N/A</u>	AADT <u>>10,000</u>
DECK RIDING SURFACE <u>Asphalt</u>	
YEAR LAST REHABILITATED <u>2012</u>	

KEY PLAN



**Figure 1: Trafalgar Road Improvement Class EA Study
Existing Structure at Black Creek**

1. INTRODUCTION

The MMM Group Ltd. (MMM) was retained by the Regional Municipality of Halton to complete a Class Environmental Assessment (Class EA) Study for Trafalgar Road (Regional Road 3) from Steeles Avenue (Regional Road 8) to Highway 7, in the Town of Milton. The study addressed the need for roadway improvements along this corridor. The study was carried out in compliance with Schedule "C" of the Municipal Engineers Association "Municipal Class Environmental Assessment" (2000, amended 2007, 2011 and 2015).

As part of the Class EA, a reinforced concrete rigid frame bridge (1183230 BR01) was visually inspected in accordance with the *Ontario Structure Inspection Manual, 2008* (OSIM). The following is a summary of the findings from the field investigation completed by MMM on November 5th, 2015.

2. STRUCTURE LOCATION

The existing structure is located approximately 0.4 km north of 15 Side Road on Trafalgar Road and crosses over Black Creek. For the purpose of this memo, Trafalgar Road assumed to run in the north-south direction.

A Key Plan showing the structure location has been provided on page 1 of this memo.

3. STRUCTURE AND ROADWAY DESCRIPTION

3.1 Structure

The existing structure, of unknown original construction date, consists of a single 9.1 m span rigid frame bridge with a sidewalk on the west and concrete parapet walls on either side. An asphalt wearing surface and waterproofing system has been applied on top of the concrete deck. The bridge is 13.3 m wide with a vertical clearance ranging from 2.7 m to 3.1 m.

The bridge was rehabilitated in 2012 including patch repairs to the soffit, replacement of the sidewalk, curb and parapet walls, a concrete overlay and new waterproofing and pavement. The bridge is generally in good condition with local spalls on the sidewalk and parapets.

Original drawings are not available for the bridge; however, the 2012 rehabilitation drawings are available and have been reviewed by MMM.

In addition, adjacent to the existing bridge (to the southeast and southwest) are two reinforced concrete retaining walls that will need to be removed and replaced to facilitate the future road widening. Also, a catch basin located immediately adjacent to the existing bridge and the subsequent outlet to the east of the structure will have to be removed and replaced.

3.2 Roadway

Trafalgar Road is a Regional Arterial road which supports the movement of people and goods (i.e. truck uses). The road currently carries one 3.5 m wide northbound lane and one 3.5 m wide southbound lane of traffic with 1.65 m shoulders and a 1.58 m sidewalk to the west. The anticipated future cross section will carry two lanes of traffic in each direction, as well as a multi-use trail on the east side and a sidewalk on the west side.

3.3 Traffic Data

The posted speed at the bridge is 60 km/h; however, throughout the study area on Trafalgar Road, the speed limit increases to 80 km/h and the AADT is greater than 10,000 vehicles per day. The design speed for Trafalgar Road through the area of the Black Creek crossing is 80 km/h.

4. SUMMARY OF SIGNIFICANT FINDINGS

This investigation consisted of a preliminary site investigation to evaluate the feasibility of the Trafalgar Road widening. The existing structure is generally in good condition with potential for extension or twinning.

4.1 Abutment and Wingwalls

The abutments have some wet staining and efflorescence approximately 1 m above the waterline. The wingwalls are generally in good condition.

4.2 Soffit

The soffit is generally in good condition with local patches and stained cracks (see Photo 5).

4.3 Deck top and Sidewalk

With the exception of a local spall on the sidewalk at the southwest corner of the bridge, the deck top and sidewalk appear in good condition.

4.4 Barriers and Railings

The barrier wall appears to have been replaced during the previous rehabilitation (2012) and appears in good condition. Narrow cracks and a local spall were observed at the southeast limit of the barrier wall (see Photo 9).

4.5 Approaches

The wearing surface is in good condition with medium unsealed transverse cracks at the ends of the approach slabs (see Photo 10).

4.6 Utilities

Overhead utility wires were noted to the west of the bridge as well as a single utility duct was along the west fascia of the bridge.

5. CONSULTATION AND PROPOSED REHABILITATION

Initially the proposed Trafalgar Road widening was to be accommodated with a twinning of the existing bridge to the east; however, subsequently a review of the road profile and hydraulics has suggested that the existing waterway restrictions will result in flooding of the roadway during a regional storm event. Therefore, the road profile is proposed to be raised by approximately 2-3 metres and the existing structure will be removed and replaced by a new bridge.

It is anticipated that the proposed widening will require acquisition of property east and west of the current road right-of-way. In addition, the concrete retaining walls to the southeast and southwest of the structure will both need to be relocated.

Prepared By: William Van Ruyven, P.Eng.
Reviewed By: Max Nie, P.Eng.

PHOTO LOG
Bridge 400m North of 15 Side Road
(118323 BRO1)

**Trafalgar Road Improvement Study
Trafalgar Road from Steeles Avenue to Hwy 7**



Photo 1: East elevation



Photo 2: Downstream (west)

**Trafalgar Road Improvement Study
Trafalgar Road from Steeles Avenue to Hwy 7**



Photo 3: East fascia



Photo 4: Southeast embankment

**Trafalgar Road Improvement Study
Trafalgar Road from Steeles Avenue to Hwy 7**



Photo 5: Soffit local patch repairs



Photo 6: Retaining wall to the southwest

**Trafalgar Road Improvement Study
Trafalgar Road from Steeles Avenue to Hwy 7**



Photo 7: Retaining wall to the southeast



Photo 8: Looking north over structure

**Trafalgar Road Improvement Study
Trafalgar Road from Steeles Avenue to Hwy 7**



Photo 9: Southeast Delaminated Barrier



Photo 10: Unsealed Crack at North Approach (typical)

To: MMM Design Team Date: May 19th, 2016
 From: MMM Structural Department Job No.: 3214006
 Subject: Trafalgar Road Improvement Study - Structural Site Visit

STRUCTURE IDENTIFICATION SHEET

STRUCTURE NAME <u>1182960 CU01 & 1182960 BR01</u>	
SITE NUMBER <u>1182960 CU01 & 1182960 BR01</u>	MTO DISTRICT <u>N/A</u>
HIGHWAY <u>Above</u> <u>Unknown Stream</u>	Below <u>N/A</u>
TYPE OF STRUCTURE <u>Reinforced CIP Concrete Rigid Frame Box Culverts</u>	
NUMBER OF SPANS <u>1 & 2</u>	SPAN LENGTHS _____
ROADWAY WIDTH <u>12 – 13.5 m</u>	YEAR BUILT <u>1980</u>
DIRECTION OF STRUCTURE <u>East-West</u>	
SEQUENCE NUMBER <u>N/A</u>	TOWNSHIP NUMBER <u>N/A</u>
LHRS NUMBER <u>N/A</u>	BRIDGE NUMBER (MUNIC.) <u>N/A</u>
LOCATION <u>Trafalgar Road</u> <u>(0.4km & 1.0 N. of Steeles Ave.)</u>	JURISDICTION <u>Halton Region</u>
INSPECTOR'S NAME <u>William Van Ruyven, P.Eng.</u>	
PARTY MEMBERS <u>Colin Smyth</u>	
DATE OF INSPECTION <u>November 5, 2015</u>	
TEMPERATURE <u>12 °C</u>	WEATHER <u>Overcast</u>
MTO REGION <u>N/A</u>	AADT <u>>10,000</u>
DECK RIDING SURFACE <u>Asphalt</u>	
YEAR LAST REHABILITATED <u>Unknown</u>	

KEY PLAN

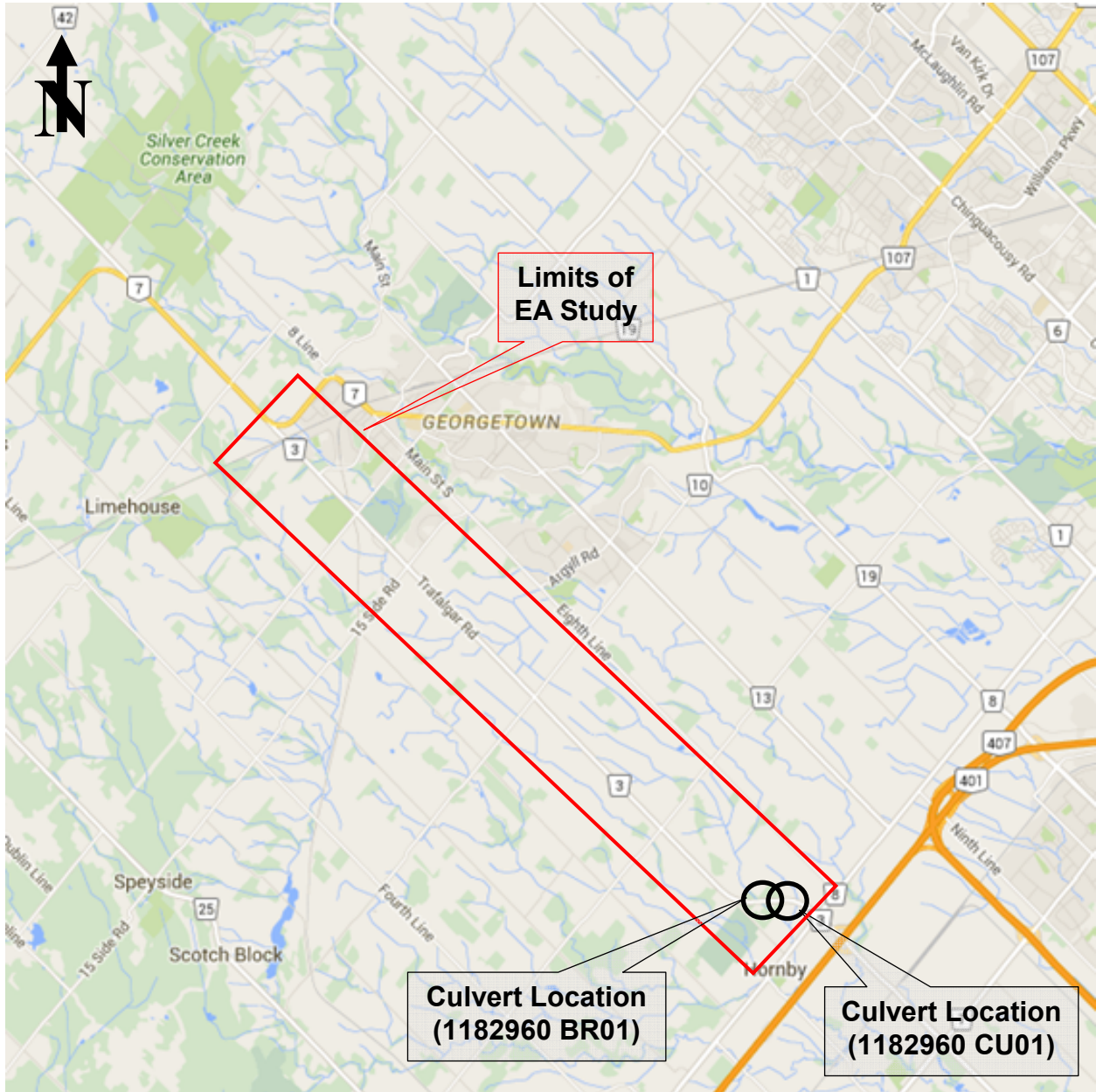


Figure 1: Trafalgar Road Improvement Study Existing Structures

1. INTRODUCTION

The MMM Group Ltd. (MMM) was retained by the Regional Municipality of Halton to complete a Class Environmental Assessment (Class EA) Study for Trafalgar Road (Regional Road 3) from Steeles Avenue (Regional Road 8) to Highway 7, in the Town of Milton. The study addressed the need for roadway improvements along this corridor. The study was carried out in compliance with Schedule "C" of the Municipal Engineers Association "Municipal Class Environmental Assessment" (June 2000).

There are two concrete structural box culverts in the project study area. As part of the Class EA, a reinforced concrete box culvert (1182960 CU01) and a twin cell reinforced concrete box culvert (1182960 BR01) were visually inspected in accordance with the *Ontario Structure Inspection Manual, 2008* (OSIM). The following is a summary of the findings from the field investigation completed by MMM on November 5th, 2015.

2. STRUCTURE LOCATION

The structures are located approximately 0.4 km and 1.0 km north of Steeles Avenue on Trafalgar Road for the single cell and twin cell culverts respectively. For the purpose of this memo, Trafalgar Road assumed to run in the north-south direction.

A Key Plan showing the structure locations has been provided on page 1 of this memo.

3. STRUCTURE AND ROADWAY DESCRIPTION

3.1 Reinforced Concrete Box Culvert (1980, 1182960 CU01)

The reinforced concrete box culvert is 3.1 m wide by 2.4 m tall and approximately 28 m long with 250 mm thick walls and roof slab. The culvert is approximately perpendicular to Trafalgar Road with no head or wing walls. Original drawings are not available for the culvert.

3.2 Twin Cell Reinforced Concrete Box Culvert (1980, 1182960 BR01)

The twin cell reinforced concrete box culvert consists of two 3.1 m wide by 2.4 m tall and approximately 25 m long with 280 mm thick walls and 300 mm thick roof slab. The culvert is skewed approximately 60 degrees to Trafalgar Road with no head or wing walls. Original drawings are not available for the culvert.

3.3 Roadway

Trafalgar Road is a Regional Arterial road which supports the movement of people and goods (i.e. truck uses). Trafalgar Road currently carries a 3.50 - 3.75 m wide lane with a 2.0 - 3.0 m shoulders in either direction in this area. The posted speed at the culverts ranges from 60 - 70 km/h; however, throughout the study area along Trafalgar Road, the speed limit increases to 80 km/h and the AADT is greater than 10,000 vehicles per day. The anticipated future cross section will carry two lanes of traffic in each direction and a multi-use trail on the east only. The design speed for Trafalgar Road through the area of the twin cell box culvert crossing is 90 km/h.

4. SUMMARY OF SIGNIFICANT FINDINGS

This investigation consisted of a preliminary site investigation to evaluate the conditions of the structural culverts and the feasibility to accommodate the widening of Trafalgar Road.

4.1 Reinforced Concrete Box Culvert (1980, 1182960 CU01)

The culvert is generally in good condition with efflorescence and wet stains.

4.1.1 Culvert Barrel

The existing box culvert is generally in good condition, with some wet cracks and efflorescence on the soffit and barrel walls (see Photos 3 and 4).

4.1.2 Watercourse

The watercourse flows from east to west and is heavily vegetated at the inlet and outlet (see Photos 1 and 2). Low flows were observed at the time of inspection.

4.1.3 Approaches

The asphalt pavement approaches are in good condition (see Photos 5 and 6).

4.1.4 Railing

The steel beam guide railing is in good condition (see Photos 5 and 6).

4.1.5 Embankments

The embankments at all four quadrants of the culvert appear stable and are well vegetated (see Photos 1 and 2).

4.1.6 Utilities

Overhead hydro wires are located to the east of the culvert. South of the structure street lighting is provided; however there is no lighting to the north of the culvert.

4.2 Twin Cell Reinforced Concrete Box Culvert (1980, 1182960 BR01)

4.2.1 Culvert Barrel

The existing twin cell box culvert is generally in good condition, with some wet cracks and efflorescence on the soffit and barrel walls. A recent rehabilitation including chip and patch repairs to the soffit was completed in 2014; however, a crack and rust staining was noted in a delaminated concrete patch. Failed patches should be removed and replaced. In addition, approximately 3 m from the east end of the south span, a partially repaired area (with saw cut only) should be chipped, scaled and patched (see Photos 11 and 14).

A local spall on the fascia and scour/undermining were present at the upstream (east) end of the culvert (see Photos 12 and 13). Should the culvert be extended, these deteriorations will be removed as part of the extension.

4.2.2 Deck Top and Exterior Walls

Longitudinal full depth cracks were noted along the top of the exterior and centre wall (likely a construction joint). This is not anticipated to impact the function of the structure (see Photo 9).

Due to the skew of the culvert and absence of wingwalls, there is a significant portion of culvert that is exposed beyond the road limits. The deck top is generally in good condition with no visible defects.

4.2.3 Watercourse

The watercourse flows from east to west and is generally free of obstruction. During the field investigation, the majority of the flow was passing through the south cell while the north cell has a higher invert elevation due to sediment accumulation (see Photos 17 and 18).

4.2.4 Approaches

The asphalt pavement approaches are in good condition with light ravelling.

4.2.5 Railing

The steel beam guide rails along the east and west sides of the road are in good condition.

4.2.6 Embankments

The embankments at all four quadrants of the culvert appear stable and are well vegetated.

4.2.7 Utilities

No utilities were noted during the field investigation.

5. CONSULTATION AND PROPOSED REHABILITATION

In conclusion, based on the observations made during this site visit, the existing structure of both culverts are generally in good condition. It is anticipated that the proposed widening of Trafalgar Road will require an extension of the existing culverts including new wingwalls, headers and relocation of the existing railing. In addition to these modifications, the following proposed repairs are recommended:

- removal of all delaminated and deteriorated concrete (including previous patches); and,
- local patch repairs and place additional steel reinforcement in areas when existing reinforcement is deteriorated.

Subsequent to the field investigation, hydraulic analysis of the twin cell culvert has recommended the addition of a third cell immediately adjacent to the existing structure. Based on the observations made during the site visit, the addition of a third cell is feasible.

Prepared By: William Van Ruyven, P.Eng.

Reviewed By: Max Nie, P.Eng

PHOTO LOG
400 m North of Steeles Avenue
(Culvert 1182960 CU01)

**Trafalgar Road Improvement Study
Trafalgar Road from Steeles Avenue to Hwy 7**



Photo 1: East elevation



Photo 2: West elevation

Trafalgar Road Improvement Study
Trafalgar Road from Steeles Avenue to Hwy 7



Photo 3: Efflorescence and wet staining



Photo 4: Wet staining along barrel

**Trafalgar Road Improvement Study
Trafalgar Road from Steeles Avenue to Hwy 7**



Photo 5: Wearing Surface (typical)



Photo 6: Approach Roadway above Culvert

PHOTO LOG
1 km North of Steeles Avenue
(Culvert 1182960 BR01)

**Trafalgar Road Improvement Study
Trafalgar Road from Steeles Avenue to Hwy 7**



Photo 7: East elevation



Photo 8: West elevation

**Trafalgar Road Improvement Study
Trafalgar Road from Steeles Avenue to Hwy 7**



Photo 9: Full depth crack at top of wall (full exposed length)



Photo 10: Soffit patch repairs (typical)

**Trafalgar Road Improvement Study
Trafalgar Road from Steeles Avenue to Hwy 7**



Photo 11: Crack and staining in patch repair (delaminated)



Photo 12: Spall in southeast wall face

**Trafalgar Road Improvement Study
Trafalgar Road from Steeles Avenue to Hwy 7**



Photo 13: East end minor scour



Photo 14: Saw cut in soffit not patched

**Trafalgar Road Improvement Study
Trafalgar Road from Steeles Avenue to Hwy 7**



Photo 15: Rust Staining on Soffit



Photo 16: Asphalt Wearing Surface above Culvert

**Trafalgar Road Improvement Study
Trafalgar Road from Steeles Avenue to Hwy 7**



Photo 17: South Box Watercourse



Photo 18: North Box Watercourse

**Trafalgar Road Improvement Study
Trafalgar Road from Steeles Avenue to Hwy 7**



Photo 19: Upstream of Culvert



Photo 20: Downstream of Culvert