THE CITY OF
SAULT STE MARIE

FORT CREEK AQUEDUCT
PROJECT FILE REPORT
SCHEDULE B CLASS ENVIRONMENTAL ASSESSMENT

TULLOCH
ENGINEERING

August 2016
15-1192

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Revision #	Issued By	Date	Issue / Revision Description
0	PMC	August 24/2016	Draft EA Document, excluding previously distributed Watershed Appraisal and Hydraulic Assessment - Issued for Client Review
1	PMC	September 9, 2016	Final EA Document

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Engineers Seal

EXECUTIVE SUMMARY

Introduction

The Fort Creek Aqueduct through Steelton has outlived its useful service life and is need of replacement. Sections of the aqueduct are over 100 years old and replacement is necessary to ensure safety of motorists and pedestrians. The hydraulic capacity of the aqueduct also needs to be evaluated and improvements made as necessary to meet current stormwater standards. A Class Environmental Assessment (EA) has thus been undertaken by The City's Engineering and Planning Department to determine the required hydraulic capacity needed, and to review potential alternate routes through the Steelton area, prior to its replacement.

Class Environmental Assessment

Infrastructure projects undertaken by municipalities must follow a Class Environmental Assessment process, which is a streamlined approach used for routine and predictable projects to fulfill the requirements of the Environmental Assessment Act. The Class EA process was developed to ensure that environmental concerns are addressed and public consultation is sought.

Alternative Solutions

As part of this Class EA alternative solutions have been developed. A substantive watershed appraisal and hydraulic assessment was conducted and the report concludes a relief channel or a second aqueduct is not required to convey anticipated stormwater flows.

The alternative solutions therefore include: do nothing, construct a new aqueduct on an alternate route avoiding Wellington St W as much as possible, or replace the aqueduct in its current location, to a cross sectional area large enough to carry expected flows using today's design standards.

A public open house was held in June 2016 to present the problem/opportunity and to seek public and agency input. The alternative solutions were presented along with the preferred solution.

Preferred Solution

The preferred solution is to replace the aqueduct through Steelton in the same location along Wellington St W, including replacing the inlet and off road section west of Carmen's Way. The existing Carmen's Way and Wellington Street crossings are adequate and can be left in place. In addition the preferred solution includes the upgrading of the St Georges Avenue storm sewer westerly from the John Street intersection to the aqueduct.

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FORT CREEK AQUEDUCT – PROJECT FILE REPORT

SCHEDULE B CLASS ENVIRONMENTAL ASSESSMENT

PHASE 1: PROBLEM OR OPPORTUNITY

1.0 INTRODUCTION

1.1 BACKGROUND AND PURPOSE OF REPORT

The Fort Creek Aqueduct is a concrete box culvert/storm sewer that conveys the Fort Creek underground through the urbanized area of the City to the St Mary's River. The City of Sault Ste. Marie has initiated this Class Environmental Assessment (Class EA) to identify and evaluate alternative ways to undertake improvements to a major section of the Fort Creek Aqueduct between Carmen's Way and John Street. This portion of the aqueduct (to be referred to as the "*Steelton section*" in this document) is located in the former Town of Steelton and has outlived its useful service life. Sections of the structure are over 100 years old and there is an increasing need for emergency repairs as evidenced by sudden localized failures occurring in the roof slab. The safety of pedestrians and motorists is of concern.

In addition to the structural adequacy, the hydraulic capacity of the aqueduct also needs to be evaluated for adequacy to accommodate current storm design flow standards. There is an apparent increase in high intensity precipitation events over the past few years which has resulted in area flooding. The potential for future flooding can be reduced if during the replacement of this drainage system its capacity to carry storm water is increased where needed.

The existing aqueduct is located under the south sidewalk of Wellington Street West, an important arterial road in the city. If replacement of the aqueduct is being considered, it is prudent to also examine if another location would better accommodate the creek as it flows through Steelton. Depending on the required hydraulic capacity, a relief aqueduct and/or open channel on an alternate route may also be needed.

Due to these concerns, Tulloch Engineering Inc. was retained by the City of Sault Ste Marie to complete a Class Environmental Assessment (EA) to recommend ways to replace the aging structure with a new one. This project file report documents the steps taken in the decision making process leading to the selection of the recommended solution.

1.2 DESCRIPTION OF STUDY AREA

As outlined in Figure 1, the study area for the Class EA includes portions of Steelton, centered on Wellington Street West between John Street and Carmen's Way. It also includes the neighborhood to the south (St. Georges/Beverly/St. Andrews) and the neighbourhood to the north (Northland/Boydell).

These neighbourhoods were included since they may present a preferable alternate route for the aqueduct or a location for a relief drainage system.

The study area is part of the developed urban area of Sault Ste Marie, located immediately west of the downtown core along Wellington Street West. The area is known as Steelton, in reference to the former town that was amalgamated with the City of Sault Ste Marie in 1918. Steelton's Town Hall, which included the Clerk's office, the Town Engineer and Police station, was located at the corner of St Georges Avenue and Wellington Street West, in the building now used as the Steelton Senior Citizens Centre.

1.3 Class Environmental Assessment Process

Municipal infrastructure projects are required to meet the requirements of the Ontario Environmental Assessment Act. The Municipal Class EA (October 2000, as amended in 2007/2011) applies to a group or "class" of municipal road, water and wastewater projects which occur frequently and which have relatively minor and predictable impacts. These projects are approved under the EA Act, as long as they are planned, designed and constructed according to the requirements of the Class EA document. Figure 2 summarizes the Municipal Class EA Planning and Design process.

The specific requirements of the Class EA for a particular project depend on the type of project, its complexity and the significance of environmental impacts. To assist proponents in determining the status of projects, four categories of projects are identified in the Municipal Class EA document, including Schedule "A","A+", "B" and "C" projects:

Schedule A

These projects are limited in scale, have minimal adverse environmental effects, and typically consist of normal maintenance and operational activities. These projects are considered pre-approved and may proceed without following the full Class EA planning process.

Schedule A+

These projects are also limited in scale, have minimal adverse environmental effects, and are considered pre-approved, but there is a requirement for public notification prior to construction or implementation of the project. The purpose of the notification is to inform the public of projects occurring in their local area. Although the public is informed of the project, there is no appeal mechanism to the Ministry of the Environment and Climate Change (MOECC); any concerns raised can be addressed at the municipal council level.

Schedule B

These projects have the potential for some adverse environmental effects, thus requiring a screening process involving mandatory contact with directly affected public and relevant review agencies. If all concerns can be adequately addressed, the project may proceed. These projects generally include improvements and minor expansions to existing facilities.

Schedule C

These projects have potential for significant environmental effects and are subject to the full planning and documentation procedures specified in the Class EA document. An Environmental Study Report must be prepared and submitted for review by the public and relevant review agencies. If all public and agency comments and issues can be adequately mitigated during the public review period, the project may proceed. These projects generally include construction of new facilities or major expansions to existing facilities.

Schedule Selection

In order to determine the appropriate Class EA schedule for this project, the Municipal Class Environmental Assessment documents offer the following definitions to assist. Note that "*wastewater*" refers to either sanitary sewage or storm water, and that a "*sewage collection system*" would include box culverts (aqueducts) carrying storm water.

Schedule "A" Activities

Municipal Wastewater Management Projects Description # 1:

"normal operations… modify, repair, reconstruct existing facilities,… repairs and renovations to existing sewage collection systems"

It can be concluded that regular sewer repairs and/or replacement of existing sewers, (including storm sewer box culverts) could be considered a Schedule A activity.

Schedule "A+" Activities

Municipal Wastewater Management Projects Description # 1:

"Establish, extend, or enlarge a sewage collection system… provided all such facilities are in either an existing road allowance or an existing utility corridor"

It can also be concluded that constructing a new storm sewer system or enlarging an existing could be considered a Schedule A+ activity if it is entirely on a municipal road allowance or in a utility corridor.

Schedule "B" Activities

Municipal Wastewater Management Projects Description # 1:

"Establish, extend or enlarge a sewage collection system and all works necessary to connect the system to an existing outlet where such facilities are not in an existing road allowance or an existing utility corridor"

It can also be concluded that constructing a new storm sewer system or enlarging an existing could be considered a Schedule B activity if it is not on a municipal road allowance or in a utility corridor.

Schedule "C" Activities

Municipal Wastewater Management Projects Description #1:

"Construct a new sewage system, including outfall to receiving water body…"

It can be concluded that establishing a completely new storm sewer system including a new outfall to a lake or river is considered a Schedule C activity.

Initial Schedule Selection

Based on the above, the study is initially considered a Schedule B activity, given that consideration will be given to alternate routes for the aqueduct, which may involve the use of private property.

1.4 Previous Reports

The Fort Creek drainage system from its headwaters to the St Mary's River outlet has been the subject of numerous reports written for both the Sault Ste Marie Region Conservation Authority and the City of Sault Ste Marie Engineering and Planning Department over many years. The reports referenced for this EA are listed in Section 3. The purpose for the reports can be categorized into:

Flood Plain Mapping
Open Channel Conditions
Fort Creek Dam (Justification, Design Criteria, Operations, Dam Safety)
Fort Creek Aqueduct Condition Appraisals
Fort Creek Aqueduct Hydrological/Hydraulic Analysis

This municipal class EA has been initiated as a result of the findings of these studies, particularly the reports addressing the condition and hydraulic capacity of the Steelton aqueduct.

1.4.1 Biennial Inspections

The entire Fort Creek aqueduct system has been inspected biennially (every second year) by qualified personnel for many years, initially by City Engineering staff and more recently by various consulting engineering firms (STEM Engineering Group, Fenco Consultants Ltd). The purpose of these continuing inspections is to document changes in condition and to recommend appropriate repair and maintenance work.

A consistent chainage has been established and marked with paint along the concrete walls, (0+00 m at the south side of Queen Street West) and each inspection report makes reference to noted defects based on the chainage. Reports can therefore be compared in order to note changing conditions. Listed below is a sample of typical defects noted and listed in the inspection reports throughout the Steelton section:

- spalling of concrete
- missing parging around pipes
- debris accumulation

- substantial cracking
- severely rusted I- beams in poor condition
- exposed rebar
- delaminating concrete
- spalled and missing concrete
- holes in slab

An inspection summary from the 2015 Biennial Inspection by STEM Engineering Group Inc. for the Wellington Street West section can be found in Appendix 3. The report concludes "*the culvert from St. Andrews Terrace to station 11+69 (Wellington Street West at Carmen's Way) is in poor condition in many areas and requires replacement or repair.*"

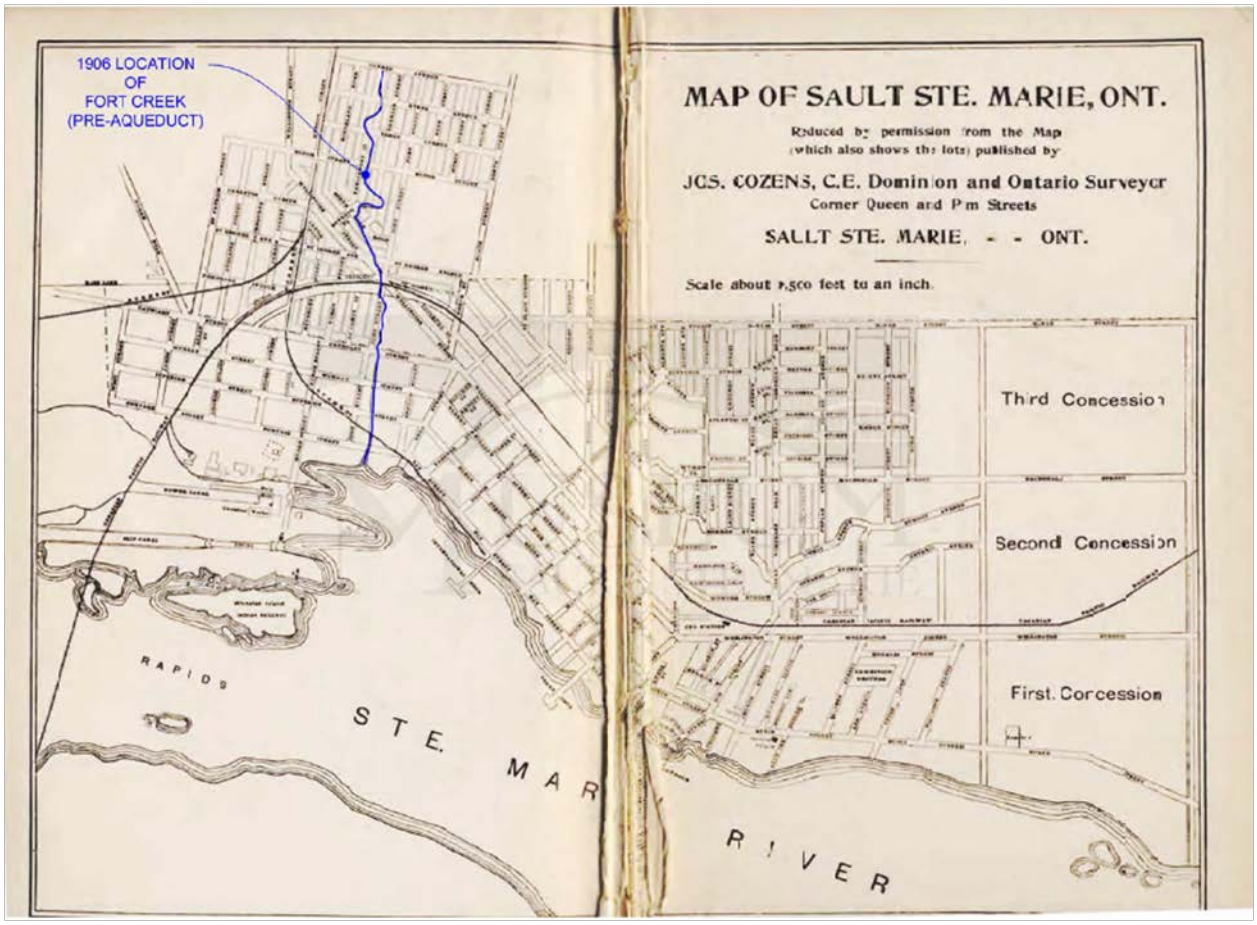
Deteriorating joint just north of St Andrews Terrace –photo by STEM Engineering

2015 Biennial Inspection

1.5 History of Aqueduct Construction

Prior to urban development, Fort Creek was a natural watercourse draining approximately 1500 hectares in the west/central section of Sault Ste Marie to the St Mary's River. The watercourse has been physically altered through the years, to the point that very little of the original creek bed remains today. The following map of Sault Ste Marie, reproduced from the 1906 Vernon's Directory, shows the original location of the creek through Steelton to the St Mary's River, prior to the construction of the

aqueduct.



Map Courtesy of Sault Ste Marie Museum

The earliest road crossings were constructed between 1912 and 1917 for Queen Street W, Central Park Avenue, Albert Street West, Alexandra Street, Cathcart Street, and St Andrews Terrace. The Steelton section of the creek was also placed in a box culvert (aqueduct) along the south side of Wellington Street during the same time period.

The creek bed north of Wellington was moved westerly and channelized along the Algoma Central Railway tracks from its original meandering location further to the east, where the Parliament Street neighbourhood is now located. The relocation and covering of the creek through the town was done presumably to allow for development and to address safety/flooding concerns. Adjoining sections south of the CPR between the various road crossings were built in the 1930's and 1940's.

The result is a continuous underground drainage system that now extends from north of Wellington Street West at Carmen's Way to its outlet south of Queen Street West, with just a short open section at the CPR railway bridge (a stone arch) near John Street. This short section of open channel under the CPR appears to be original creek bed.

Original creek bed under the Canadian Pacific Railway bridge

Throughout the Steelton section, the interior dimensions of the original aqueduct vary. Widths change from 4.9 m wide to 2.3 m, heights are generally between 1.8 m and 2.0 m, however the Wellington Street West and Carmen's Way crossings are only 1.0 m high. Cross sectional areas range between 4.0 square metres and 9.8 square metres.

The creek drainage characteristics were further altered with the construction of a flood control dam north of Second Line from 1968-1970. The Fort Creek dam, operated by the Sault Ste Marie Region Conservation Authority has greatly reduced the flooding potential in Steelton. (See Section 1.8)

1.6 History of Repairs In Steelton Portion

As noted, the construction of the aqueduct was started over 100 years ago. The Steelton portion, the subject of this study, was started after 1912, based on original drawing dates. The 1981 Fenco Engineering Report "*Fort Creek Aqueduct"* schematically shows the structure and lists the original drawings that were located for the original construction of the aqueduct as well as repairs to various sections between St. Andrews Terrace and Hudson Street (now the Carmen's Way right of way). Various

referenced drawings for both original construction and major repair work are dated: 1912, 1927, 1940, 1954, 1957, and 1961.

In 1982, two additional repairs were completed by the City under contract C82-4E, and in 2005 as part of the Carmen's Way construction, where 118 m of the aqueduct was replaced just east of the ACR underpass to permit construction of Carmen's Way and to improve the grade of the road on the west leg of the new intersection. This relocation was the second relocation here. Prior to the construction of the underpass in 1959, the creek flowed south in an open channel adjacent to the ACR tracks, crossing Wellington Street West in a box culvert immediately east of the then "at grade" railway crossing. From the railway tracks it then drained easterly under the south sidewalk of Wellington Street West over to John Street, crossing under the CPR. In order to construct the ACR underpass, relocation was necessary to permit the grade separation between the road and the railway.

As part of the 1958/59 underpass construction, the inlet was positioned opposite the Bloor Street right of way, adjacent to the ACR. From the inlet south, 106 m of a 2.84 m x 1.90 m corrugated steel pipe (CSP) arch was installed to convey flows. The use of steel pipe was a departure from the standard cast in place concrete designs used elsewhere downstream. It is assumed it was considered more economical to use CSP in this off road location.

In addition to the major repair work undertaken by contract through the Engineering Department, the City's Public Works Department has undertaken repairs to the concrete deck over the years, either when holes appeared due to deteriorating concrete or when the bi-annual inspections noted the need for localized repair work.

1.7 Flooding History Before the Dam

As noted in the 1967 Proctor and Redfern (P&R) Report "*Report on Fort Creek Aqueduct Appraisal for the Sault Ste Marie Region Conservation Authority*", prior to the construction of the dam, the urban area of the watershed had a history of persistent flooding. A storm classified as "heavy" but of an intensity that it could occur 3 times a year on average, had the potential to cause considerable flooding, particularly if the ground was saturated at the time. The June 1970 P&R Report "*Fort Creek Channel Second Line to Aqueduct*" also confirms that the areas of the city where storm sewers were connected to the aqueduct had been subjected to frequent and severe flooding for many years. Major floods were documented in 1945, 1962, 1965, 1968 and 1969. The lower Fort Creek area was severely affected by each of these events. Even while the Fort Creek dam was under construction, but not yet operational, a severe rainfall and subsequent downstream flooding was experienced on May 31, 1970.

The 1967 Proctor and Redfern report cited a 1959 report giving two options: the first was the construction of a dam to store flood waters; the second was to improve the capacity of the aqueduct to carry greater flood flows. The dam option was chosen and with its completion the potential for downstream flooding was greatly reduced.

Steelton Flooding before the Dam – between St. Andrews Terrace and the CPR (date unknown)

1.8 Fort Creek Dam

The Sault Ste Marie Region Conservation Authority (SSMRCA) constructed the Fort Creek dam between 1968 and 1970 as a flood control structure in the Fort Creek Conservation area north of Second Line. The drainage area above the dam is approximately 8.4 square km. The dam is designed to retain run-off from rainfall events and release it when downstream flows have subsided. The photo below, taken September 13, 2013, shows the high watermark (as evidenced by silt in the trees) for the reservoir behind the dam, after major rainfalls occurred on September 6, 9 and 10, 2013. This combined rainfall resulted in water levels within the upstream of the dam to rise beyond the estimated 1 in 100 year flood level.

Fort Creek Dam Reservoir- photo taken September 13, 2013

The dam is a 113 m long earthen structure with a clay core. The outlet consists of a 1.067 m wide stainless steel slide gate into a 91.4 m long chute spillway that passes through the dam. There is a hexagonal shaped concrete drop inlet structure/overflow weir designed to be used for extreme events once reservoir elevations are high enough. There is also an emergency overflow spillway blocked by a series of erodible berms (fuse plugs) to prevent catastrophic failure of the dam.

The dam continues to be operated and maintained by the SSMRCA. The dam is inspected by a qualified dam safety engineer periodically (typically every 5 years).

1.9 Flooding History After Dam

Records from the Public Works and Transportation Department (PWT) were reviewed in an effort to determine the history of flooding in the Steelton area following the construction of the Fort Creek dam. Most service calls to PWT indicate that only minor incidents have been recorded, with street flooding primarily due to ice/snow or debris blocking catch basin inlets. Areas of localized flooding, primarily in the John Street/St. Georges Avenue/St. Andrews Terrace area, during heavy rainfall events generally disappear in an hour or so, once the surcharged local storm sewer has capacity to take in the standing water. There have been occurrences of maintenance access covers “blowing off” during heavy rainfall in the vicinity of John Street and St. Georges Avenue. The City has received insurance claims for damages in the past from motorists who drove over uncovered maintenance holes while traversing flooded sections of these streets.

However, it can be concluded that the Fort Creek dam has greatly reduced the flooding potential and severity in the Steelton area.

1.10 Storm Water Management – Current Guidelines

The recently completed 2015 *Sault Ste Marie Stormwater Investigative Study*, by R.V. Anderson Ltd., has established recommended guidelines for future storm water management in the City. The report recommends that major stormwater drainage systems "be designed to convey stormwater runoff from the major storm event (the 100-year return period storm and the Timmins Storm)". The Fort Creek aqueduct is considered a major stormwater drainage system, given its contributing drainage area and hydraulic capacity.

A 100-year return period storm is a storm event that has a 1% probability of occurring in any given year, or in other words 10 such magnitude storms could be expected over 1000 years. A common misunderstanding exists that a 100-year flood is likely to occur only once in a 100-year period. There is approximately a 63 % chance of one or more 100-year floods occurring in any 100-year period.

The Timmins Storm is a historical storm that resulted in a flood of a magnitude which exceeds all previously recorded events. It occurred in the Timmins Ontario region in September 1961 and has been designated as the provincial regulatory or regional storm for Northern Ontario. Hurricane Hazel, which occurred in October 1954, is the designated regulatory storm for Southern Ontario.

1.11 Problem/Opportunity Statement

The concerns over the Steelton aqueduct can be summarized in a problem statement:

The Steelton section of the Fort Creek Aqueduct between its inlet (adjacent to Algoma Central Railway across from the Bloor Street right of way) and its outlet (south of St Andrews Terrace at John Street) was originally constructed approximately 100 years ago (1912 – 1917) to channelize the flows of the creek in a concrete box structure under the south sidewalk of Wellington Street West, through Steelton. Despite continued repair work over many years it continues to decline in structural integrity.

In addition to these structural issues, portions of it may not have the capacity to carry the volume of storm water flows it is expected to receive from major storm events using current rainfall intensity data. Thus the potential for flooding in the Wellington Street West/John Street/St. Andrew's Terrace areas may be greater than the City of Sault Ste Marie stormwater guidelines recommend.

Therefore there is a twofold problem that exists:

> The existing aqueduct needs to be replaced or upgraded to ensure continued safe conditions for pedestrian and vehicular traffic.
> The hydraulic capacity of the aqueduct needs to be analyzed and improvements made, as necessary, in reference to the City of Sault Ste Marie guidelines for this major stormwater drainage system.

By addressing the problems associated with the aqueduct, an opportunity is thus created to review the current location of this major drainage system along Wellington Street West, to see if it remains the optimal route.

PHASE 2: IDENTIFICATION & EVALUATION OF ALTERNATIVE SOLUTIONS

2.1 Inventory of Existing Conditions

2.1.1 Natural Environment

Tulloch Environmental has completed an Existing Conditions (EC) and Environmental Impact Assessment (EIA) for the study area. The report can be found in Appendix 1.

It concludes "*the proposed Fort Creek aqueduct storm sewer replacement will not have lasting significant impacts on the natural heritage in the area. There may be minor and short term negative impacts associated with sediment transport resulting from shoreline and in-water work, however, through the use erosion and sediment control of best management practices the impact magnitude and duration is expected to be minimal.*"

2.1.2 Soils

The natural soils in the study area consist of glacial till of the Pleistocene period. Boreholes indicate depths are greater than 11 m in the Steelton area and may be overlain by a layer of clay in some areas. Local glacial till consists of a variable mix of sand, silt, gravel and clay, and is generally granular in nature.

2.1.3 Groundwater Conditions

The static water table is estimated to be 3 to 3.5 metres deep in the study area with seasonal fluctuations.

2.1.4 Socio- Economic and Cultural Environment

The study area is located entirely in the City of Sault Ste Marie, along the Wellington Street West corridor, just west of the downtown core. It forms part of Ward 4. There are four urban arterial roads through the study area, with the following recent two way average annual daily traffic (AADT) counts:

Street Section	**AADT**
Wellington St West, east of Carmen's Way	14,200
Carmen's Way, north of Wellington St W.	6,000
Carmen's Way, south of Wellington St W.	9,600

St Georges Ave West, east of Wellington St W.	8,900
Huron St, south of Wellington St W.	3,600

There are two railway track systems that help define the study area. The Canadian National Railway (CNR), which formerly was the Algoma Central Railway (ACR), borders the west side and the Canadian Pacific Railway (CPR) borders the south side.

Pedestrian traffic on local sidewalks is considered typical for a mixed residential/commercial area. The unique feature in Steelton is the fact that the south sidewalk of Wellington Street West forms the "roof" of the Fort Creek aqueduct within the study area/project limits. Pedestrians have been walking along the top of this major storm water structure for over 100 years, many probably unaware of the underground creek below them.

2.1.5 Land Use

The City's Official Plan lists the study areas' land use as commercial, residential and Industrial.
The commercial zones are along both sides of Wellington Street West, reflecting the businesses located there. The only land zoned industrial is the site of the CNR Railway yard on the west side of Carmen's Way. The balance of the study area is residential, with houses along the various residential streets both north and south of Wellington Street West. The east side of Carmen's Way is identified as a Parks and Recreation zone reflecting the green space utilized by the City's Hub Trail.

The City maintains the former Steelton Town Hall as a municipal facility. Previously used as a library and Public Health office, the building now is used as the Steelton Senior Citizen Centre.

There are no environmental constraints indicated in Schedule A of the Official Plan. (Fish habitat is addressed in Section 2.1.1 Natural Environment).

A review of Schedule E in the Official Plan indicates the potential for archaeological resources may be found in the strip of green space between the CPR tracks and Edinburg Street. An archeological assessment would need to be undertaken if construction activity is proposed for this area.

Schedule B of the Official Plan outlines natural constraints to development, and provides tributary flood lines for various watercourses, including the Fort Creek. Steelton is known to be an urban area that is prone to flooding. A specific policy in the Official Plan, policy SA.3 addresses Steelton:

"Development and redevelopment are permitted provided:

SA.3 Steelton – The improvements which resolve the flooding problem are identified by the municipality, with the technical advice of the Conservation Authority (and MNR) and are proposed as a public project and provided when possible".

It can be concluded that the improvements being evaluated in this class EA directly respond to Policy SA.3 of the Official Plan.

The Steelton Area in the SSM Official Plan Schedule B - Red Indicates a Specific Flood Area

The flood line or flood plain area shown above is as identified by the Conservation Authority using the Timmins regional storm. The Steelton area is considered flood zone #3 in the Official Plan. It is noted that it follows the original creek location, which is to the east of the aqueduct location, shown in blue.

2.1.6 Municipal Services

The Steelton area is serviced throughout by municipal sanitary sewers, storm sewers and potable water. Union Gas mains provide natural gas servicing. By means of overhead plant, electricity, Bell Canada and Shaw Cable connections are available to all properties.

2.1.7 Recreation

The Hub Trail is located along the east side of Carmen's Way, providing cycling, walking and other non-motorized forms of recreation in the study area. As noted there is a green space between the CPR right of way and Edinburg Street that is also used for recreational purposes by area residents.

2.2 Alternative Solutions

The following alternative solutions were considered for this project:

1) Do nothing.
2) Rebuild the existing aqueduct in the same location, with adequate capacity to carry anticipated flows. Provide relief capacity elsewhere if required.
3) Build a new drainage system for Fort Creek through Steelton (underground in a structure, and/or in an open channel) in a new location.

2.2.1 Do Nothing (Alternative 1)

This alternative involves leaving the existing structure in place, and continuing to inspect and repair it as required to safeguard the public. It assumes adequate repair work can continue indefinitely in a cost effective manner and that the existing hydraulic capacity will suffice.

2.2.2 Rebuild the existing aqueduct in the same location (Alternative 2)

This alternative involves reconstructing the existing aqueduct in the same location along the south side of Wellington Street West. It would be built to current structural standards to carry anticipated loads from vehicles and pedestrians and also sized to have the hydraulic capacity to meet current City design standards (see Section 1.10). It may also be possible to leave the recently constructed sections near Carmen's Way in place if capacity is adequate or if relief hydraulic capacity can be added. Depending on the required hydraulic capacity, a relief drainage system may be required elsewhere if adequate physical space is not available along Wellington Street West.

2.2.3 Build a new drainage system through Steelton for the Fort Creek (Alternative 3)

This alternative looks at an alternative route for the Fort Creek to drain through Steelton. It assumes the existing aqueduct can be removed and the Fort Creek made to drain in an alternate location. A local storm sewer would need to be installed in the former aqueduct location to provide storm water drainage for the immediate area only. The new drainage system may not have to be entirely underground; it could potentially consist of some open channel in combination with some underground aqueduct if a Carmen's Way route is considered. Potential alternate locations could also include an underground aqueduct along Northland Road, closer to the path of the original creek.

Before any of the alternatives were evaluated, the required hydraulic capacity of the new storm drainage system was determined.

2.3. Major and Minor Systems and Overland flow route

Storm sewers are designed to convey flows during the most frequent rainfall events and are designed for a certain magnitude of storm events and thus make up the "minor" drainage system. The storm sewer systems found on local streets are part of the minor system, and by current City standards are designed to carry anticipated flows from a 1 in 10 year rainfall event. The 10 year return period storm is the standard used by the City for storm sewer design. It is based on rainfall intensity duration data from Environment Canada. Thus, a 10 year rainfall event has a 10% probability of occurring in any given year. A sewer designed to this standard is expected to successfully convey the runoff from many rainfall events, but there is a 10% chance each year it will be subjected to more stormwater than it can handle,

with resulting surcharging and flooding potential. Once the local system is surcharged, ponding occurs in low areas which can eventually become overland flow as excess water accumulates. Overland flow is usually considered the "major" drainage system.

In Steelton the major drainage system also includes the Fort Creek aqueduct as it is expected to convey more than minor events (1 in 10 year). Both the aqueduct and the overland flow system are expected to convey flows in excess of the minor system during larger magnitude, more infrequent storm events.

The overland flow path through Steelton follows the natural topography of the area which was determined by the Fort Creek over many thousands of years. Thus, excess water flows along the surface generally following the location of the former creek (see map in Section 1.5) accumulating in low spots (John Street from St. Georges to St. Andrews; St. Andrews Terrace from John Street to Wellington Street West) before draining south under the CPR railway bridge. When the railway was built, the track elevation was set above the natural ground elevation, thus acting as a dam, blocking all overland flow and channeling it towards the original creek crossing built by the CPR next to John Street. (See photo in Section 1.7)

It is also noted that the reconstruction of John Street in 2011 included the installation of a 900 mm x 1800 mm box culvert southerly to the St Georges Ave intersection. This was connected to an existing 900 mm storm sewer that conveys flow along St Georges Avenue over to the aqueduct. This 900 mm sewer has considerably less capacity than the John Street box culvert and therefore contributes to the flooding potential of this intersection.

2.4 Watershed Appraisal and Hydraulic Assessment

To determine the required capacity of the new aqueduct a hydraulic study has been completed. The Tulloch Engineering report "*Fort Creek Aqueduct Watershed Appraisal and Hydraulic Assessment*" is attached in Appendix 2. This report describes the current drainage characteristics of the entire watershed, assesses the capacity of the current drainage infrastructure and then makes recommendations for conveyance improvements. Although this Class EA is intended to review alternatives for the Steelton area, the hydraulic study covers by necessity the entire Fort Creek watershed since both upstream and downstream conditions affect the volume and rate of runoff the Fort Creek conveys through the Steelton area. Thus the hydraulic study reviews and analyzes the effects the Fort Creek Dam has on the aqueduct, impacts of current upstream and downstream restrictions and the increased capacity that has been provided by downstream improvements through recent City aqueduct contracts in 2013, 2015 and 2016.

2.4.1 Study Approach

The report first evaluated the hydrology of the existing drainage area, and then a hydraulic analysis was performed of the entire minor drainage system. This was followed by a final integrated hydraulic analysis of the minor and major drainage systems as a whole. Utilizing the results of these analyses, the study then hydraulically analyzed a series of alternatives to address identified deficiencies within the existing underground aqueduct and major drainage system.

This appraisal was organized to systematically develop and evaluate the hydrologic and hydraulic characteristics of both the major and minor drainage systems to ensure accuracy. Included is an examination of the assumptions, hydrologic methods and hydraulic evaluations of past reports to present a comprehensive appraisal of the watershed and its drainage systems.

2.5 Evaluation of Alternative Solutions

Based on the results of the hydrology and hydraulic modeling it is thus possible to evaluate the three alternate solutions for the Steelton study area. Of major importance is the finding that all flows, up to the Timmins regional storm runoff can be carried through Steelton in one structure (twin barrel in some locations) and a separate relief aqueduct (or open channel) elsewhere to add additional capacity is not required.

2.5.1 Do Nothing

This alternative represents baseline conditions and its evaluation is required by the Municipal Class EA process. A decision to "do nothing" would typically be made when the cost of all other alternatives, both financial and environmental, significantly outweigh the benefits. It is not preferred here since the identified problems are not addressed and with the passage of time concerns for public safety due to the deteriorating structure will increase. Continued repair work with occasional replacement of small sections is not cost effective and the hydraulic capacity of the aqueduct cannot be changed to reflect expected flows identified in the hydraulic analysis.

2.5.2 Rebuild the Aqueduct in the same Location

To analyze this alternative the positives and negatives were considered:

Positives

1) The existing location is the shortest route between the inlet at Carmen's Way and the outlet at the CPR train bridge.
2) All work would be on municipal property, so private property would not be needed.
3) The existing trench could be reused, decreasing excavation and restoration costs
4) The existing route has been in place for over 100 years, and all other utilities including sewers, water mains, duct banks and force mains have been installed to accommodate the location.
5) Impacts on the natural environment would be less by replacing in the same location.
6) Based on the hydraulic modeling a new aqueduct can be accommodated (to carry the regional storm) in the same location as the existing, without requiring a relief channel or aqueduct.

Negatives

1) Replacing the structure along Wellington Street West would cause considerable disruption to traffic and local businesses and residents in the area, during the construction phase.
2) The south sidewalk would be unavailable to pedestrians for an extended period; however it would also be unavailable for the removal of the existing, if an alternate route is chosen.

3) Removing and replacing the aqueduct will require “in water” work, thus requiring considerable erosion and sediment control efforts.

2.5.3 Rebuild the Aqueduct in a new Location

Two alternate locations were considered feasible:

A) South along Carmen’s Way in an open channel, then draining easterly under St Andrews Terrace in an aqueduct over to the existing outlet at the CPR bridge.
B) Starting at the inlet, heading west along the Bloor Street right of way, then along Northland Road. It would connect with the existing route either at Boydell Place or at St Georges Avenue (by crossing private property).

Positives

1) Wellington Street West is a major arterial street; it would cease functioning as a major storm drainage corridor as well, if the Carmen’s Way location was chosen.
2) The removal of the existing aqueduct and replacing it with a local storm sewer would have less disruption to the local businesses, residents and traffic on Wellington St West.
3) An open channel along Carmen’s Way has more benefits to the natural environment, when compared to a box culvert.
4) Construction in a new location (not in an existing watercourse) would lessen the concerns of sediment entering the watercourse.

Negatives

1) If an alternate route is used, the existing structure would still need to be demolished/removed and a new storm sewer placed along Wellington Street West to convey drainage from the road and local bordering properties, adding cost and still disrupting traffic and businesses/residents.
2) All alternate routes are longer than the existing.
3) The Carmen’s Way route offers the potential for some open channel, potentially reducing costs, but moves the creek west and further away from the natural overland flow route. The topography is not conducive to this route as it is against the natural grade. Localized flooding in the John Street and St Andrews Terrace corridor would not be addressed.
4) An open channel alongside the Hub Trail may be perceived as a safety risk by area residents.
5) Constructing a major box culvert drainage system on residential streets (Northland Road or St Andrews Terrace) would be difficult and expensive. All underground utilities would be affected and would need to be relocated.
6) A Northland Road route would require the use of private property, unless the aqueduct remained on Wellington Street West from Boydell Place to St Andrews Terrace, removing many of the positives.
7) The alternate routes would be costly and less effective hydraulically since they are not the shortest.

2.6 Evaluation Criteria

In order to evaluate the alternative solutions, the following evaluation criteria were developed. The ratings are shown in the chart below, and should be read as the higher the number of asterisks (***) the better the expected result (i.e. the less impact on the environment or the lower the cost).

1) How well will the alternative solve the problem, as identified in the problem statement?
2) Are impacts to the natural environment minimized?
3) All undertakings have some negative impacts on people (residents, business owners, motorists, cyclists, pedestrians, tourists, etc), possibly short and/or long term. To what extent does the alternative minimize the negative impacts on the social, cultural and economic environments?
4) How significant are the impacts to private and/or public property? This criterion considers both the short term effects of construction and the long term benefits of the solution to properties involved.
5) Cost implications: How cost effective is the alternative in solving the problem?

	Alternative #1 Do Nothing	Alternative #2 Replace Aqueduct in Same Location	Alternative #3 Replace Aqueduct in Different Location
Effectiveness	*	*****	***
Natural Environment	**	****	****
Cultural, social, economic environments	**	***	***
Property effects	*	***	*
Costs	*	***	*
Totals	7	18	12
Class EA Schedule	A	A+	B

2.7 Preferred Solution

Based on the results of the evaluation matrix, the preferred solution is Alternative #2, to replace the aqueduct through Steelton in the same location. The structure would be designed to convey the Regional Storm. It is noted that since the recommended solution is to replace the existing aqueduct and private property is not required, the project meets the EA Schedule A+ criteria.

2.8 Potential Environmental Impacts and Mitigating Measures

Three areas of environmental concern have thus been identified:

- Impacts to the natural heritage, specifically construction effects on aquatic habitat due to the potential for sedimentation downstream.
- Impacts to fishery resources due to potential for spills and deleterious substances entering the creek.
- Potential economic loss due to the disruption of access to local properties and reduced traffic flow along Wellington Street West, during construction.

The natural heritage issues will be addressed as outlined in Section 5 of the Existing Conditions and Environmental Impact Assessment Report (summarized in Table 3 of the report). As noted, a detailed sediment and erosion control plan and a water management plan will be developed to mitigate potential negative impacts.

Access and Traffic Concerns

To mitigate traffic and access concerns, the contract documents will require a Traffic Control Plan to be produced by the contractor that will address both vehicular and pedestrian traffic. The traffic plan will emphasize the need to keep construction activity on the south side of Wellington Street West, thus keeping the north side of the centreline available for traffic flow. Two traffic options are available during construction:

- if parking is removed on the north side, two-way traffic could be permitted;

-if parking is left in place, one lane for west bound traffic could be accommodated; east bound traffic would be detoured.

These options are shown in Figure 6. A decision on the preferred option will be made prior to project start once timing is known.

When Wellington Street West and St. Georges Avenue need to be closed for the St. Georges Avenue storm sewer replacement, advance notice will be posted and a detour established for vehicles and pedestrians.

Many buildings have laneway access, which will be maintained. Pedestrian access to each building will also be maintained. Given the varying effects the aqueduct replacement will have on individual buildings, plans will be developed for each, in discussion with the owner.

2.9 Public Consultation

A Public Information Centre (PIC) was held on June 1, 2016 in the Steelton Senior Citizen Centre located on Wellington Street West within the study area. The purpose was to consult with the public and interested parties, review the alternatives and to present the recommended alternative. Notice was

published in the Sault Star on May 26th and May 28th, 2016 and placed on the City website. The notice was also mailed to all residents and other interested parties on the contact list including Garden River First Nation, Batchewana First Nation, Métis Nation of Ontario, Sault Ste Marie Region Conservation Authority, EA Coordinator Ministry of the Environment, and Ward 4 City Councillors.

A summary of the open house, the public notice, information bulletin and copies of all written comments received can be found in Appendix 4.

2.10 Selection of Preferred Solution

The preferred solution to address the Steelton Fort Creek Aqueduct issues outlined in this study consists of:

- The replacement of the aqueduct through Steelton in substantially the same location, as shown in Figure 5. The sections replaced in 2005 (Carmen's Way crossing and Wellington Street West crossing) would remain in place.

- The upgrading of the St. Georges Avenue storm sewer from the John Street intersection westerly to the Fort Creek Aqueduct, as shown in Figure 5.

2.11 Notice of Study Completion and Project File Report

The completion of this Project File Report and filing of the Notice of Study Completion concludes the Class EA process for this project. The report is made available to the public for review upon request for thirty (30) calendar days. If concerns regarding the project cannot be resolved in discussion with the City of Sault Ste Marie, a person or party may request that the Minister of the Environment and Climate Change make an order for the project to comply with Part II of the *Environmental Assessment Act* (referred to as a Part II Order), which requires an Individual Environmental Assessment. Requests must be received by the Minister within the 30-day review period. If no new or outstanding concerns are brought forward during the review period, the City may complete detailed design and construction of the project.

3.0 References

AMEC Earth & Environmental, Sault Ste Marie Region Conservation Authority Fort Creek Dam Sault Ste Marie Dam Safety Review, February 2005.

City of Sault Ste Marie 2015 Stormwater Master Plan and Policy

City of Sault Ste Marie Official Plan 1996, Amended 2003, City website November 2012

Conestoga Rovers & Associates, Sault Ste Marie Region Conservation Authority Flood Control System Engineering Assessment, August 16, 2005.

Conestoga Rovers & Associates, Sault Ste Marie Region Conservation Authority, Dam Safety Review Report, Fort Creek Dam, January 2015.

Conestoga Rovers & Associates, Stem Engineering Group Inc., Fort Creek Aqueduct Hydrologic/Hydraulic Analysis, December 2014.

Fenco Consultants Ltd., the City of Sault Ste Marie, Engineering Report Fort Creek Aqueduct, August 1981.

Geotechnical Study, City of Sault Ste Marie; The Trow Group, January 1977

M.M. Dillon Ltd., Sault Ste Marie Region Conservation Authority Flood Plain Mapping Report, November 1977.

Ministry of Transportation Drainage Management Manual, Drainage and Hydrology Section, Transportation Engineering Branch, MTO 1995-1997.

Municipal Engineers Association: Municipal Class Environmental Assessment, October 2000, as amended in 2007 and 2011.

Ontario Ministry of the Environment, 2003 Stormwater Management Planning and Design Manual

Proctor and Redfern Limited, Sault Ste Marie Region Conservation Authority; Fort Creek Flood Reduction Study, E.O. #87039, February 1988.

Proctor and Redfern Limited, Sault Ste Marie Region Conservation Authority, Fort Creek Channel Second Line to Aqueduct, E.O. # 70131, June 1970.

Proctor and Redfern Limited, Sault Ste Marie Region Conservation Authority; Report on Fort Creek Aqueduct Appraisal for the SSM Region Conservation Authority, E.O. # 679, October 1967.

Proctor and Redfern Limited, The City of Sault Ste Marie Ontario, Report on the Construction of a Dam at Fort Creek. E.O. # 6237, April 1963.

Sault Ste Marie Region Conservation Authority: Operation and Maintenance Manual, May 01, 2014 Fort Creek Dam (Draft)

Stem Engineering Group, the City of Sault Ste Marie, Biennial Aqueduct Inspections Fort Creek Aqueduct Review, Project # 15098, December 2015.

Stem Engineering Group, the City of Sault Ste Marie, Engineering Report Fort Creek Aqueduct, Project # 11045, December 2011.

Stem Engineering Group, the City of Sault Ste Marie, Engineering Report Fort Creek Aqueduct, Project # 06077.02, December 2008.

Vernon's Directories (1906), Sault Ste Marie Museum Website www.saultmuseum.com

APPENDIX 1

Existing Environmental Conditions and Impact Assessment Report

Fort Creek Aqueduct Class EA
Existing Environmental Conditions and Impact Assessment
Sault Ste. Marie, Ontario

Tulloch Project No.: 151192-01

Prepared for:
The City of Sault Ste. Marie
99 Foster Drive
Sault Ste. Marie, ON P6A 5X6

Prepared by:
Tulloch Environmental, a division of Tulloch Engineering Inc.
1942 Regent Street, Unit L
Sudbury, ON P3E 5V5

27 May 2016

TULLOCH
ENVIRONMENTAL

Executive Summary

Tulloch Environmental (Tulloch) was retained to complete an Existing Conditions (EC) and Environmental Impact Assessment (EIA) for replacing an underground box aqueduct storm sewer which conveys a section of the Fort Creek through Sault Ste. Marie, ON. The project is considered a Schedule B undertaking in the Class EA primarily due to the possibility of requiring the use of some private land. The primary objective of this EC and EIA was to evaluate the environmental impacts associated with the proposed replacement of the Fort Creek aqueduct storm sewer.

Fieldwork for this study was conducted on December 11th 2015. This field work consisted of: aquatic habitat survey, vegetation survey, tree identification and survey, habitat for Species at Risk, and general wildlife habitat survey. The following paragraphs summarize the findings from this study.

1. The property **is not located near any 'significant' natural heritage features**. Including; wetlands, significant valley lands, areas of natural & scientific interest (ANSI), significant woodlands, floodplains, or any other designated natural heritage system constraints.
2. The area with the largest potential environmental impact associated with this project is the potential for sedimentation/siltation and material entering the lower reach of Fort Creek and the St. Mary's River. **These impacts can be avoided through standard erosion and sediment control measures and construction site water management**.
3. Habitat within the study area was characterized as highly artificial; principally domestic grasses and planted trees (native and horticultural varieties).
4. The presence of scattered milkweed within the study area suggests monarch butterfly reproduction on site is possible.

In conclusion, with the implementation of the mitigation recommendations that have been included in this report, **the proposed Fort Creek aqueduct storm sewer replacement will not have lasting significant impacts on the natural heritage in the area**. There may be minor and short term negative impacts associated with sediment transport resulting from shoreline and in-water work, however, through the use erosion and sediment control of best management practices the impact magnitude and duration is expected to be minimal. It is therefore recommended that the proposed development can proceed as planned with the proposed mitigation measures as outlined in this report.

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1.0 INTRODUCTION

1.1. GENERAL

Tulloch Engineering (Tulloch) was retained by the City of Sault Ste. Marie to complete an Existing Conditions (EC) and Environmental Impact Assessment (EIA) to support the Schedule B Class Environmental Assessment (EA) for the proposed replacement of the Fort Creek Aqueduct storm sewer, located in Sault Ste. Marie, Ontario (**Figure 1**). The section of the Fort Creek Aqueduct storm sewer to be replaced is an approximately 750 m section of Fort Creek which is enclosed in an underground concrete box culvert under the south sidewalk of Wellington Street West, approximately 1 km upstream of the Fort Creek confluence with the St. Mary's River. The aqueduct serves as both a storm sewer and conveyance channel for the Fort Creek.

The primary objective of this EC and EIA Report is to evaluate the environmental impacts associated with the proposed Fort Creek Aqueduct replacement. This includes; ensuring the development does not contravene the Endangered Species Act, evaluating potential environmental impacts, and proposing mitigation measures to address the impacts.

1.2. POLICY FRAMEWORK

Various regulatory agencies and legislative authorities have established a number of policies, generally outlined below, in an effort to protect ecological features and functions. This section does not constitute a land-use planning assessment. The documents referenced should be read in their entirety for a more detailed understanding of the land-use policy framework applicable to the subject lands. Assessment of the natural features and functions of the site were undertaken having regard for the requirements of the following policies and legislation:

- Provincial Policy Statement, 2014
- Species of Conservation Interest
- Federal Species at Risk Act (2004)
- Provincial Endangered Species Act (2007)

Legend

Inset Study Area (Bottom Right)

Figure 1: Project Location

TULLOCH ENVIRONMENTAL

0 1.5 3 4.5 6 7.5 km

Notes:

Background base map produced by the Ontario Ministry of Natural Resources under Licence with the Ontario Ministry of Natural Resources © Queen's Printer for Ontario, 2006/07/08/09/10.

Datum: NAD83
Projection: NAD83 Zone 17N

N W E S

Fort Creek Aqueduct

J:\2015 Projects\151192 SSM Fort Creek Aqueduct (Environmental Component)\Maps

PROJECT: 151192

SCALE: 1:100,000 DATE: February 2016

Description of the Proposed Project

As indicated above, the City of Sault Ste. Marie has initiated a Schedule B Class Environmental Assessment (EA) for the upgrading or replacement of the Fort Creek Aqueduct along Wellington Street West through the Steelton area. The creek was channelized into a large concrete box culvert around 1912-1913 and is generally located under the south sidewalk on Wellington Street West. The existing aqueduct has structural deficiencies and portions may be undersized to carry major rainfall events.

Project Activities

Activities will include the following general project components:

- Road work
- Excavation of existing structure
- Replacement of the structure

2.0 METHODOLOGY

2.1. Background Information Review

A review of available background information was completed, which included reviewing topographic maps, aerial images and other sources of natural heritage information, including but not limited to information provided by the Ontario Ministry of Natural Resources and Forestry (MNRF), the Ontario Freshwater Fishes Life History Database, and the Natural Heritage Information Centre (NHIC). Additional resources are provided in the list of Literature Cited.

Tulloch Environmental contacted the MNRF to obtain any available fishery data associated with the watercourse. Background information was received regarding fishery and wildlife values which highlighted any areas of sensitivity and also timing restrictions for in-water work. Correspondence with the MNRF is presented in **Appendix C**.

2.2. Natural Heritage Features Field Assessment

A site visit was performed by a Tulloch biologist on the December 11, 2015. The biologist walked the full length of the proposed aqueduct routes, as well as all greenspaces within 120m of proposed routes. In addition to a general habitat description, this field assessment focused on identifying potential habitat for SAR species identified during the background natural heritage review as potentially present within the study area. Any areas with potential for designation as Significant Wildlife Habitat (see OMNRF Significant Wildlife Habitat Technical Guide) were also noted.

All fieldwork conducted for the EC and EIA took place on December 11th, 2015 during ideal weather conditions (**Table 1**). Fieldwork consisted of vegetation surveys, breeding birds, turtles and reptiles, and general wildlife. The following sub-sections outline the survey methodologies used in the EC and EIA.

Table 1- Fieldwork Survey

Date	Personnel	Weather Conditions	Air Temperature (°C)	Purpose of visit
11/12/2015	Kelly Major	Overcast	3 (high of 8)	Natural Heritage Assessment

2.2.1. Vegetation survey

Vegetation was surveyed and a list of plant species was compiled (**Appendix A**).

2.2.2. Species at Risk

Bird Species

Tree canopies and bridges were surveyed for evidence of nesting and cavity trees were noted and evaluated for potential as chimney swift roosting habitat. Access to some parts of the study area was restricted due to privately owned land.

Herptile Species

Waterbodies and lowland areas were assessed for turtle and other reptile habitat. Two Species at Risk (SAR) turtles were identified as having the potential to occur in the study area during the background review. These include the Common Snapping Turtle (*Chelydra serpentina*) and Blanding's Turtle *(Emydoidea blangingii)*.

The SAR Milksnake (*Lampropeltis triangulum triangulum)* was identified as having the potential to occur in the study area during the background review. During the field investigation, habitat within and adjacent to the project footprint was assessed to determine if its characteristics would provide suitable habitat for the listed herptile species. There were no appropriate habitats for any SAR species and no candidate Significant Wildlife Habitats were observed.

Fish Species

Fish community information was not available specifically for Fort Creek.

Plant Species

Oval-leaved bilberry (*Vaccinium ovalfolium*), Flooded Jellyskin (*Leptogium rivulare),* Gattinger's Agalinis (*Agalinis gattingeri),* Hill's Thistle (Cirsium hillii), and Houghton's Goldenrod (*Solidago houghtonii*) are all plant species at risk identified as having high potential or a previously documented occurrence in the vicinity of the project area (based on range, habitat and records). A search for the plants and their habitat was undertaken during the field investigation, and site specific vegetation survey.

Bat Habitat Assessment

Myotis bats, as nocturnal insectivores, frequently forage over water where prey is more abundant and accessible. As a result, they are known to roost in woodlots and structures adjacent waterbodies; including rivers. An assessment of potential bat habitat was completed during the field investigation.

2.2.3. Incidental Wildlife Survey

The wildlife assessment within the property was completed through incidental observations while on site. Any incidental observations of wildlife were noted, as well as searches for wildlife evidence such as nests, dens, tracks and scat was conducted. For each observation, notes and, when possible, photos were taken. These observations also helped validate our conclusions on the ecological function of the ecosystems identified within the project area.

3.0 EXISTING CONDITIONS & SURVEY RESULTS

3.1. VEGETATION COMMUNITIES

A review of secondary sources and other relevant background materials indicates that no significant wetlands, significant valleylands, areas of natural & scientific interest (ANSI), significant woodlands, floodplains, or any other designated natural heritage system constraints are located within 120m of the proposed development.

All vegetation classes surveyed on the property are considered common in Ontario and likely have experienced disturbances in the past. The terrestrial study area surrounding (120m) was characterized as highly artificial; principally domestic grasses and planted trees (native and horticultural varieties). Some unmanaged ditches and fence lines permitted thickets of shrubs and low trees to form (mostly Manitoba maple, aspens, sumac, dogwood and other fast growing and shade intolerant species). The site was also highly disturbed owing to, (1) the presence of extensive vehicular and pedestrian traffic (i.e. arterial municipal roadways, train tracks, a bike path and sidewalks), (2) adjacent industrial and commercial land use (e.g. Algoma Central Railyards), and (3) municipal landscape maintenance (e.g. mowing of grassy areas). Common household litter was prevalent throughout the site.

A total of fifty (50) plant species were documented in the Survey Area during the survey. A list of plant species observed during field studies within the Survey Area is included in **Appendix A**. Reference photos have been provided in **Appendix B.** All plant species were common to the region, and indicative of developed areas.

3.2. FISH AND FISH HABITAT

Given that habitat in Fort Creek has been extensively altered, it is unlikely to support a diverse fish community, if any at all. However, fish habitat is present downstream of the project area near the outlet of Fort Creek, and in the St. Mary's River.

3.3. BIRDS

Field assessment identified six bird species all of which were common to Ontario and no SAR species were found. One partial nest (likely red-eyed vireo) was observed hanging from a planted birch adjacent to the intersection of John St. and Wellington St. West. No cavities were observed in trees large enough to support chimney swift roosting.

3.4. SPECIES-AT-RISK

A review of background information, including consultation with the MNRF indicated that Species at Risk or their habitat may occur in the project area. **Table 2** outlines the SAR that was identified as potentially occurring within the site as identified through the background natural heritage information collection.

Table 2– SAR with the Potential to Occur at or near the project location.

*Common Name	Scientific Name	*ESA
Bald Eagle	*Haliaeetus leucocephalus*	Special Concern
Black Tern	*Chlidonias niger*	Special Concern
Bobolink	*Dolichonyx oryzivorus*	Threatened
Eastern Meadowlark	*Sturnella magna*	Threatened
Least Bittern	*Ixobrychus exilis*	Threatened
Peregrine Falcon	*Falco peregrinus*	Special Concern
Whip-poor-will	*Caprimulgus vociferus*	Threatened
Bank Swallow	*Riparia riparia*	Threatened
Barn Swallow	*Hirundo rustica*	Threatened
Canada Warbler	*Wilsonia canadensis*	Special Concern
Chimney Swift	*Chaetura pelagica*	Threatened
Common Nighthawk	*Chordeiles minor*	Special Concern
Olive sided flycatcher	*Contopus cooperi*	Special Concern
Short-eared Owl	*Asio flammeus*	Special Concern
Lake Sturgeon	*Acipenser fulvescens*	Threatened
Northern Brook Lamprey	*Ichthyomyzon fossor*	Special Concern
Redside Dace	*Clinostomus elongatus*	Endangered
Shortjaw Cisco	*Coregonus zenithicus*	Threatened
Rusty-patched Bumble Bee	*Bombus affinis*	Endangered
Flooded Jellyskin	*Leptogium rivulare*	Threatened
Gattinger's Agalinis	*Agalinis gattingeri*	Endangered
Hill's Thistle	*Cirsium hillii*	Threatened
Houghton's Goldenrod	*Solidago houghtonii*	Threatened
Oval-leaved bilberry	*Vaccinium ovalfolium*	
Milksnake	*Lampropeltis triangulum triangulum*	Special Concern
Blandings Turtle	*Emydoidea blandingii*	Threatened
Snapping Turtle	*Chelydra serpentina*	Special Concern

* Information sources include: NHIC = Natural Heritage Information Centre; OBBA = Ontario Breeding Bird Atlas; OHA = Ontario Herptofaunal Atlas; OHA = Ontario Mammals Atlas; OOA = Ontario Odonata Atlas; --- denotes no information or not applicable.

Bird Species

No bald eagle, black tern, bobolink, eastern meadowlark, least bittern, peregrine falcon, whip-poor-will, bank swallow, barn swallow, Canada warbler, chimney swift, common nighthawk, olive sided flycatcher, or short-eared owl were observed or heard on the property during the survey. Additionally, the project area does not provide suitable habitat for these species.

Herptile Species

No Common Snapping Turtle (*Chelydra serpentina*), or Blanding's Turtle *(Emydoidea blangingii)* were observed during the field investigation. The quality of SAR habitat within the project area is limited. No turtles were observed during the field investigation. No candidate Significant Wildlife Habitats were observed.

One species of SAR snakes were identified as having the potential to occur in the study area during the background review. This is the Milksnake (*Lampropeltis triangulum triangulum).* During the field investigation, habitat within and adjacent to the project footprint was surveyed for individual snakes and potential snake habitat. No SAR snake species were observed during any of the surveys conducted on the property. Habitat such as rock outcrops or rock piles that would be suitable for snake hibernacula were not observed.

Fish Species

The MNRF did not identify the area associated with the aqueduct as critical fish habitat.

Plant Species

Flooded jellyskin, Gattinger's agalinis, Hill's thistle, Houghton's goldenrod, and oval-leaved bilberry were identified as having high potential or there was a previously documented occurrence in the vicinity of the project area (based on range, habitat and records). None of the listed species were observed during the vegetation inventory.

Bat Habitat Assessment

The field investigation incorporated a habitat search of bats. The area was assessed to determine if any structures or tree cavities were present on site that could potentially be used for bat roosting or maternal colonies. No candidate bat roosts were observed during the investigation.

No cavity trees were observed in any of the large trees.

3.4.1. Species at Risk Summary

There were no species at risk or their critical habitat found on site during the survey on December 11th 2015. Notwithstanding limitations with the timing of this survey, habitat did not appear appropriate for any other SAR species and no candidate Significant Wildlife Habitats were observed.

4.0 IMPACT ASSESSMENT

Potential impacts to the natural environment associated with the proposed project are detailed below.

4.1. TERRESTRIAL VEGETATION

Much of the project area is characterize by existing infrastructure, and disturbed natural features with minimal ecological value. The proposed project is not expected to have any long standing impacts on the natural heritage system in the area.

All vegetation classes surveyed on the property are considered common in Ontario and appear to have experienced disturbances in the past. Minor short term impacts to vegetation communities may result from various aspects of the underground concrete box culvert replacement project. These may include:

(1) The clearing of sections of terrestrial habitat within the right-of-way, adjacent to the underground box culvert may be required. This clearing will involve the removal of highly disturbed habitat, permeated with common invasive, non-native species. Considering the nature of this area, the overall impact on the natural heritage system will be minor. The removal of shrubs and grasses will have an impact on potential nesting habitat for birds.

(2) The clearing of vegetation around the underground box culvert sewer right-of-way and potentially for construction lay down areas will have a minor impact on the natural heritage of the area. The vegetation inventory suggests that the species are predominantly associated with disturbed habitats and are generally all early succession species that have regenerated following previous right-of-way clearing and general roadway maintenance.

It is anticipated that the general impacts associated with the removal of the above terrestrial habitats from development activities may include:

- General loss of natural vegetation from the areas noted above;
- Temporary reduction in soil stability during construction potentially resulting in increased sediment transport through wind and overland water flow (particularly in the areas that will be regraded);
- Loss of foraging habitat for butterflies, bees and other insects that feed on the existing vegetation;
- Loss of habitat for small mammals that could utilize the area as nesting and foraging habitat; and,
- Loss of foraging habitat for birds of prey who would feed on the small mammals utilizing the area.

The disturbance to the existing terrestrial vegetation through the anticipated clearing, grading, underground box culvert replacement, and other construction activities will not significantly alter the ecological function of the existing features or have a lasting ecological impact on the natural heritage system.

4.2. AQUATIC HABITAT

The existing underground box culvert sewer will be removed and replaced with another similar structure manufactured to updated specifications to accommodate modern design and flow criteria. As such, the proposed underground box culvert replacement meets all the above criteria, and will not require DFO review, provided serious harm to fish and fish habitat can be avoided.

Fort Creek has no known fisheries information available. It has been heavily modified and altered over time as a result of urbanization. The MNRF has acknowledged Fort Creek as a heavily altered and urban aquatic habitat. No aquatic SAR species are expected to inhabit Fort Creek, and there is no indication there is suitable habitat for aquatic SAR species. **The MNRF did not indicate timing windows for in-water work.** The primary concern from an aquatic habitat perspective associated with this project is the potential for sedimentation/siltation and preventing any material from entering the lower reach of Fort Creek and the St. Mary's River.

The proposed work and activities associated with the underground box culvert replacement have been assessed to determine the potential impacts to the fishery. These impacts have been identified using the Pathway of Effects (PoE) diagrams (DFO, 2013). The PoE diagrams are used to display how activities may impact existing habitat and how mitigation can eliminate or minimize these impacts. This is accomplished through the use of pathways, stressors and residual effects flow charts, and has been developed for both in-water and land-based construction activities. The following is a summary of potential negative residual effects resulting from construction activities associated with the proposed work based on the PoE diagrams:

- Use of Industrial Equipment: Change in contaminant concentrations may result from oil or fuel leaks from equipment. In-water use of equipment may result in the release of sediment. Activities on land and banks may expose soils and decrease bank stability, resulting in the release and re-suspension of sediment.
- Change in Timing, Duration and Frequency of Flow / Fish Passage: Temporary changes in flow patterns may result in the displacement or stranding of fish or limiting fish passage upstream and downstream during the duration of the crossing construction.
- Placement of Materials or Structures in Water: The placement of shoreline stabilizing materials and the angular rock fill and support cribs may result in changes to the existing habitat and cover, changes to sediment concentrations or changes in the food or nutrient supply.
- Structure Removal: The removal of in-water structures (existing concrete box sewer) may result in changes to bank stability, hydraulics, substrate and exposed soils. This may lead to the release of sediment and loss of or changes to habitat.

- Isolation of In-water Work Areas: Isolation of in-water work areas will cause a temporary narrowing of the channel with the potential to cause minor erosion/substrate re-suspension and a temporary reduction in fish passage / stranding of fish. Installation and removal of isolation materials (i.e., sheet piles) will result in short-lived disruptions of substrate (i.e., sedimentation).

Mitigation measures for the above potential pathways are addressed and discussed in **Section 5** below.

4.3. Breeding Birds

The proposed development is expected to have a minimal impact on breeding birds. The vegetated area and forest fragments (edges and understories) provide the only natural habitat within the project area, and the vast majority of this habitat will be retained. Vegetation removal around the underground box culvert for construction purposes will contribute to a slight reduction in the available nesting and foraging habitat for breeding birds within the project area.

In addition, construction activities and the required vegetation clearing of the inlet and outlet areas, to facilitate the underground box culvert replacement, will also result in a minor and temporary loss of foraging and nesting habitat for breeding birds. This habitat will be restored, and likely improved from its current state, and will continue to provide foraging and nesting habitat for breeding birds. Overall, the continued regeneration of vegetation following construction should provide no net loss of breeding bird habitat over the existing condition.

In general, it is likely that there will be a short-term negative impact on breeding birds due to the clearing of land and construction activities at the site. However, it is likely that the regeneration of vegetation around the underground box culvert, will result in no net loss of habitat to breeding birds

4.4. Herptiles

No significant impacts to herptile populations or habitats are anticipated as a result of the proposed project. Construction activities associated with this underground box culvert replacement project could temporarily negatively impact herptiles or herptile habitat. However, field surveys did not identify any species present in the project area, so no significant impacts to herptiles are likely to occur.

Following the completion of the project, the setback provided will be sufficient to protect herptiles that may be living in or near Fort Creek and to maintain a strong ecological connection.

4.5. Species at Risk

Bird Species

No Bald Eagle, Black Tern, Bobolink, Least Bittern, Eastern Meadowlark, Peregrine Falcon, or Whip-poor-will were observed or heard in the project area during the survey. Additionally, the project area does not provide suitable habitat for these species. Therefore, no impacts are anticipated as a result of development.

Herptile Species

No turtles or snakes of any kind were observed during the field surveys and it is unlikely that the development will have any negative impacts on SAR Turtles or Milksnake. It is unlikely that any SAR turtles or Milksnake would consider inhabiting the area around the underground box culvert given that the site does not connect any core habitat.

Fish Species

No aquatic SAR species are expected to inhabit Fort Creek, and there is no indication there is suitable habitat for aquatic SAR species. The primary concern from an aquatic habitat perspective is to protect downstream habitat from sediment transport.

Plant Species

Oval-leaved bilberry (*Vaccinium ovalfolium*), a plant species at risk, was identified as having high potential in the project area or there was a previously documented occurrence in the vicinity of the project area (based on range, habitat and records). A search for Oval- leaved bilberry and its habitat was undertaken during the field investigation, and no presence was determined. No impacts to Oval-leaved bilberry or its habitat is anticipated.

Bat Species

No negative impacts to bats are anticipated as a result of construction activity or upon final completion of the underground box culvert structure. Field surveys did not identify any SAR bats or identify any bat habitat within the project area.

4.6. INCIDENTAL WILDLIFE

No significant impacts to wildlife will be occurring as a result of the project, given its limited footprint and duration (less than two years). Some inadvertent impacts on local wildlife may be associated with construction activities for this development. The most common of these impacts include physical harm or death resulting from contact with heavy equipment and major earth works. Snakes are particularly susceptible to conflict with heavy equipment. Noise associated with construction activities can also disrupt wildlife, particularly during breeding periods.

While few incidental wildlife sightings were identified during field surveys, the following impacts on local wildlife associated with the removal of the underground concrete box culvert may include:

- physical injury of wildlife by heavy machinery or construction activities during the construction of the development;
- loss of foraging and possible nesting/denning habitat;
- conflict between humans and pets with wildlife following occupancy:
    - Predation from pets;

- Mortality from vehicle strikes; and,
- Other conflicts with humans (trapping, poisoning, etc.).

4.7. CUMULATIVE IMPACTS

Cumulative impacts are defined as compound environmental effects as a result of multiple or successive activity. There are no cumulative impacts anticipated as a result of the proposed project.

5.0 MITIGATION

The following sections outline some of the general and specific mitigation measures that should be considered to mitigate the impacts associated with the proposed project. This includes both construction related mitigation measures and mitigation measures to address impacts related to the occupation of the new Fort Creek underground box culvert. A summary of the potential impacts, the recommended mitigation, and the associated residual negative effects is presented in **Table 3**.

5.1. TERRESTRIAL VEGETATION

The following section outlines the recommended measures to mitigate the impacts associated with the project on the terrestrial vegetation communities within the project footprint. These measures are primarily for construction activities at the upstream and downstream extent of the project area, where the underground storm sewer resurfaces.

Mitigation during construction

The following mitigation recommendations should be considered to protect terrestrial vegetation on the right-of-way and surrounding property parcels from impacts associated with construction activities.

- Restoration for the loss of native trees, shrubs, and plants is recommended. This restoration should include:
  - Vegetation replanting should be focused throughout disturbed areas to provide shade, bank stabilization etc.
  - The replanting should only use native species common to the project area.
  - Planting should also occur throughout the disturbed area to encourage species diversity and a more naturalized area.
- The development and implementation of standard erosion and sediment control measures should be implemented to protect terrestrial environment from erosion.
- Silt fencing should be installed along riparian areas at the upstream and downstream extent of the project area, where the underground storm sewer resurfaces.
- Stockpiling of excavated material should not occur outside the delineated working limits. If stockpiling is to occur outside this area, silt fencing should be used to contain it and the piles

should be removed as quickly as possible. Furthermore, the amount of material stockpiled will be minimized where possible.

- If dewatering is required, it is recommended that appropriate mitigation measures are implemented to mitigate the impact on adjacent terrestrial environments. These measures may include; silt socks, dewatering ponds, etc.

5.2. AQUATIC HABITAT

The following measures are recommended to mitigate the impacts of the project on the Fort Creek.

General Mitigation

- A detailed **sediment and erosion control plan** should be developed specifically to address any in-water works associated with the underground concrete box culvert replacement to mitigate impacts on the downstream habitat.
- A detailed **water management plan** should be prepared to address concerns with water passage through the construction area, in particular during high flow events.
- There are no in water work timing windows to be adhered to as long as sediment and erosion controls are installed that effectively prevent transport of sediment downstream.

Mitigation during construction

- Sediment and erosion control measures should be implemented prior to construction and maintained until the work site is stabilized to prevent entry of sediment into the water. These measures should include provisions for working close to a watercourse and include a plan to address inadvertent disruptions to infrastructure.
- All construction equipment used should arrive on site clean and be mechanically sound to avoid leakage of oil, gasoline, hydraulic fluids and grease.
- Construction site water should be managed in a manner to prevent the transport of suspended sediment downstream into fish habitat at the outlet of Fort Creek and the St. Mary's River.
- All materials and equipment used for the purpose of site preparation and project completion should be operated and stored in a manner that prevents any deleterious substance (e.g., construction waste, petroleum products, silt) from entering the water.
- Stabilize any waste materials removed from the work site to prevent them from entering the environment. This could include covering stockpiles with biodegradable mats or tarps if necessary.
- Riparian habitat should be planted with native vegetation. Species like; willows (*Salix sp*.), White Cedar (*Thuja occidentalis*), Red Osier Dogwood (*Cornus sericea*) and Buttonbush (*Cephalanthus occidentalis*) are preferred species.

Timing of In-Water Work

- The MNRF was contacted and advised that there are no timing window constraints for this project as long as proper sediment and erosion control measures are installed prior to construction.
- Minimize duration of in-water work;
- Conduct in-stream work during periods of low flow to reduce the risk to fish and their habitat or to allow work in water to be isolated from flows; and,
- Schedule work to avoid wet, windy and rainy periods that may increase erosion, flows and sedimentation.

5.3. BREEDING BIRDS

The following mitigation measures are intended to address the potential impacts associated with the proposed development on breeding birds.

Mitigation during construction

- Clearing of **any** vegetation should be avoided during the breeding bird season, between April 15th, and August 31st.

Mitigation after Project

- In addition, the planting of native vegetation and shrubs that will encourage the presence of song birds.

5.4. HERPTILES

The following mitigation measures are intended to address the potential impacts associated with the proposed development on herptiles.

Mitigation after occupation

- As limited potential for herptiles was determined during the field investigation, no ongoing mitigation should be required after occupation of the new Fort Creek underground storm sewer.

5.5. INCIDENTAL WILDLIFE

The following mitigation measures are intended to address the potential impacts associated with the proposed development on wildlife that may inhabit the property.

Mitigation during construction

The following mitigation should be considered to address impact to incidental wildlife during construction:

- Avoid clearing vegetation during sensitive times of the year for wildlife (spring and early summer);
- Ensure that any sediment and erosion control fencing or perimeter fencing does not inhibit wildlife from exiting the property during the clearing activities;
- Construction crews working on site should respect all forms of local wildlife and should not harm or harass any wildlife; and

Mitigation after occupation

- No ongoing mitigation for wildlife should be required after occupation of the new Fort Creek underground storm sewer.

5.6. Environmental Monitoring

It is recommended that an environmental monitor be utilized during the construction activities associated with Fort Creek underground box culvert replacement project. The role of this monitor will be to:

1. Review the sediment and erosion control plan for the site prior to any construction activities;
2. Be on site at the onset of the construction activities associated with the project to provide guidance and inspect all mitigation measures associated with this activity;
3. Conduct one inspection during the active construction to ensure continued compliance with mitigation;
4. Conduct one site visit following the construction activity to ensure restoration of the natural environmental features was done as intended, document the general heath of the environment, and assess the condition of newly planted vegetation.

In addition to the above, if any vegetation clearing is to be done between April 15th and August 31st, a qualified biologist is required to survey the property within 72 hours (ideally < 48 hours) of clearing to ensure that no bird nesting is occurring within the property.

Table 3- Summary of Constraints and Mitigation for Natural Heritage Features

NATURAL HERITAGE FEATURE/FUNCTION	POTENTIAL IMPACT	CONSTRAINT TO DEVELOPMENT	PROPOSED MITIGATION	RESIDUAL EFFECT
Terrestrial Vegetation	Loss of native trees, shrubs, and plants adjacent to the underground storm sewer from regrading.	Low	The restoration of vegetation adjacent to the underground storm sewer and surrounding land. This includes; • Replanting along road and watercourse to provide shade and stabilize banks, • Replanting using only native species appropriate for the conditions, and	No net change in terrestrial habitat at the project site; No residual effect anticipated;
	Reduction in soil stability	Low	Erosion and sediment control measures should be installed prior to any construction. This typically involves the installation of silt fencing, which will also protect wildlife from physical harm as indicated above.	No residual effect anticipated
	Encroachment of construction activity into the natural habitat to be retained	Low	Silt fencing should be installed along the length of the impacted construction area to clearly delineate the natural area from the project construction area.	No residual effect anticipated
	Siltation resulting from dewatering activities (if required)	Low	Appropriate dewatering mitigation measures should be utilized including; silt socks, dewatering ponds etc.	No residual effects anticipated
Aquatic Habitat	Sedimentation downstream of the project site as a result of construction activities	**Moderate**	A detailed sediment and erosion control plan should be developed to address in-water works and work adjacent to the Fort Creek. A detailed water management plan should be developed to address construction site water management.	Minor and temporary reduction in water quality is likely.
	General increase in erosion and sedimentation	Low	Erosion and sediment control measures should be installed prior to any construction. This typically involves the installation of silt fencing, which will also protect wildlife from physical harm as indicated above.	No residual effect anticipated
	Loss of aquatic habitat	Low	No sensitive habitat was identified in the immediate project footprint. No in-water timing restrictions are proposed.	No residual effect anticipated
Fisheries resources	Physical harm to fish as a result of in-water construction activity	Low	All in-water work should be conducted in low-water conditions.	No residual effect is anticipated
	Spills and deleterious substances	**Moderate**	Ensure that machinery arrives on site in a clean condition and is maintained free of fluid leaks, invasive species and noxious weeds; 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; Limit machinery fording of the watercourse to a one-time event (i.e., over and back), and only if no alternative crossing method is available. If repeated crossings of the watercourse are required, construct a temporary crossing structure.	No residual effect anticipated

NATURAL HERITAGE FEATURE/FUNCTION	POTENTIAL IMPACT	CONSTRAINT TO DEVELOPMENT	PROPOSED MITIGATION	RESIDUAL EFFECT
Breeding Birds	Loss of nesting habitat/foraging habitat	Low	The clearing of the vegetation should be avoided during the breeding bird nesting window (April 15th to July 31st).	Minor loss of potential habitat.
Herptiles	Physical harm to herptiles as a result of in-water construction activity	Low	All in-water work should be conducted in low-water conditions outside the timing window.	No residual effect anticipated
SAR - Barn Swallow	Harassment of birds around nests	Low	If nesting, avoid unnecessary use of heavy machinery where barn swallows are foraging for food (early morning and late evening).	No residual effect anticipated
	Removal of candidate nesting habitat	Low	Vegetation clearing should not be done during the nesting period (April 15th to July 31st)	No residual effect anticipated
Wildlife (General)	Physical injury from resulting from construction activities.	Low	Avoid clearing vegetation during sensitive times of the year for wildlife (spring and early summer).	No residual effect anticipated
	Loss of foraging & possible nesting/denning habitat.	Low	None required	No residual effect anticipated
	Conflict between humans and pets with wildlife	Low	Owner environmental awareness packages provided to new occupants.	Minor increase in wildlife fatalities.
Cumulative Impacts	Increase in impermeable surfaces	Low	Promote the use of permeable materials, particularly around construction laydown areas.	No residual effect anticipated
Environmental Monitoring	Non-compliance with mitigation.	None	It is recommended that an environmental monitor be utilized to; • Monitor construction activities and relevant mitigation measures.	No residual effect anticipated

6.0 SUMMARY AND RECOMMENDATIONS

This report outlines the environmental impacts associated with the proposed construction activity at the Fort Creek underground box culvert storm sewer, located in the city of Sault Ste. Marie, ON. **Table 3** provides a brief summary of the potential impacts that may occur as a result of the proposed project, the recommended mitigation measures to address these impacts, and a summary of the residual impacts that may be expected.

Conclusions

The natural heritage elements identified on the proposed project area generally poses a low constraint to project activities and should be easily mitigated using the measures outlined in Section 5 and general construction best practices. The area with the largest potential environmental impact associated with this project is the potential for sedimentation/siltation and preventing any material from entering the lower reach of Fort Creek and the St. Mary's River. These impacts can be avoided through standard erosion and sediment control measures and construction site water management. In general, the residual impacts resulting from this project, noted in **Table 3**, can be mitigated and should not pose any impediments to development.

The results and findings of this study have been reported without bias or prejudice. The conclusions of this study are based on our own professional opinion substantiated by the findings of this study and have not been influenced in anyway.

_____ _____

Report Prepared by
Christian Standring, Environmental Technician
Tulloch Environmental

Report Reviewer
Bill Tibble, Environmental Team Lead
Tulloch Environmental

7.0 LITERATURE CITED

Environment Canada. 2013. A Synthesis of Human-related Avian Mortality in Canada. Available at https://www.documentcloud.org/documents/800519-environment-canada-bird-study.html

Ontario Breeding Bird Atlas (OBBA). 2001. Guide for Participants. Atlas Management Board, Federation of Ontario Naturalists, Don Mills. Available at: http://www.birdsontario.org/atlas/download/obba_guide_en.pdf

OMNR. 2010. Significant Wildlife Habitat Technical Guide. Available at: http://www.mnr.gov.on.ca/en/Business/FW/Publication/MNR_E001285P.html

OMNR 2011. Eco-region criteria schedule 5E. Available at: http://www.ebr.gov.on.ca/ERS-WEB-External/displaynoticecontent.do?noticeId=MTE1ODc5&statusId=MTczNDgy

Appendix A

Vegetation Inventory

Vegetation Observations (June 5, 2015)

Common Name	Scientific Name
Trees	
Unknown Maple	*Acer sp.* (Horticultural)
Unknown Aspen	*Populus sp* (Horticultural)
Blue Spruce	*Picea sp.* (Horticultural)
White Spruce	*Picea glauca*
Manitoba Maple	*Acer negundo*
Hawthorn	*Crataegus sp.*
Staghorn Sumac	*Rhus typhina*
Red Osier Dogwood	*Cornus sericea*
Apple Tree	*Malus domestica*
Red Pine	*Pinus resinosa*
White Pine	*Pinus strobus*
Scotts Pine	*Pinus sylvestris*
Trembling Aspen	*Populus tremuloidus*
Sugar Maple	*Acer saccharum*
Largetooth Aspen	*Populus grandidentata*
Balsam Poplar	*Populus balsamifera*
White Ash	*Fraxinus americana*
Eastern White Cedar	*Thuja occidentalis*
Willow sp.	*Salix sp.*
Red Maple	*Acer rubrum*
Shrubs	
Staghorn Sumac	*Rhus typhina*
Mountain Holly	*Ilex mucronata*
Raspberry	*Rubus sp.*
Rose sp.	*Rosa sp.*
Honeysuckle sp.	*Lonicera sp.*
Snowy Mountain Ash	*Sorbus decora*
Herbaceous	
Unknown thistle	
Queen Anne's Lace	*Daucus carota*
Common Tansey	*Tanacetum vulgare*
Dandelion	*Taraxacum sp.*
Narrow Hawkweed	*Hieracium umbellatum*
Birds Foot Trefoil	*Lotus corniculatus*
Clover sp.	*Trifolium sp.*
Sulphur Cinquefoil	*Potentilla recta*
Rough Goldenrod	*Solidagoo rugosa*
Common Plantain	*Plantago major*
Mullein	*Verbascum thapsus*
Cow Vetch	*Vicia cracca*
Common Burdock	*Arctium minus*

Common Name	Scientific Name
Red Clover	*Trifolium pratense*
Milkweed	*Asclepias syriaca*
Canada Goldenrod	*Solidago canadensis*
Evening Primrose	*Oenothera sp.*
Bittersweet Nightshade	*Solanum dulcamara*
Healall	*Prunella vulgaris*
Watercress	*Nasturtium officinale*
Yarrow	*Achillea millefolium*
Grasses	
Read Canary Grass	*Phalaris arundinacea*
Polytrichum Moss	*Polytrichum piliferum*
Bracken Fern	*Pteridium latiusculum*

Appendix B

Site Photos

Photo 1: Northerly view of the Sault Ste. Marie Aqueduct North from the corner of Carmen's way and Wellington St. West

Photo 2: Northerly view of the Sault Ste. Marie Aqueduct North along Carmens Way

Photo 3: Westerly view of the Sault Ste. Marie Aqueduct North along Carmen's Way

Photo 4: Unknown thistle located on the opposite side of Carmen's Way from the rail yard

Photo 5: Looking west, south side of Wellington, from St Andrew's Terrace.

Photo 6: Inlet of aqueduct looking South.

Photo 7: looking west from Huron St, south side of Wellington.

Photo 8: looking east, south side of Wellington, from west of Huron.

Appendix C

Ministry of Natural Resources and Forestry Correspondence

From: Goertz, Derek (MNRF) [mailto:Derek.Goertz@ontario.ca]
Sent: Wednesday, April 20, 2016 8:51 AM
To: Bill Tibble
Subject: Fort Creek Aqueduct Improvements - Fisheries Timing Window

Hi Bill,

As I mentioned on the phone yesterday, due to the highly altered state of the system downstream of the dam I'm comfortable with removing the need for a timing restriction on in-water work associated with the Fort Creek aqueduct improvements. This means that in-water work is permitted year round.

Because removing timing restrictions completely is so atypical, I've consulted with our Regional Fisheries Specialist and Conservation Officer. We are all on the same page.

The biggest concern I have is around sedimentation/siltation and preventing any material from entering the lower reach of Fort Creek and the St. Mary's River. I imagine an erosion and sediment control plan will be implemented to prevent any impacts from occurring downstream of the project site?

If you have any questions please don't hesitate to contact me at 705-941-5130 or derek.goertz@ontario.ca.

Regards,

Derek Goertz
Management Biologist
Sault Ste. Marie District
Ontario Ministry of Natural Resources and Forestry
64 Church Street, Sault Ste. Marie, ON P6A 3H3
Tel: 705-941-5130, Fax: 705-949-6450
derek.goertz@ontario.ca

From: Bill Tibble [mailto:bill.tibble@tulloch.ca]
Sent: April 20, 2016 9:46 AM
To: Goertz, Derek (MNRF)
Subject: RE: Fort Creek Aqueduct Improvements - Fisheries Timing Window

Thanks Derek.
The ESC plan is currently being developed. The final design drawings aren't expected to be completed for another month or so, and we won't be able to complete the ESC plan until it is finalized. Do you require a copy of the plan for your review? Given the nature of the project we will be submitting a request for review to DFO as well.
Thanks again Derek.

Bill Tibble M.Sc.
Environmental Department Lead / Aquatic Ecologist

TULLOCH ENGINEERING 25 ANNIVERSARY YEARS

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bill.tibble@TULLOCH.ca | TULLOCH.ca

From: Goertz, Derek (MNRF) [mailto:Derek.Goertz@ontario.ca]
Sent: Wednesday, April 20, 2016 12:58 PM
To: Bill Tibble
Subject: RE: Fort Creek Aqueduct Improvements - Fisheries Timing Window

Thanks Bill. I wouldn't mind a copy of ESC plan if it's not too much trouble.

Regards,

Derek Goertz
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Sault Ste. Marie District
Ontario Ministry of Natural Resources and Forestry
64 Church Street, Sault Ste. Marie, ON P6A 3H3
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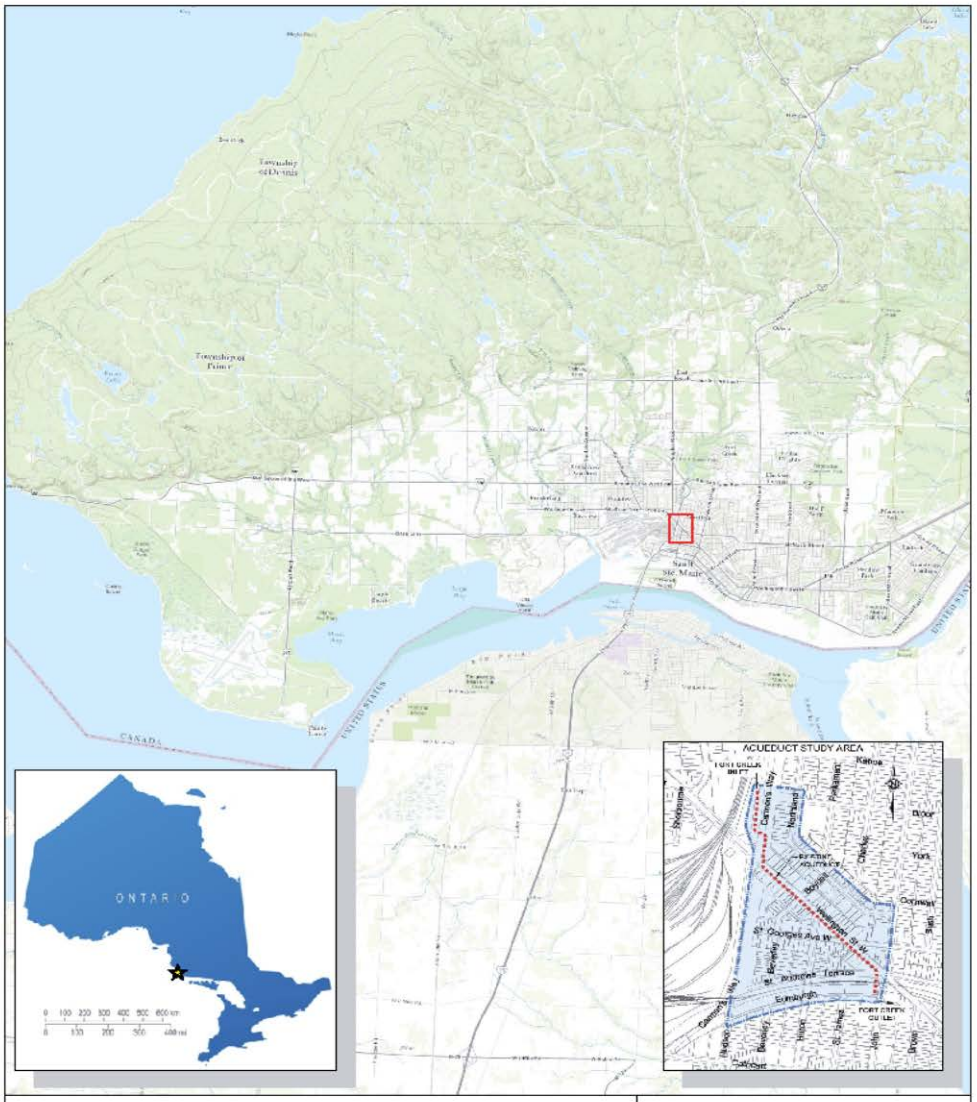

Legend

Inset Study Area (Bottom Right)

TULLOCH ENVIRONMENTAL

Study Area

0 1.5 3 4.5 6 7.5 km

Notes:

Datum: NAD83
Projection: NAD83 Zone 17N

N W E S

Fort Creek Aqueduct

J:\2015 Projects\151192 SSM Fort Creek Aqueduct (Environmental Component)\Maps

PROJECT: 151192

SCALE: 1:100,000 DATE: February 2016

APPENDIX 2

Watershed Appraisal and Hydraulic Assessment

(Bound Separately)

APPENDIX 3

Summary Report 2015 Biennial Inspection

STEM Engineering Group Inc.

REPORT OF

Biennial Aqueduct Inspections
Fort Creek Aqueduct Review

FOR:

The City of Sault Ste. Marie

PREPARED BY:

STEM Engineering Group Inc.
875 Queen Street E. Suite 2
Sault Ste. Marie, ON
P6A 2B3

(705)942-6628 tel
(705)942-7515 fax

DATE:

December 23, 2015

STEM Project No:

15098

TABLE OF CONTENTS

1.0 INTRODUCTION

The Fort Creek aqueduct is made up of concrete culvert sections separated by open channels. For 2015, STEM inspected the Wellington Street portion of the aqueduct as part of the City's infrastructure maintenance program.

The inlet of the aqueduct starts at the Fort Creek Conservation Reservoir by Second Line. It crosses under Second Line east of Carmen's Way and proceeds as an open channel to White Oak Drive, where it crosses under Carmen's Way from the east to the west sides. It then runs as an open channel along the west side of Carmen's Way to Wellington Street, where it crosses under Wellington and turns east. This part of the aqueduct acts as sidewalk along the south side of Wellington Street from Carmen's Way to St. Andrew's Terrace. The aqueduct then turns south and is an open channel for approximately 70 metres. This aqueduct then heads east under John Street, to the backyard access laneway east of John Street. It then continues south until it reaches the south side of Queen Street where it outlets into an open channel and then on into the St. Mary's River.

Since the aqueduct is made up of various sections and sizes, this and previous reports separate the entire aqueduct into the following sections:

- From Queen Street to John Street
- Along Wellington Street; from John Street to Carmen's Way
- Carmen's Way Crossing at Wellington and White Oak Drive
- Second Line Crossing

Many areas along the culvert sections are in poor condition and should be upgraded in the next few years to eliminate localized failures. This includes the culverts starting along Wellington Street and continuing southward from John Street. Many of these areas have roof slabs which have exposed rebar on the underside, and steel roof beams which are delaminating. Many of the culvert sections have layers of mud and debris and should be cleaned out on a regular basis. Sections of this aqueduct have been replaced in the last few years, including the section under Queen Street.

2.0 BACKGROUND

<u>Queen Street to John Street</u>

The largest part of the aqueduct is between Queen Street and John Street. The culvert section of the aqueduct is about 1.6 m high x 6.1 m wide from Queen Street to Cathcart. It reduces at Cathcart in height by 450 mm because of a sanitary main crossing here which is encased in the concrete floor. Along this route it crosses several streets, Esposito Park and a laneway between Cathcart and John Street.

The original design of the aqueduct dates back from 1912 to the 1940's. The roof consists of 10 to 12" deep steel beams supporting 4" to 6" concrete roof slabs. Between 2013 & 2015, replacement sections were completed from Queen to South of Albert Street using suspended slabs integral with new walls and floors. In 2010, the section under Alexandra Street was similarly replaced. Previous replacements along several street crossings were carried out in the 1980's. There are various grade changes in the aqueduct with services running into and across the aqueduct.

South of Queen Street at the Casino is an open channel and 5 corrugated pipes leading the flow to the St. Mary's River. In 2013 a lot of vegetation was removed from the open channel down to the Casino Bridge to improve the flow capacity south of Queen Street.

Wellington Street – John Street to Carmen's Way

Although this part of the aqueduct varies in size due to upgrades and different designs, the culvert size is 1.8 m high x 2.4 m wide on average. The aqueduct runs parallel to Wellington Street and serves as a sidewalk on the south side, until it reaches Carmen's Way. It has an outlet at the intersection of St. Andrews Terrace and John Street, where it then enters another culvert section parallel to John Street moving southerly. Again, the original construction and roof design at the outlet is similar to the sections from Queen to John Streets. Several temporary roof repairs were completed on this portion of the aqueduct in the past few years.

Carmen's Way Crossing at Wellington and White Oak Drive

These original culvert crossings were extended as part of the new Carmen's Way Truck Route in 2005. The Wellington Street crossing culvert is 1.0 m high x 4.0 m wide at the south end, and then changes to 1.4 m high x 2.75 m wide, and finally increases to 1.9 high x 2.8 wide at the upstream end. A large steel grate at the upstream inlet on the west side of Carmen's Way prevents debris or unauthorized entry.

The crossing under White Oak Drive is a twin chamber that inlets at the corner of White Oak Drive and Carmen's Way, and outlets on the west side of Carmen's Way into the open channel that runs parallel to Carmen's Way. In 2011, concrete wall and catch basin pipe repairs were completed near the north upstream under White Oak drive.

Second Line Crossing / Carmen's Way Crossing

The aqueduct under Second Line is a twin chamber which runs under Second Line and flows into an open channel that proceeds to the east side of Carmen's Way. It then turns west and crosses Carmen's Way at White Oak Drive. The north and south ends at Second Line were extended in 1994 during a road reconstruction project at that time.

3.0 METHODOLOGY

The aqueduct portion from Albert Street to John Street is slated for replacement in the next 2 to 3 years, so we did not inspect this portion of the aqueduct. For this year we inspected the culvert under the sidewalk beside Wellington Street, as this area has roof sections which are in very poor condition and have had reports of localized failures. Refer to the 2013 and 2011 inspection reports for the methodology and observations of the remaining sections of the Fort Creek Aqueduct.

Using three men, two inside and one on the surface, we entered the aqueduct at the outlet location near St. Andrews Terrace. In the Wellington street section, we were able to stand straight up for most of the way, and then crouched over past Station 0+800. We performed visual and hammer tap sounding inspections and took photographs.

When we reached where the Wellington aqueduct changed to the new aqueduct crossing under the Carmen's Way intersection, we were not able to enter it because it was not large enough for safe inspection. This section may be inspected by lying on dollies; however, the water flow must be stopped or diverted from coming through this section during the inspection.

4.0 OBSERVATIONS

A record of our inspection is summarized below. The record is separated in sections based on changes in dimension or conditions of the aqueduct. Photographs showing the condition of the aqueduct are contained on the CD provided with this report for the City's records.

FORT CREEK AQUEDUCT WELLINGTON ST. FROM JOHN ST. TO CARMEN'S WAY INSPECTION, OCTOBER 02, 2015:

Chainage Location	Description	Comments	Photo
Throughout	• Ceiling in poor condition • Concrete missing • Rebar exposed • Downstream end encased beams corroding with delaminated bottom flanges.	Monitor, will soon need repairs or replacements	
Downstream Entrance (South)	• Concrete drainage pipe on west side. • Concrete broken away below	Parge	
6+80 to 7+17	• Downstream is south orientation		
6+80	• PVC catch basin lead on east side.	Parge	
6+87	• Lead on east wall, parged. • Large piece of concrete has begun to spall from ceiling	**Repair required**	01, 02
6+88.3	• Large crack on east wall • Crack on west wall with efflorescence leaching • Beam bottom flange delaminating • Concrete broken away with efflorescence leaching. • Bottom of wall eroding • Aqueduct is 4980mm wide x 1775mm high	**Repair required**	03, 04
7+00	• South side of joint hollow sound	Monitor	
7+03	• West wall hollow sound when hammer-tapped (delaminated) • Concrete broken away on top at entrance to Wellington Street • Beam bottom flange delaminating.	Monitor, will soon need repair	
7+10	• 200 mm storm sewer • Concrete broken away and deteriorated at bottom of wall.	Should be parged	
7+14	• Concrete beam is leaching, but sounds ok when tapped. • Transition section; 4550mm x 1650mm	Monitor	
7+17 to 11+27	• Aqueduct changes direction. Downstream is now east orientation		
7+17	• Concrete broken away at top • Leaching and delamination at joint • Large crack in west wall also leaching • Badly cracked all around, parged once but done poorly	**Repair required**	05, 06
7+22	• 150mm pipe on west side, packed with dirt • Roof has shrinkage cracking with some leaching • Newer concrete starts.	Parge	
7+33	• Joint with cracking all the way around, spalling on roof • Sounds hollow when tapped – delaminated • Piece of concrete missing, local failure through ceiling • Slab on ceiling 75mm lower on east side • Shrinkage cracks on walls throughout with efflorescence.	**Repair required**	07, 08, 09
7+40	• South side has bad leaching and rust stains • Sounds solid when tapped.	Monitor	

Chainage Location	Description	Comments	Photo
7+45	• Badly cracked with efflorescence on north wall • Ceiling concrete missing • Exposed rebar at top • Hollow sound when tapped • Expansion board showing • Joint on south wall leaching • Beam bottom flanges delaminating.	**Repair required**	10, 11, 12
7+47	• 50 mm Aluminum pipe running through aqueduct (150 mm below roof) • Exposed rebar and delaminated on north side, near bottom.	Monitor	
7+51	• Joint • Concrete missing from ceiling; 3600mm of rebar is exposed • South wall OK.	**Repair required**	13, 14
7+63	• Joint • Concrete missing on walls. • Spalled in small localized areas of roof	Monitor	
7+65	• Concrete missing from ceiling • Rebar exposed.	**Repair required**	15
7+72	• Catch basin		
7+73	• Joint with local failure through ceiling • Concrete missing from ceiling • Bottom layer rebar exposed (rusting) • Staining.	**Repair required; 3000mm east and 1800 west. Repair partially complete.**	16, 17, 18
7+73 rev.	• City repaired 4800mm west of joint November, 2011.	Monitor	
7+80	• 3 areas on roof with rebar delamination near south side • Many rebar exposed • Isolated areas of spalling • Also, crack on north side with oil-type leaking.	**Repair required**	19, 20
7+85	• 2 exposed rebar.	Monitor	
7+92	• Joint • Concrete missing, rebar exposed on north wall and ceiling. • Hollow sound on roof and wall when hammer tapped • Aqueduct is 2285mm wide x 2055mm high (average)	**Repair required; 3300mm east and 1800 west**	21, 22
7+95	• Two conduits through aqueduct (not parged) • Aqueduct is 2285mm wide x 1830mm high (average)	Parge.	
8+00	• Start of newer aqueduct • Ceiling lowered • West side of joint bad, concrete missing, rebar exposed • Crack across the entire width of the floor. • Aqueduct is 2465mm wide at height transition	Monitor	
8+08	• Catch basin lead on south side.		
8+12.5	• Joint • Delaminated rebar on ceiling, 900mm each side of joint. • Hollow sound when hammer-tapped	**Repair required**	23

Chainage Location	Description	Comments	Photo
8+13	• Catch basin lead on north side, parged with subdrain.		
8+15	• Holes drilled through on both sides • Concrete missing • Rebar exposed and concrete missing around holes • Gravel visible.	**Repair required**	24, 25
8+23	• 300 mm parged lead on south side • Some spalling of roof concrete.	Monitor	
8+26	• Joint • Aggregate exposed, but sounds ok when tapped. • Some staining • Aqueduct is 2465mm wide x 1730mm high (average)	**Repair recommended**	26, 27
8+29	• Catch basin lead on south side.	Parge	
8+38	• 150mm PVC pipe on north side, no parging.		
8+39	• Severe ceiling crack, concrete missing, rebar exposed • Hollow tapping sound near joint.	**Repair required**	28, 29
8+40 to 9+88.2	• No Chainage but in good condition • Shrinkage cracks evenly spaced with some leaching. • Roof slopes (50mm drop) and height varies – 1700 to 1800mm along length. • 3 - 250mm and 1 - 450mm pipes	OK, monitor	
9+88.2	• Joint • Ceiling badly cracked, concrete missing, rebar exposed • Delamination up to 900mm away from joint.	**Repair required**	30, 31
9+90	• Lead on south side not parged.	Parge	
9+91	• Some spalling on ceiling	**Repair required**	32
9+95	• Repaired area		
9+99	• Aqueduct is 2335mm wide x 1625mm high		
10+03	• Lead on north side bricked in, no concrete • Catch basin PVC bricked in, not parged • Some delamination on south side wall. • Aqueduct is 2335mm wide x 1830mm high	Monitor	
10+07	• 150 mm PVC pipe not parged on north side	Parge	
10+10	• Steel pipe on south side badly corroded with hot water running through • Minor efflorescence on roof • Roof looks newer than walls.	Monitor	
10+15	• Joint, older section with curved aqueduct bottom • Large crack on south wall. • Walls and bottom are older than ceiling. • Walls are not plumb and have rebar staining	Monitor, Walls will eventually need repair	
10+21	• Exposed rebar on north side	Monitor	
10+30	• Cold Joint • Cracking on south wall • Honeycombing on south wall.	Monitor	
10+31	• Pier on north side • Wall cracks past 10+31, horizontal crack on south side	Monitor	

Chainage Location	Description	Comments	Photo
10+40	• 150 mm clay pipe on south wall		
10+43	• 150 mm PVC pipe on north wall • A lot of cracks in walls.	Monitor	
10+50	• Joint with rebar staining on ceiling, extends 3000mm west. • East ceiling slab 75 mm lower than west; looks deliberate. • Aqueduct is 2335mm wide x 1775mm high • (average at center)	Monitor	
10+60	• Joint, wet ceiling • Exposed aggregate • Hole on north wall, upper corner	**Repair required**	33, 34
10+74	• Joint in very poor condition • Hollow south wall (delaminating) • Wet north wall • Ceiling concrete missing, rebar exposed, delaminated, poor condition. Extent is about 3000mm west of joint. • Aqueduct is 2335mm wide x 1830mm high	**Repair required**	35, 36
10+80	• PVC catch basin lead on north wall, no concrete	Parge	
10+86	• Joint • North side wet and stained at bottom	Monitor	
10+89	• Manhole on south side • Ladder rungs in good condition • Rebar staining on ceiling underside continues	Monitor	
10+98	• 150 mm cast iron sanitary on south wall		
10+99	• Joint in poor condition • North wall constructed with bottle-neck, narrowing the aqueduct at this station. • Exposed rebar on ceiling, poor condition. • Extents are 1000mm east and 2100mm west. • South wall has 100 and 150mm pipes, probably sanitary lines. • Aqueduct is 2055 wide x 1830mm high	**Repair required**	37, 38
11+05	• Spalling on roof	**Repair required**	39
11+10	• Joint in poor condition • Concrete broken away on ceiling on south side • Can see daylight • Exposed corroding rebar on ceiling, exposed aggregate • Extends 3000mm north of joint • 250mm pipe on north side	**Repair required**	40, 41
11+26	• Manhole on south side with surface staining • Local patch of exposed rebar on ceiling, rusting about 3300mm east of manhole • Aqueduct is 2335mm wide x 1830mm high	**Repair required**	42, 43
11+27	• Aqueduct changes size • 4.0 m wide X 1.0 m high • Joints every 900 to 1200mm with minor efflorescence • Concrete looks dry, newer. • Start of crossing at Carmen's Way	Cannot continue	
11+69	• Corner of Wellington and Carmen's Way		

END OF INSPECTION

5.0 DISCUSSION

Aqueduct Section along Wellington Street

We found the condition of the smaller aqueduct on Wellington to vary greatly ranging from fair to very poor.

The areas we found requiring repair or replacement were the following:

1) The roof and joints in many areas have exposed or delaminated rebar. The culvert entrance at St. Andrews Terrace has steel beams with corroded bottom flanges.

2) Station 7+33 had a joint with a local failure through the roof, with exposed rebar and concrete missing from the ceiling. Station 7+92 was similar, and its condition was reported in 2011. The City did a partial repair at 7+73 in 2011. We identified a total of 22 stations which require repair.

3) The section of aqueduct between 9+88 to 11+10 (Beverly Street) is an area of concern because it has significantly deteriorated over the years and requires repair. Much of the rebar is exposed and corroded. Although this aqueduct is located under the sidewalk and not under the road, it does receive a fair amount of traffic at Beverly Street and several entrances to businesses here.

In summary, the culvert from the entrance at St. Andrews Terrace to station 11+69 is in poor condition in many areas and requires replacement or repair.

Other sections of Fort Creek Aqueduct

The priority for this year was the Wellington street section of the Fort Creek aqueduct, as this section is in very poor condition and the replacement of this portion is being proposed. The portions of the aqueduct under Second Line, Carmen's Way, Alexandra Street & South of Queen Street were not inspected this year. Refer to the 2013 and 2011 reports for the previous inspection of these areas.

6.0 CONCLUSION AND RECOMMENDATIONS

Based on our observations and discussion from the 2015 and 2013 inspections, we have developed the following conclusions and recommendations for the Fort Creek Aqueduct:

1) Our inspection found the aqueduct has a variety of culvert profiles constructed at different eras and therefore different designs. Certain segments have been replaced in recent years and essentially these are in good condition. The segments under Queen to Albert and under Alexandra have been replaced in 2013 and 2010 respectively. Construction of an additional twin aqueduct, located west of the main aqueduct at Queen St, was started in 2015 in order to increase flow capacity.

2) One concern is the older sections of culvert which have the top slab supported by concrete encased I-beams. This type of construction is found repeatedly from Albert Street to Queen Street. Many of these areas are deteriorated, and this section of aqueduct is slated for replacement in the next 2 to 3 years.

3) Another concern is the older section of culvert along Wellington Street where the top slab is in poor condition with exposed rebar from the inside. Many areas need to be repaired or replaced to prevent another possible local failure at these areas. Many localized repairs are not economical because one has to repeatedly go back to repair the next section of immediate concern. A one-time replacement in the near future is recommended, and again is slated for replacement in the next 2 to 3 years.

4) We also want to address the problem of cleaning out the culverts. Some culverts were not accessible for inspection and in need of cleaning and flow control. A cleaning plan and technique should be developed and carried out so inspection of the remaining portions can be completed.

7.0 SUMMARY

1) Generally the newer, more recently replaced sections of the aqueduct are in good condition.

2) The remaining sections of original aqueduct containing encased I-beams should be replaced, are being slated for replacement within the next 2 to 3 years.

3) On Wellington Street, many stations need to be repaired to prevent another possible local failure at these locations. To minimize isolated repair areas, the aqueduct section along Wellington should be replaced, and again are being slated for replacement within the next 2 to 3 years.

4) A plan for cleaning the channels and diverting water flow for the low headroom portions should be developed and implemented to allow inspection of the total aqueduct.

5) We recommend to continue monitoring the aqueducts every 2 to 3 years.

Dan MacNeill, P.Eng.
Senior Engineer

STATEMENT OF QUALIFICATIONS AND LIMITATIONS

This report has been prepared by STEM Engineering Group Inc. (STEM) and is intended solely for the Client named.

The material contained in the report:

- reflects our best judgment in light of the information reviewed by STEM at the time of preparation
- represent STEM's professional judgement in light of these Limitations and industry standards for the preparation of similar reports
- may be based on information provided to STEM which has not been independently verified
- shall not be used to express or imply warranties as to the fitness of the property for a particular purpose, unless otherwise agreed in writing by STEM
- is not a certification of compliance with past or present regulations
- must be read in its entirety and sections thereof should not be read out of such context
- has not been updated since the date of issuance of the report and its accuracy is limited to the time period and circumstances in which it was collected, processed, made or issued

Unless expressly stated to the contrary in the report:

- This assessment does not wholly eliminate uncertainty regarding the potential for existing or future costs, hazards or losses in connection with a property
- No physical or destructive testing, no intrusive exploration, and no design calculations have been performed unless specifically recorded
- Conditions existing but not recorded were not apparent given the level of study undertaken; further investigation can be performed on items of concern if so required
- Any time frame given for deterioration represents an educated guess based on apparent condition. Failure of the item, or the optimum repair/replacement process, may vary from our estimate
- Responsibility for detection of or advice about pollutants, contaminants or hazardous material is not included in our mandate
- Any use which a third party makes of this report, or any reliance on or decisions to be made based on it, are the responsibility of such third parties.

We accept no responsibility for any decisions made or actions taken as a result of this report unless we are specifically advised of and participate in such action, in which case our responsibility will be as agreed to at that time. Any user of this report specifically denies any right to claims against the Consultant, Sub-Consultants, their officers, agents and employees in excess of the fee paid for professional services

This Statement of Qualifications and Limitations is attached to and forms part of the report.

APPENDIX 4

Public Open House Summary

TULLOCH
ENGINEERING

Structural Civil & Municipal Contract Administration Environmental Geotechnical Mechanical & Electrical Inspection & Testing

Public Information/Consultation Centre

Fort Creek Aqueduct Environmental Assessment

June 1, 2016, 3:00 p.m. to 7:00 p.m.

Library Room – Steelton Senior Citizen Centre

Representatives in attendance:

City of Sault Ste Marie representatives: Carl Rumiel, 3:00 p.m. to 6:45 p.m.

Don Elliott, 4:00 p.m. to 5:00 p.m.

Tulloch Engineering representatives: Pat McAuley, 2:30 p.m. to 7:00 p.m.

John McDonald, 2:30 p.m. to 7:00 p.m.

Public participation:

Public attendance: 3 people signed in on sign in sheet (attached)

Information material on walls and tables:

-large scale mounted drawings (overlaying city air photos) of:

- existing conditions

-alternative routes considered

-recommended alternative (replace existing)

-traffic control options during construction, to get opinions on two options:

- provide 2 way traffic during construction by removing parking on north side

- leave parking on the north side and permit one way west bound traffic only, east bound to be diverted

-Existing Environmental Conditions and Impact Assessment Report by Tulloch Environmental

-Watershed Appraisal and Hydraulic Assessment by Tulloch Engineering

71 Black Road, Unit 3
Sault Ste. Marie, ON
P6B 0A3
www.tulloch.ca

Phone: (705) 949.1457
Fax: (705) 945.5092
saultstemarie@tulloch.ca

TULLOCH
ENGINEERING

-Municipal Class E.A document for reference

-draft project report showing evaluation criteria and results

-Sign in sheets, comment sheets

Summary:

Very poor turnout, appears to be little public interest in the project, despite newspaper advertisements, mail outs to all businesses and residences along the route and holding the PIC in the centre of the study area

3 attendees only and discussion centered on timing and traffic effects.

-appears project may not proceed until 2018, with possible start in late 2017, according to City reps

Comment/question sheets were taken and the 3 attendees were asked to fill it out and return it.

PMc

02/06/2016

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Sault Ste. Marie, ON
P6B 0A3
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saultstemarie@tulloch.ca

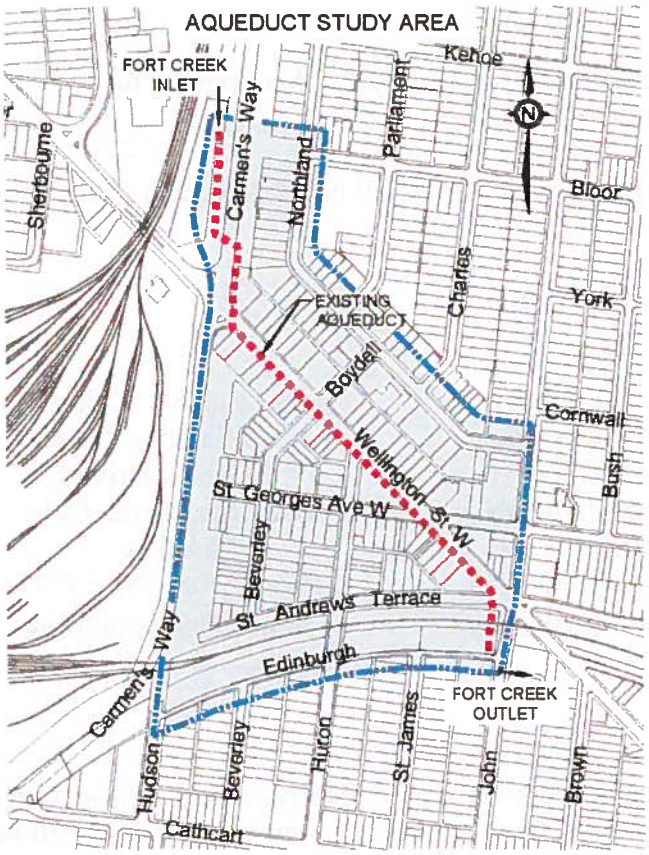
TULLOCH
ENGINEERING

Notice of Public Information Centre

Fort Creek Aqueduct Improvements through Steelton
Class Environmental Assessment Study

The Study

The City of Sault Ste Marie has initiated a Class Environmental Assessment (EA) for the upgrading or replacement of the Fort Creek Aqueduct along Wellington Street West through the Steelton area. The creek was channelized into an underground concrete box culvert around 1912-1917 and is located under the south sidewalk on Wellington Street West. The existing aqueduct has structural deficiencies and some portions are undersized to carry major rainfall events.



PTO

The Process

The project is being planned under **Schedule B** of the **Municipal Class Environmental Assessment** process and a key component of the study is consultation with interested stakeholders (public and review agencies).

To facilitate this, a Public Information Centre (PIC) will be held:

Wednesday June 1st 2016

in the Steelton Senior Citizen Centre

Library Room

235 Wellington Street W.

3:00 p.m. to 7:00 p.m.

Consultants and municipal staff will be available to discuss the problems associated with the Fort Creek aqueduct, review the alternate solutions, and to get input from the public and regulatory agencies.

The public is invited on a come and go basis anytime between 3 p.m. and 7 p.m. to visit and provide input or to have questions answered.

Upon completion of the studies a Project File will be prepared and made available for additional public review and comment.

For more information, please contact:

Pat McAuley P. Eng.
Tulloch Engineering
71 Black Rd Unit 8
Sault Ste Marie ON.
P6B 0A3
Phone (705) 949 1457
pat.mcauley@tulloch.ca

Carl Rumiel, P. Eng.
City of Sault Ste. Marie
99 Foster Drive
Sault Ste. Marie, ON
P6A 5X6
Phone (705) 759-5379
c.rumiel@cityssm.on.ca

Information will be collected in accordance with the *Freedom of Information and Protection of Privacy Act*. With the exception of personal information, all comments will become part of the public record.

Fort Creek Aqueduct Environmental Assessment Study

Public Information Centre

Wednesday June 1, 2016

Steelton Senior Citizen Centre 3:00 p.m. to 7:00 p.m.

Please Sign In:

NAME	ADDRESS	PHONE	EMAIL ADDRESS
Carl Rumpel			
P mcAvoy			
John Pavoni			
MATT PAVONI			
Tom Kulmala	[illegible]	[illegible]	[illegible]

Pat McAuley

From: JOHN PAVONI [redacted]
Sent: Friday, June 03, 2016 6:47 AM
To: pat mcauley; c rumiel
Cc: Matt
Subject: fort creek aqueduct environmental assessment

thanks, pat and carl for the information presented to matt and i on wednesday past. the outline of the scope of work, timelines, traffic options, aerial views and historic developments left us with a pretty good idea of the objective of the open house. to confirm, our preference for traffic flow on wellington st (through the steelton area) would be two-way. of course this choice is of value to us based on the nature of the vehicle sales business. regards, john and matt pavoni.

FIGURE 1

Study Area

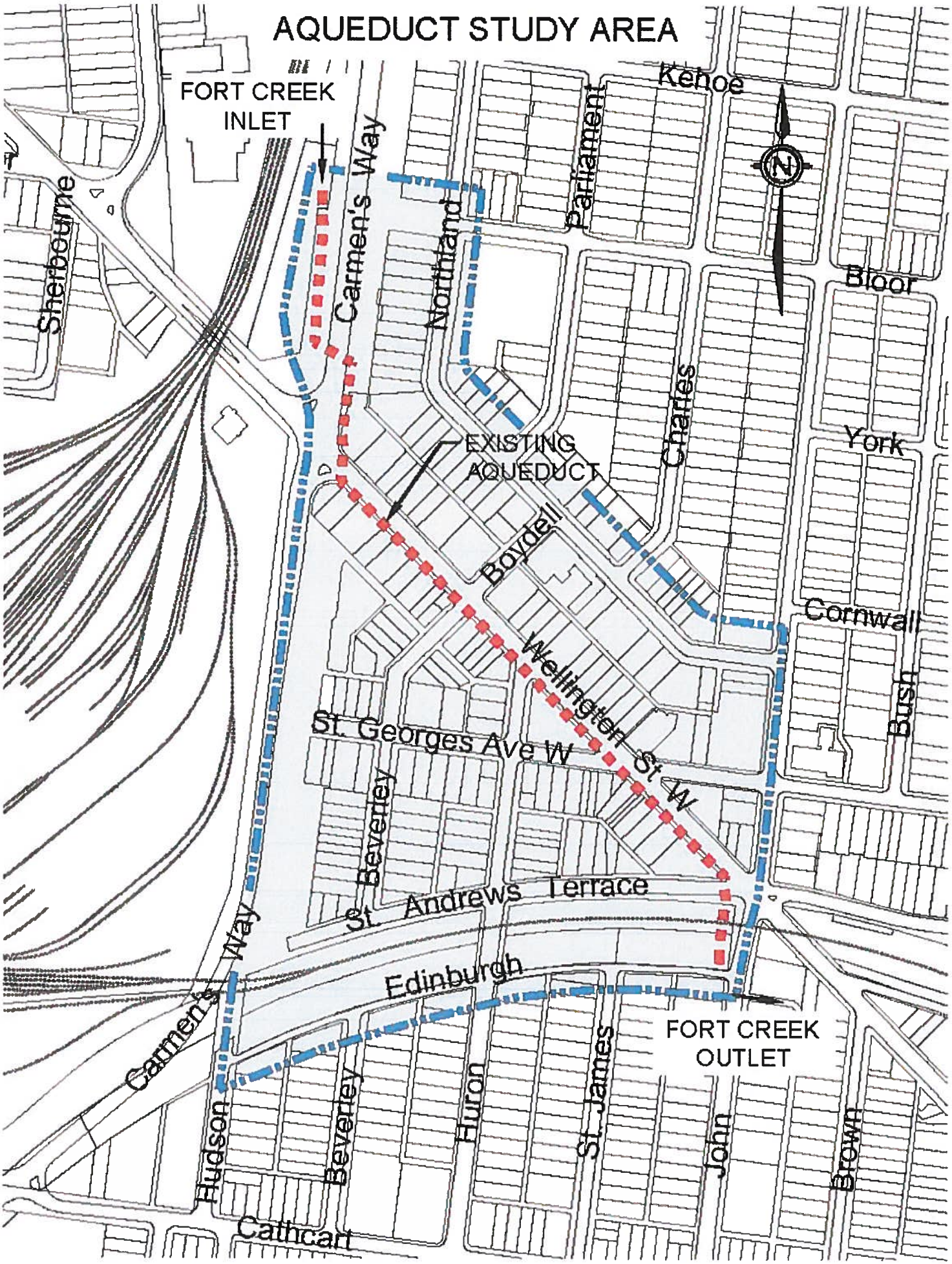

AQUEDUCT STUDY AREA
FORT CREEK INLET
Kehoe
Sherbourne
Carmen's Way
Northland
Parliament
Bloor
Charles
York
EXISTING AQUEDUCT
Boydell
Cornwall
Wellington St W
St. Georges Ave W
Beverley
St. Andrews Terrace
Edinburgh
Carmen's Way
FORT CREEK OUTLET
Hudson
Beverley
Huron
St James
John
Brown
Cathcart
Bush
N

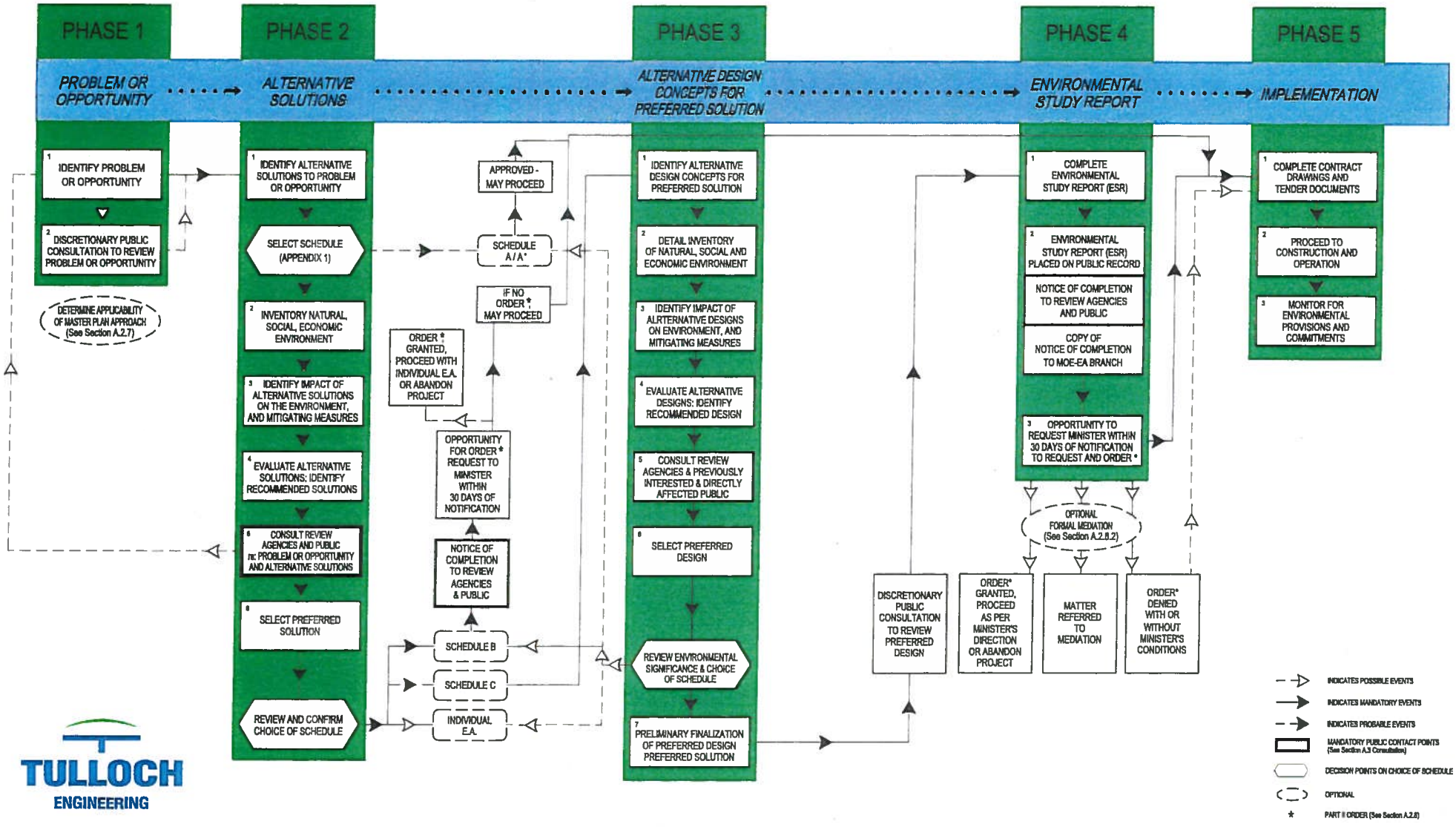
FIGURE 2

Municipal Class EA Planning and Design Process

EXHIBIT A.2

MUNICIPAL CLASS EA PLANNING AND DESIGN PROCESS

NOTE: This flow chart is to be read in conjunction with Part A of the Municipal Class EA



TULLOCH ENGINEERING

FIGURE 3

Existing Alignment & Conditions

FORT CREEK AQUEDUCT

EXISTING ALIGNMENT & CONDITIONS

NORTH

TULLOCH ENGINEERING

FORT CREEK INLET
NORTHLAND ROAD
NORTHLAND ROAD
HUB TRAIL
CARMENS WAY
BEVERLEY STREET
LANEWAY
LANEWAY
WELLINGTON STREET
MUNICIPAL PARKING
ST. GEORGES AVE.
JOHN STREET
WELLINGTON STREET
BEVERLEY STREET
LANEWAY
HUB TRAIL
HURON STREET
ST. GEORGES AVE.
LANEWAY
FORT CREEK OUTLET
ST. ANDREWS TERRACE
CPR RAILWAY

A B C D E F G

LEGEND

- EXISTING AQUEDUCT
- EXISTING RAILWAY & TRAIN YARDS
- EXISTING OPEN CHANNELS

TYPICAL STRUCTURAL DEFICIENCIES

A

B

C

D

E

F

G

FIGURE 4

Alternative Solutions

FORT CREEK AQUEDUCT

ALTERNATIVE SOLUTIONS

NORTH

TULLOCH ENGINEERING

FIGURE 5

Preliminary Preferred Solution

FORT CREEK AQUEDUCT

PRELIMINARY PREFERRED SOLUTION

TULLOCH ENGINEERING

NEW AQUEDUCT INLET

NEW AQUEDUCT ALONG EXISTING ALIGNMENT

4.0m x 2.0m CONCRETE AQUEDUCT SECTIONS

EXISTING AQUEDUCT (2006) NOT EFFECTED BY CONSTRUCTION

4.0m x 1.0m CONCRETE AQUEDUCT SECTIONS

NO IMPACT TO INTERSECTION

NEW AQUEDUCT ALONG EXISTING ALIGNMENT

3.6m x 1.2m CONCRETE AQUEDUCT SECTIONS

4.0m x 1.5m CONCRETE AQUEDUCT SECTIONS

NO IMPACT TO INTERSECTION

INCREASED INLET CAPTURE ZONE

NEW CONSTRUCTION

2.4m x 1.2m CONCRETE AQUEDUCT SECTION

DOUBLE 3.5m x 1.5m CONCRETE AQUEDUCT SECTION

NEW AQUEDUCT OUTLET

NORTHLAND ROAD

WELLINGTON STREET

HUB TRAIL

CARMENS WAY

BEVERLEY STREET

HURON STREET

ST. GEORGES AVE.

JOHN STREET

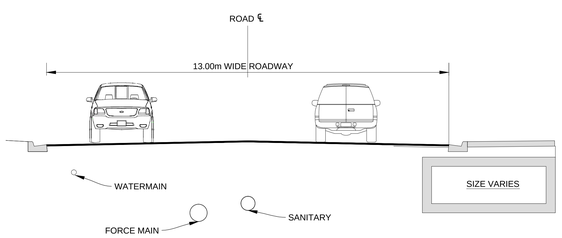
ST. ANDREWS TERRACE

CPR RAILWAY

LANEWAY

MUNICIPAL PARKING

CROSS SECTION FOR WELLINGTON STREET



CROSS SECTION FOR ST. GEORGES AVENUE

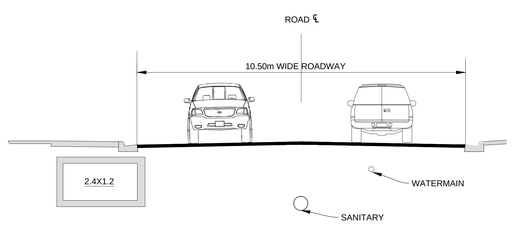


FIGURE 6

Traffic Control Proposal

FORT CREEK AQUEDUCT

TRAFFIC CONTROL PROPOSAL

TULLOCH ENGINEERING

NORTH

NORTHLAND ROAD

NORTHLAND ROAD

CARMENS WAY

HUB TRAIL

BEVERLEY STREET

LANEWAY

LANEWAY

STAGED CONSTRUCTION TO MAINTAIN TRAFFIC FLOW

ST. GEORGES AVE.

JOHN STREET

ONE WAY TRAFFIC

MUNICIPAL PARKING

1 OR 2

NO IMPACT TO INTERSECTION

WELLINGTON STREET

TWO WAY TRAFFIC

NO IMPACT TO INTERSECTION

TEMPORARY CLOSURE AT INTERSECTION

TEMPORARY CLOSURE AT INTERSECTION

TEMPORARY CLOSURE AT INTERSECTION

STAGED CONSTRUCTION TO MAINTAIN TRAFFIC FLOW

LANEWAY

LANEWAY

BEVERLEY STREET

HUB TRAIL

ST. GEORGES AVE.

HURON STREET

ST. ANDREWS TERRACE

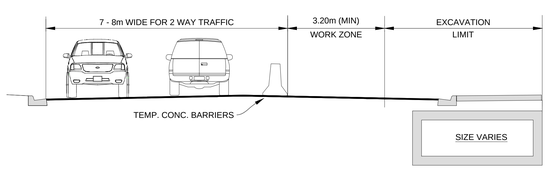
CPR RAILWAY

LEGEND

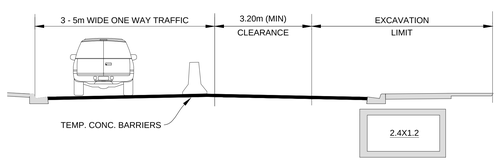
- EXISTING AQUEDUCT
- AQUEDUCT BEING REPLACED
- CONSTRUCTION ZONE
- EXISTING RAILWAY & TRAIN YARDS
- EXISTING OPEN CHANNELS

SUGGESTED TRAFFIC LAYOUT FOR WELLINGTON STREET

2 WAY TRAFFIC



TRAFFIC LAYOUT FOR ST. GEORGES AVENUE



ALTERNATE TRAFFIC LAYOUT FOR WELLINGTON STREET

1 WAY TRAFFIC WITH PARKING