APPENDIX A

PROJECT-SPECIFIC DESIGNATED SUBSTANCE AND HAZARDOUS MATERIALS SURVEY REPORT

Public Works and Government Services Canada

Travaux publics et Services gouvernementaux Canada

Burlington Lift Bridge, PWGSC Engineering Asset Properties

PWGSC Project R.012641.002

121-24849-00

PROJECT-SPECIFIC DESIGNATED SUBSTANCE AND HAZARDOUS MATERIALS SURVEY REPORT

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GENIVAR

GENIVAR

December 13, 2012

Ms. Maegan Harrison
Senior Environmental Specialist
Public Works and Government Services Canada
4900 Yonge Street
Toronto, ON, M2N 6A6

Re: Project-Specific Designated Substances and Hazardous Materials Survey (DSHMS) for the Controls, Drives and Cables Replacement Project of the Burlington Lift Bridge located at 1157 Beach Boulevard in Hamilton, ON

Dear Ms. Harrison:

GENIVAR Inc. (GENIVAR) was retained by Public Works and Government Services Canada (PWGSC) to identify designated substance which may be disturbed during an upcoming controls, drives and cables replacement project of the Burlington Lift Bridge located at 1157 Beach Boulevard, in Hamilton, Ontario.

1. Objectives

The Project-Specific Designated Substances and Hazardous Materials Survey (DSHMS) of the Burlington Lift Bridge was conducted based on the review of the *Project Preliminary Design* package provided by PWGSC. In addition, the Burlington Lift Bridge staff was consulted to gain a better understanding of the upcoming controls, drives and cables replacement project.

The objectives of this survey were as follows;

- To identify designated substances and/or hazardous materials that may be present and disrupted within the "work area" associated with the controls, drives and cables replacement project.
- Sampling of suspect materials (where necessary)
- To prepare this report documenting the identities, usages, locations and quantities of any designated substances and hazardous materials identified within the work area;
- To provide PWGSC with recommendations for the management of these materials in support of the upcoming controls, drives and cables replacement project.

The areas, materials and components inspected as part of this project were in accordance with those specified in the Statement of Work (PWGSC Project R.012641.002) for this project issued October 2012. The scope of work consisted of the following;

- The areas inspected during this survey (the work area) consisted of the Control House, North Bridge Tower, South Bridge Tower and the Lift Bridge Structure.
- Survey of building construction materials within the work area
- Survey of components, fixtures, and fixed equipment/furniture within the work area
- Sampling and/or confirmation of materials presumed to be asbestos-containing and/or lead-containing within the work area.

Bulk samples for asbestos analysis were submitted to IATL Laboratories of Mount Laurel, New Jersey, for analysis using Polarized Light Microscopy (PLM) following the U.S. EPA/600/R-93/116 Method. Vinyl floor tiles were analyzed using transmission electron microscopy (TEM) following the NIOSH 7402 method of analysis. IATL is certified under the National Voluntary Laboratory Accreditation Program (NVLAP) to perform asbestos analysis of bulk samples.

Hassan Ktaech and Stephen Heikkila, of GENIVAR, visited the site on November 5th, 2012, to conduct the on-site survey.

2. Observations and Results

Designated substances and hazardous materials identified by this survey are detailed below. Relevant site photographs taken during the survey are presented in **Appendix A** of this report. Laboratory Certificates of Analysis are provided in **Appendix B** of this report.

2.1 Asbestos

After conducting a review of the *Project Preliminary Design* package provided by PWGSC and a preliminary visual assessment of the work area, the following suspected asbestos-containing material was identified and sampled:

- 12”x12” off-white vinyl floor tiles with faint streaks within the Control House Electrical Room, and their associated underlying mastic/adhesive.

A total of three (3) bulk samples were collected from the suspect building/construction material (i.e. vinyl floor tiles) listed above and submitted to IATL Laboratories of Mount Laurel, New Jersey, for analysis of asbestos content.

Table 1 summarizes the confirmed asbestos-containing materials identified within the work area that may be disturbed during the upcoming controls, drives and cables replacement project, along with recommended remedial actions for each material.

Table 2-1 Summary of Asbestos-Containing Materials

Location	Material	Description	Assessment[1]	Action[2]
Control House – Electrical Room (2nd Floor)	Vinyl Floor Tile	Grey 9” x 9” vinyl floor tile Approximately 16 m^2 of tiles remain beneath electrical equipment 3 tiles in fair condition	- ***Sample ID***: N/A - ***Concentration***: *20-30% Chrysotile* - ***Material:*** Non-Friable - ***Accessibility***: A *(Areas of the building within reach, from floor level, of all building users. Activities of the building users may result in disturbance of ACM not normally within reach from floor level)* - ***Condition***: Fair	**Action 5** Follow ***Type 1*** procedures – if the material is *wetted* and the work is done using *non-powered hand tools*[3]

Location	Material	Description	Assessment[1]	Action[2]
Control House – Electrical Room (2nd Floor)	Electrical Cable Sheathing	Insulating sheathing on high voltage wires, visibly frayed on some cable ends, only accessible to hydro workers	- ***Sample ID***: N/A - ***Concentration***: *Presumed ACM* - ***Material:*** Non-Friable - ***Accessibility***: D *(Areas of the building inaccessible solid ceiling systems, walls, or mechanical equipment, etc. where demolition of the ceiling, wall or equipment, etc., is required to reach the ACM. Evaluation of the condition and extent of ACM is limited or impossible, depending on the Assessor's ability to visually examine the material)* - ***Condition***: Fair	**Action 5** Follow ***Type 1*** procedures – if the material is *wetted* and the work is done using *non-powered hand tools*[3]

1. Asbestos concentration based on the following reports: *Final Asbestos Survey, Burlington Lift Bridge, 1157 Beach Boulevard, Hamilton, Ontario XCG Consultants Ltd., February 11, 2007; Asbestos Update Survey Report, Burlington Lift Bridge, 1157 Beach Boulevard, Hamilton Ontario DST Consulting Engineers, January 9, 2008; Lead-based Paints, Leachate and Asbestos Sampling Letter, Burlington Lift Bridge Pinchin Environmental, January 11, 2009; Environmental Sampling for Asbestos and Lead Content at the Burlington Lift Bridge Control Building, Burlington, Ontario Genivar, April 21, 2008; Asbestos Update Survey Report, Burlington Lift Bridge, 1157 Beach Boulevard, Hamilton Ontario DST Consulting Engineers, March 24, 2009, and; Asbestos and Lead Re-Assessment Survey, Burlington Lift Bridge, Hamilton, ON, Genivar, February 1, 2012 .*
2. Action levels based on PWGSC DP 057 and are in compliance with Ontario and Federal regulations.
3. If the work is completed using conventional powered hand tools, work must follow **Type 3** procedures.

Table 2 summarizes the suspected asbestos-containing materials which was sampled but had no detectable asbestos concentrations, or had asbestos concentrations less than the regulated amount (0.5%) and therefore identified as "non-asbestos".

Table 2-2 Summary of Non Asbestos-Containing Materials

Material	Description	Sample ID[1]
Vinyl Floor Tile (FT-1)	12"x12"; off-white w/ faint streaks. 2nd Floor Electrical Room	BLB – 1A,1B,1C

1. For sample ID and concentration levels refer to Laboratory Certificates of Analysis.

2.2 Lead

The following buildings/structures that may be disturbed during the upcoming controls, drives and cables replacement project were surveyed to confirm the presence and evaluate the current condition of lead-containing materials (LCM) identified within those buildings in prior assessments and re-assessment reports:

- Control House
- North and South Bridge Towers

No LCM was identified in this survey which wasn't already identified in previous reports. Previously identified LCM that may be disturbed as a result of the upcoming controls, drives and cables replacement project are summarized in the following table:

Table 2-3 Summary of Lead-Containing Materials*

Location	Description	Assessment*
Control House – Exterior Structure (catwalk)	Green paint. Approximately 100 m^2 of heavily peeling paint	- ***Concentration***: *7.06 %* - ***Condition***: Poor
Control House – 2nd Floor	White Wall Paint	- ***Concentration***: *0.10 %* - ***Condition***: Good

Location	Description	Assessment*
Control House – Stairwell	Grey Paint on Railings	- ***Concentration***: *0.41 %* - ***Condition***: Good
South Bridge Tower – Machine Room	Grey Wall Paint. Approximately 10 m^2 of paint observed to be peeling, flaking, etc.	- ***Concentration***: *0.44 – 0.58 %* - ***Condition***: Good – Poor
South Bridge Tower – Machine Room	Grey Floor Paint. Approximately 7 m^2 of paint observed to be peeling, flaking, etc.	- ***Concentration***: *0.33 %* - ***Condition***: Good – Fair
South Bridge Tower – Exterior	Green Paint	- ***Concentration***: *7.06 %* - ***Condition***: Good – Poor
North Bridge Tower – Machine Room	Grey Wall Paint. Approximately 10 m^2 of paint observed to be peeling, flaking, etc.	- ***Concentration***: *0.44 – 0.58 % (Assumed)* - ***Condition***: Good – Poor
North Bridge Tower – Machine Room	Grey Floor Paint. Approximately 7 m^2 of paint observed to be peeling, flaking, etc.	- ***Concentration***: *0.33 % (Assumed)* - ***Condition***: Good – Fair
North Bridge Tower – Exterior	Green Paint	- ***Concentration***: *7.06 % (Assumed)* - ***Condition***: Good – Poor
Lift Span and Towers of Bridge	Red Primer Paint. The entire lift span structure is observed to be peeling, flaking, etc. The red primer at the 'splash-zone' has been removed and repainted.	- ***Concentration***: *Assumed* - ***Condition***: Fair

* Data summarized from: *Lead-based Paints, Leachate and Asbestos Sampling Letter, Burlington Lift Bridge Pinchin Environmental, January 11, 2009; Environmental Sampling for Asbestos and Lead Content at the Burlington Lift Bridge Control Building, Burlington, Ontario Genivar, April 21, 2008; Asbestos Update Survey Report, Burlington Lift Bridge, 1157 Beach Boulevard, Hamilton Ontario DST Consulting Engineers, March 24, 2009, and; Asbestos and Lead Re-Assessment Report, Burlington Lift Bridge, PWGSC Engineering Asset Properties, 1157 Beach Boulevard, Hamilton Ontario Genivar, March 31, 2011, and; Asbestos and Lead Re-Assessment Survey, Burlington Lift Bridge, Hamilton, ON, Genivar, February 1, 2012 .*

2.3 Other Designated Substances & Hazardous Materials

2.3.1 Mercury

A mercury-containing thermostat was observed within the Control House (Photograph 11, Appendix C).

In addition, it is presumed that fluorescent light tubes (lamps) identified within the work area contain mercury vapour.

2.3.2 Silica

Materials known to contain silica such as concrete, masonry, glass and mortar were identified. These types of materials are prevalent throughout the site and require consideration in advance of their disturbance.

2.3.3 Other Designated Substances

Other designated substances including mould, acrylonitrile, arsenic, benzene, coke oven emissions, ethylene oxide, isocyanates and vinyl chloride were not observed in the work area.

2.3.4 Polychlorinated Biphenyl (PCB)

Fluorescent light ballasts were observed in the work area. Individual lamp ballasts were not inspected during the survey due to health & safety concerns. However, based on the date of construction, PCBs are suspected within the lamp ballasts.

2.3.5 Guano (Bird Droppings)

Approximately 20 m^2 of guano was observed on the bridge structure beneath the mechanical and sheave rooms on both of the North and South towers.

3. Recommendations

The following recommendations are provided for management of the designated substances and hazardous materials identified during the survey.

3.1 Asbestos-Containing Materials

The following recommendations are made for action or management (as required) of asbestos-containing materials:

- Asbestos-containing vinyl floor tiles (as confirmed by the previous reports) were identified to contain concentrations of 20-30% Chrysotile asbestos. The asbestos-containing vinyl floor tiles (9"x9" grey vinyl floor tiles) were observed to be in mainly good condition with a few tiles observed to be in fair condition. It is recommended that the vinyl floor tiles which require removal to facilitate the work, including those observed in fair condition, are removed and replaced following **Type 1 asbestos removal** procedures as prescribed by *O.Reg.278/05*.
- Electrical cable sheathing is presumed to be asbestos-containing due to inaccessibility for sampling. If the upcoming controls, drives and cables replacement project has the potential of disturbing this material, **Type 1 asbestos removal** procedures as prescribed by *O.Reg.278/05* should be followed if the material is removed using non-powered hand tools, otherwise, dispose of the entire cable as asbestos-waste.
- It should be noted that other asbestos-containing materials (ACM) are present within other areas of the Burlington Lift Bridge complex which are not mentioned in this report. It is not anticipated that these materials will be affected by the planned upgrades, however, in accordance with the requirements of O. Reg. 278/05, prior to beginning work, the asbestos survey reports and Asbestos Management Plan must be reviewed.
- In addition, the possibility exists that other asbestos-containing materials (ACM) may be present that may be concealed by existing building materials, components and/or fixtures. If demolition or construction work activities uncover materials suspected to contain asbestos, all work must stop and the materials should either be assumed to be asbestos-containing or samples of the material must be collected by a qualified person and analyzed to identify asbestos content. If the material is assumed or confirmed to be as being asbestos-containing, it must be handled in accordance with the requirements of *O.Reg.278/05*.

3.2 Lead-Containing Materials

The following recommendations are made for action or management (as required) of lead-containing materials:

- Work that will disrupt and/or pulverize (including drilling, cutting, grinding or abrading) lead-containing materials must follow the recommendations provided in the *Ministry of Labour Guideline for Lead on Construction Projects*, dated September 2004.
- Follow **Type 1 Operations** if the removal of lead-containing materials is performed with a chemical gel or paste and fibrous laminated cloth wrap. Removal procedures must be performed using non-powered hand tools, other than manual scraping or sanding, as prescribed in the *Ministry of Labour Guideline for Lead on Construction Projects.*
- Follow **Type 2 Operations** if the removal of lead-containing materials is performed by scraping or sanding using non-powered hand tools. Manual demolition of lead-containing materials on walls or building components by striking a wall with a sledgehammer or similar tool must follow measures and procedures for working with lead for **Type 2 Operations** as prescribed in the *Ministry of Labour Guideline for Lead on Construction Projects.*
- Follow **Type 3 Operations** if the removal of lead-containing materials is performed by dry removal using an electric or pneumatic cutting device. Any work that may expose a worker to lead dust, fume or mist that is greater than 1.25 mg/m^3 must follow measures and procedures

for working with lead for **Type 3 Operations** as prescribed in the *Ministry of Labour Guideline for Lead on Construction Projects.*

In addition, the aforementioned painted surfaces (containing lead) mentioned in *Section 2.2* should be handled with appropriate health and safety precautions so as to comply with requirements of the Designated Substances regulation, *O. Reg. 490/09*, and disposal of these materials must also comply with the requirements of *Reg. 347 – General – Waste Management*.

Finally, lead is assumed to be present in the solder joints of the copper piping, storm drainage and floor drains that may exist throughout the building however, it is unlikely that any special action will be required during the upcoming controls, drives and cables replacement project work unless the cutting of the pipes at joints is required.

3.3 Guano (Bird Droppings)

Workers removing accumulations of guano are at risk of exposure to airborne fungal spores likely to be released when disturbed. Removal and disposal of the guano material is required prior to activities that may disturb the material. The handling, transport, and disposal of the material must be performed by workers that are properly trained and equipped with corrective personal protective equipment.

3.4 Mercury

Mercury vapour within light fixtures poses no risk to workers or occupants provided the mercury containment remains intact and undisturbed. Removal and disposal of mercury-containing equipment is required prior to demolition activities that may disturb the equipment. The handling, transport, and disposal of mercury containing equipment must follow all applicable provincial and federal regulations and guidelines pertaining to Mercury.

It is not anticipated that fluorescent lamps will be affected by the planned upgrades, however, if disturbance of this material is likely, it is recommended that all bulbs be removed from the light fixtures prior to the upcoming controls, drives and cables replacement project, consolidated using safe methods, and shipped off-site for disposal as hazardous waste (if applicable).

3.5 Polychlorinated Biphenyl (PCB)

When decommissioned, verify the PCB content of fluorescent light ballasts as per the Environment Canada publication “Identification of Lamp Ballasts Containing PCBs”, 1991. Handle, store and dispose of PCB-containing ballasts in accordance with Federal Regulation SOR/2008-273.

3.6 Silica

Silica hazards arise when materials such as concrete that contain sand are drilled, abraded, ground, sawn or otherwise aggressively reshaped. During work activities, work that will disturb silica-containing materials should follow the recommendations provided in the *Ministry of Labour Guideline for Silica on Construction Projects, September 2004*.

In addition, Silica containing materials should be handled with appropriate health and safety precautions so as to comply with requirements of the Designated Substances regulation, *O. Reg. 490/09*, and disposal of these materials must also comply with the requirements of *Reg. 347 – General – Waste Management*.

4. Closure

This survey report is intended to identify/confirm designated substances and hazardous materials within the specified areas in consideration, and which may be disturbed during the upcoming controls, drives and cables replacement project. Prior to beginning work, Asbestos and Designated Substances and Hazardous Materials Survey Reports and Asbestos Management Plan available for the Burlington Lift Bridge property must be reviewed.

Please do not hesitate to contact the undersigned should you have any questions.

Yours truly,

GENIVAR Inc.

Stephen Heikkila, E.I.T.
Technician, Environment

Hassan Ktaech, B.A. Hon.
Project Manager, Environment

Encl. – Appendix A: Project Photographs
Appendix B: Laboratory Certificates of Analysis

Appendix A

Project Photographs

Photograph 1: [Control House Electrical Room - 2nd Floor] Asbestos-containing grey 9”x9” vinyl floor tile observed to be in fair condition around pipe conduit penetration.

Photograph 2: [Control House Electrical Room (2nd Floor)] Presumed asbestos-containing electrical cable sheathing observed to be in fair condition.

Photograph 3: [Control House Electrical Room - 2nd Floor] Non-asbestos-containing 12”x12” off-white vinyl floor tile with faint streaks (Sample Set BLB-1).

Photograph 4: [Catwalk] Lead-containing green paint application observed to be in poor condition.

Photograph 5: [North / South Bridge Towers] Lead-containing grey wall paint application in the mechanical room observed to be in poor condition.

Photograph 6: [North / South Bridge Towers] **"**MCC" unit to me moved within the mechanical rooms.

Photograph 7: [North/South Towers Mechanical Room] Lead-containing grey floor paint application observed to be in good condition.

Photograph 8: [Lift Bridge Structure] Lead-containing red primer paint application observed to be in fair condition.

Photograph 9: [Bridge Tower, below Sheave Room] Guano observed on the bridge tower structure.

Photograph 10: [Bridge Tower, below Sheave Room] Guano observed on the bridge tower structure.

Photograph 11: [Control House – Electrical Room] Mercury-containing thermostat.

Appendix B

Laboratory Certificates of Analysis

IATL **International Asbestos Testing Laboratories**

9000 Commerce Parkway Suite B Mt. Laurel, NJ 08054
Telephone: 856-231-9449 Fax: 856-231-9818

CERTIFICATE OF ANALYSIS

Client: GENIVAR Inc.
600 Cochran Drive; Suite 500
Markham ON L3R 5K3

Report Date: 11/12/2012
Report No.: 289891
Project: PWGSC BLB 2012
Project No.: 121-24849-00

BULK SAMPLE ANALYSIS SUMMARY

Lab No.: 4836151 **Description / Location:** Grey Floor Tile; 12x12
Client No.: BLB-1A

% Asbestos	Type	% Non-Asbestos Fibrous Material	Type	% Non-Fibrous Material
None Detected	None Detected	None Detected	None Detected	100

Lab No.: 4836152 **Description / Location:** Grey Floor Tile; 12x12
Client No.: BLB-1B

% Asbestos	Type	% Non-Asbestos Fibrous Material	Type	% Non-Fibrous Material
None Detected	None Detected	None Detected	None Detected	100

Lab No.: 4836153 **Description / Location:** Grey Floor Tile; 12x12
Client No.: BLB-1C

% Asbestos	Type	% Non-Asbestos Fibrous Material	Type	% Non-Fibrous Material
None Detected	None Detected	None Detected	None Detected	100

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

Analytical Method: EPA 600/R-93/116, by Polarized Light Microscopy

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

Analysis Performed By: V. Smith

Approved By:

Date: 11/12/2012

Frank E. Ehrenfeld, III
Laboratory Director

IATL International Asbestos Testing Laboratories

9000 Commerce Parkway Suite B Mt. Laurel, NJ 08054
Telephone: 856-231-9449 Fax: 856-231-9818

CERTIFICATE OF ANALYSIS

Client: GENIVAR Inc.
600 Cochran Drive; Suite 500
Markham ON L3R 5K3

Report Date: 11/13/2012
Report No.: 290043
Project: PWGSC BLB 2012
Project No.: 121-24849-00

TEM BULK SAMPLE ANALYSIS SUMMARY

IATL No.: 124836151A **Description / Location:** Grey Floor Tile

Client No.: BLB-1A

Organic Fraction:	64.3 %	
Gravimetrically Reduced Subsample:	35.7 %	
Percent Asbestos Detected:	ND	None Detected
Percent Non-Asbestos Fibrous Material:	ND	None Detected
Percent Non-Fibrous Material:	35.7 %	Other

Comments:

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

Methodology: Transmission Electron Microscopy (TEM) In Accordance With :
ELAP 198.4 "Method For Identifying And Quantitating Asbestos In Non-Friable Organically Bound Bulk Samples", Revised 1/11/2005.
EPA-600/R-93/116 Section 2.5 "Asbestos In Bulk Building Materials By TEM Gravimetry."

IATL assumes that all sampling methods and data upon which these results are based have been accurately supplied by the client.

The "Gravimetrically Reduced Subsample" is the portion of the submitted sample remaining following the ashing and acid treatment processes. TEM analysis occurs on this portion of the sample. Final results are calculated to represent the sample as submitted.

This confidential report relates only to those item(s) tested and does not represent an endorsement by NIST-NVLAP, AIHA or any agency of the U.S. government.

Results are verifiable for only those operations and analyses performed in the laboratory.

Analysis Performed By: B. Reich

Approved By:

Date: 11/13/2012

Frank E. Ehrenfeld, III
Laboratory Director

IATL International Asbestos Testing Laboratories

9000 Commerce Parkway Suite B Mt. Laurel, NJ 08054
Telephone: 856-231-9449 Fax: 856-231-9818

CERTIFICATE OF ANALYSIS

Client: GENIVAR Inc.
600 Cochran Drive; Suite 500
Markham ON L3R 5K3

Report Date: 11/13/2012
Report No.: 290043
Project: PWGSC BLB 2012
Project No.: 121-24849-00

TEM BULK SAMPLE ANALYSIS SUMMARY

IATL No.: 124836152A **Description / Location:** Grey Floor Tile

Client No.: BLB-1B

Organic Fraction:	72.1 %	
Gravimetrically Reduced Subsample:	27.9 %	
Percent Asbestos Detected:	ND	None Detected
Percent Non-Asbestos Fibrous Material:	ND	None Detected
Percent Non-Fibrous Material:	27.9 %	Other

Comments:

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

Methodology: Transmission Electron Microscopy (TEM) In Accordance With :
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Results are verifiable for only those operations and analyses performed in the laboratory.

Analysis Performed By: B. Reich

Date: 11/13/2012

IATL International Asbestos Testing Laboratories

9000 Commerce Parkway Suite B Mt. Laurel, NJ 08054
Telephone: 856-231-9449 Fax: 856-231-9818

CERTIFICATE OF ANALYSIS

Client: GENIVAR Inc.
600 Cochran Drive; Suite 500
Markham ON L3R 5K3

Report Date: 11/13/2012
Report No.: 290043
Project: PWGSC BLB 2012
Project No.: 121-24849-00

TEM BULK SAMPLE ANALYSIS SUMMARY

IATL No.: 124836153A **Description / Location:** Grey Floor Tile

Client No.: BLB-1C

Organic Fraction:	71.8 %	
Gravimetrically Reduced Subsample:	28.2 %	
Percent Asbestos Detected:	ND	None Detected
Percent Non-Asbestos Fibrous Material:	ND	None Detected
Percent Non-Fibrous Material:	28.2 %	Other

Comments:

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

Methodology: Transmission Electron Microscopy (TEM) In Accordance With :
ELAP 198.4 "Method For Identifying And Quantitating Asbestos In Non-Friable Organically Bound Bulk Samples", Revised 1/11/2005.
EPA-600/R-93/116 Section 2.5 "Asbestos In Bulk Building Materials By TEM Gravimetry."

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This confidential report relates only to those item(s) tested and does not represent an endorsement by NIST-NVLAP, AIHA or any agency of the U.S. government.

Results are verifiable for only those operations and analyses performed in the laboratory.

Analysis Performed By: B. Reich

Date: 11/13/2012

APPENDIX B

ENVIRONMENTAL EFFECT EVALUATION (EEE) REPORT

Environmental Effects Evaluation (EEE) Report

Public Works and Government Services Canada
Replacement of Controls, Drives and Overhead Cables
Burlington Canal Vertical Lift Bridge
Burlington, Ontario
PWGSC Project No. R.0126410.001

Prepared by
Public Works and Government Services Canada –
Environmental Services
Ontario Region

November 2012

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LIST OF APPENDICES

Environmental Effects Evaluation (EEE) Report

PART A: PROJECT INFORMATION

Federal Authority:	**Public Works and Government Services Canada**
Project Title:	***Replacement of Controls, Drives and Overhead Cables, Burlington Canal Vertical Lift Bridge***
Location:	**Burlington, Ontario**
EEE Assessor:	**Maegan Harrison**
Telephone:	**416 512-5540**
PWGSC Project Number:	**R.0112641.001**

PART B: SCOPE OF PROJECT

Project Description

Public Works and Government Services Canada (PWGSC) is proposing to replace the existing bridge control system (including the controls, drives and overhead cables) at the Burlington Lift Bridge which are used to operate the Bridge, located at 1157 Beach Road in Hamilton, Ontario. The Lift Bridge is to the east of the QEW/Burlington skyway, and serves both commercial vessels and pleasure craft that wish to pass from Hamilton Harbour into Lake Ontario proper. The bridge is owned and operated by PWGSC.

The Burlington Lift Bridge structure is comprised of two towers with a moveable lift span in between that can be lifted and lowered. The lift span is 116 m long, weighs approximately 2000 tons and can be lifted to a height of 36 m to facilitate navigation of large vessels. The span has two-way vehicular traffic and a pedestrian walkway along the west side. The existing control system originating in the towers contains the lift mechanism consists of machinery, sheaves and cables. There is one 150 horsepower drive motor in each tower to supply power to the machinery and one 150 horsepower motor in each tower to synchronize the drive motors (4 motors in total).

The project involves the replacement of controls, drives and overhead cables at the Burlington Lift Bridge. The components of the existing system which are to be replaced include:

- All four main drive motors;
- The main drive motor control cubicles in the control house electrical room;
- The feedback tachometers (pilot generators) and over speed switches located in the tower top machinery rooms;
- The resistor and reactor banks located in the control house electrical room; and
- All miscellaneous components associated with the existing main drive system.

Project Details - Replacement

The existing bridge control system is programmable logic controller based with three consoles located in the control house operator's room: the main bridge console, the roadway traffic controls (gate and signals) console, and the waterway navigation lights console.

The existing motor control centres located in the tower top machinery rooms will be replaced with new motor control centres. Two new main drive motors will be installed in each tower top machinery room to take the place of the existing main drive motors.

The four roadway traffic gates located closest to the lift span and currently referred to as "barrier gates" will be removed and replaced with true resistance barrier gates. The new barrier gates will be capable of stopping a 2000 kg vehicle impacting the gate at 70 km/h.

All conduits and wiring on the bridge towers and lift span, as well as to the traffic gates, traffic barriers, and traffic signals shall be replaced with new. The existing cable tray shall be retained and re-used if possible. If new cable tray is required, it shall be stainless steel.

The existing tower-to-tower aerial cables shall be replaced. Unless otherwise directed, the new cables shall be located entirely on the west side of the bridge in order to achieve maximum separation from the high voltage transmission lines located east of the bridge. Cables shall be suspended on stainless steel messengers using heavy duty PVC coasted stainless steel cable saddles.

Some project components, including flooring in the control room, sheathing of electrical cables, and paint and guano on the bridge may contain designated substances and hazardous materials. These items will be removed in accordance with applicable legislation.

See **Appendix A** for Preliminary Project Drawings.

Operation

The new bridge control system will provide the following functionality:

- Enforcement of correct sequencing and interlocking of the various items of bridge machinery as required to ensure proper operation and safeguard persons and property
- Control of the waterway navigation lights, with the direction being given permission to proceed selectable by the bridge operator
- Controls for the main switchgear breakers, generators, transfer switch, load bank, and similar items
- Control of the main drive system including automatic slow-down points and breaks
- Ability to electrically release any single brake for testing without energizing the main drive motors (brake test function).
- Ability to electrically release all brakes in one tower without energizing the main drive motors (drift test function)
- Applicable warnings and alarms, including automatic safety shutdowns for items such as: excess skew, over speed, loss of power, etc.
- Bypass switches for all interlocks which are dependent on a limit switch.
- Normal and emergency stops.

Decommissioning

Currently there are no plans for decommissioning or abandoning the proposed project as these improvements are meant to extend the life of the bridge.

Scheduling

It is expected that the project construction will start in January 2014. The construction activities will primarily take place outside of the bridge's operational season (late March to December) to avoid impacts to navigation.

PART C: SCOPE OF EVALUATION

Environmental Setting

The Burlington Lift Bridge is located at 1157 Beach Road in Hamilton, Ontario. The Burlington Lift Bridge property consists of two parcels of land on either side of the Burlington Canal. The bridge is east of the QEW/Burlington Skyway. It is currently owned, managed and operated by PWGSC.

The bridge is the most recent of five moveable bridges located on this site since 1830 (http://pwgsc-tpsgc.gc.ca/ontario/text/burlington-e.html). The bridge lifts on-demand for all large vessels and on the hour and half hour for pleasurecraft during the navigation season. The navigation season usually runs from late March to late December.

Since it opened in 1962, the bridge has been operated in excess of 166,380 times, allowing the passage of over 250,000 vessels. On a yearly basis, the bridge will operate approximately 4000 times allowing approximately 6500 vessels to pass through the canal; this includes more than 1000 cargo-carrying vessels. As part of provincial Highway No. 20, the bridge connects the cities of Burlington and Hamilton as well as providing an alternative route to the QEW/Burlington Skyway.

In addition to the bridge itself, the Burlington Life Bridge includes the following facilities on the property:

- Gate house, which is located on the west side of Beach Road, north of the North Tower;
- Maintenance Workshop which is at ground level, immediately west of the South Tower;
- Control House (3 story) which is adjacent and west of the Maintenance Workshop;
- Other facilities, including a storage shed and parking lot; and,
- Another maintenance workshop further west of the Control House

Biophysical Environment

The topography in the vicinity of the Burlington Lift Bridge is relatively flat with the exception of Beach Road itself, which is approximately 3 - 4.6 metres higher than the rest of the property.

Paved areas of the property include Beach Road, unnamed access roads, and a parking area. The remainder of the site consists of lawns, with some trees and brush to the northwest and southeast of the lift bridge.

The east section of the property consists of a sandy beach which slopes gently toward Lake Ontario. The land to the west of Beach Road is generally flat except for the eastern portion, where the ground rises steeply toward Beach Road, and contains a concrete retaining wall along the edge of the embankment.

Species at Risk

The Species at Risk Act (SARA) is meant to provide protection for wildlife species (listed on Schedule 1 of the SARA) and/or critical habitat. The federal government's responsibility for listed aquatic species and birds is also covered by the Fisheries Act and Migratory Bird Convention Act respectively which means that prohibitions apply to these species wherever they are found in Canada. For all other species SARA applies on federal lands only. However, species not protected by SARA may otherwise be protected through provincial legislation. In Ontario, provincial designations of species at risk are protected under the Ontario Endangered Species Act (OESA). Both Acts use the same designation categories, starting with the greatest concern; extirpated, endangered, threatened, and special concern.

A search of the Natural Historic Information Centre (NHIC) database through the MNR (NHIC, 2011) was performed for the purpose of obtaining information on existing species of concern at the project site. The NHIC database contains geo-referenced records of observations of species at risk throughout the province. A rare species query was submitted for a 1 km x 1 km square area centered on the BLB (i.e., NHIC square 17NH99_74) to determine what, if any records of rare species exist at the asset.

A total of 26 records of rare species were identified through the NHIC database for the square kilometre around the BLB; however only three such species are afforded any designation under SARA, as follows:

- Peregrine Falcon (*Falco peregrinus*) – listed as special concern under SARA;
- American Chestnut (*Castanea dentate*) – listed as endangered under SARA;
- Spotted Wintergreen (*Chimaphila maculata*) – listed as endangered under SARA.

Peregrine Falcons, a species classified as "special concern" as per the *Species at Risk Act* (SARA), have nested and reproduced on the BLB on the south face of the north tower since 2003. The Falcons have consistently used the bridge as their territory and have reproduced on-site. Most recently, in 2012, three juveniles hatched successfully (Peregrine Falcon Foundation, 2011). Table 1 shows the breeding timelines for the Falcons at the bridge.

Table 1: Peregrine Falcon Breeding Timelines at the Burlington Lift Bridge	
Nesting season	Late February/Early March to end of July *
Scrape on north tower (nest formation) and laying of eggs	-end of March to early April
Hatching of eggs (approx 33 – 35 days)	-April to May
Fledging/eyases in nest (approx 6 weeks)	-May to June
Attempt to fly (approx 40-45 days)	-June to July
Dependent on Adults, start hunting independently (9-12 weeks)	-July to August
Young birds disperse from nest area	-August to September

* During mild winters, mating/breeding behaviour commences in late February.

PWGSC has developed a "**Peregrine Falcon Management Plan for the Bridge**" (2012) in consultation with Environment Canada (EC) and Ministry of Natural Resources (MNR). This document is attached in Appendix C.

Note that the last record of Spotted wintergreen is from 1886. Environment Canada (2012) notes that there are only four locations in Ontario where this species is still found; it is no longer found in Burlington. There is no likely interaction between the project and this species.

The record for the American chestnut was from 1993. This species is found throughout southern Ontario (Environment Canada, 2012). Main threats to the species include a blight fungus and logging. Note that the project will have no impact on trees. In the event that an American Chestnut is present on the BLB property, it is unlikely there will be any impacts to this endangered species since there are no trees in the immediate vicinity of the works.

Regarding air quality at the site, emissions related to heavy traffic on the QEW and to industrial operations in Hamilton and surrounding area likely contribute to less than optimal air quality indexes, particularly in the summer months.

Vegetation at the site is limited to grass and shrubbery and patches of trees. The project does not require that vegetation be removed or disturbed; no trees or shrubs are to be removed for the project.

The project site is located over the Burlington Canal.

Fish populations in the immediate vicinity of the project are assumed to be similar to those documented by Bowlby et. al (2010) within Hamilton Harbour, and may include the following species:

- Brown bullhead;
- White perch;
- Yellow perch;
- Gizzard shad;
- Alewife;
- Channel catfish;
- Common carp;
- Emerald Shiner;
- Logperch;
- Largemouth Bass;
- Spottail shiner;
- White sucker;
- Bluegill; and,
- Pumpkinseed.

None of these fish species are known to be at risk or protected under SARA.

Passerine and marine birds as well as birds of prey are present in the area. Orioles, Blue jays, pigeons, and eagles have been noted by the Canadian Peregrine Foundation (2011b) at or around the site. Although the asset and the asset property likely do not provide significant habitat for migratory birds, the surrounding areas do. Migratory birds in Southern Ontario are assumed to be breeding and nesting from spring until late July. It is possible, but extremely unlikely that any nests, eggs, or unfledged migratory birds will be present on the asset during the project due to the project schedule (commencing in mid-summer).

Socioeconomic Environment

The Burlington Canal provides Burlington Bay (Hamilton Harbour) with navigable access to the Atlantic Ocean via Lake Ontario and St. Lawrence Seaway. The canal, which was built in the 1930s, connects the Hamilton Harbour industrial region to international trade and commerce. The Burlington Canal remains a busy waterway and is vital to the area commerce.

The Burlington Lift Bridge spans the canal and lifts by way of counterweights to allow shipping and pleasure marine craft to pass underneath. The bridge lifts on-demand for all large vessels and on the hour and half-hour for pleasure craft. In order to ensure safety, the bridge must be raised early since in the event of a failure, a vessel requires ample warning time to turn since a fully loaded vessel can take in excess of 1.5 kilometres to stop. All such marine traffic to and from Hamilton Harbour is via the Canal.

The bridge also serves as a four-lane lift bridge, providing passage over the canal for vehicular traffic. The bridge also has a sidewalk that is used by pedestrians and cyclists to cross the canal. A trail system is present along the canal for recreational use. The lift bridge also provides an alternate crossing to the Burlington Skyway/QEW over the ship canal.

The Burlington Bay Canal Lighthouse (Burlington Canal Range Rear) is located just to the west of the Burlington Lift Bridge, which is a round stone tower with associated lighthouse keeper's residence built in 1857 and inactive since 1961.

Heritage

A Heritage Value Assessment was commissioned by PWGSC for the Burlington Lift Bridge in 2010. The Heritage Value Assessment considered historical associations, engineering significance, and environment and heritage criteria. The assessment concluded that the bridge is a non-heritage asset at the national level, but is considered to be a regional level-III asset for historical interest based on historical and engineering themes and the asset's significance as a regional landmark.

Noise

The Burlington Lift Bridge is located in a noisy environment. Noise contributions include: vehicular traffic on the QEW, the Burlington Skyway Bridge, the Burlington Lift Bridge's steel deck, high traffic on Eastport Drive/Beach Drive, warning horns (when the bridge is being lifted), and horns from incoming ships that are about to pass through the Burlington Canal.

Environmental Effects - Methodology

The environmental effects evaluation methodology used in this report focuses the evaluation on those environmental components of greatest concern. The Valued Ecological Components (VECs) most likely to be affected by the project as described are indicated in **Table 3.** VECs were selected based on ecological importance to the existing environment (above), the relative sensitivity of environmental components to project influences and their relative social, cultural or economic importance. The potential impacts resulting from these interactions are described below.

Scoping

This environmental effects evaluation considers the full range of project / environment interactions and the environmental factors that could be affected by the project as defined above and the significance of related impacts with mitigation.

Table 3 : Potential Project / Environment Interactions Matrix

	DIRECT ENVIRONMENTAL EFFECTS														INDIRECT ENVIRONMENTAL EFFECTS										OTHER
	PHYSICAL						BIOLOGICAL								SOCIO-ECONOMIC							CULTURAL			
Project Component/Activity ☒ Indicates a potential Project-Environment Interaction.	**Air Quality**	**Soil Quality**	**Surface Water Quality/Quantity**	**Groundwater Quality/Quantity**	**Terrain/ Topography**	**Geology,/ Geophysics**	**Vegetation**	**Biodiversity**	**Species at Risk**	**Wildlife/Wildlife Habitat (Terrestrial)**	**Wildlife/Wildlife Habitat (Aquatic)**	**Fish and Fish Habitat**	**Birds (Habitat, Migratory Corridors/ Buffer Zones)**	**Wetlands/Bogs/Ponds**	**Land-use**	**Noise/Vibration**	**Drinking water**	**Transportation Network**	**Navigation**	**Recreation/Tourism**	**Employment/Economy**	**Cultural Resources**	**Archaeological Resources**	**Aboriginal - traditional land/resources**	**Effects of the Environment on the Project**
Construction																									
Deconstruction/ removal of existing controls, drives and overhead cables	☒	☒	☒	☐	☐	☐	☐	☐	☒	☐	☐	☒	☐	☐	☐	☒	☐	☒	☐	☐	☐	☐	☐	☐	☐
Installation of new controls, drives and overhead cables	☒	☒	☒	☐	☐	☐	☐	☐	☒	☐	☐	☒	☐	☐	☐	☒	☐	☒	☐	☐	☐	☐	☐	☐	☐
Operation																									
Operation of bridge with new components	☐	☐	☒	☐	☐	☐	☐	☐	☒	☐	☐	☒	☐	☐	☐	☒	☐	☐	☐	☐	☐	☐	☐	☐	☐

Evaluation of Environmental Effects

The VECs selected in **Table 3** are addressed in **Table 5** below. The residual effects of the project on the environment are defined. Similarly, the physical works/activities and required mitigation measures are detailed and the significance of residual (post-mitigation) effects is estimated.

The following ratings are based on:

- **information provided by the proponent;**
- **a review of project related activities;**
- **an appraisal of the environmental setting, and identification of resources at risk;**
- **the identification of potential impacts within the temporal and spatial bounds; and**
- **personal knowledge and professional judgment of the assessor.**

The significance of project related impacts was determined in consideration of their frequency, the duration and geographical extent of the effects, magnitude relative to natural or background levels, and whether the effects are reversible or are positive or negative in nature. These criteria are indicated in Table 4.

Table 4. Assessment Criteria for Determination of Significance.

Magnitude	Magnitude, in general terms, may vary among Issues, but is a factor that accounts for size, intensity, concentration, importance, volume and social or monetary value. It is rated as compared with background conditions, protective standards or normal variability.	
	Small	Relative to natural or background levels
	Moderate	Relative to natural or background levels
	Large	Relative to natural or background levels
Reversibility	Reversible	Effect can be reversed
	Irreversible	Effects are permanent
Geographic Extent	Immediate	Confined to project site
	Local	Effects beyond immediate project site but not regional in scale
	Regional	Effects on a wide scale
Duration	Short Term	Between 0 and 6 months in duration
	Medium Term	Between 6 months and 2 years
	Long Term	Beyond 2 years
Frequency	Once	Occurs only once
	Intermittent	Occurs occasionally at irregular intervals
	Continuous	Occurs on a regular basis and regular intervals

Table 5: Environmental Effects Analysis – Mitigation Measures and Residual Effects

Valued Ecosystem / Social Component	Description of Potential Project Interaction with VEC/VSC	Mitigation Measures[1]	Residual Effects[2]	Significance of Residual effects[3]	Further Study or Follow up
Air Quality	Potential for fumes and air emissions from construction materials and vehicle/machinery to degrade air quality. Potential generation of dust during removal old paint, Asbestos containing materials, guano and concrete repair by abrasive blasting.	Vehicles/machinery to be in good repair, equipped with emission controls as applicable and operated within regulatory requirements. Vehicles and machinery should not be left idling while not in use. Ensure practices and procedures for lead paint removal adhere to the **Lead Management Plan (Pinchin, 2005**) and the Occupational Health and Safety Branch of the Ontario Ministry of Labour "Guideline: Lead on Construction Projects." Ensure practices and procedures for abatement removal adhere to the **Asbestos Management Plan** and PWGSC's DP 057. Ensure practices and procedures for concrete removal or rehabilitation follow the Occupational Health and Safety Branch of the Ontario Ministry of Labour "Guideline: Silica on Construction Projects." Ensure that any guano removed is done accordance with procedures developed	Minimal potential for the degradation of local air quality due to the existing impacts to air quality from traffic and blasting. Impacts would not be significant as they would: result in small increase compared to background; be reversible over time; be located only in immediate area of bridge; take place for less than 6 months; and occur continuously during construction.	-1	No

[1] Although some of the pertinent legislation, regulations, guidelines and policies are noted in the mitigation, the information is not considered necessarily complete. Furthermore, it is to be expected that new, amended, modified or otherwise updated legislation, regulations, guidelines and policies will come available over time. The Contractor is responsible to ensure that all applicable legislation, regulations, guidelines and policies are adhered to.

[2] Residual Effects and Significance of Residual Effects evaluated in **Error! Reference source not found.**

[3] Significance of Residual Effects rated as follows:

0 = None, 1 = Not significant, 2 = Significant, 3 = Unknown, Positive (+), Negative (-)

Valued Ecosystem / Social Component	Description of Potential Project Interaction with VEC/VSC	Mitigation Measures[1]	Residual Effects[2]	Significance of Residual effects[3]	Further Study or Follow up
		by PWGSC to minimize impacts to workings and the environment.			
Surface Water	Potential for debris and other materials (e.g. concrete, asbestos, lead particles, guano, petroleum products or other deleterious substances) during construction, and operational activities to enter the Burlington Canal.	All activities including maintenance procedures should be controlled to prevent the entry of petroleum products, lead paint chips, concrete, concrete wash water, guano, debris, rubble, or other deleterious substances into the water. Adhere to protection/mitigation measures specified in the DFO's Bridge Maintenance Operational Statement (attached in Appendix C).	Minimal potential for sediments, dust or contaminants (concrete, lead, fuel, waste water) to enter Burlington Canal. Impacts would not be significant as they would: result in small increase compared to background; be reversible over time; be located only in immediate area of bridge; take place for less than 6 months; and occur intermittently during construction.	-1	No
Fish/Fish Habitat	Potential for debris and other materials (e.g. concrete, lead particles, petroleum products or other deleterious substances) during construction, cleanup, and operational activities to enter the Burlington Canal thereby negatively impacting fish and fish habitat.	There shall be no deposit/release of deleterious substance (i.e., concrete, concrete wash water, lead, or construction debris) in the Burlington Canal. Any materials that are accidentally released to the Canal must be retrieved immediately by the contractor. All activities shall follow the mitigation and protection measures outlined in DFO's Bridge Maintenance Operational Statement, where applicable to avoid any harmful alteration, disruption or destruction (HADD) of fish habitat (attached in Appendix C).	Minimal potential for sediments, dust or contaminants (lead, construction materials, fuels or waste water) to enter Burlington Canal. Impacts would not be significant as they would: result in small increase compared to background; be reversible over time; be located only in immediate area of bridge; take place for less than 6 months; and occur intermittently during construction.	-1	No

Valued Ecosystem / Social Component	Description of Potential Project Interaction with VEC/VSC	Mitigation Measures[1]	Residual Effects[2]	Significance of Residual effects[3]	Further Study or Follow up
		Submit Notification Form to DFO 10 days prior to starting work. Form available at: (http://www.dfo-mpo.ca/regions/central/habitat/os-eo/provinces-territories-territoires/on/os-eo20-eng.htm) No refuelling of equipment is permitted within 30 m of the Burlington Canal. All equipment and machinery will be in good working order while on site. Repairs or maintenance to equipment will not be conducted within 30 m of the Burlington Canal.			
Birds	Potential disturbances to the bird population in the area from construction activities (i.e. generation of noise and dust).	All work is to be undertaken in compliance with Migratory Birds Convention Act and with local noise bylaws. If a migratory bird is found to be using the construction area or bridge structure for breeding or nesting, the contractor will halt work. Environment Canada must be contacted for further guidance prior to work commencing. Minimize the frequency of dust-generating construction activities during prolonged periods of dry weather.	Minimal potential for dust and generation of noise to disturb birds due to small magnitude, use of best management practices relating to lead removal, limited geographical extent, and duration of construction activities.	-1	No
Species at Risk	Potential disturbance to Peregrine Falcons, a protected species under the *Species At Risk Act* (SARA).	Should Peregrine Falcons and/or their nesting activities be present during the repainting works, measures (e.g. avoid work/activities during nesting season, protective equipment to be worn by worker to avoid harm during defensive	Minimal potential for disturbance and adverse effect to Falcons if works are undertaken in accordance with protection and mitigation	-1	Yes At time of project implementation, should it not

Valued Ecosystem / Social Component	Description of Potential Project Interaction with VEC/VSC	Mitigation Measures[1]	Residual Effects[2]	Significance of Residual effects[3]	Further Study or Follow up
		behaviour of Flacons) are to be implemented as per the "**Peregrine Falcon Management Plan**" developed in consultation with Environment Canada and Ministry of Natural Resources (Appendix C). At the time of the project implementation an assessment will be made as to the presence of an active nest with eggs or fledglings. If present, modification to schedule at that time will be undertaken, if feasible, so that the repainting work occurs outside of the peregrine falcon nesting season, particularly for the North Tower (current and historic nesting site). If the repainting cannot be avoided during the nesting season (late February to July), and an active nests with eggs or fledglings are present, PWGSC will contact MNR and Environment Canada (EC) prior to construction to coordinate the evaluation of potential mitigation options (i.e., placement tarping/enclosure around the North Tower to isolate the work area from the nest site or nest relocation) and assessment of impacts and management recommendations for implementation. PWGSC will inform appropriate construction personnel of the location of the nest and buffer zones prior to commencement of any work (for example, during pre-construction meetings) during the nesting season.	in the Peregrine Falcon Management Plan.		be feasible to conduct the project outside of the Peregrine Falcon nesting period, an assessment should be undertaken in consultation with EC and MNR to determine the presence of an active nest with eggs or fledglings. If an active nest is evident PWGSC will request EC and MNR to evaluate potential impacts and provide manageme nt options.

Valued Ecosystem / Social Component	Description of Potential Project Interaction with VEC/VSC	Mitigation Measures[1]	Residual Effects[2]	Significance of Residual effects[3]	Further Study or Follow up
		If the management directions in the Peregrine Falcon Management Plan do not appear to be effective, the contractor will cease work and contact PWGSC who will seek advice from MNR and EC.			

PART D: CONSULTATIONS

Public Consultation

The potential for public concern related to environmental effects is minimal due to the limited interaction this project will have with the environment. Public consultation was not deemed necessary as part of this environmental evaluation. PWSGC will communicate with the public regarding bridge closures as per their procedures. A record of public participation determination is found in **Appendix B**.

Aboriginal Communication

PWGSC must continue to ensure the Crown's duty to consult with respect to crown conduct that may potentially have an adverse impact on established or potential Aboriginal or Treaty rights, as recognized and affirmed under section 35 of the Constitution Act, 1982 is undertaken. No Aboriginal concerns have been raised in the past for any projects taking place at this project site, so it is unlikely that this project will have an

Provincial Agency Consultation

PWGSC is proposing the project on federal land and does not require any environmental licences or permits from other provincial/municipal agencies. Based on this information and the general nature of the project site and limited project activities, agency consultation was not deemed necessary and therefore not conducted as part of this evaluation.

Federal Department Consultation

PWGSC is proposing the project on their land and does not require any environmental licences or permits from other federal departments. Additionally, none of the activities will require in-water work, and the project will adhere to DFO's Operational Statement. The project primarily involves upgrading internal cables and motor drives rather than significant changes to the bridge structure itself. Consultation with federal departments was not conducted as part of this evaluation.

PART E: ACCURACY AND COMPLIANCE MONITORING

A follow-up program (as defined in S. 2(1) and as applicable to non-designated projects on federal lands) is a program for determining the effectiveness of any mitigation measures.

_X_ Follow-up program is not likely required for this project. However, site monitoring (accuracy and compliance monitoring) may be conducted to verify whether required mitigation measures were implemented. The proponent must provide site access to Responsible Authority officials and/or its agents upon request.

____ Follow-up program is required for this project. The proponent must provide site access to Responsible Authority officials and/or its agents upon request.

Monitoring to track the implementation of mitigation measures is required in order for PWGSC to ensure that mitigation measures are being adhered to. All required mitigation measures from Table 5 are summarized in the Mitigation Monitoring Report form, **Appendix D**.

Prepared by: MHarrison Date: Nov. 20, 2012
Maegan Harrison, Senior Environmental Specialist, PWGSC, Ontario Region

The above has completed this environmental effects evaluation report to the best of their ability and knowledge.

Reviewed by: Mohammad Murtaza Date: Nov 21, 2012
Mohammad Murtaza, Manager, Environmental Regulations & Sustainability
PWGSC, Ontario Region

The above has reviewed this environmental effects evaluation (EEE) report and agrees that it meets the requirement of the Canadian Environmental Assessment Act, 2012.

PART F: DETERMINATION

The federal authority is required to provide a determination of the significance of environmental effects as a result of funding this project. The decision outlined below is based on the interpretation of environmental effects and mitigation measures described in Part D of this report.

Project Name: Burlington Lift Bridge – Controls, Drives and Overhead Cables Replacement
PWGSC Project #: R.012843.049
Location: Hamilton, Ontario

The Federal Authority has evaluated the project for significant adverse environmental effects as required under Section 67 of *Canadian Environmental Assessment Act (CEAA), 2012*. On the basis of this evaluation, the department has determined that the decision opposite the "X" applies to the proposed project.

___ Project not likely to cause significant adverse environmental effects - proceed.

X Project not likely to cause significant adverse environmental effects with mitigation - proceed using mitigative measures as determined.

___ Inadequate information available - further study and assessment is required.

___ Project likely to cause significant adverse environmental effects that cannot be justified in the circumstances - project will not proceed.

___ Project likely to cause significant adverse environmental effects that may be justified in the circumstances - refer to the Governor in Council for decision.

PART G: SIGNATURE CERTIFICATE

This document summarizes the results of an environmental effects evaluation related to the above project that has been performed and completed by the Federal Authority in accordance with the *Canadian Environmental Assessment Act, 2012.*

Accepted by: _____ Date: NOV 23, 2012
Assad Ghubril, Senior Project Manager, PWGSC, Ontario Region

The above has read and understood this environmental effects evaluation (EEE) report and acknowledges responsibility for ensuring the implementation of mitigation measures and for ensuring the design and implementation of 'accuracy and compliance monitoring', if any, identified in this report.

Approved by: _____ Date: 14 Dec 2012
Dan Joyce, Asset Manager, Engineering Assets
PWGSC, Ontario Region

The above has read and understood this environmental effects evaluation (EEE) report and acknowledges responsibility for ensuring the implementation of mitigation measures and for ensuring the design and implementation of 'accuracy and compliance monitoring', if any, identified in this report.

REFERENCES

Environment Canada. Species at Risk Registry. http://www.sararegistry.gc.ca/default_e.cfm (Accessed on October 29, 2012)

Ministry of Natural Resources. Biodiversity Explorer. http://nhic.mnr.gov.on.ca/ (Accessed on October 29, 2012)

PWGSC. 2012. Environmental Assessment Screening. Burlington Lift Bridge Tank Systems Upgrades.

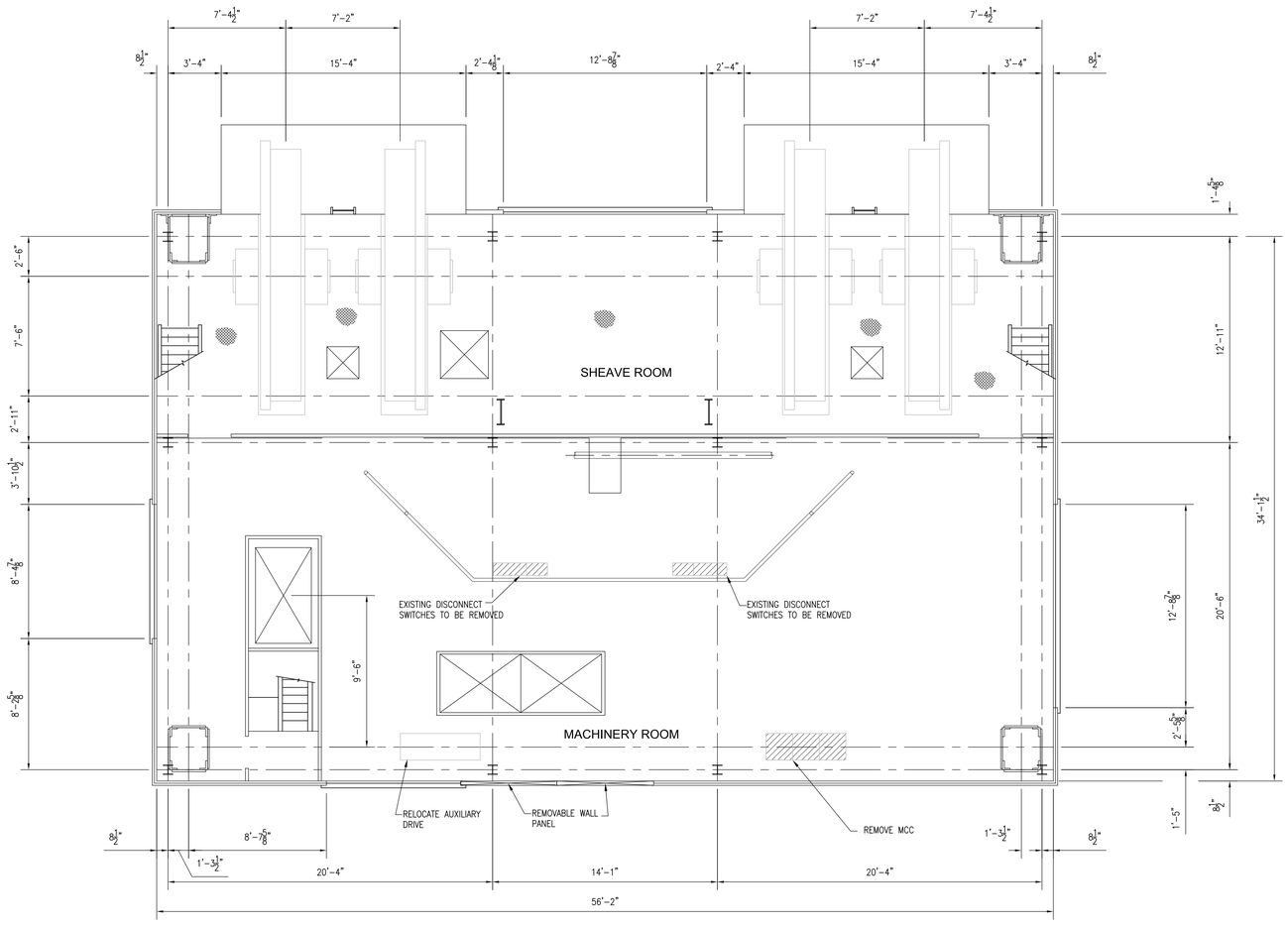
PWGSC, 2008. Environmental Assessment Screening. Burlington Lift Bridge Repainting.

PWGSC. May 2012. Peregrine Falcon Management Plan for Burlington Lift Bridge. Hamilton, Ontario.

APPENDIX A
FIGURES

04 11

0 0.5 1 2 3 inches



MAIN FLOOR PLAN - SOUTH

2 1 0 4 8

SCALE 1/4" = 1'-0"

Public Works and Government Services Canada
Architectural and Engineering Services
Ontario Region

Travaux publics et Services gouvernementaux Canada
Services d'architecture et de génie
Région de l'Ontario

PARSONS BRINCKERHOFF

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TORONTO, ONTARIO
CANADA M4P 1E4
PHONE: 416-487-5256 FAX: 416-487-9766
WWW.PBWORLD.COM

PRELIMINARY DESIGN SUBMITTAL
NOT FOR CONSTRUCTION

04		
03		
02		
01		
revision		date

Do not scale drawings.
Verify all dimensions and conditions on site and immediately notify the engineer of all discrepancies.

A/B|C
A Detail No. / No. du détail
B drawing no. – where detail required / dessin no. – où détail exigé
C drawing no. – where detailed / dessin no. – où détaillé

project title / titre du projet
HAMILTON ONTARIO
PWGSC
4900 YONGE STREET
TORONTO, ON CANADA M2N 6A6
BURLINGTON CANAL
VERTICAL LIFT BRIDGE

drawing title / titre du dessin
REPLACEMENT OF CONTROLS, DRIVES AND OVERHEAD CABLES

ELECTRICAL DEMOLITION PLAN
SOUTH MACHINERY ROOM

drawn by / dessine par	J. PEREZ
designed by / conc par	G. PATINO/B. CROUTHAMEL
approved by / approuve par	M. VANDEREE
tender / soumission	TENDER
project manager / administrateur de projets	
project date / date du projet	2012/10/08
project no. / no. du projet	R.012641.001
drawing no. / dessine no.	E52

DATE PLOTTED: 10/10/2012 PLOT SCALE: 1 CAD FILE: T:\Sys\Projects\52718-BLB\DWG\Gsc-E-52.dwg

04 11

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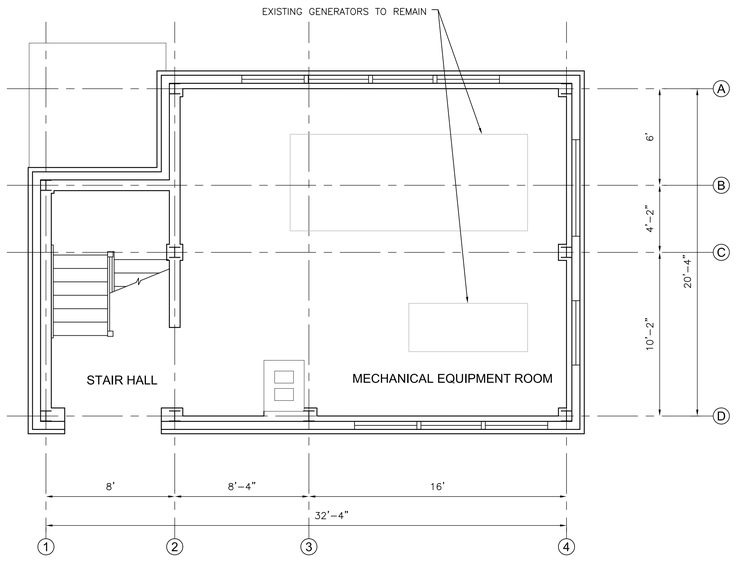
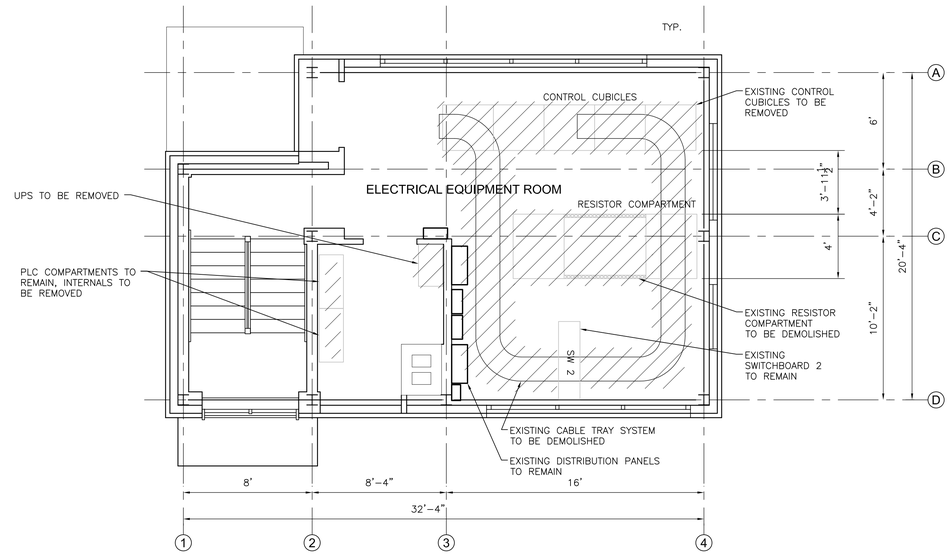
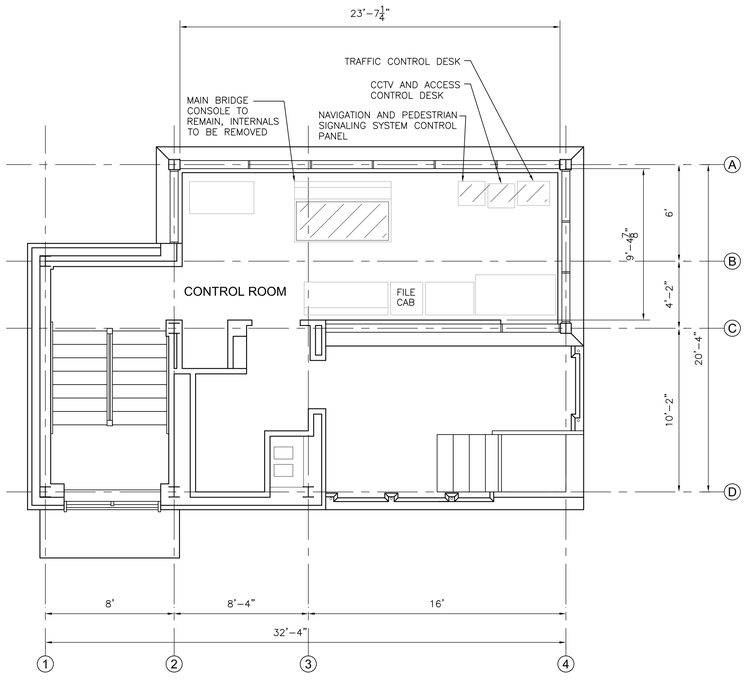


GROUND FLOOR PLAN



SECOND FLOOR PLAN



THIRD FLOOR PLAN

Public Works and Government Services Canada
Architectural and Engineering Services
Ontario Region

Travaux publics et Services gouvernementaux Canada
Services d'architecture et de génie
Région de l'Ontario

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PWGSC
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TORONTO, ON CANADA M2N 6A6
BURLINGTON CANAL
VERTICAL LIFT BRIDGE

drawing title / titre du dessin
REPLACEMENT OF CONTROLS, DRIVES AND OVERHEAD CABLES

ELECTRICAL DEMOLITION PLAN
CONTROL HOUSE

drawn by / dessine par	J. PEREZ
designed by / conc par	G. PATINO/B. CROUTHAMEL
approved by / approuve par	M. VANDEREE
tender / soumission	TENDER
project manager / administrateur de projets	
project date / date du projet	2012/10/08
project no. / no. du projet	R.012641.001
drawing no. / dessine no.	E53

DATE PLOTTED: 10/10/2012 PLOT SCALE: 1 CAD FILE: T:\Sys\Projects\52718-BLB\DWG\Gsc-E-53.dwg

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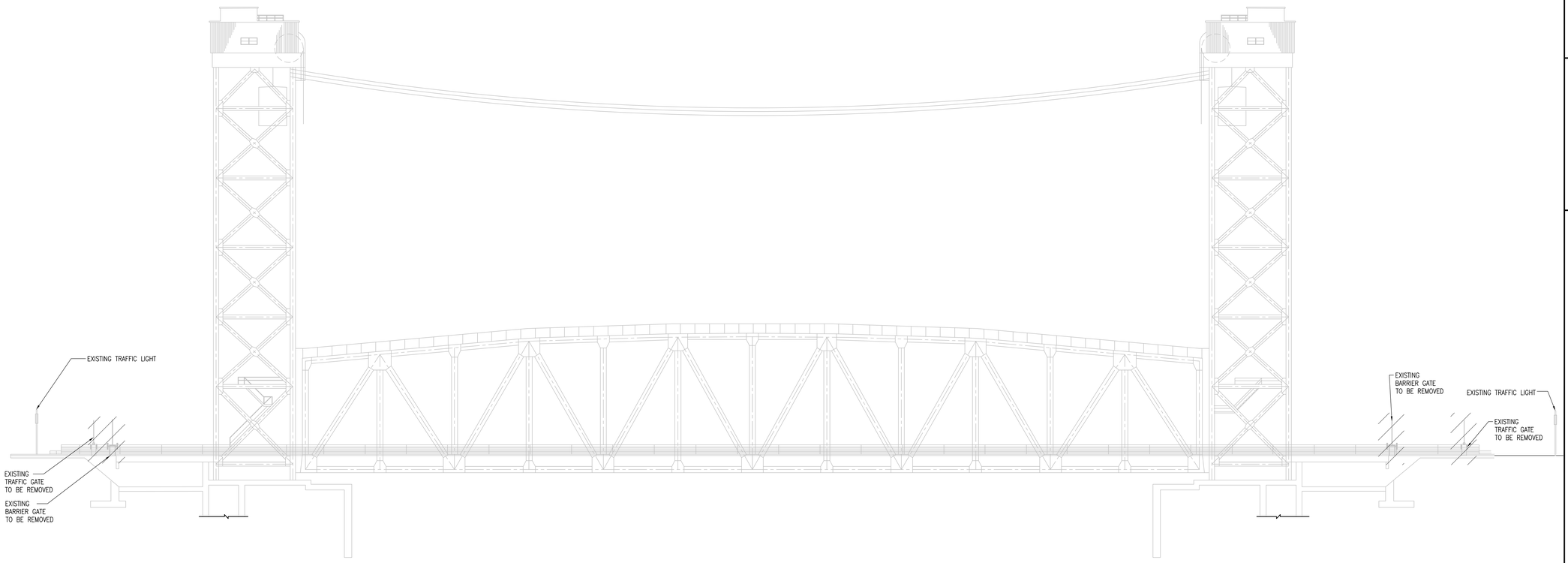
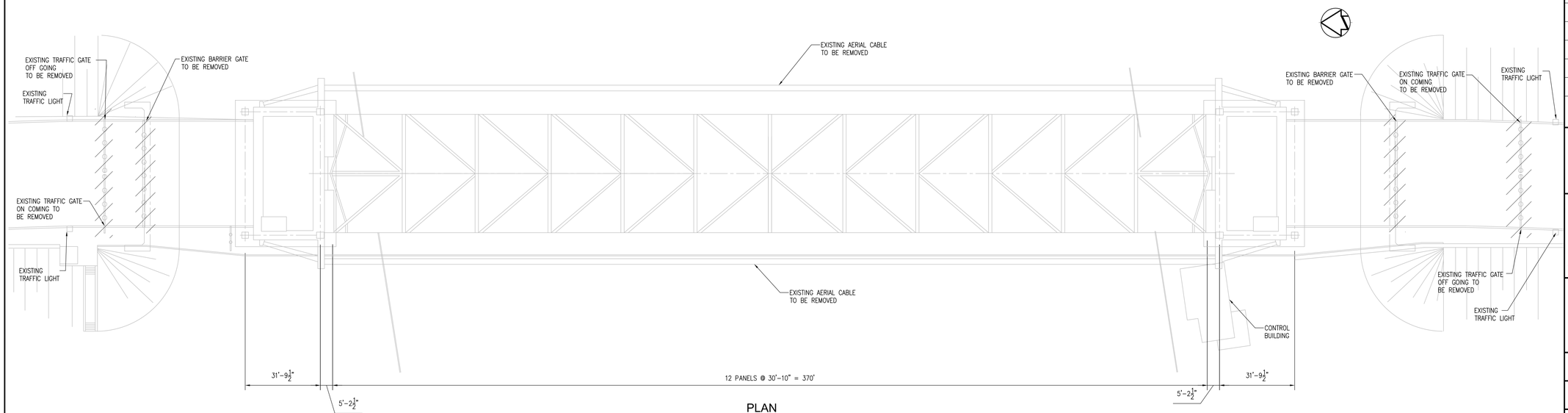


ELEVATION



PLAN

20' 10' 0 20' 40'

SCALE 1" = 20'-0"

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BURLINGTON CANAL
VERTICAL LIFT BRIDGE

drawing title
titre du dessin
REPLACEMENT OF CONTROLS, DRIVES AND OVERHEAD CABLES

ELECTRICAL DEMOLITION PLAN ROADWAY

drawn by
dessine par J. PEREZ

designed by
conc par G. PATINO/B. CROUTHAMEL

approved by
approuve par M. VANDEREE

tender
soumission TENDER

project manager
administrateur de projets

project date
date du projet 2012/10/08

project no.
no. du projet R.012641.001

drawing no.
dessine no. E54

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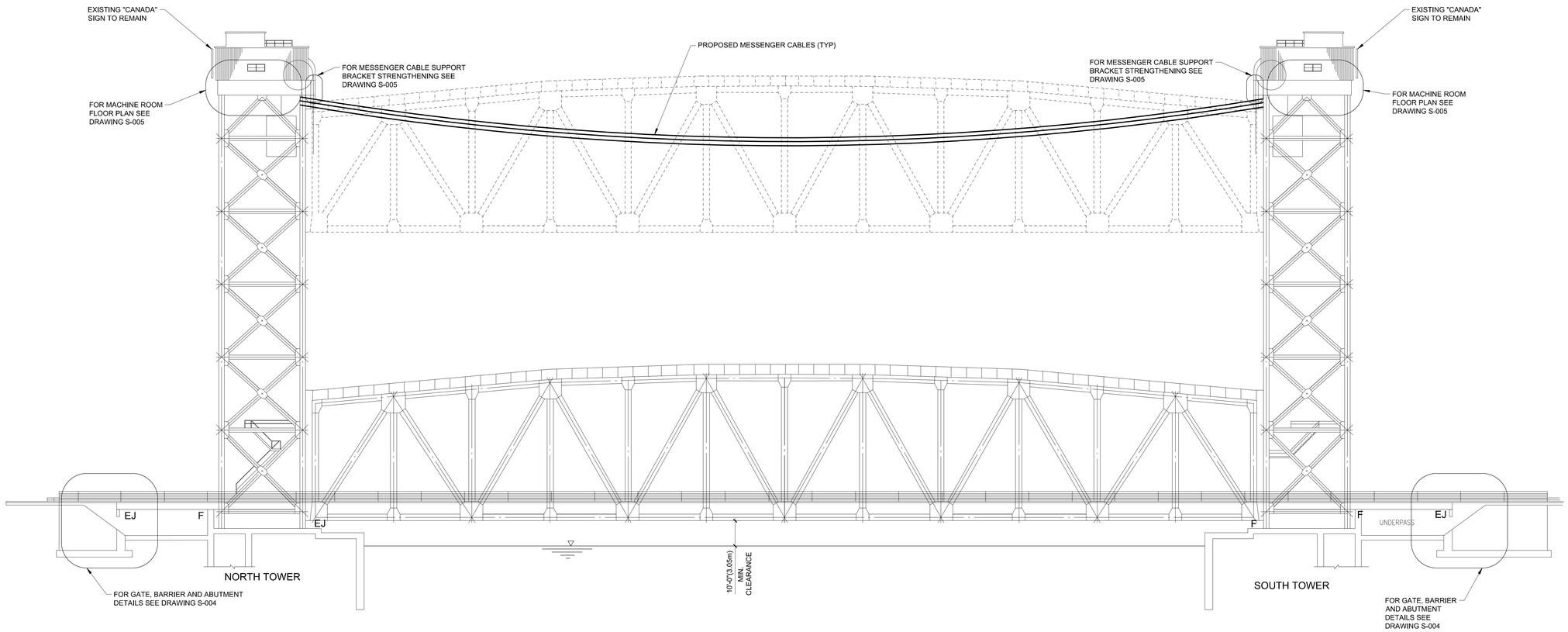
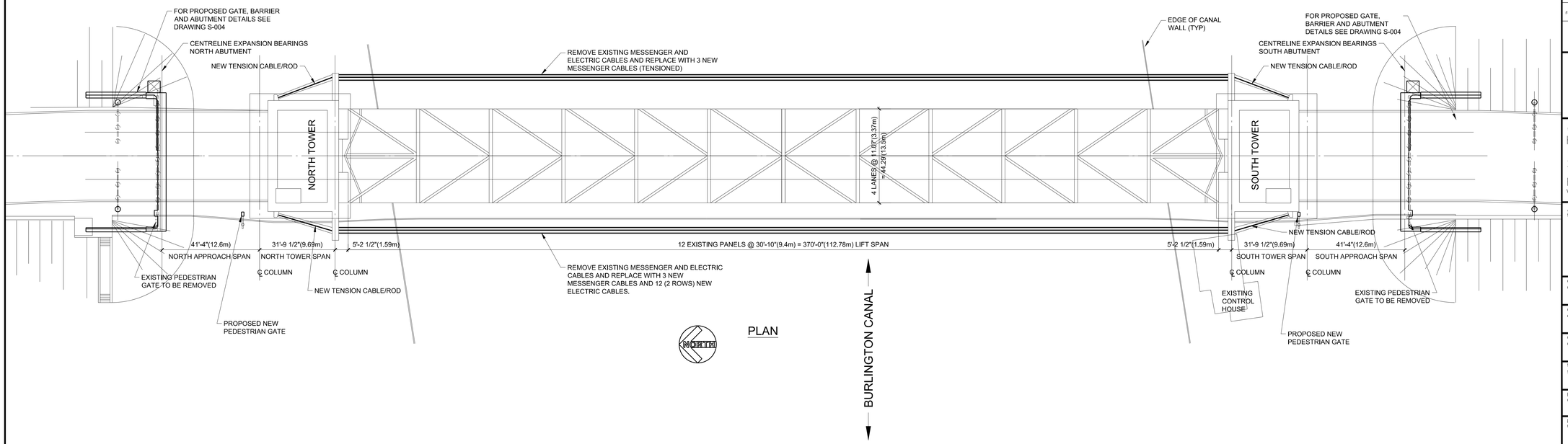


WEST ELEVATION



PLAN

SCALE 1/16"=1'-0" 0 5 10 25 50ft.

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REPLACEMENT OF CONTROLS, DRIVES AND OVERHEAD CABLES
GENERAL PLAN AND ELEVATION

drawn by / dessiné par	DEB
designed by / conc par	ARZ
approved by / approuvé par	SKS
tender / soumission	–
project manager / administrateur de projets	
project date / date du projet	2012/09/21
project no. / no. du projet	R.012641.001
drawing no. / dessine no.	S-003

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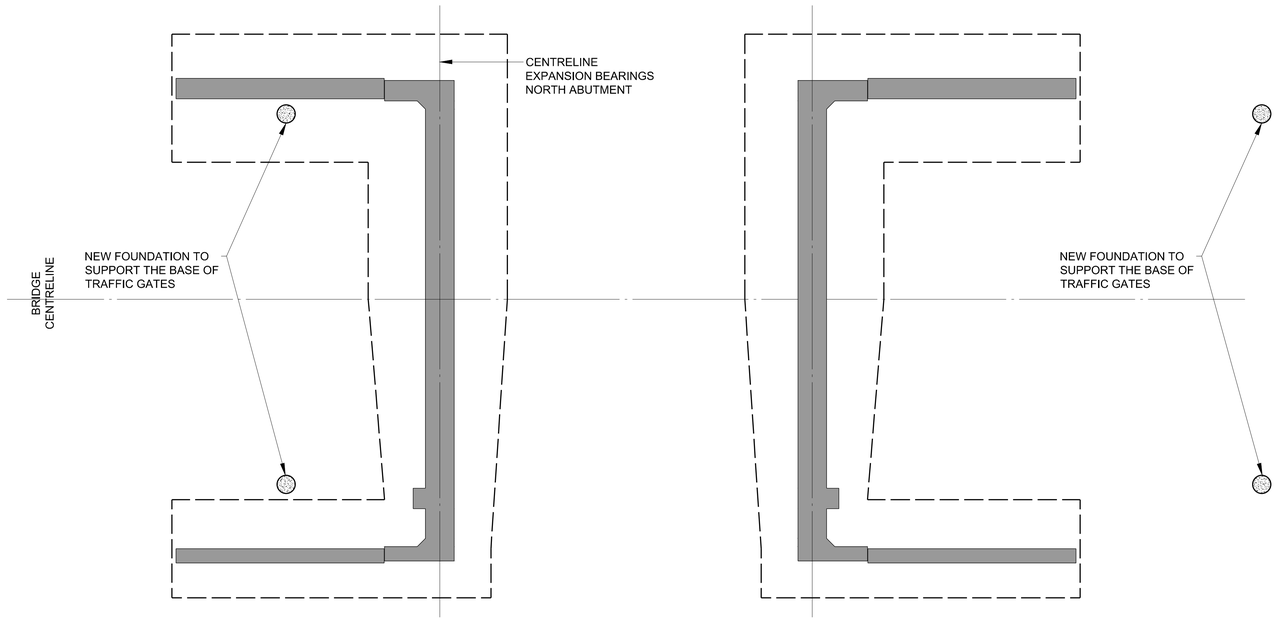
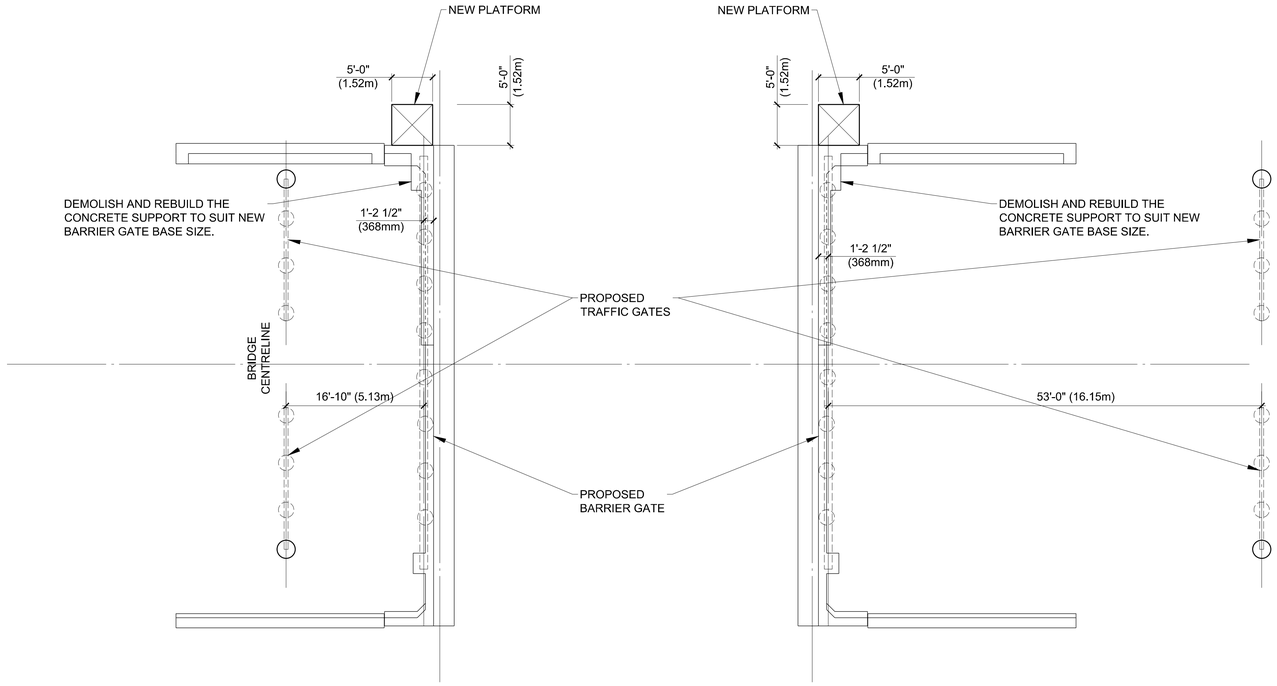


NORTH ABUTMENT FOUNDATION PLAN
SCALE: 1/8"=1'-0"

SOUTH ABUTMENT FOUNDATION PLAN
SCALE: 1/8"=1'-0"

NORTH



NORTH ABUTMENT PLAN
SCALE: 1/8"=1'-0"

SOUTH ABUTMENT PLAN
SCALE: 1/8"=1'-0"

SCALE 1/8"=1'-0" 0 5 10 25ft.

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dessin no. – ou detaillé

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VERTICAL LIFT BRIDGE

drawing title
titre du dessin
REPLACEMENT OF CONTROLS, DRIVES AND OVERHEAD CABLES

ABUTMENT PLANS AND DETAILS

drawn by
dessine par DEB

designed by
conc par ARZ

approved by
approuve par SKS

tender
soumission –

project manager
administrateur de projets

project date
date du projet 2012/09/21

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drawing no.
dessine no. S-004

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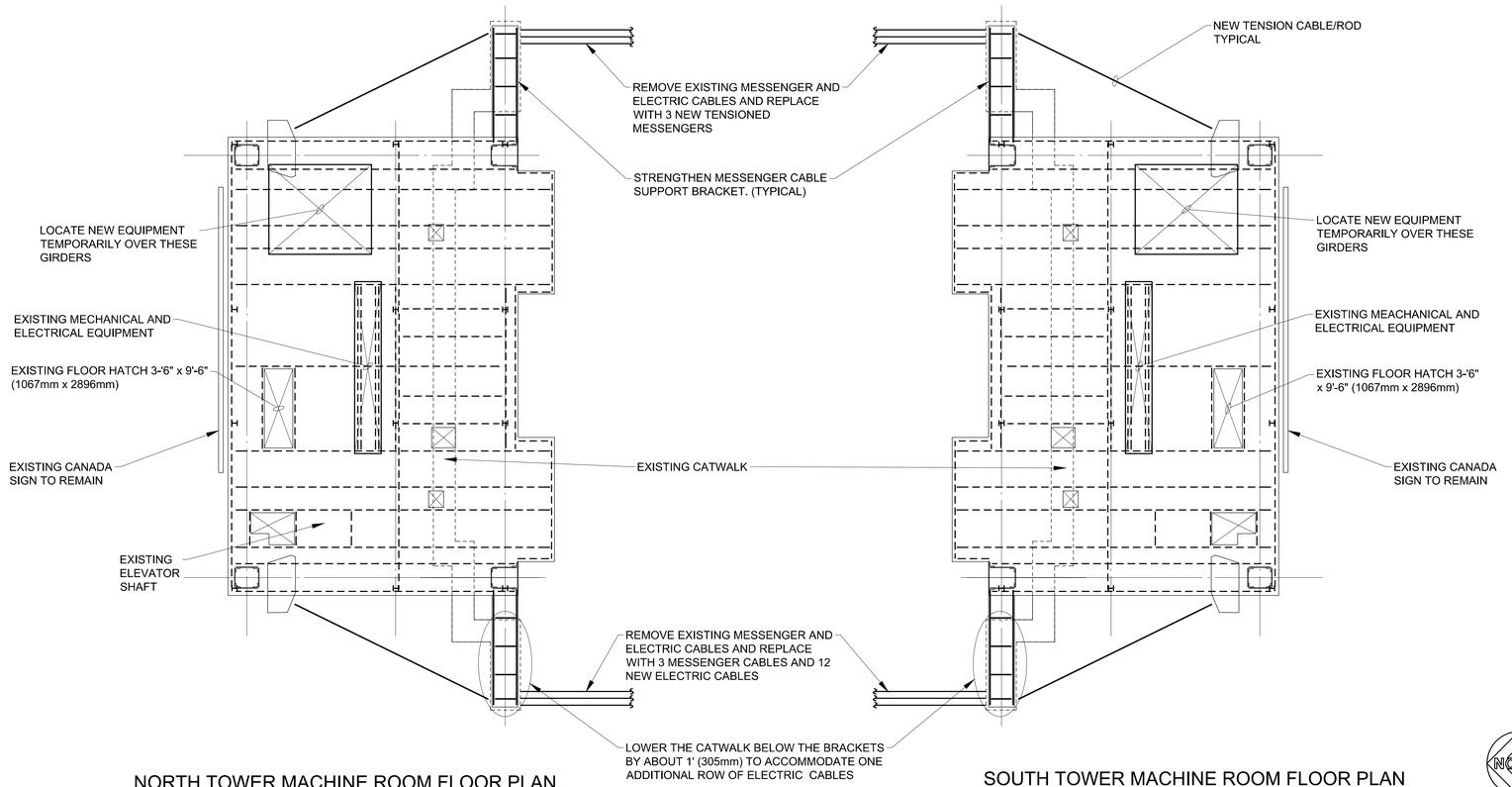
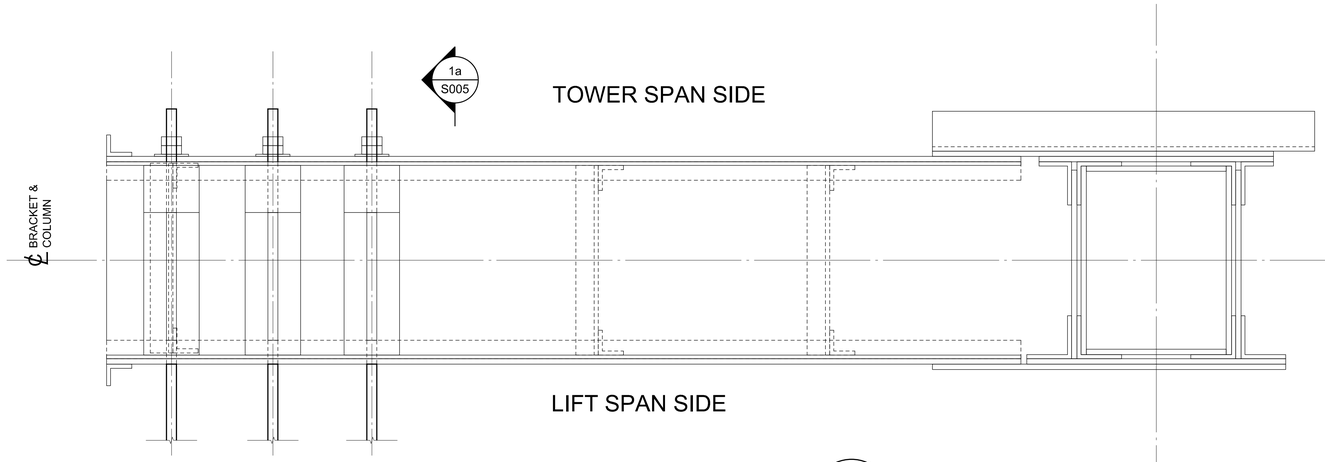


NORTH TOWER MACHINE ROOM FLOOR PLAN

SCALE: 1/8"=1'-0"

SOUTH TOWER MACHINE ROOM FLOOR PLAN

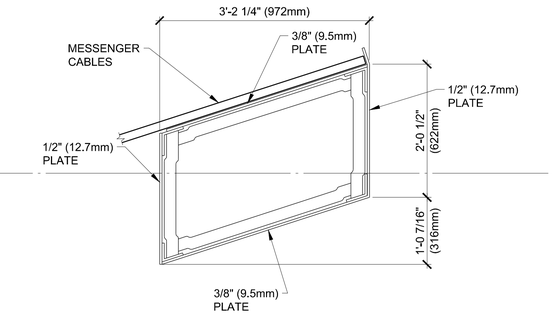
SCALE: 1/8"=1'-0"



MESSENGER CABLE SUPPORT BRACKET PLAN

1
S-005

SCALE 1" = 1'-0"



MESSENGER CABLE SUPPORT BRACKET DETAIL

1a
S-005

SCALE 1" = 1'-0"

SCALE 1/8"=1'-0" 0 4 10 25ft

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VERTICAL LIFT BRIDGE

drawing title
titre du dessin
REPLACEMENT OF CONTROLS, DRIVES AND OVERHEAD CABLES
MACHINE ROOM FLOOR PLANS AND MESSENGER CABLE DETAILS

drawn by / dessine par: DEB
designed by / conc par: ARZ
approved by / approuve par: SKS
tender / soumission: –
project manager / administrateur de projets:
project date / date du projet: 2012/09/21
project no. / no. du projet: R.012641.001
drawing no. / dessine no.: S-005

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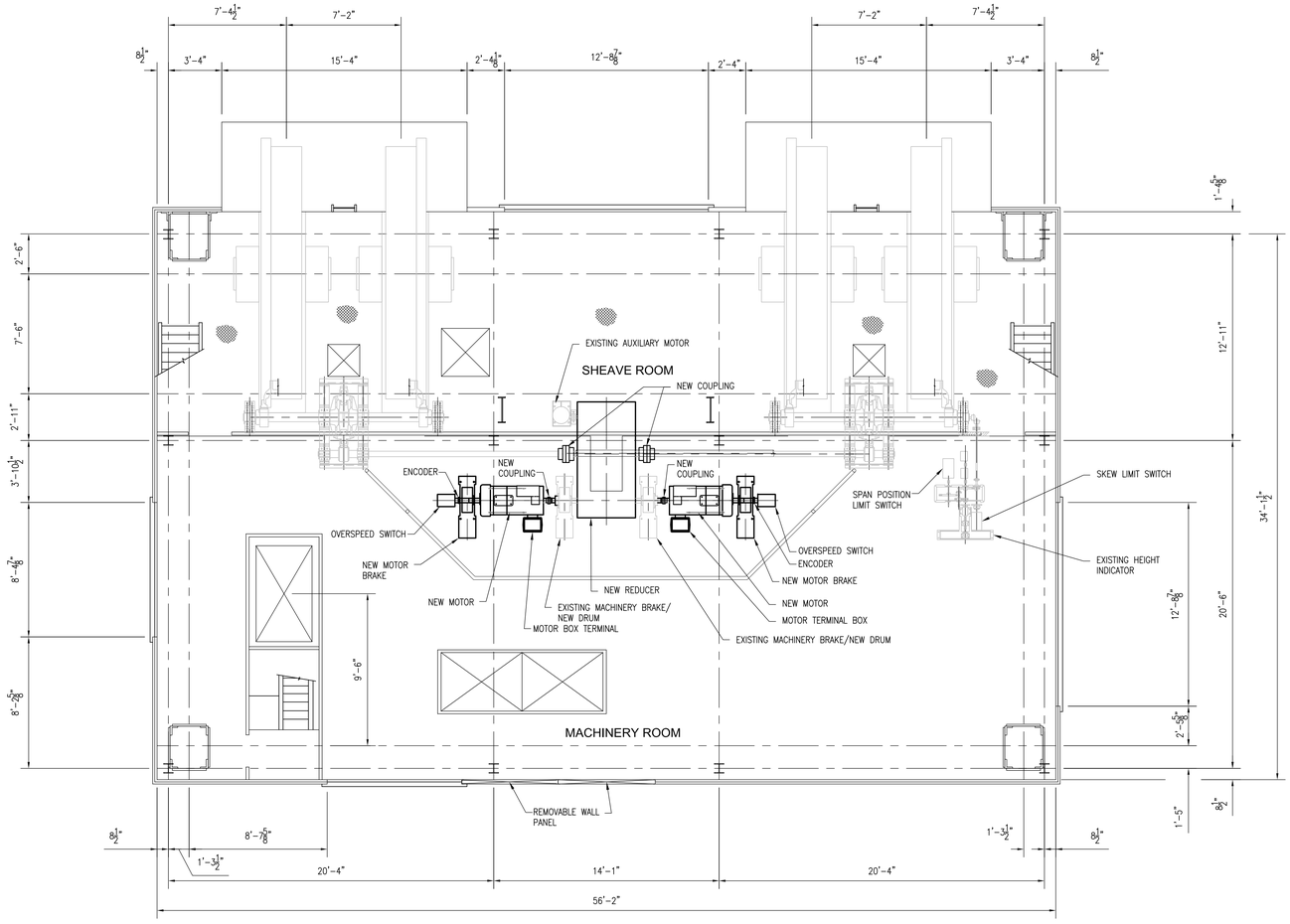

MAIN FLOOR PLAN - SOUTH

SOUTH MACHINE ROOM SHOWN
NORTH SIMILAR

2 1 0 4 8

SCALE 1/4" = 1'-0"

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drawing title / titre du dessin
REPLACEMENT OF CONTROLS, DRIVES AND OVERHEAD CABLES

MECHANICAL PLAN/ GENERAL NOTES

drawn by / dessine par: J. PEREZ
designed by / conc par: M. ELZA
approved by / approuve par: M. VANDEREE
tender / soumission: TENDER
project manager / administrateur de projets:
project date / date du projet: 2012/10/08
project no. / no. du projet: R.012641.001
drawing no. / dessine no.: H1

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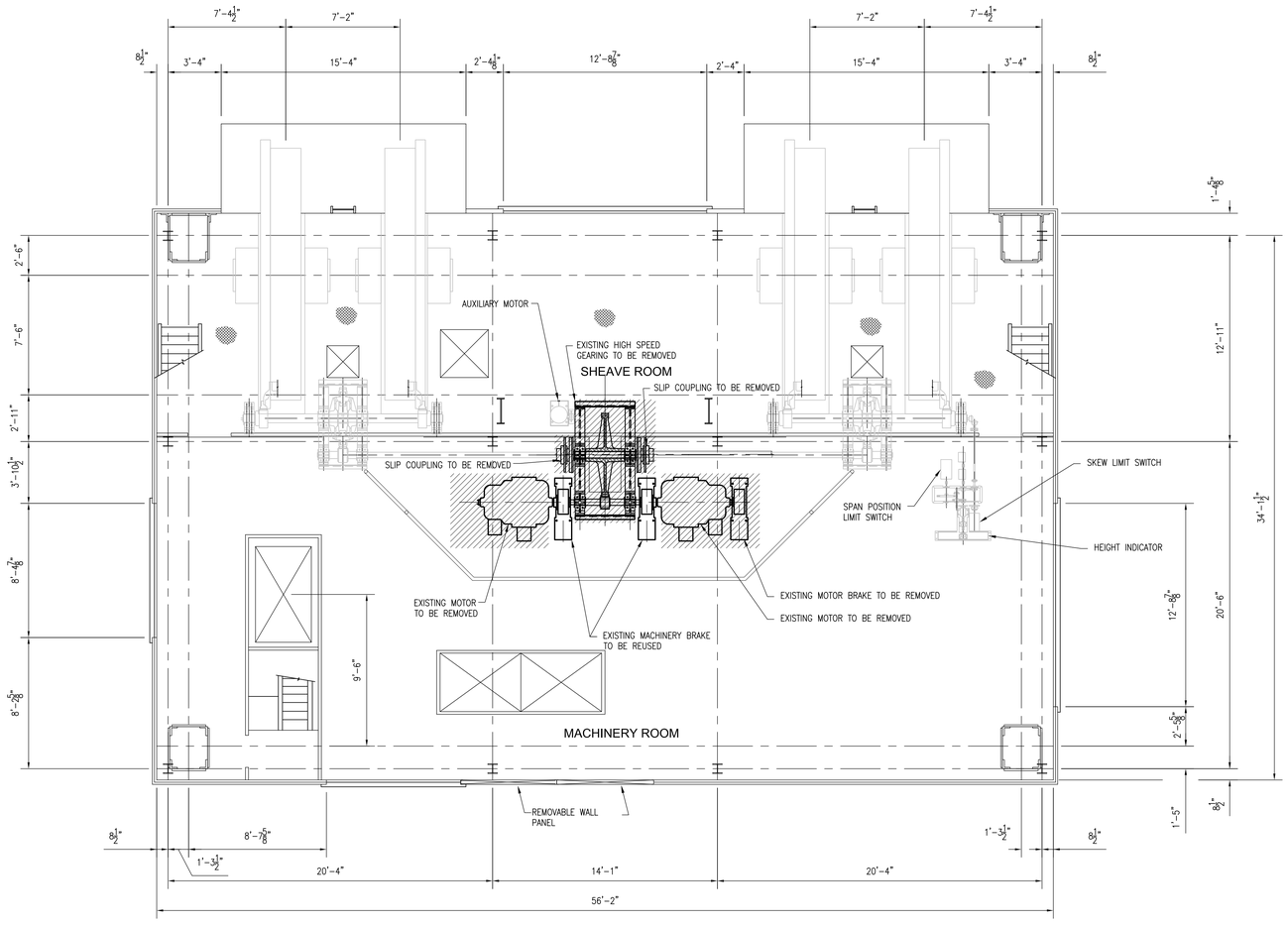

MAIN FLOOR PLAN - SOUTH

SOUTH MACHINERY ROOM SHOWN
NORTH SIMILAR

2 1 0 4 8

SCALE 1/4" = 1'-0"

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Ontario Region

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VERTICAL LIFT BRIDGE

drawing title / titre du dessin
REPLACEMENT OF CONTROLS, DRIVES AND OVERHEAD CABLES

MECHANICAL DEMOLITION PLAN
MACHINERY ROOMS

drawn by / dessine par: J. PEREZ
designed by / conc par: M. ELZA
approved by / approuve par: M. VANDEREE
tender / soumission: TENDER
project manager / administrateur de projets:
project date / date du projet: 2012/10/08
project no. / no. du projet: R.012641.001
drawing no. / dessine no.: H6

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APPENDIX B

RECORD OF PUBLIC PARTICIPATION DETERMINATION

Record of Public Participation Determination

Is there an indication that…	Describe potential indication and issues	Consider public participation?	
There is an existing or likely public interest in the type, location or potential effects of the project?		□ Yes	☒ No
There are members of the public with a history of being involved in past proposed projects in the area?		□ Yes	☒ No
The project has the potential to generate conflict between environmental and social or economic values of concern to the public?		☐ Yes	☒ No
The project may be <u>perceived</u> as having the potential for significant adverse environmental effects? [4]		☐ Yes	☒No
There is potential to learn from community ecological? knowledge or Aboriginal traditional knowledge?		□ Yes	☒ No
There is uncertainty about potential direct and indirect environmental effects or the significance of identified effects?		☐ Yes	☒ No
The project has been or will be subject to other public participation processes,		□ Yes	☒ No
There is any other reason why public participation is or is not appropriate?		□ Yes	☒ No

As a result of the scan above, is public participation under CEAA appropriate in the circumstances?

□ Yes ☒ No

Additional comments to support determination:

[4] *Environmental Effect as per the definition in CEAA (2012) is*

- *Changes to the environment to components of the environment that are within the legislative authority of Parliament (fish as defined by the Fisheries Act, aquatic species under the Species at Risk Act, and migratory birds as defined in the Migratory Birds Convention Act (1994)*
- *Changes to the environment that occur on federal lands, or inter-provincially or outside of Canada.*
- *The effect of any change on health and socio-economic condition, physical and cultural heritage, use of resources for traditional purposes and structures of historical significance are limited with respect to Aboriginal peoples.*

APPENDIX C
BACKGROUND DOCUMENTS

Peregrine Falcon Management Plan

Burlington Lift Bridge
Hamilton, Ontario

Environmental Services
Professional and Technical Programs
Ontario Region
Public Works and Government Services Canada
4900 Yonge Street
Toronto, Ontario
M2N 6A6

1.0 Introduction

Peregrine Falcons (*Falco peregrinus anatum*) have nested and bred on the Burlington Lift Bridge for over the past three years since 2003. The Falcons have consistently used the bridge as their territory and have bred on-site. Their presence however interferes with the ongoing operation (i.e. projects associated with ensuring the long term operation) as well as routine maintenance and repair activities at the bridge. This has raised health and safety concerns.

The bridge is owned and operated by Public Works and Government Services Canada (PWGSC). In consideration of the status of the Peregrine Falcon as a species at risk and the health and safety of PWGSC personnel, this management plan was developed to provide best management practices for PWGSC personnel to implement while conducting the above activities especially during the nesting period of the falcons. It also serves as a protocol to facilitate communication between PWGSC and the *Species-at-Risk Act (SARA)* authority Environment Canada-Canadian Wildlife Service (EC-CWS).

This is a live document and is subject to change. Changes in conditions or situations may arise at the bridge that will necessitate the need to modify best management practices and/or mitigation measures. These changes will occur after consultation with EC-CWS and other experts of the species. The contact is at Environmental Services - Ontario Region, Public Works and Government Services Canada (see *Contact Information* page 11) for more up-to-date information.

2.0 Legislative Protection

The Peregrine Falcon is listed as threatened under Schedule 1 of Canada's *Species at Risk Act (SARA)*, which came into force in 2003. SARA provides individual and habitat protection for listed wildlife species. Subsection 32 (1) makes it an offence to "kill, harm, harass, capture or take an individual of a wildlife species that is listed as an extirpated species, an endangered species or a threatened species. Subsection 32 (2) states that "no person shall possess, collect, buy, sell or trade an individual of a wildlife species that is listed". Section 33 makes it an offence to "damage or destroy the residence of one or more individuals of a wildlife species that is listed as an endangered species or a threatened species".

It is designated as "threatened" by the Ontario Ministry of Natural Resources (OMNR) under the *Endangered Species Act*, which protects the species from killing, collecting, harassment and destruction of habitat. Its designation is the same as that given by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC), in which Ontario is an active participant.

3.0 Bridge History and Operations

The Burlington Canal Lift Bridge is located on the western shore of Lake Ontario on a site rich in history. The bridge spans the Burlington Canal that was opened in 1826. Once a narrow cut, the canal now provides Burlington Bay (Hamilton Harbour) with

navigable access to the Atlantic Ocean. The canal connected the Hamilton Harbour industrial region to international trade and commerce. It was among a series of waterway projects begun 200 years ago to provide navigation from Lake Erie to the Atlantic Ocean. Today the Burlington Canal remains a busy waterway and is vital to the area commerce.

There were five different moveable bridges located on this site since 1830. The present bridge was opened in 1962 and carried two lanes of vehicular traffic across the canal. This structure originally had tracks for the Hamilton - Northwestern railway which was removed in 1982 when the road way was widened to four lanes.

The Burlington Lift Bridge is located at 1157 Beach Blvd. (at the intersection of Eastport Drive/Provincial Highway 20) in Hamilton, Ontario. The property itself consists of two parcels of land on either side of the Burlington Canal. The bridge structure consists of two towers and moveable bridge. The lift span is 380 feet long, weighs 2200 tons and has a vertical lift of 110 feet. Both towers contain machinery, sheaves and wire ropes that are used to move the lift span. There is one 150 horsepower drive motor in each tower to supply power to the machinery and one 150 horsepower motor in each tower to synchronize the drive motors.

The bridge spans across the water and lifts by way of the above motors and counterweights to allow large ships and pleasure marine craft to pass underneath. The bridge lifts on-demand for all large vessels and on the hour and half-hour for pleasure craft. To ensure safety for large shipping vessels, the bridge must be raised early (at least 15 minutes before the arrival of a ship) to allow for ample warning time for the vessel to turn in the event of a bridge failure. A fully loaded vessel may take in excess of a mile to stop. All marine traffic to and from Hamilton Harbour must pass under the bridge.

The navigation season usually runs from late March to late December. During the winter shut down the bridge staff overhauls the tower drive gear.

Since its construction, the bridge has been operated in excess of 180,000 times, allowing the passage of over 280,000 vessels. On a yearly basis, the bridge operates approximately 4000 times allowing approximately 6500 vessels to pass through the canal; this includes more than 1000 cargo-carrying vessels.

The bridge also provides for 4-lane vehicular traffic flow along Eastport Drive/Beach Blvd. as an alternative to the Burlington Skyway/Queen Elizabeth Way (QEW) located approximately 140 metres to the southwest.

4.0 Peregrine Falcon Biology and History

The Peregrine Falcon is a fast-flying, crow-sized raptor. It has long pointed wings, a long narrow tail and flies with quick powerful wing-beats. The species has a distinctive facial pattern with a dark "helmet" or "sideburns". Adults are dark slate-gray on the back, with a light-coloured barred breast. Younger birds are brown, with a streaked breast. The species usually breeds between the months of March and

August. Peregrine Falcons typically nest on high, steep cliffs overlooking large bodies of water. Some individuals have established territories in urban centres and nest on tall office buildings which mimic cliff faces, a natural nesting habitat.

Peregrines Falcons eat birds almost exclusively, although fledglings are often observed chasing after and catching large flying insects such as dragonflies. Dozens of species of birds have been recorded as prey, ranging in size from chickadees and goldfinches to pigeons, ducks, and gulls. While on migration, falcons primarily hunt shorebirds. Studies on a few individuals from Canada and Greenland have suggested that the birds spend roughly one month flying south, and another month coming back north in the spring. On average, they leave their breeding grounds in September and return in March. Many of the urban falcons in eastern North America have now chosen to not migrate at all anymore - they remain in their breeding territory all year long due to year-round food source such as rock doves (pigeons). Falcons have been observed at the Burlington Bridge year round. This suggests that the falcons at the bridge do not migrate. However, different individuals/pairs have nested there over the past six years.

Peregrine Falcons usually mate for life, but will accept a new partner if their mate dies. A pair may separate for the winter during migration. Pairs that remain at a site throughout the year generally maintain their bond. Most falcons engage in courtship rituals every spring. Once a pair has commenced courtship, a nest site is selected. The male shows several potential nest sites to the female who then decides which one of these she prefers. A pair will often re-use the same nest site.

Peregrines Falcons are native to a wide variety of open habitats, including wetlands, alpine meadows, and tundra. In all cases, falcons choose a nesting site which is isolated and in a protected location and is in proximity to desirable hunting grounds. Typically a cliff or rocky outcrop is selected for a nest site. Their preference is a ledge 15 to 60 metres above ground, with a southerly exposure and a protective overhang above. Nests consist of a shallow depression scraped out by the adults and no nest materials are added.

Incubation usually lasts 33 to 35 days from the date the last egg is laid (or the second last, if that is when incubation began). Peregrine chicks grow rapidly. By the time they are six weeks old they are already adult size, and are starting to fly. As the chicks develop, the parents allow them to become increasingly independent, and each week the appearance and behaviour of the chicks changes noticeably. There is a great deal of variation in the time at which Peregrine chicks leave the nest for their first flight (fledge). On rare occasions they take off as early as 33 days after hatching, while others linger for over 50 days. The majority, however, leave 45 days after hatching. Females generally stay in the nest longer, because they are heavier and need a longer period to develop and strengthen the flight muscles needed to carry them safely.

Females continue to lay eggs annually until they die. The only time that a female would lay more than one clutch of eggs in a year is if the first clutch are lost or damaged before hatching or if the chicks die within their first few days. Re-nesting following loss of the first clutch is common.

Peregrine Falcons have recently begun to live in cities on an increasingly regular basis, using skyscrapers and high bridges as nesting sites. The majority of falcons that have settled in eastern North America in recent years have chosen urban centres. Among the cities which have had nesting falcons are Toronto, Mississauga, Hamilton, London, Ottawa, Winnipeg, Detroit, Cleveland, Columbus, Buffalo, Rochester, New York, Boston, and Pittsburgh.

4.1 Peregrine Falcon History at the Burlington Lift Bridge

Peregrine Falcons have nested on the south-facing ledge on the north tower of the bridge since 2003. This sheltered ledge high on the bridge tower is much like a towering cliff and the substrate in the ledge consists of loose gravel; typical characteristics of their natural breeding habitat.

Turnover of mating pairs often occur at the bridge. Often falcons will clash with each other in competitive territorial disputes resulting in one of the pairs to relinquish control and the other pair to gain occupation of the bridge. Whatever the outcome of these yearly disputes, a mating pair is always present at the bridge.

In 2005, a nesting box was installed on the south tower but was not used by the falcons. It was subsequently dismantled and removed. Nesting boxes provide added security for the falcons by preventing the eggs from rolling off the ledge. A nesting box also shields birds from the elements and from predators. At other nesting sites, peregrine falcons have been quick to accept the nest box when it is offered. As well, the nesting box enables the eggs/chicks to be located clear of any maintenance and/or repair activities as well as any moving equipment.

Figure 1: South side of north tower. Nest site is usually on ledge (just above brown counterweight).

In 2004, eggs were laid at the bridge ledge but did not hatch. A chick was successfully hatched in the spring of 2005, but died about three weeks after hatching. In April 2006, four eggs were laid but none hatched.

in the spring of 2007, a nest box was installed at the window of the north tower, but it was not used by the falcons during that season. In May 2008, four eggs were successfully hatched in the new nest box. Of the four chicks two fledged successfully while two disappeared. During the 2009 season, three chicks were hatched, again in the new nest box, one subsequently succumbed to disease, another disappeared before fully fledging and the third successfully fledged. During the 2010 and 2011 seasons, two chicks were hatched in the nest box in both years. All four dispersed from the nest site. In 2012, three male chicks were hatched in the nest box.

During non-breeding seasons, the falcons would continue to occupy the bridge regarding it as their territory and hunt, yet they typically do not display aggressive defensive behaviour towards bridge staff.

The raising and lowering of the bridge does not appear to disturb the falcons. If bridge personnel appear on any part of the structure during breeding season, the birds will exhibit defensive territorial behaviour. This occurs even when personnel are working on the south tower (the nest is on the north tower). Falcons at other urban nest sites have been known to become more defensive as the years progress. The defensive behaviours tend to escalate the more years that they are present at a particular nest site.

Table 1: Peregrine Falcon Breeding Timelines at the Burlington Lift Bridge

Breeding Activity	Timeline
Nesting season (includes mating and nest site selection)	Late February/Early March – end of July *
Scrape on north tower (nest formation), or utilization of nest box and laying of eggs	End of March to early April (April 7, 2004; between late March/early April 2005; March 20, 2006)
Hatching of eggs (approx 33 – 35 days)	Mid May (was anticipated May 13, 2004 (failed)) -May 14, 2005 (successful), -May 19, 2006 (failed) -Mid-May 2008 (four successful hatches) -Mid-May 2009 (three successful hatches)
Fledging/Eyases in nest (approx 6 weeks)	End of May to Mid June (banding early June)
Fledgling Period (approx 40-45 days)	38-45 days
Dependent on Adults, start hunting independently (9-12 weeks)	Late July to mid August
Young birds disperse from nest area	Mid August to early September
No breeding occurs. Adults remain at the bridge, staking it as a territory, hunting yet not disturbing bridge staff.	September to February (fall and early winter months).

* During mild winters, mating/breeding behaviour commences late February.

4.2 Conservation

Since the Second World War, Peregrine Falcon populations worldwide suffered drastic reduction in numbers due to illegal trade (most popular with falconers) and primarily exposure to Dichloro-Diphenyl-Trichloroethane (DDT), a synthetic pesticide that affected the eggs of nesting falcons. DDT caused the thinning of the egg shells resulting in egg failures. The connection between the use of DDT and the declining numbers was not apparent until the 1960s. Since then efforts have been made to increase the numbers by reducing the use of DDT and other agricultural pesticides, and clamping down on illegal trade. Most recently, falcons have been allowed to nest on ledges of artificial structures such as office buildings and bridges.

Populations have recovered to the point that it has been removed from the list of species in regulation under Ontario's Endangered Species Act (ESA). Its status has been down-listed from endangered to threatened. The species will continue to be protected as a *Specially Protected Raptor* under the *Fish and Wildlife Conservation Act*. This act protects it from hunting and trapping and also protects nests and eggs. Habitat management guidelines are available to protect peregrine falcon nest sites in the vicinity of forest management operations.

5.0 Bridge Maintenance and Repair

Bridge maintenance and repair projects are required on an ongoing basis throughout the year to ensure its safe operation. Projects that were conducted in the past and/or are planned in the near future range from installation of a back up electrical motor to replacement of cables and repainting of the entire bridge structure including both towers and the lift span. Depending upon the activities, these may disturb the falcons when conducted during their nesting period (early March to mid-August). Potential disturbances include noise to close human proximity to the falcons' nest such as certain repair or maintenance activities.

In addition, routine activities (i.e. inspection and maintenance) are required to continue over the lifetime of the bridge on an annual and/or monthly basis. As well, unexpected emergencies such as mechanical and/or electrical breakdown may require repairs to be performed during the nesting period. Such activities may result in close human-to-falcon proximity or contact. Essential maintenance, inspection and repairs must be undertaken to ensure the safe and smooth operation of the bridge as it facilitates navigation to/from a major port.

Human to falcon proximity during the nesting season has resulted in aggressive behaviour exhibited by the falcons which swoop/dive very close to maintenance personnel. Talons are often extended during this tactic. This behaviour is likely a defensive reaction by the falcons to ward off potential predators from its nest. As a result, personnel are in danger of falling off the bridge in their efforts to avoid the aggressive behaviour (however fall arrest safety systems are in place at the bridge and staff is not in danger of falling from the structure if safety systems are properly used). Falcons may inflict personal injury such as gashes, or scrapes inflicted by the talons and/or beaks.

6.0 Proposed Nest Relocation/Manipulation and Falcon Best Management Practices

In consultation with Environment Canada (EC) and the Ontario Ministry of Natural Resources (MNR) in 2007, an approach to address this issue was developed and agreed to amongst these two departments and PWGSC. It included a listing of best management practices and mitigation measures to be implemented on an ongoing basis.

6.1 Nest Relocation Initiative undertaken prior to 2007 Nesting Season

In circumstances where routine or emergency maintenance and repair activities result in human-to-falcon close proximity or contact, other management alternatives were considered such as the relocation of the nesting site to another section of the bridge facility where there will be minimal potential of human-falcon proximity or contact. The primary aim of the nest relocation initiative was to prevent the falcons from nesting on a particular section of the bridge and encourage them to nest on another part that was predetermined to afford minimal disturbance from ongoing operation, repair and maintenance activities particularly those that cannot be avoided during the nesting season.

The following measures were undertaken as of April 1, 2007:

- A nesting box was installed before breeding season at the north tower window (this box is different than the one installed on the south tower in 2005). This window is located in close proximity to the falcon's "historical" nesting location, but at a higher elevation. The nest box faces south towards the south tower.
- It was recommended that bridge personnel who regularly work on the bridge appear on the structure as frequently as possible to enable the falcons to recognize them. Sensing a lack of threat may curtail defensive attacks on the personnel during breeding season.

The goal was to have the falcons select the nesting box as their new and permanent nesting site. It was anticipated that if the new nest box was chosen, the ledge where the previous nesting site was located could be "decommissioned" (physical barriers placed to prevent nesting). During 2008 and subsequent years, the falcons did use the nest box and successfully hatched chicks.

6.2 Nest Relocation

Nest relocation may be required and conducted if the falcons do not successfully nest in the new location but nest in another operationally inappropriate site, and/or a situation arises where bridge operations may endanger the safety of the birds. *However this is a measure that will be considered only as a last possible resort.*

Once the eggs have been laid or the chicks have hatched, no relocation can be conducted. Under no circumstances can live eggs be relocated as this may result in abandonment by the adults. Chicks cannot be moved until at least twelve (12) days after hatching. Any possible relocation may occur after the 12 day period has passed and can only occur under the discretion of an MNR biologist that has the training and experience in relocating falcons. If relocation is deemed necessary, it will be done only after careful consideration of the life cycle stage and circumstances of the nest site. Otherwise, from the time eggs are laid to the time fledglings leave the nest (approximately 80 days in total), there cannot be any relocation. If relocation were to occur, the chicks will be moved to the nest box.

Since the historical nest and nest box site are not in locations accessible to the public and are at a significant height on the operating bridge, the biologist must have all appropriate Health and Safety training as required by PWGSC.

PWGSC will coordinate with EC and/or MNR to obtain a SARA permit that allows PWGSC staff to work in close proximity to the birds in the event that routine and/or emergency maintenance is required. On an on-going basis, PWGSC will consult EC and/or MNR for advice on working in close proximity to the birds and how to avoid or deal with defensive measures employed by the adults.

In summary, nest relocation will only be implemented if the following conditions are met:

- Capture and relocation of live chicks is anticipated by EC and/or MNR.
- Bridge activities that could result in compromising the safety of the birds cannot be avoided.
- Monitoring confirms the exact nest location and nesting chronology within one-day accuracy.
- PWGSC has coordinated with EC and/or MNR and obtained a SARA permit.
- Any biologist who handles a peregrine falcon has current appropriate EC and/or MNR approvals/accreditation and has prior experience at this or other peregrine falcon nest sites.
- Personnel must have appropriate Health and Safety Training as determined by PWGSC.

6.3 Peregrine Falcon Best Management Practices/Mitigation Measures

The following ongoing falcon best management practices/mitigation measures will be implemented on an ongoing basis as required.

1. When feasible, bridge work (maintenance and/or repair) will be planned to occur outside of the nesting season, as applicable.

2. When feasible, avoid activities within the vicinity of the nest area that may adversely disturb the falcons.

3. If an activity has the potential to adversely impact nesting falcons and cannot be avoided during the nesting season, PWGSC will contact EC prior to conducting work (or as soon as possible for emergency work). PWGSC will coordinate with EC, MNR and/or experts to evaluate potential impacts and provide additional management recommendations for implementation.

4. PWGSC will inform appropriate operations, maintenance and construction personnel of the location of the nest and buffer zones prior to commencement of any work during the nesting season.

5. If avoidance during the nesting season is not possible, PWGSC will coordinate with EC to minimize disturbance, capture, etc., determine if a SARA Permit is

warranted, and possibly implement with the assistance of EC and/or MNR one or more nest management alternatives described above.

6. If avoidance is not possible, minimize the duration of time spent on work activities that must be conducted in the vicinity of the nest site during the nesting season.

7. If avoidance is not possible, maximize the number of separate activities within one short time period (i.e., within the same week) in the vicinity of the peregrine falcon nest during the nesting season. This will enable the falcons to recognize "regular" bridge personnel and hopefully curtail defensive attacks.

8. If PWGSC receives information that the historic nest site is not occupied by breeding peregrines, and no new nest site is occupied on the structure, then maintenance and construction activities will be considered to have no effect and may proceed with no restrictions that year.

9. If PWGSC receives information that an active nest site fails and is abandoned then maintenance and construction activities from that point forward will be considered to have no effect and may proceed with no restrictions for the remainder of the year (until a new nest is established).

10. No disturbance in the vicinity of the known nest site will occur regardless of the time of year, without prior coordination with EC and/or MNR, except during an emergency.

11. PWGSC will not permit third-party activities during the nesting season on the bridge without assessment for potential impacts and addition of specific avoidance measures in the permit if applicable.

The following types of maintenance or construction activities[1] are expected to have *no effect* on nesting peregrine falcons and may be conducted on the structure at any time of the year without any restrictions. Effects of other activities need to be evaluated on a case-by-case basis.

- Drift/debris removal from the canal.
- Inspections at or near ground level (except with helicopter).
- Minor culvert maintenance.
- Minor structural or road surface repairs (on the roadway or shoulder or bridge deck, without snooper cranes).
- Lawn management (no tree cutting).
- Sign replacement, repairs, and cleaning.
- Snow and ice removal and sanding.
- Special events, pedestrian (e.g., bridge pedal, foot races, walkathons, etc.).
- Sweeping of pavement at ground level (not including roof-tops).

[1] Only pertains to maintenance activities that occur on the level of the roadway or bridge traffic deck (not over the sides, underneath, or above the level of the rails of the deck). It also includes only minor repairs to the roadway, road shoulder, sidewalk, bridge traffic deck, or rails that do not involve equipment that is louder than ambient noise levels (i.e., impact pile drivers, jackhammers, pneumatic wrenches, etc.) or do not involve large construction vehicles (i.e., tractors, backhoes, graders, scrapers, pavers, concrete mixers, etc.). Any work that includes use of a helicopter, lift crane, or snooper crane is not included.

- Work outside of the nesting season that does not alter a known nest ledge (other than enhancements).

Contact Information

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References

Oregon Peregrine Falcon Management Plan 2002-2007(abbrev.), Environmental Services, Oregon Department of Transportation, 2000.

The Canadian Peregrine Falcon Website. http://www.peregrine-foundation.ca/fullmenu.html

PWGSC, Info. Centre, Fact Sheets, Burlington Canal Lift Bridge. http://www.pwgsc.gc.ca/text/factsheets/burlingtoncanal-e.html

Personal communication. Clare Lamont, Bridge Master, Burlington Lift Bridge.

Personal communication. Mark Nash, Director, Canadian Peregrine Foundation.

Appendix A

Table 2: Planned Activities and Projects at the Burlington Lift Bridge (shaded indicates completed).

Planned Projects	Project Dates	Proposed Falcon Mitigation Measures	Anticipated CEAA Status
Construction of Waterfront Trail on either side of the bridge (final construction being done on the City of Burlington side)	Completed summer 2006	Not applicable – ground level construction.	EA Screening was prepared.
Soil Capping between maintenance garage and light keepers house on south side delayed from remainder of project (completed in 2005) for potential historical/artefacts in the local area.	Completed in 2006	Not near north tower nesting site and not during nesting season. No large equipment being used.	EA Screening was prepared
Replace sidewalk on the Bridge Concrete/metal deck cantilevered off the metal bridge span. Approximately 8 metres above water. Potential concrete and metal debris.	Completed winter 2007	Conduct early January to early March when bridge is closed for navigation (winter shutdown). Outside bird breeding, nesting, fledging periods.	EA Screening was prepared.
Paint existing towers and span (metal structure) and removal of siding from Control Tower. Lead paint and asbestos – controlled removal. Potential lead and asbestos debris. Removal of bird droppings and modification of trays and drain holes to girders	Three-year project. On hold.	Conduct early January to early March when bridge is closed for navigation (winter shutdown). Outside bird breeding, nesting, fledging periods.	EA Screening was prepared.
Replace roadway approaches (between pavement and bridge structure)	Future date not specified.	Not applicable - not near nesting site (at ground level).	EA Screening Undertake in accordance with falcon best management practices/mitigation measures. Additional advice from EC and MNR.
Upgrade Control and Drives: Replace all electrical components (including cables as necessary)	Fiscal Years 2010 – 2013	Conduct early January to early March when bridge is closed for	EA Screening Undertake in

Planned Projects	Project Dates	Proposed Falcon Mitigation Measures	Anticipated CEAA Status
and control hardware to the two towers and span. Most work inside towers and control building.		navigation (winter shutdown). This is outside the falcon breeding, nesting, and fledging periods.	accordance with falcon best management practices/mitigation measures. Additional advice to be sought from EC and MNR.
Replace Overhead Power Control Cables	On-hold.	Conduct replacement from mid-August to early March, which is outside of falcon breeding, nesting, and fledging periods.	EA Screening Undertake in accordance with falcon best management practices/mitigation measures. Additional advice to be sought from EC and MNR.
Replace Corrugated Asbestos-containing Cladding on Control Building and machine rooms at the top of both towers.	Control Building completed 2008/2009; towers completed 2009/2010.	Conduct replacement from mid-August to early March, which is outside of falcon breeding, nesting, and fledging periods.	EA Screening was prepared. Undertake in accordance with falcon best management practices/mitigation measures. Additional advice to be sought from EC and MNR.
Various Inspections - Annual inspection of cables; involves personnel standing on bridge span as it is lifted. - Elevator Safety inspection as per Code. Hatchway in the roof of the tower must be accessed	Annual – year round if required Monthly Twice weekly	In close proximity to nest site. Undertake in accordance with falcon best management practices/mitigation measures. Conduct outside bird breeding, nesting, fledging periods as applicable. However, cables may require inspection during the above periods. In close proximity to nest site. Undertake in accordance with falcon best management practices/mitigation measures. *Not possible to conduct outside bird*	Not a project as defined by CEAA – no EA required.

Planned Projects	Project Dates	Proposed Falcon Mitigation Measures	Anticipated CEAA Status
- Maintenance/inspections of equipment in tower motor rooms and sheave rooms		*breeding, nesting, fledging periods.*	
Cable Kellum Grips maintenance repairs (on overhead cables). Work will be conducted outside of the south tower and involve replacement of the cable grips. The grips hold the cables to the tower.	Completed Fall 2006	Undertake in accordance with falcon best management practices/mitigation measures. Conduct outside falcon breeding, nesting, fledging periods.	Excluded - maintenance or repair of existing physical work – no EA required.
Various small electrical maintenance projects: - Diesel Generator Maintenance - Junction Boxes - Transfer Switch Replacement - Panel alarm upgrade - Camera Security Upgrade - Installation of grounding wire in one tower.	Ongoing	Undertake in accordance with falcon best management practices/mitigation measures. Conduct outside falcon breeding, nesting, fledging periods.	Excluded - maintenance or repair of physical work – no EA required.
Various small structural maintenance projects: - Removal of bird droppings, modification to drains and cable trays. In close proximity to birds during nesting. - Drain Holes to Girders (Removal of bird droppings and modification of trays and drain holes to girders have been moved to the painting project) - Deck Repairs - Drain Inspection	Completed 2008	Undertake in accordance with falcon best management practices/mitigation measures. Conduct outside falcon breeding, nesting, fledging periods.	Excluded maintenance or repair of existing physical work – no EA required.
Ongoing routine maintenance: examples (does not include all maintenance items); - Inspect upper buffers (at nesting level) - Lube main counterweight guides (once every 6 weeks	Year round; ongoing.	Undertake in accordance with falcon best management practices/mitigation measures. *Not possible to conduct outside falcon breeding,*	Excluded - maintenance or repair of existing physical work – no EA required.

Planned Projects	Project Dates	Proposed Falcon Mitigation Measures	Anticipated CEAA Status
- at nesting level) - Inspect hitches/aux. counterweight. sheave (once a month – ½ way up the north tower) - Change lights (all over) - Inspect weather station top of South tower (opposite nest) - Lube auxiliary counterweight wires once every 6 wks (both towers) - Power washing (once per year in fall)		*nesting, fledging periods as applicable.*	
Emergencies: examples; - Mechanical and electrical breakdowns may occur at any time of the year requiring access to all areas of the bridge (towers and span).	Year round.	In close proximity to nest site. Undertake in accordance with falcon best management practices/mitigation measures. *Not possible to conduct outside falcon breeding, nesting, fledging periods.*	Excluded - maintenance or repair of existing physical work. (Section 7 (b) or (c) of the Act - no EA required.)

Appendix B

Table 3: History of Peregrine Falcon Activities at the Burlington Lift Bridge

Year: 2004		
Parents	***Chicks***	***Latest Sighting / Status of "Chicks"***
Surge (male); Female name unknown as she was not banded.	None of 3 eggs laid hatched. Eggs were laid on a ledge on the North Tower.	N/A
Year: 2005		
Surge and unknown female	One chick hatched but succumbed three weeks after hatching.	N/A
Year: 2006		
Surge and unknown female	None of 4 eggs laid hatched.	N/A
Year: 2007		
Nest box constructed and installed in south facing window of North Tower.		
Dundas and unknown female	None of 3 eggs laid hatched. These were laid on a ledge on the North Tower and not in the nest box.	N/A
Year: 2008 – Nest box used every breeding season from this year.		
Pittsburgh Pete (male) from Pittsburgh, Penn, USA and unknown female.	*Maitland* (male) *Parker* (male) *Nebesny* (female) *Nellie* (female)	Males disappeared shortly after first flights. Females dispersed at the normal stage of the lifecycle. *Nebesny* was sighted settling down just north of Detroit, Michigan, USA. Her mate is *Zeus* from Cleveland, Ohio, USA.
Year: 2009		
Cirrus (female) from Dayton, Ohio. *Sir Adam Beck* (male) from King Street, Toronto.	*Berl* (female) *Truss* (female) *Maple* (female)	*Berl* went missing shortly after her first flight. *Truss* dispersed from the bridge at the normal stage of their lifecycle. She was seen with a male as a mature bird at the Brampton Courthouse on 2011. She had her own chick *Courtney*. *Maple* died of infection of mouth, esophagus and crop (Trichomoniasis).
Year: 2010		
Cirrus (female) from Dayton, Ohio. *Sir Adam Beck* (male) from King Street, Toronto.	*Brant* (male) *Diana* (female)	Both chicks fledged and dispersed from the bridge at the normal stage of their lifecycle.
Year: 2011		
Cirrus (female) from Dayton, Ohio. *McKenzie* (male) from Sun Life Tower, Etobicoke.	*Lady Nelson* (female) *Lady Lamont* (female)	Both chicks fledged and dispersed from the bridge at the normal stage of their lifecycle.
Year: 2012		
Cirrus (female) from Dayton, Ohio. *McKenzie* (male) from Sun Life Tower, Etobicoke.	*Jimmy* (male) *Port Hope* (male) *Carrey* (male)	Jimmy disappeared before the fledge period was over. Port Hope was found deceased on the Burlington Skyway. Carrey dispersed successfully as expected in the lifecyle.

BRIDGE MAINTENANCE

Fisheries and Oceans Canada
Ontario Operational Statement

Version 3.0

Bridge maintenance is undertaken to extend the life of the structure and to ensure that it functions as designed, thus ensuring public safety. This Operational Statement applies only to: deck sweeping and washing to remove traction material (e.g., sand and salt residue), cleaning of all bridge components (substructure, superstructure and deck), the removal and application of protective coatings, deck wearing surface replacement, the removal of debris to protect piers and abutments, and structural repairs.

Bridge maintenance activities have the potential to negatively impact fish and fish habitat by introducing sand, sediments, deck surface materials such as concrete and asphalt, and other deleterious substances (e.g., salt, paint, solvents, oil and grease) into watercourses. Removal of woody debris and riparian vegetation may alter natural habitat features and flows that exist in the watercourse. Operation of machinery may impact habitat on the banks and bed, and result in erosion and sedimentation. Placement of rock to stabilize structures may alter natural habitat and flows, and block fish passage.

Fisheries and Oceans Canada (DFO) is responsible for protecting fish and fish habitat across Canada. Under the *Fisheries Act* no one may carry out a work or undertaking that will cause the harmful alteration, disruption or destruction (HADD) of fish habitat unless it has been authorized by DFO. By following the conditions and measures set out below you will be in compliance with subsection 35(1) of the *Fisheries Act.*

The purpose of this Operational Statement is to describe the conditions under which it is applicable to your project and the measures to incorporate into your project in order to avoid negative impacts to fish habitat. You may proceed with your bridge maintenance project without a DFO review when you meet the following conditions:

- the work does not include realigning the watercourse or replacing the existing bridge,
- the work does not involve new dredging, placing fill (e.g., filling scour pools) or excavating the bed or bank of the watercourse below the ordinary high water mark (HWM) (see definition below),
- explosives are not used to remove debris, including ice build-up,
- the withdrawal of any water will not result in reduction in the wetted width of a stream, and will not exceed 10% of the instantaneous flow, in order to maintain existing fish habitat, and
- you incorporate the *Measures to Protect Fish and Fish Habitat when Maintaining a Bridge* listed below in this Operational Statement.

If you cannot meet all of the conditions listed above and cannot incorporate all of the measures listed below then your project may result in a violation of subsection 35(1) of the *Fisheries Act* and you could be subject to enforcement action. In this case, you should contact your Conservation Authority, or the DFO office in your area (see Ontario DFO office list) or Parks Canada if the project is located within its jurisdiction, including the Trent-Severn Waterway and the Rideau Canal, if you wish to obtain an opinion on the possible options you should consider to avoid contravention of the *Fisheries Act*. For activities carried out under the *Crown Forest Sustainability Act*, the requirements of this Operational Statement are addressed through an existing agreement and the Ontario Ministry of Natural Resources is the first point of contact.

You are required to respect all municipal, provincial or federal legislation that applies to the work being carried out in relation to this Operational Statement. The activities undertaken in this Operational Statement must also comply with the *Species at Risk Act* (**www.sararegistry.gc.ca**). If you have questions regarding this Operational Statement, please contact one of the agencies listed above.

We ask that you notify DFO, preferably 10 working days before starting your work by filling out and sending the Ontario Operational Statement notification form (**www.dfo-mpo.gc.ca/regions/central/habitat/os-eo/prov-terr/index_e.htm**) to the DFO office in your area. This information is requested in order to evaluate the effectiveness of the work carried out in relation to this Operational Statement.

Measures to Protect Fish and Fish Habitat when Maintaining a Bridge

1. Deck Sweeping

1.1. Adequately seal drains and open joints before sweeping to prevent material from falling into the watercourse.

1.2. Clean and remove debris and sediment from drainage devices and dispose of the material in a way that will prevent it from entering the watercourse.

2. Deck Washing

2.1. Sweep decks, including curbs, sidewalks, medians and drainage devices to remove as much material as practical before washing.

2.2. Adequately seal drains and open joints before washing to prevent sediment-laden wash-water from entering the watercourse.

2.3. Direct wash-water past the ends of the bridge deck to a vegetated area to remove suspended solids, dissipate velocity and prevent sediment and other deleterious substances from entering the watercourse. If this cannot be achieved, use silt fences or other sediment and erosion control measures to prevent wash-water from entering the watercourse.

2.4. When extracting water from a watercourse, ensure the intakes of pumping hoses are equipped with an appropriate device to avoid entraining and impinging fish. Guidelines to determine the appropriate mesh size for intake screens may be obtained from DFO (*Freshwater Intake End-of-Pipe Fish Screen Guideline* (1995), available at **www.dfo-mpo.gc.ca/Library/223669.pdf**).

2.5. Where possible, avoid using small streams as a source for water.

3. Removal and Application of Protective Coatings

3.1. Remove paint or protective coatings in a manner that prevents any paints, paint flakes, primers, blasting abrasives, rust, solvents, degreasers or other waste material from entering the watercourse.

3.2. Use measures such as barges or shrouding to trap and prevent blasting abrasives, protective coatings, rust and grease from entering the watercourse.

3.3. Contain paint flakes, abrasives, and other waste materials for safe disposal.

3.4. Store, mix and transfer paints and solvents on land and not on the bridge to prevent these materials from entering the watercourse in the event of a spill.

3.5. Do not clean equipment in the watercourse or where the wash-water can enter the watercourse.

4. Removal of Debris (e.g., including woody debris, garbage and ice build-up)

4.1. Unless the debris accumulation is an immediate threat to the integrity of the piers and abutments, time debris removal to avoid disruption to sensitive fish life stages by adhering to appropriate fisheries timing windows (see the *Ontario In-Water Construction Timing Windows*), with the exception of ice build-up removal.

4.2. Limit the removal of material to that which is necessary to protect piers and abutments.

4.3. Remove debris by hand or with machinery operating from shore or a floating barge.

4.4. Emergency debris removal using hand tools or machinery (e.g., backhoe) can be carried out at any time of year. Emergencies include situations where carrying out the project immediately is in the interest of preventing damage to property or the environment, or is in the interest of public health or safety. Your local Conservation Authority, DFO, or Parks Canada office, as appropriate, is to be notified immediately. **You should follow all other measures to the greatest extent possible.**

4.5. A separate Operational Statement exists for the removal of beaver dams and associated debris, and it applies to dams that are not directly connected or immediately adjacent to the bridge structure.

5. Structural Repairs and Reinforcements

5.1. Use barges or shrouding to trap and prevent concrete and other bridge materials from entering the watercourse.

5.2. If replacement rock reinforcement/armouring is required to stabilize eroding areas around bridge structures (e.g., abutments and/or wing walls), the following measures should be incorporated:

5.2.1 Place appropriately-sized, clean rocks into the eroding area.

5.2.2 Do not obtain rocks from below the HWM of any water body.

5.2.3 Avoid the use of rock that is acid-generating. Also avoid the use of rock that fractures and breaks down quickly when exposed to the elements.

5.2.4 Install rock at a similar slope to maintain a uniform stream bank and natural stream alignment.

5.2.5 Ensure rock does not interfere with fish passage or constrict the channel width.

5.2.6 If any in-water work is involved, adhere to fisheries timing windows, as outlined in Measure 4.1 above.

6. If working from land, install effective sediment and erosion control measures before starting work to prevent the entry of sediment into the watercourse. Inspect them regularly during the course of construction and make all necessary repairs if any damage occurs.

7. While this Operational Statement does not cover the clearing of riparian vegetation, the removal of select plants may be required. This removal should be kept to a minimum and limited to the right-of-way of the bridge.

8. Operate machinery on land (from outside of the water) or on the water (i.e., from a barge or vessel) in a manner that minimizes disturbance to the banks or bed of the watercourse.

8.1. Machinery is to arrive on site in a clean condition and is to be maintained free of fluid leaks.

8.2. Wash, refuel and service machinery and store fuel and other materials for the machinery away from the water to prevent any deleterious substance from entering the water.

8.3. Keep an emergency spill kit on site in case of fluid leaks or spills from machinery.

8.4. Restore banks to original condition if any disturbance occurs.

9. Stabilize any waste materials removed from the work site to prevent them from entering the watercourse. This could include covering spoil piles with biodegradable mats or tarps or planting them with grass or shrubs.

10. Vegetate any disturbed areas by planting and seeding preferably with native trees, shrubs or grasses and cover such areas with mulch to prevent erosion and to help seeds germinate. If there is insufficient time remaining in the growing

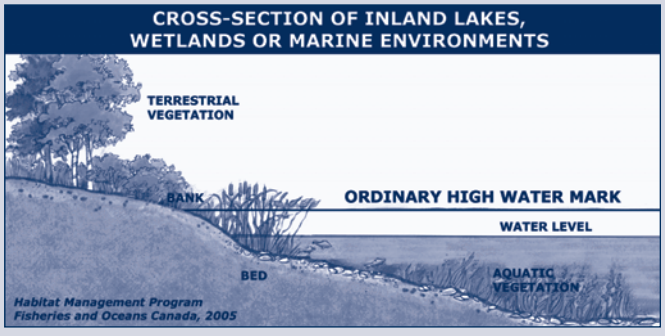
season, the site should be stabilized (e.g., cover exposed areas with erosion control blankets to keep the soil in place and prevent erosion) and vegetated the following spring.

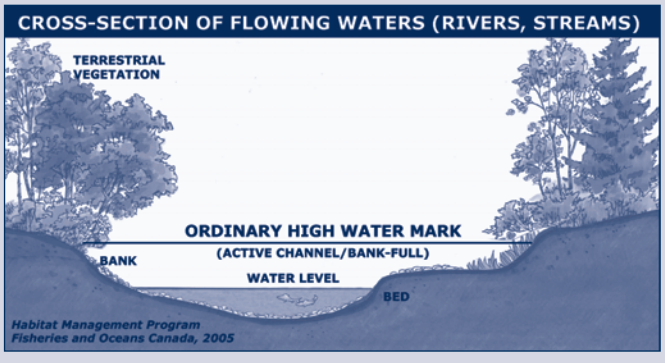
10.1. Maintain effective sediment and erosion control measures until re-vegetation of disturbed areas is achieved.

Definition:

Ordinary high water mark (HWM) – The usual or average level to which a body of water rises at its highest point and remains for sufficient time so as to change the characteristics of the land. In flowing waters (rivers, streams) this refers to the "active channel/bank-full level" which is often the 1:2 year flood flow return level. In inland lakes, wetlands or marine environments it refers to those parts of the water body bed and banks that are frequently flooded by water so as to leave a mark on the land and where the natural vegetation changes from predominately aquatic vegetation to terrestrial vegetation (excepting water tolerant species). For reservoirs this refers to normal high operating levels (Full Supply Level).

For the Great Lakes this refers to the 80th percentile elevation above chart datum as described in DFO's *Fish Habitat and Determining the High Water Mark on Lakes*.





FISHERIES AND OCEANS CANADA OFFICES IN ONTARIO

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Aussi disponible en français

http://www.dfo-mpo.gc.ca/oceans-habitat/habitat/modernizing-moderniser/epmp-pmpe/index_f.asp

DFO/2007-1329

APPENDIX D

MITIGATION MONITORING REPORT FORM

Burlington Lift Bridge – Controls, Drives and Overhead Cables Replacement
Burlington Lift Bridge, Ontario
PWGSC Project No. R.012641.002

The purpose of this record is to monitor the implementation of mitigation measures and best management practices identified in the Environmental Effects Evaluation. It is the responsibility of the Project Manager to ensure that this record is completed over the duration of the project. This environmental Mitigation Monitoring Report form must be completed in full. Specify in the table below whether the mitigation measures and best management practices set out in the environmental assessment have been applied. If a mitigation measure has not been applied, specify the reason(s) why this was not done.

Furthermore although some of the pertinent legislation, regulations, guidelines and policies are noted in the mitigation, the information is not considered necessarily complete. It is to be expected that new, amended, modified or otherwise updated legislation, regulations, guidelines and policies will come available over time. The contractor is responsible to ensure that all applicable legislation, regulations, guidelines and policies are adhered to.

Environmental Mitigation Measure	**Implementation Schedule/Date**	**Person/Title / Firm Responsible**	**Compliance (Task Complete – Yes or No/Date) If No, provide reason**
Vehicles/machinery to be in good repair, equipped with emission controls as applicable and operated within regulatory requirements. Vehicles and machinery should not be left idling while not in use. Ensure practices and procedures for lead paint removal adhere to the **Lead Management Plan (Pinchin, 2005**) and the Occupational Health and Safety Branch of the Ontario Ministry of Labour "Guideline: Lead on Construction Projects." Ensure practices and procedures for abatement removal adhere to the **Asbestos Management**			

Environmental Mitigation Measure	Implementation Schedule/Date	Person/Title / Firm Responsible	Compliance (Task Complete – Yes or No/Date) If No, provide reason
Plan and PWGSC's DP 057. Ensure practices and procedures for concrete removal or rehabilitation follow the Occupational Health and Safety Branch of the Ontario Ministry of Labour "Guideline: Silica on Construction Projects." Ensure that any guano removed is done accordance with procedures developed by PWGSC to minimize impacts to workings and the environment.			
All activities including maintenance procedures should be controlled to prevent the entry of petroleum products, lead paint chips, concrete, concrete wash water, guano, debris, rubble, or other deleterious substances into the water. Adhere to protection/mitigation measures specified in the DFO's Bridge Maintenance Operational Statement (attached in Appendix C).			
There shall be no deposit/release of deleterious substance (i.e., concrete, concrete wash water, lead, or construction debris) in the Burlington Canal. Any materials that are accidentally released to the Canal must be retrieved immediately by the contractor. All activities shall follow the mitigation and protection measures outlined in DFO's Bridge Maintenance Operational Statement, where			

Environmental Mitigation Measure	Implementation Schedule/Date	Person/Title / Firm Responsible	Compliance (Task Complete – Yes or No/Date) If No, provide reason
applicable to avoid any harmful alteration, disruption or destruction (HADD) of fish habitat. Submit Notification Form to DFO 10 days prior to starting work. Form available at: (http://www.dfo-mpo.ca/regions/central/habitat/os-eo/provinces-territories-territoires/on/os-eo20-eng.htm) No refuelling of equipment is permitted within 30 m of the Burlington Canal. All equipment and machinery will be in good working order while on site. Repairs or maintenance to equipment will not be conducted within 30 m of the Burlington Canal.			
All work is to be undertaken in compliance with Migratory Birds Convention Act and with local noise bylaws. If a migratory bird is found to be using the construction area or bridge structure for breeding or nesting, the contractor will halt work. Environment Canada must be contacted for further guidance prior to work commencing. Minimize the frequency of dust-generating construction activities during prolonged periods of dry weather.			
Should Peregrine Falcons and/or their nesting activities be present during the repainting works, measures (e.g. avoid work/activities during nesting season, protective equipment to be			

Environmental Mitigation Measure	Implementation Schedule/Date	Person/Title / Firm Responsible	Compliance (Task Complete – Yes or No/Date) If No, provide reason
worn by worker to avoid harm during defensive behaviour of Flacons) are to be implemented as per the "**Peregrine Falcon Management Plan**" developed in consultation with Environment Canada and Ministry of Natural Resources At the time of the project implementation an assessment will be made as to the presence of an active nest with eggs or fledglings. If present, modification to schedule at that time will be undertaken, if feasible, so that the repainting work occurs outside of the peregrine falcon nesting season, particularly for the North Tower (current and historic nesting site). If the repainting cannot be avoided during the nesting season (late February to July), and an active nests with eggs or fledglings are present, PWGSC will contact MNR and Environment Canada (EC) prior to construction to coordinate the evaluation of potential mitigation options (i.e., placement tarping/enclosure around the North Tower to isolate the work area from the nest site or nest relocation) and assessment of impacts and management recommendations for implementation. PWGSC will inform appropriate construction personnel of the location of the nest and buffer zones prior to commencement of any work (for example, during pre-construction meetings) during the nesting season. If the management directions in the Peregrine			

Environmental Mitigation Measure	Implementation Schedule/Date	Person/Title / Firm Responsible	Compliance (Task Complete – Yes or No/Date) If No, provide reason
Falcon Management Plan do not appear to be effective, the contractor will cease work and contact PWGSC who will seek advice from MNR and EC.			

NOTES: _____

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_____

_____

_____

_____

Environmental Assessment Mitigation Monitoring Report Form Completed By:

Name: _____ Title: _____

Company: _____ Phone No.: _____

Signature: _____ Date: _____

APPENDIX C

PEREGRINE FALCON

MANAGEMENT

PLAN

Peregrine Falcon Management Plan

Burlington Lift Bridge
Hamilton, Ontario

Environmental Services
Professional and Technical Programs
Ontario Region
Public Works and Government Services Canada
4900 Yonge Street
Toronto, Ontario
M2N 6A6

1.0 Introduction

Peregrine Falcons (*Falco peregrinus anatum*) have nested and bred on the Burlington Lift Bridge for over the past three years since 2003. The Falcons have consistently used the bridge as their territory and have bred on-site. Their presence however interferes with the ongoing operation (i.e. projects associated with ensuring the long term operation) as well as routine maintenance and repair activities at the bridge. This has raised health and safety concerns.

The bridge is owned and operated by Public Works and Government Services Canada (PWGSC). In consideration of the status of the Peregrine Falcon as a species at risk and the health and safety of PWGSC personnel, this management plan was developed to provide best management practices for PWGSC personnel to implement while conducting the above activities especially during the nesting period of the falcons. It also serves as a protocol to facilitate communication between PWGSC and the *Species-at-Risk Act (SARA)* authority Environment Canada-Canadian Wildlife Service (EC-CWS).

This is a live document and is subject to change. Changes in conditions or situations may arise at the bridge that will necessitate the need to modify best management practices and/or mitigation measures. These changes will occur after consultation with EC-CWS and other experts of the species. The contact is at Environmental Services - Ontario Region, Public Works and Government Services Canada (see *Contact Information* page 11) for more up-to-date information.

2.0 Legislative Protection

The Peregrine Falcon is listed as threatened under Schedule 1 of Canada's *Species at Risk Act (SARA)*, which came into force in 2003. SARA provides individual and habitat protection for listed wildlife species. Subsection 32 (1) makes it an offence to "kill, harm, harass, capture or take an individual of a wildlife species that is listed as an extirpated species, an endangered species or a threatened species. Subsection 32 (2) states that "no person shall possess, collect, buy, sell or trade an individual of a wildlife species that is listed". Section 33 makes it an offence to "damage or destroy the residence of one or more individuals of a wildlife species that is listed as an endangered species or a threatened species".

It is designated as "threatened" by the Ontario Ministry of Natural Resources (OMNR) under the *Endangered Species Act*, which protects the species from killing, collecting, harassment and destruction of habitat. Its designation is the same as that given by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC), in which Ontario is an active participant.

3.0 Bridge History and Operations

The Burlington Canal Lift Bridge is located on the western shore of Lake Ontario on a site rich in history. The bridge spans the Burlington Canal that was opened in 1826. Once a narrow cut, the canal now provides Burlington Bay (Hamilton Harbour) with

navigable access to the Atlantic Ocean. The canal connected the Hamilton Harbour industrial region to international trade and commerce. It was among a series of waterway projects begun 200 years ago to provide navigation from Lake Erie to the Atlantic Ocean. Today the Burlington Canal remains a busy waterway and is vital to the area commerce.

There were five different moveable bridges located on this site since 1830. The present bridge was opened in 1962 and carried two lanes of vehicular traffic across the canal. This structure originally had tracks for the Hamilton - Northwestern railway which was removed in 1982 when the road way was widened to four lanes.

The Burlington Lift Bridge is located at 1157 Beach Blvd. (at the intersection of Eastport Drive/Provincial Highway 20) in Hamilton, Ontario. The property itself consists of two parcels of land on either side of the Burlington Canal. The bridge structure consists of two towers and moveable bridge. The lift span is 380 feet long, weighs 2200 tons and has a vertical lift of 110 feet. Both towers contain machinery, sheaves and wire ropes that are used to move the lift span. There is one 150 horsepower drive motor in each tower to supply power to the machinery and one 150 horsepower motor in each tower to synchronize the drive motors.

The bridge spans across the water and lifts by way of the above motors and counterweights to allow large ships and pleasure marine craft to pass underneath. The bridge lifts on-demand for all large vessels and on the hour and half-hour for pleasure craft. To ensure safety for large shipping vessels, the bridge must be raised early (at least 15 minutes before the arrival of a ship) to allow for ample warning time for the vessel to turn in the event of a bridge failure. A fully loaded vessel may take in excess of a mile to stop. All marine traffic to and from Hamilton Harbour must pass under the bridge.

The navigation season usually runs from late March to late December. During the winter shut down the bridge staff overhauls the tower drive gear.

Since its construction, the bridge has been operated in excess of 180,000 times, allowing the passage of over 280,000 vessels. On a yearly basis, the bridge operates approximately 4000 times allowing approximately 6500 vessels to pass through the canal; this includes more than 1000 cargo-carrying vessels.

The bridge also provides for 4-lane vehicular traffic flow along Eastport Drive/Beach Blvd. as an alternative to the Burlington Skyway/Queen Elizabeth Way (QEW) located approximately 140 metres to the southwest.

4.0 Peregrine Falcon Biology and History

The Peregrine Falcon is a fast-flying, crow-sized raptor. It has long pointed wings, a long narrow tail and flies with quick powerful wing-beats. The species has a distinctive facial pattern with a dark "helmet" or "sideburns". Adults are dark slate-gray on the back, with a light-coloured barred breast. Younger birds are brown, with a streaked breast. The species usually breeds between the months of March and

August. Peregrine Falcons typically nest on high, steep cliffs overlooking large bodies of water. Some individuals have established territories in urban centres and nest on tall office buildings which mimic cliff faces, a natural nesting habitat.

Peregrines Falcons eat birds almost exclusively, although fledglings are often observed chasing after and catching large flying insects such as dragonflies. Dozens of species of birds have been recorded as prey, ranging in size from chickadees and goldfinches to pigeons, ducks, and gulls. While on migration, falcons primarily hunt shorebirds. Studies on a few individuals from Canada and Greenland have suggested that the birds spend roughly one month flying south, and another month coming back north in the spring. On average, they leave their breeding grounds in September and return in March. Many of the urban falcons in eastern North America have now chosen to not migrate at all anymore - they remain in their breeding territory all year long due to year-round food source such as rock doves (pigeons). Falcons have been observed at the Burlington Bridge year round. This suggests that the falcons at the bridge do not migrate. However, different individuals/pairs have nested there over the past six years.

Peregrine Falcons usually mate for life, but will accept a new partner if their mate dies. A pair may separate for the winter during migration. Pairs that remain at a site throughout the year generally maintain their bond. Most falcons engage in courtship rituals every spring. Once a pair has commenced courtship, a nest site is selected. The male shows several potential nest sites to the female who then decides which one of these she prefers. A pair will often re-use the same nest site.

Peregrines Falcons are native to a wide variety of open habitats, including wetlands, alpine meadows, and tundra. In all cases, falcons choose a nesting site which is isolated and in a protected location and is in proximity to desirable hunting grounds. Typically a cliff or rocky outcrop is selected for a nest site. Their preference is a ledge 15 to 60 metres above ground, with a southerly exposure and a protective overhang above. Nests consist of a shallow depression scraped out by the adults and no nest materials are added.

Incubation usually lasts 33 to 35 days from the date the last egg is laid (or the second last, if that is when incubation began). Peregrine chicks grow rapidly. By the time they are six weeks old they are already adult size, and are starting to fly. As the chicks develop, the parents allow them to become increasingly independent, and each week the appearance and behaviour of the chicks changes noticeably. There is a great deal of variation in the time at which Peregrine chicks leave the nest for their first flight (fledge). On rare occasions they take off as early as 33 days after hatching, while others linger for over 50 days. The majority, however, leave 45 days after hatching. Females generally stay in the nest longer, because they are heavier and need a longer period to develop and strengthen the flight muscles needed to carry them safely.

Females continue to lay eggs annually until they die. The only time that a female would lay more than one clutch of eggs in a year is if the first clutch are lost or damaged before hatching or if the chicks die within their first few days. Re-nesting following loss of the first clutch is common.

Peregrine Falcons have recently begun to live in cities on an increasingly regular basis, using skyscrapers and high bridges as nesting sites. The majority of falcons that have settled in eastern North America in recent years have chosen urban centres. Among the cities which have had nesting falcons are Toronto, Mississauga, Hamilton, London, Ottawa, Winnipeg, Detroit, Cleveland, Columbus, Buffalo, Rochester, New York, Boston, and Pittsburgh.

4.1 Peregrine Falcon History at the Burlington Lift Bridge

Peregrine Falcons have nested on the south-facing ledge on the north tower of the bridge since 2003. This sheltered ledge high on the bridge tower is much like a towering cliff and the substrate in the ledge consists of loose gravel; typical characteristics of their natural breeding habitat.

Turnover of mating pairs often occur at the bridge. Often falcons will clash with each other in competitive territorial disputes resulting in one of the pairs to relinquish control and the other pair to gain occupation of the bridge. Whatever the outcome of these yearly disputes, a mating pair is always present at the bridge.

In 2005, a nesting box was installed on the south tower but was not used by the falcons. It was subsequently dismantled and removed. Nesting boxes provide added security for the falcons by preventing the eggs from rolling off the ledge. A nesting box also shields birds from the elements and from predators. At other nesting sites, peregrine falcons have been quick to accept the nest box when it is offered. As well, the nesting box enables the eggs/chicks to be located clear of any maintenance and/or repair activities as well as any moving equipment.

Figure 1: South side of north tower. Nest site is usually on ledge (just above brown counterweight).

In 2004, eggs were laid at the bridge ledge but did not hatch. A chick was successfully hatched in the spring of 2005, but died about three weeks after hatching. In April 2006, four eggs were laid but none hatched.

in the spring of 2007, a nest box was installed at the window of the north tower, but it was not used by the falcons during that season. In May 2008, four eggs were successfully hatched in the new nest box. Of the four chicks two fledged successfully while two disappeared. During the 2009 season, three chicks were hatched, again in the new nest box, one subsequently succumbed to disease, another disappeared before fully fledging and the third successfully fledged. During the 2010 and 2011 seasons, two chicks were hatched in the nest box in both years. All four dispersed from the nest site. In 2012, three male chicks were hatched in the nest box.

During non-breeding seasons, the falcons would continue to occupy the bridge regarding it as their territory and hunt, yet they typically do not display aggressive defensive behaviour towards bridge staff.

The raising and lowering of the bridge does not appear to disturb the falcons. If bridge personnel appear on any part of the structure during breeding season, the birds will exhibit defensive territorial behaviour. This occurs even when personnel are working on the south tower (the nest is on the north tower). Falcons at other urban nest sites have been known to escalate their defensive behaviours the longer they occupy a particular nest site.

Table 1: Peregrine Falcon Breeding Timelines at the Burlington Lift Bridge

Breeding Activity	Timeline
Nesting season (includes mating and nest site selection)	Late February/Early March – end of July *
Scrape on north tower (nest formation), or utilization of nest box and laying of eggs	End of March to early April (April 7, 2004; between late March/early April 2005; March 20, 2006)
Hatching of eggs (approx 33 – 35 days)	Mid May (was anticipated May 13, 2004 (failed)) -May 14, 2005 (successful), -May 19, 2006 (failed) -Mid-May 2008 (four successful hatches) -Mid-May 2009 (three successful hatches)
Fledging/Eyases in nest (approx 6 weeks)	End of May to Mid June (banding early June)
Fledgling Period (approx 40-45 days)	38-45 days
Dependent on Adults, start hunting independently (9-12 weeks)	Late July to mid August
Young birds disperse from nest area	Mid August to early September
No breeding occurs. Adults remain at the bridge, staking it as a territory, hunting yet not disturbing bridge staff.	September to February (fall and early winter months).

* During mild winters, mating/breeding behaviour commences late February.

4.2 Conservation

Since the Second World War, Peregrine Falcon populations worldwide suffered drastic reduction in numbers due to illegal trade (most popular with falconers) and primarily exposure to Dichloro-Diphenyl-Trichloroethane (DDT), a synthetic pesticide that affected the eggs of nesting falcons. DDT caused the thinning of the egg shells resulting in egg failures. The connection between the use of DDT and the declining numbers was not apparent until the 1960s. Since then efforts have been made to increase the numbers by reducing the use of DDT and other agricultural pesticides, and clamping down on illegal trade. Most recently, falcons have been allowed to nest on ledges of artificial structures such as office buildings and bridges.

Populations have recovered to the point that it has been removed from the list of species in regulation under Ontario's Endangered Species Act (ESA). Its status has been down-listed from endangered to threatened. The species will continue to be protected as a *Specially Protected Raptor* under the *Fish and Wildlife Conservation Act*. This act protects it from hunting and trapping and also protects nests and eggs. Habitat management guidelines are available to protect peregrine falcon nest sites in the vicinity of forest management operations.

5.0 Bridge Maintenance and Repair

Bridge maintenance and repair projects are required on an ongoing basis throughout the year to ensure its safe operation. Projects that were conducted in the past and/or are planned in the near future range from installation of a back up electrical motor to replacement of cables and repainting of the entire bridge structure including both towers and the lift span. Depending upon the activities, these may disturb the falcons when conducted during their nesting period (early March to mid-August). Potential disturbances include noise to close human proximity to the falcons' nest such as certain repair or maintenance activities.

In addition, routine activities (i.e. inspection and maintenance) are required to continue over the lifetime of the bridge on an annual and/or monthly basis. As well, unexpected emergencies such as mechanical and/or electrical breakdown may require repairs to be performed during the nesting period. Such activities may result in close human-to-falcon proximity or contact. Essential maintenance, inspection and repairs must be undertaken to ensure the safe and smooth operation of the bridge as it facilitates navigation to/from a major port.

Human to falcon proximity during the nesting season has resulted in aggressive behaviour exhibited by the falcons which swoop/dive very close to maintenance personnel. Talons are often extended during this tactic. This behaviour is likely a defensive reaction by the falcons to ward off potential predators from its nest. As a result, personnel are in danger of falling off the bridge in their efforts to avoid the aggressive behaviour (however fall arrest safety systems are in place at the bridge and staff is not in danger of falling from the structure if safety systems are properly used). Falcons are capable of inflicting personal injury such as gashes, or scrapes with their talons and beaks.

6.0 Proposed Nest Relocation/Manipulation and Falcon Best Management Practices

In consultation with Environment Canada (EC) and the Ontario Ministry of Natural Resources (MNR) in 2007, an approach to address this issue was developed and agreed to by the two departments and PWGSC. It included a listing of best management practices and mitigation measures to be implemented on an ongoing basis.

6.1 Nest Relocation Initiative undertaken prior to 2007 Nesting Season

In circumstances where routine or emergency maintenance and repair activities result in human-to-falcon close proximity or contact, other management alternatives were considered such as the relocation of the nesting site to another section of the bridge facility where there will be minimal potential of human-falcon proximity or contact. The primary aim of the nest relocation initiative was to prevent the falcons from nesting on a particular section of the bridge and encourage them to nest on another part that was predetermined to afford minimal disturbance from ongoing operation, repair and maintenance activities particularly those that cannot be avoided during the nesting season.

The following measures were undertaken as of April 1, 2007:

- A nesting box was installed before breeding season at the north tower window (this box is different than the one installed on the south tower in 2005). This window is located in close proximity to the falcon's "historical" nesting location, but at a higher elevation. The nest box faces south towards the south tower.
- It was recommended that bridge personnel who regularly work on the bridge appear on the structure as frequently as possible to enable the falcons to recognize them. Sensing a lack of threat may curtail defensive attacks on the personnel during breeding season.

The goal was to have the falcons select the nesting box as their new and permanent nesting site. It was anticipated that if the new nest box was chosen, the ledge where the previous nesting site was located could be "decommissioned" (physical barriers placed to prevent nesting). During 2008 and subsequent years, the falcons did use the nest box and successfully hatched chicks.

6.2 Nest Relocation

Nest relocation may be required and conducted if the falcons do not successfully nest in the nest box but nest in another operationally inappropriate site, and/or a situation arises where bridge operations may endanger the safety of the birds. *However this is a measure that will be considered only as a last possible resort.*

Once the eggs have been laid or the chicks have hatched, no relocation can be conducted. Under no circumstances can live eggs be relocated as this may result in abandonment by the adults. Chicks cannot be moved until at least twelve (12) days after hatching. Any possible relocation may occur after the 12 day period has passed and can only occur under the discretion of an MNR biologist that has the training and experience in relocating falcons. If relocation is deemed necessary, it will be done only after careful consideration of the life cycle stage and circumstances of the nest site. Otherwise, from the time eggs are laid to the time fledglings leave the nest (approximately 80 days in total), there cannot be any relocation. If relocation were to occur, the chicks will be moved to the nest box.

Since the historical nest and nest box site are above ground level at a significant height on the operating bridge, the biologist must have all appropriate Health and Safety training as required by PWGSC.

PWGSC will coordinate with EC to obtain a SARA permit that allows PWGSC staff to work in close proximity to the birds in the event that routine and/or emergency maintenance is required. On an on-going basis, PWGSC will consult EC and/or MNR for advice on working in close proximity to the birds and how to avoid or deal with defensive measures employed by the adults.

In summary, nest relocation will only be implemented if the following conditions are met:

- Capture and relocation of live chicks is anticipated by EC and/or MNR.
- Bridge activities that could result in compromising the safety of the birds cannot be avoided.
- Monitoring confirms the exact nest location and nesting chronology within one-day accuracy.
- PWGSC has coordinated with EC and/or MNR and obtained a SARA permit.
- Any biologist who handles a peregrine falcon has current appropriate EC and/or MNR approvals/accreditation and has prior experience at this or other peregrine falcon nest sites.
- Personnel must have appropriate Health and Safety Training as determined by PWGSC.

6.3 Peregrine Falcon Best Management Practices/Mitigation Measures

The following ongoing falcon best management practices/mitigation measures will be implemented on an ongoing basis as required.

1. When feasible, bridge work (maintenance and/or repair) will be planned to occur outside of the nesting season, as applicable.

2. When feasible, avoid activities within the vicinity of the nest area that may adversely disturb the falcons.

3. If an activity has the potential to adversely impact nesting falcons and cannot be avoided during the nesting season, PWGSC will contact EC prior to conducting work (or as soon as possible for emergency work). PWGSC will coordinate with EC, MNR and/or experts to evaluate potential impacts and provide additional management recommendations for implementation.

4. PWGSC will inform appropriate operations, maintenance and construction personnel of the location of the nest and buffer zones prior to commencement of any work during the nesting season.

5. If avoidance during the nesting season is not possible, PWGSC will coordinate with EC to minimize disturbance, capture, etc., determine if a SARA Permit is

warranted, and possibly implement with the assistance of EC and/or MNR one or more nest management alternatives described above.

6. If avoidance is not possible, minimize the duration of time spent on work activities that must be conducted in the vicinity of the nest site during the nesting season.

7. If avoidance is not possible, maximize the number of separate activities within one short time period (i.e., within the same week) in the vicinity of the peregrine falcon nest during the nesting season. This will enable the falcons to recognize "regular" bridge personnel and hopefully curtail defensive attacks.

8. If PWGSC receives information that the historic nest site is not occupied by breeding peregrines, and no new nest site is occupied on the structure, then maintenance and construction activities will be considered to have no effect and may proceed with no restrictions that year.

9. If PWGSC receives information that an active nest site fails and is abandoned then maintenance and construction activities from that point forward will be considered to have no effect and may proceed with no restrictions for the remainder of the year (until a new nest is established).

10. No disturbance in the vicinity of the known nest site will occur regardless of the time of year, without prior coordination with EC and/or MNR, except during an emergency.

11. PWGSC will not permit third-party activities during the nesting season on the bridge without assessment for potential impacts and addition of specific avoidance measures in the permit if applicable.

The following types of maintenance or construction activities[1] are expected to have *no effect* on nesting peregrine falcons and may be conducted on the structure at any time of the year without any restrictions. Effects of other activities need to be evaluated on a case-by-case basis.

- Drift/debris removal from the canal.
- Inspections at or near ground level (except with helicopter).
- Minor culvert maintenance.
- Minor structural or road surface repairs (on the roadway or shoulder or bridge deck, without snooper cranes).
- Lawn management (no tree cutting).
- Sign replacement, repairs, and cleaning.
- Snow and ice removal and sanding.
- Special events, pedestrian (e.g., bridge pedal, foot races, walkathons, etc.).
- Sweeping of pavement at ground level (not including roof-tops).

[1] Only pertains to maintenance activities that occur on the level of the roadway or bridge traffic deck (not over the sides, underneath, or above the level of the rails of the deck). It also includes only minor repairs to the roadway, road shoulder, sidewalk, bridge traffic deck, or rails that do not involve equipment that is louder than ambient noise levels (i.e., impact pile drivers, jackhammers, pneumatic wrenches, etc.) or do not involve large construction vehicles (i.e., tractors, backhoes, graders, scrapers, pavers, concrete mixers, etc.). Any work that includes use of a helicopter, lift crane, or snooper crane is not included.

- Work outside of the nesting season that does not alter a known nest ledge (other than enhancements).

Contact Information

Canadian Wildlife Service
Species at Risk Unit – Ontario Region
Environment Canada
4905 Dufferin Street, Toronto, Ontario M3H 5T4
Phone: 416-739-4214

Canadian Peregrine Foundation
Director (Mark Nash)
1450 O'Connor Drive, Suite 214, Toronto, Ontario M4B 2T8
Phone: 416-481-1233, Cell: 416-937-7226

Ontario Ministry of Natural Resources
Management Biologist
Niagara Area Office/Guelph District
4890 Victoria Avenue North
Vineland Station, Ontario L0R 2E0
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Environmental Services
Professional and Technical Services
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Toronto, Ontario M2N 6A6
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References

Oregon Peregrine Falcon Management Plan 2002-2007(abbrev.), Environmental Services, Oregon Department of Transportation, 2000.

The Canadian Peregrine Falcon Website. http://www.peregrine-foundation.ca/fullmenu.html

PWGSC, Info. Centre, Fact Sheets, Burlington Canal Lift Bridge. http://www.pwgsc.gc.ca/text/factsheets/burlingtoncanal-e.html

Personal communication. Clare Lamont, Bridge Master, Burlington Lift Bridge.

Personal communication. Mark Nash, Director, Canadian Peregrine Foundation.

Appendix A

Table 2: Planned Activities and Projects at the Burlington Lift Bridge (shaded indicates completed).

Planned Projects	Project Dates	Proposed Falcon Mitigation Measures	Anticipated CEAA Status
Construction of Waterfront Trail on either side of the bridge (final construction being done on the City of Burlington side)	Completed summer 2006	Not applicable – ground level construction.	EA Screening was prepared.
Soil Capping between maintenance garage and light keepers house on south side delayed from remainder of project (completed in 2005) for potential historical/artefacts in the local area.	Completed in 2006	Not near north tower nesting site and not during nesting season. No large equipment being used.	EA Screening was prepared
Replace sidewalk on the Bridge Concrete/metal deck cantilevered off the metal bridge span. Approximately 8 metres above water. Potential concrete and metal debris.	Completed winter 2007	Conduct early January to early March when bridge is closed for navigation (winter shutdown). Outside bird breeding, nesting, fledging periods.	EA Screening was prepared.
Paint existing towers and span (metal structure) and removal of siding from Control Tower. Lead paint and asbestos – controlled removal. Potential lead and asbestos debris. Removal of bird droppings and modification of trays and drain holes to girders	Three-year project. On hold.	Conduct early January to early March when bridge is closed for navigation (winter shutdown). Outside bird breeding, nesting, fledging periods.	EA Screening was prepared.
Replace roadway approaches (between pavement and bridge structure)	Future date not specified.	Not applicable - not near nesting site (at ground level).	EA Screening Undertake in accordance with falcon best management practices/mitigation measures. Additional advice from EC and MNR.
Upgrade Control and Drives: Replace all electrical components (including cables as necessary)	Fiscal Years 2010 – 2013	Conduct early January to early March when bridge is closed for	EA Screening Undertake in

Planned Projects	Project Dates	Proposed Falcon Mitigation Measures	Anticipated CEAA Status
and control hardware to the two towers and span. Most work inside towers and control building.		navigation (winter shutdown). This is outside the falcon breeding, nesting, and fledging periods.	accordance with falcon best management practices/mitigation measures. Additional advice to be sought from EC and MNR.
Replace Overhead Power Control Cables	On-hold.	Conduct replacement from mid-August to early March, which is outside of falcon breeding, nesting, and fledging periods.	EA Screening Undertake in accordance with falcon best management practices/mitigation measures. Additional advice to be sought from EC and MNR.
Replace Corrugated Asbestos-containing Cladding on Control Building and machine rooms at the top of both towers.	Control Building completed 2008/2009; towers completed 2009/2010.	Conduct replacement from mid-August to early March, which is outside of falcon breeding, nesting, and fledging periods.	EA Screening was prepared. Undertake in accordance with falcon best management practices/mitigation measures. Additional advice to be sought from EC and MNR.
Various Inspections - Annual inspection of cables; involves personnel standing on bridge span as it is lifted. - Elevator Safety inspection as per Code. Hatchway in the roof of the tower must be accessed	Annual – year round if required Monthly Twice weekly	In close proximity to nest site. Undertake in accordance with falcon best management practices/mitigation measures. Conduct outside bird breeding, nesting, fledging periods as applicable. However, cables may require inspection during the above periods. In close proximity to nest site. Undertake in accordance with falcon best management practices/mitigation measures. *Not possible to conduct outside bird*	Not a project as defined by CEAA – no EA required.

Planned Projects	Project Dates	Proposed Falcon Mitigation Measures	Anticipated CEAA Status
- Maintenance/inspections of equipment in tower motor rooms and sheave rooms		*breeding, nesting, fledging periods.*	
Cable Kellum Grips maintenance repairs (on overhead cables). Work will be conducted outside of the south tower and involve replacement of the cable grips. The grips hold the cables to the tower.	Completed Fall 2006	Undertake in accordance with falcon best management practices/mitigation measures. Conduct outside falcon breeding, nesting, fledging periods.	Excluded - maintenance or repair of existing physical work – no EA required.
Various small electrical maintenance projects: - Diesel Generator Maintenance - Junction Boxes - Transfer Switch Replacement - Panel alarm upgrade - Camera Security Upgrade - Installation of grounding wire in one tower.	Ongoing	Undertake in accordance with falcon best management practices/mitigation measures. Conduct outside falcon breeding, nesting, fledging periods.	Excluded - maintenance or repair of physical work – no EA required.
Various small structural maintenance projects: - Removal of bird droppings, modification to drains and cable trays. In close proximity to birds during nesting. - Drain Holes to Girders (Removal of bird droppings and modification of trays and drain holes to girders have been moved to the painting project) - Deck Repairs - Drain Inspection	Completed 2008	Undertake in accordance with falcon best management practices/mitigation measures. Conduct outside falcon breeding, nesting, fledging periods.	Excluded maintenance or repair of existing physical work – no EA required.
Ongoing routine maintenance: examples (does not include all maintenance items); - Inspect upper buffers (at nesting level) - Lube main counterweight guides (once every 6 weeks	Year round; ongoing.	Undertake in accordance with falcon best management practices/mitigation measures. *Not possible to conduct outside falcon breeding,*	Excluded - maintenance or repair of existing physical work – no EA required.

Planned Projects	Project Dates	Proposed Falcon Mitigation Measures	Anticipated CEAA Status
- at nesting level) - Inspect hitches/aux. counterweight. sheave (once a month – ½ way up the north tower) - Change lights (all over) - Inspect weather station top of South tower (opposite nest) - Lube auxiliary counterweight wires once every 6 wks (both towers) - Power washing (once per year in fall)		*nesting, fledging periods as applicable.*	
Emergencies: examples; - Mechanical and electrical breakdowns may occur at any time of the year requiring access to all areas of the bridge (towers and span).	Year round.	In close proximity to nest site. Undertake in accordance with falcon best management practices/mitigation measures. *Not possible to conduct outside falcon breeding, nesting, fledging periods.*	Excluded - maintenance or repair of existing physical work. (Section 7 (b) or (c) of the Act - no EA required.)

Appendix B

Table 3: History of Peregrine Falcon Activities at the Burlington Lift Bridge

Year: 2004		
Parents	***Chicks***	***Latest Sighting / Status of "Chicks"***
Surge (male); Female name unknown as she was not banded.	None of 3 eggs laid hatched. Eggs were laid on a ledge on the North Tower.	N/A
Year: 2005		
Surge and unknown female	One chick hatched but succumbed three weeks after hatching.	N/A
Year: 2006		
Surge and unknown female	None of 4 eggs laid hatched.	N/A
Year: 2007		
Nest box constructed and installed in south facing window of North Tower.		
Dundas and unknown female	None of 3 eggs laid hatched. These were laid on a ledge on the North Tower and not in the nest box.	N/A
Year: 2008 – Nest box used every breeding season from this year.		
Pittsburgh Pete (male) from Pittsburgh, Penn, USA and unknown female.	*Maitland* (male) *Parker* (male) *Nebesny* (female) *Nellie* (female)	Males disappeared shortly after first flights. Females dispersed at the normal stage of the lifecycle. *Nebesny* was sighted settling down just north of Detroit, Michigan, USA. Her mate is *Zeus* from Cleveland, Ohio, USA.
Year: 2009		
Cirrus (female) from Dayton, Ohio. *Sir Adam Beck* (male) from King Street, Toronto.	*Berl* (female) *Truss* (female) *Maple* (female)	*Berl* went missing shortly after her first flight. *Truss* dispersed from the bridge at the normal stage of their lifecycle. She was seen with a male as a mature bird at the Brampton Courthouse on 2011. She had her own chick *Courtney*. *Maple* died of infection of mouth, esophagus and crop (Trichomoniasis).
Year: 2010		
Cirrus (female) from Dayton, Ohio. *Sir Adam Beck* (male) from King Street, Toronto.	*Brant* (male) *Diana* (female)	Both chicks fledged and dispersed from the bridge at the normal stage of their lifecycle.
Year: 2011		
Cirrus (female) from Dayton, Ohio. *McKenzie* (male) from Sun Life Tower, Etobicoke.	*Lady Nelson* (female) *Lady Lamont* (female)	Both chicks fledged and dispersed from the bridge at the normal stage of their lifecycle.
Year: 2012		
Cirrus (female) from Dayton, Ohio. *McKenzie* (male) from Sun Life Tower, Etobicoke.	*Jimmy* (male) *Port Hope* (male) *Carrey* (male)	Jimmy disappeared before the fledge period was over. Port Hope was found deceased on the Burlington Skyway. Carrey dispersed successfully as expected in the lifecyle.

Year: 2004		
Parents	***Chicks***	***Latest Sighting / Status of "Chicks"***
Surge (male); Female name unknown as she was not banded.	None of 3 eggs laid hatched. Eggs were laid on a ledge on the North Tower.	N/A
Year: 2005		
Surge and unknown female	One chick hatched but succumbed three weeks after hatching.	N/A
Year: 2006		
Surge and unknown female	None of 4 eggs laid hatched.	N/A
Year: 2007		
Nest box constructed and installed in south facing window of North Tower.		
Dundas and unknown female	None of 3 eggs laid hatched. These were laid on a ledge on the North Tower and not in the nest box.	N/A
Year: 2008 – Nest box used every breeding season from this year.		
Pittsburgh Pete (male) from Pittsburgh, Penn, USA and unknown female.	*Maitland* (male) *Parker* (male) *Nebesny* (female) *Nellie* (female)	Males disappeared shortly after first flights. Females dispersed at the normal stage of the lifecycle. *Nebesny* was sighted settling down just north of Detroit, Michigan, USA. Her mate is *Zeus* from Cleveland, Ohio, USA.
Year: 2009		
Cirrus (female) from Dayton, Ohio. *Sir Adam Beck* (male) from King Street, Toronto.	*Berl* (female) *Truss* (female) *Maple* (female)	*Berl* went missing shortly after her first flight. *Truss* dispersed from the bridge at the normal stage of their lifecycle. She was seen with a male as a mature bird at the Brampton Courthouse on 2011. She had her own chick *Courtney*. *Maple* died of infection of mouth, esophagus and crop (Trichomoniasis).
Year: 2010		
Cirrus (female) from Dayton, Ohio. *Sir Adam Beck* (male) from King Street, Toronto.	*Brant* (male) *Diana* (female)	Both chicks fledged and dispersed from the bridge at the normal stage of their lifecycle.
Year: 2011		
Cirrus (female) from Dayton, Ohio. *McKenzie* (male) from Sun Life Tower, Etobicoke.	*Lady Nelson* (female) *Lady Lamont* (female)	Both chicks fledged and dispersed from the bridge at the normal stage of their lifecycle.
Year: 2012		
Cirrus (female) from Dayton, Ohio. *McKenzie* (male) from Sun Life Tower, Etobicoke.	*Jimmy* (male) *Port Hope* (male) *Carrey* (male)	Jimmy disappeared before the fledge period was over. Port Hope was found deceased on the Burlington Skyway. Carrey dispersed successfully as expected in the lifecyle.

APPENDIX D

GEOTECHNICAL INVESTIGATION – PROPOSED IMPROVEMENTS - BURLINGTON CANAL LIFT BRIDGE

PROJECT NO: SM 135013-G

APRIL 23, 2013

GEOTECHNICAL INVESTIGATION
PROPOSED IMPROVEMENTS – BURLINGTON CANAL LIFT BRIDGE
HAMILTON, ONTARIO

PREPARED FOR:

PARSONS BRINCKERHOFF HALSALL INC.

Soil-Mat

BY

SOIL-MAT ENGINEERS & CONSULTANTS LTD.
130 LANCING DRIVE
HAMILTON, ONTARIO
L8W 3A1

Soil-Mat

PROJECT NO: SM 135013-G

APRIL 23, 2013

GEOTECHNICAL INVESTIGATION
PROPOSED IMPROVEMENTS – BURLINGTON CANAL LIFT BRIDGE
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PROJECT NO.: SM 135013-G

April 23, 2013

PARSONS BRINCKERHOFF HALSALL INC.
2300 Yonge Street, Suite 2300
Toronto, Ontario
M4P 1E4

Attention: Mr. Mahan Habibi, C.E.T., P. Eng.

GEOTECHNICAL INVESTIGATION
PROPOSED IMRPOVEMENTS – BURLINGTON CANAL LIFT BRIDGE
HAMILTON, ONTARIO

Dear Mr. Habibi,

We have completed the fieldwork, laboratory testing and report preparation in general accordance with our proposal P5000, dated March 7, 2013. Our findings at the four borehole locations are presented in the following report.

1. INTRODUCTION

We understand that the project will involve the construction of new traffic barrier gates on the north and south approaches to the lift bridge. The purpose of this geotechnical investigation work is to determine subsurface soils information in four boreholes [two at either abutment] and to provide comments and recommendations with respect to the design and construction of foundations, from a geotechnical point of view.

This report is based on the above summarised project, and on the assumption that the design and construction will be performed in accordance with applicable codes and standards. Any significant deviations from the proposed project design may void the recommendations given in this report. If significant changes are made to the proposed design, this office must be consulted to review the new design with respect to the results of this investigation. It is noted that, other than the limited background environmental soil testing noted below, the described scope of work is not intended to specifically address any environmental aspects of the site.

2. PROCEDURE

A total of four [4] boreholes were advanced at the locations illustrated in the attached Drawing No. 1, Borehole Location Plan using hollow stem continuous flight auger equipment to depths of up to 6.5 metres below the existing grade. All boreholes were advanced on April 3, 2013, under the direction and supervision of a staff member of SOIL-MAT ENGINEERS & CONSULTANTS LTD. Traffic control measures were implemented to close a single lane of traffic at each of the borehole locations during the drilling work. Upon completion of drilling, all boreholes were backfilled in accordance with Ontario Regulation 903, and topped off with asphalt overlying a layer of concrete.

Representative samples of the subsoils were recovered from the borings at selected depth intervals using split barrel sampling equipment driven in accordance with the requirements of the ASTM test specification D1586, Standard Penetration Resistance Testing. After undergoing a general field examination, the soil samples were preserved and transported to the SOIL-MAT laboratory for visual, tactile, and olfactory classifications. Routine moisture content tests were performed on all soil samples recovered from the borings.

In addition, one sample from each borehole was submitted to AGAT Laboratories Limited, ["AGAT"], [an accredited Canadian Environmental Laboratory] for laboratory analytical testing for Inorganic and Metal and CCME Hydrocarbons F1 – F4 parameters for comparison to the Soil, Ground Water and Sediment Standards for Use Under Part XV.1 of the *Environmental Protection Act*.

Details of the conditions encountered in the boreholes, together with the results of the field and laboratory tests are presented in Borehole Log Nos. 1 through 4, inclusive, following the text of this report. It is noted that the boundaries of soil types indicated on the borehole logs are inferred from non-continuous soil sampling and observations made during drilling. These boundaries are intended to reflect transition zones for the purpose of geotechnical design and should not be construed as the exact planes of geological change.

3. SITE DESCRIPTION AND SUBSURFACE CONDITIONS

The project site is the north and south approaches of the Burlington Canal Lift Bridge in Burlington, Ontario. The subsurface conditions encountered in Borehole Nos. 1 to 4 inclusive are summarised as follows:

Pavement Structure

The pavement structure of the road, encountered in each borehole, is outlined in the table below.

	BH 1	BH 2	BH 3	BH 4
Asphaltic Concrete	150	100	125	200
Concrete	-	250	250	-
Granular Base	400	150	125	300

Gravel and Cobbles

A deposit of coarse Gravel and Cobbles was encountered in Borehole No. 3 beneath the pavement structure to a depth of approximately 1.5 metres. This layer contained coarse Gravel/Cobbles approximately 50 to 100 millimetres in major dimension.

Silty Clay Fill

Brown Silty Clay Fill was encountered in Borehole No. 1 beneath the pavement structure to a depth of approximately 2.7 metres, and in Borehole No. 4 at a depth of approximately 2.0 metres. This Silty Clay was brown, contained traces of fine to medium Sand and Gravel with a reworked appearance, and generally firm to stiff in consistency. The Silty Clay Fill was proven to termination in Borehole No. 4, with a layer of coarse Gravel and rock fragments encountered in the lower levels.

Sand

Brown Sand was encountered at all borehole locations. The Sand was encountered at a depth of approximately 2.7 and 1.5 metres beneath the surface in Borehole No. 1 and 3, respectively, and beneath the pavement structure in Borehole Nos. 2 and 4. The Sand was fine to medium in gradation, contained traces of fine to medium Gravel, appeared to be fill in the upper levels, and was in a generally compact to dense state.

Groundwater Observations

All boreholes were recorded as dry upon completion of drilling. The static groundwater level is anticipated to be at a level equal with that of Lake Ontario, which was approximately 3 to 4 metres below the roadway surface. We expect that the static groundwater level will be well below the anticipated depth of construction.

4. FOUNDATION CONSIDERATIONS

Based on the conditions encountered at the borehole locations and the relatively light load of the proposed barrier gates, conventional spread footings are considered feasible to support to proposed structures on a properly prepared founding surface within the fill materials encountered.

The proposed barrier gates may be supported on conventional spread footings founded in the Silty Clay or Sand Fill, designed on the basis of bearing values of SLS = 75 kPa [~1,500 psf] and ULS = 100 kPa [~2,000 psf]. The excavation base should be properly prepared and hand cleaned of all loose and disturbed material before placement of foundation concrete. All foundations should be at least nominally reinforced to account for non-uniform support conditions within the fill materials.

All footings exposed to the environment must be provided with a minimum of 1.2 metres of earth cover or equivalent insulation to protection against frost damage. All footings and foundations should be designed and constructed in accordance with the current Ontario Building Code.

It is imperative that a soils engineer be retained from this office to provide geotechnical engineering services during the excavation and foundation construction phases of the project. A senior representative of SOIL-MAT should be present to observe compliance with the design concepts and recommendations of this report, and to allow changes to be made in the event that subsurface conditions differ from the conditions identified at the borehole locations.

5. EXCAVATIONS

Excavations for the installation of foundations and underground services, etc. are anticipated to extend to depths of up to 1.5 to 2.0 metres. Such excavations are expected to be relatively straightforward using hydraulic excavator equipment. Excavations through the fill should remain stable for the short construction period at 45 degrees to the horizontal. Notwithstanding, all excavations must comply with the current Occupational Health and Safety Act and Regulations for Construction Projects. Excavation slopes steeper than those required in the Safety Act must be supported or a trench box must be provided, and a senior Geotechnical Engineer from this office should examine the work on a regular basis. For the design of temporary steel sheeting, to maintain a vertical excavation the system should be designed on the basis of a soil unit weight of γ = 19.0 kN/m^3 and coefficient of earth pressure of Ka = 0.3 where small lateral movements of the sheeting are acceptable, or Ko = 0.5 where no lateral movements can be accommodated.

6. BACKFILL CONSIDERATIONS

The excavated materials will primarily consist of the Sand and Silty Clay Fill materials encountered in the boreholes. Select portion of the fill are considered suitable for reuse as trench backfill or engineered fill on the project, provided they are free of organic material, debris, or otherwise deleterious materials. It is noted that the on-site Silty Clay Fill materials are not considered to be free draining, and will present difficulty in achieving compaction in restricted areas. As such, it is recommended that a well graded granular material, such as OPSS Granular B, be utilised as backfill against foundations.

All fill material should be conditioned to a moisture content within 3 percent of its standard Proctor optimum moisture content, to achieve an efficient compaction operation and to minimise long term subsidence [settlement] of the fill mass.

The backfilling and compaction operations should be monitored by a representative of SOIL-MAT to confirm uniform compaction of the backfill material to project specification requirements. Any engineered fill in the roadway should be compacted to 98 per cent of its standard Proctor maximum dry density to within one metre of the subgrade level, above which the fill should be compacted to 100 per cent of its standard Proctor maximum dry density. A method should be developed to assess compaction efficiency employing the on-site compaction equipment and backfill materials during construction.

7. ENVIRONMENTAL CONSIDERATIONS

As noted above, a selected sample from each borehole was submitted to AGAT Laboratories Limited, ["AGAT"], [an accredited Canadian Environmental Laboratory] for laboratory analytical testing. The testing consisted of a standard panel of metals and inorganic parameters, as well as petroleum hydrocarbons. The laboratory test results received in our Office were compared with the applicable standard from the Soil, Ground Water and Sediment Standards for Use Under Part XV.1 of the *Environmental Protection Act*, as follows:

- **Table 1**: Full Depth Background Site Condition Standards in a Potable Ground Water Condition.
- **TABLE 2**: Full Depth Generic Site Condition Standards in a Potable Ground Water Condition for Residential/Parkland/Institutional [RPI] and Industrial/Commercial/Community [ICC] Land use.
- **Table 3**: Full Depth Generic Site Condition Standards in a Non-Potable Ground Water Condition for a Residential/ Parkland/ Institutional property use, [RPI], as well as for an Industrial/ Commercial/ Community [ICC] property use.

The results of this laboratory testing are presented in the attached AGAT Certificates of Analysis [13H704295].

Based on our field observations and the analytical test results from AGAT, we offer the following comments:

1. All of the tested samples exceed the Table 1 Standards for Electrical Conductivity [EC] and/or Sodium Adsorption Ratio [SAR], as well as Fraction 4 Hydrocarbons in sample BH4SS2.
2. All of the tested samples exceeded the Table 2 and 3 [RPI] Standards for EC and/or SAR.
3. Samples BH1 SS1, BH2 SS2 and BH4 SS2 exceeded the Table 2 and 3 [ICC] Standards for EC and/or SAR.
4. Sample BH3 SS1 exceeded the Table 2 and 3 Standards [in both RPI and ICC] for the Hot Water Soluble Boron parameter.
5. It is noted that EC and SAR are essentially aesthetic parameters typically associated with the application of road de-icing salt. They do not present a health hazard to human or animal life, rather they tend to render the soil environment corrosive to buried pipe and unsupportive of plant growth.
6. There was no notable visual or olfactory evidence of a petroleum hydrocarbon impact to the soil at the time of the sampling;
7. The soil sampled during this testing is believed to be representative of the soil conditions at the sampled locations only. This Office should be contacted to re-assess the environmental characteristics of the soil if any unusual staining or odours are observed during future activities

Given the above summarised test results versus the applicable Standards we offer the following comments regarding the off-site disposal of surplus material from the project.

1. As the sampled material exceeds the Table 1 Standards for one or more of EC, SAR, F4 hydrocarbons, and hot water extractable Boron, this material should not be accepted at an off-site property subject to a Record of Site Condition [RSC] of Ministry of the Environment Certificate of Authorisation (i.e. quarry facility, etc.).

2. Sampled material that exceeds the Table 2 and 3 RPI and/or ICC Standards should not be accepted at an off-site RPI or ICC property. However, depending on the condition of the potential receiving site and pending approval of the receiving property owner, it might be reasonable for selected surplus material to be accepted at an off-site ICC property [not subject to an RSC] under the 'beneficial use concept'. Further testing and/or consultation with the MOE District Engineer may be required in this reqard.

3. Material may be reused on site.

8. GENERAL COMMENTS

The subsoil descriptions and borehole information are intended to describe conditions encountered at the borehole locations. Contractors tendering or undertaking this project should carry out due diligence in order to verify the results of this investigation and to determine how the subsurface conditions will affect their operations.

We trust that this report is sufficient for your present requirements. Should you require any additional information or clarification as to the contents of this document, please do not hesitate to contact the undersigned.

Yours very truly,
SOIL-MAT ENGINEERS & CONSULTANTS LTD.

Kyle Richardson, B.Eng. E.I.T.

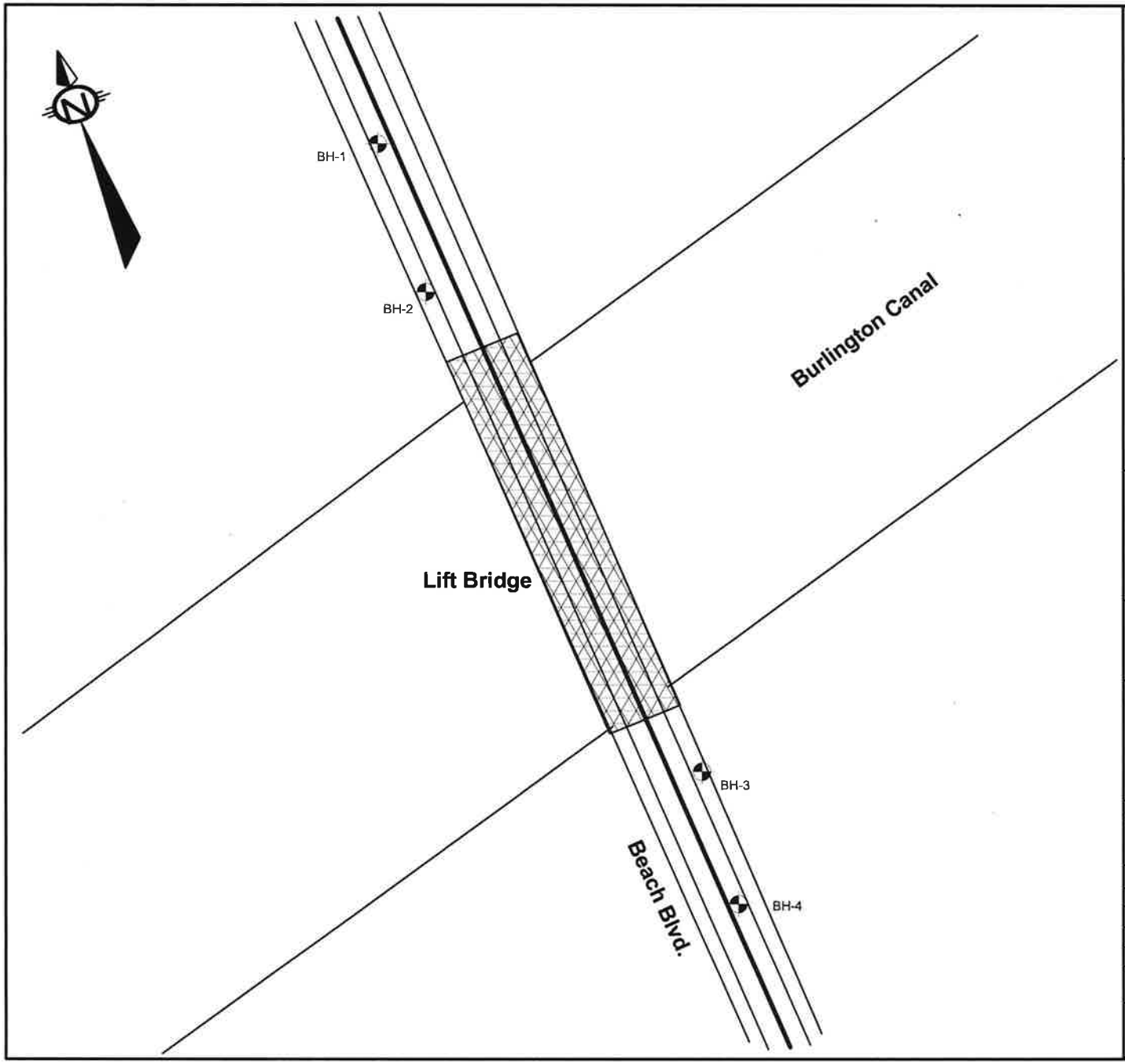
Stephen R. Sears, B. Eng. Mgmt., P. Eng..
Project Engineer

LICENSED PROFESSIONAL ENGINEER
A1023 13
S. R. SEARS
PROVINCE OF ONTARIO

Ian Shaw, P.Eng
Review Engineer

Enclosures: Drawing No. 1, Borehole Location Plan
Borehole Log Nos. 1 to 4, inclusive
AGAT Certificate of Analysis [13H704295]

Distribution: Parsons Brinckerhoff Halsall Inc. [2, plus pdf]



LEGEND

BH-# Borehole

NOTES:

1. This drawing should be read in conjunction with Soil-Mat Engineers & Consultants Ltd. supplemental report number SM 135013-G
2. Borehole locations are approximate.
3. Soil samples will be discarded after 3 months unless directed otherwise by client.

Soil-Mat
Engineers & Consultants Ltd.

CLIENT
Parsons Brinckerhoff Halsall Inc.

PROJECT TITLE
Geotechnical Investigation
Burlington Canal Lift Bridge
Hamilton, Ontario

DRAWING TITLE
Borehole Location Plan

PROJECT No.	SM 135013-G
SCALE	N.T.S.
DATE	April 2013
CHECKED	IS
DRAWN	KR
FILENAME	135013-G Borehole Location Plan.kcw

DRAWING No. 1

Project No: SM 135013-G

Project: Burlington Canal Lift Bridge

Location: Hamilton, Ontario

Client: Parsons Brinckerhoff Halsall Inc.

Log of Borehole No. 1

Project Manager: SR Sears, P. Eng.

Borehole Location: See Drawing No. 1

Soil-Mat

SUBSURFACE PROFILE

Depth (ft / m)	Elevation [m]	Description	Well Data
0 / 0	0.00	Ground Surface	
	-0.55	**Pavement Structure** — Approximately 150 millimetres of asphaltic concrete over 400 millimetres of compacted granular base.	
		Silty Clay Fill — Brown, trace Sand, trace Gravel, reworked appearance, stiff to firm.	
2 / 8	-2.70		
		Sand — Brown, fine grained, trace gravel, fill in upper levels, compact to dense.	
4 / 20	-6.50		
		End of Borehole	

NOTES:

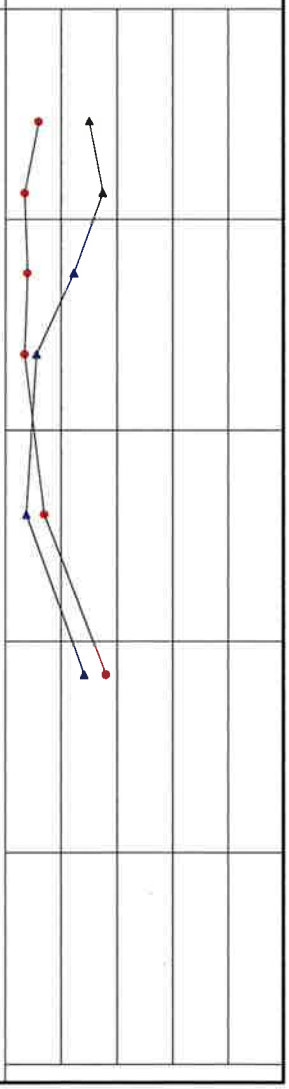
1. Borehole was advanced using hollow stem auger equipment on April 3, 2013 to termination at a depth of 6.5 metres.
2. Borehole was recorded as 'dry' upon completion of drilling and backfilled as per Ontario Regulation 903.
3. Soil samples will be discarded after 3 months unless otherwise directed by our client.

SAMPLE

Type	Number	Blow Counts	Blows/300mm	Recovery	PP (kgf/cm2)	U.Wt.(kN/m3)
SS	1	4 6 6 6	12			
SS	2	2 3 4	7			
SS	3	3 4 4	8			
SS	4	2 3 4	7			
SS	5	3 4 10	14			
SS	6	9 13 23	36			

Moisture Content w% (10 20 30 40)

Standard Penetration Test blows/300mm (20 40 60 80)



Drill Method: Solid Stem Augers

Drill Date: April 3, 2013

Hole Size: 150 mm

SOIL-MAT ENGINEERS & CONSULTANTS LTD.
130 Lancing Drive, Hamilton, ON L8W 3A1
Phone: (905) 318-7440 Fax: (905) 318-7455
e-mail: info@soil-mat.on.ca

Datum: Existing Road Surface

Checked by: IS

Sheet: 1 of 1

Project No: SM 135013-G

Project: Burlington Canal Lift Bridge

Location: Hamilton, Ontario

Client: Parsons Brinckerhoff Halsall Inc.

Log of Borehole No. 2

Project Manager: SR Sears, P. Eng.

Borehole Location: See Drawing No. 1

Soil-Mat

SUBSURFACE PROFILE

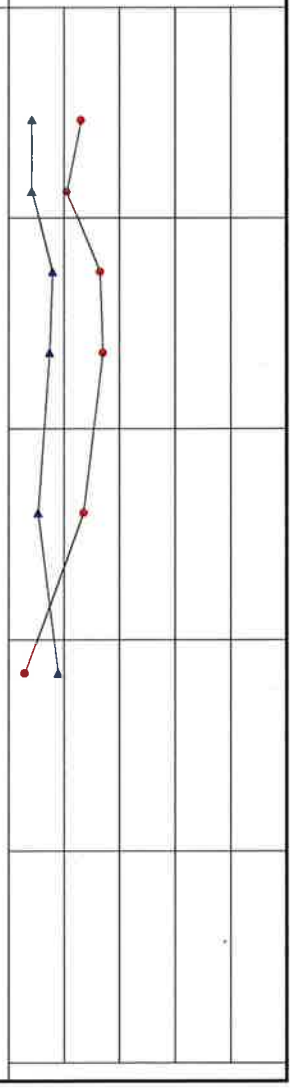
Depth (ft / m)	Elevation [m]	Description	Well Data
0 / 0	0.00	Ground Surface	
	-0.50	**Pavement Structure** — Approximately 100 millimetres of asphaltic concrete over 250 millimetres of concrete over 150 millimetres of compacted granular base.	
2 /			
4 /			
6 / 2		**Sand** — Brown, medium grained, trace Gravel, fill in upper levels, compact to dense.	
8 /			
10 /			
12 / 4			
14 /			
16 /			
18 /	-5.50	Transition to wet	
20 / 6			
	-6.50	End of Borehole	
22 /		NOTES:	
24 /		1. Borehole was advanced using hollow stem auger equipment on April 3, 2013 to termination at a depth of 6.5 metres.	
26 / 8		2. Borehole was recorded as 'dry' upon completion of drilling and backfilled as per Ontario Regulation 903.	
28 /		3. Soil samples will be discarded after 3 months unless otherwise directed by our client.	
30 /			
32 /			

SAMPLE

Type	Number	Blow Counts	Blows/300mm	Recovery	PP (kgf/cm2)	U.Wt.(kN/m3)
SS	1	10 12 14 14	26			
SS	2	6 10 11 12	21			
SS	3	9 16 17	33			
SS	4	10 16 18	34			
SS	5	10 11 16	27			
SS	6	2 3 3	6			

Moisture Content w% (10 20 30 40)

Standard Penetration Test blows/300mm (20 40 60 80)



Drill Method: Solid Stem Augers

Drill Date: April 3, 2013

Hole Size: 150 mm

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e-mail: info@soil-mat.on.ca

Datum: Existing Road Surface

Checked by: IS

Sheet: 1 of 1

Project No: SM 135013-G

Project: Burlington Canal Lift Bridge

Location: Hamilton, Ontario

Client: Parsons Brinckerhoff Halsall Inc.

Log of Borehole No. 3

Project Manager: SR Sears, P. Eng.

Borehole Location: See Drawing No. 1

Soil-Mat

SUBSURFACE PROFILE

Depth (ft / m)	Elevation [m]	Symbol	Description	Well Data
0 / 0	0.00		Ground Surface	
	-0.50		**Pavement Structure** Approximately 125 millimetres of asphaltic concrete over 250 millimetres of concrete over 125 millimetres of compacted granular base.	
4	-1.50		**Gravel and Cobbles** Coarse Gravel, approximately 50 to 100mm in size	
2			**Sand** Brown, medium grained, trace Gravel, fill in upper levels, compact to dense.	
6 / 2	-6.50		End of Borehole	

NOTES:

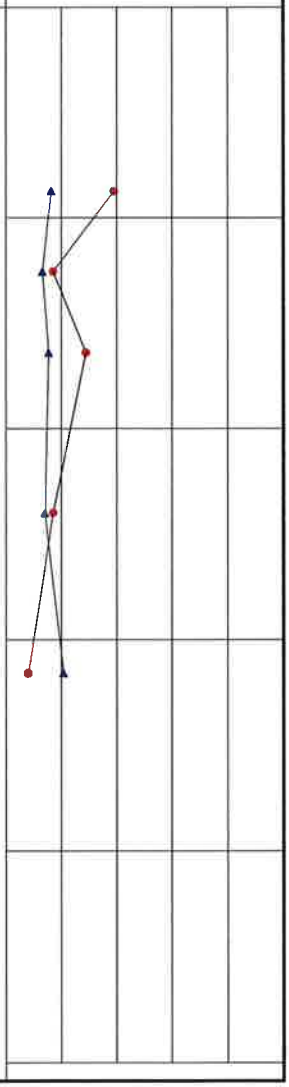
1. Borehole was advanced using hollow stem auger equipment on April 3, 2013 to termination at a depth of 6.5 metres.
2. Borehole was recorded as 'dry' upon completion of drilling and backfilled as per Ontario Regulation 903.
3. Soil samples will be discarded after 3 months unless otherwise directed by our client.

SAMPLE

Type	Number	Blow Counts	Blows/300mm	Recovery	PP (kgf/cm2)	U.Wt.(kN/m3)
SS	1	10 23 16	39			
SS	2	7 7 10	17			
SS	3	10 15 14	29			
SS	4	6 8 9	17			
SS	5	3 4 4	8			

Moisture Content w% 10 20 30 40

Standard Penetration Test blows/300mm 20 40 60 80



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Drill Method: Solid Stem Augers

Drill Date: April 3, 2013

Hole Size: 150 mm

Datum: Existing Road Surface

Checked by: IS

Sheet: 1 of 1

Project No: SM 135013-G

Project: Burlington Canal Lift Bridge

Location: Hamilton, Ontario

Client: Parsons Brinckerhoff Halsall Inc.

Log of Borehole No. 4

Project Manager: SR Sears, P. Eng.

Borehole Location: See Drawing No. 1

Soil-Mat

SUBSURFACE PROFILE

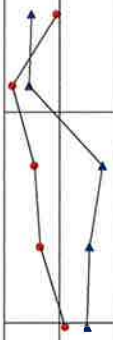
Depth (ft / m)	Elevation [m]	Description
0 / 0	0.00	Ground Surface
	-0.55	**Pavement Structure** — Approximately 200 millimetres of asphaltic concrete over 350 millimetres of compacted granular base.
	-1.20	**Sand Fill** — Brown, trace Gravel, compact to loose.
2 / 1	-2.00	Buried cable encountered at 1.2 metres - assumed abandoned (not shown on locates).
		Silty Clay Fill — Brown, trace Gravel, reworked appearance, stiff to very stiff.
4 / 2	-4.10	
	-4.30	Rock fragments
		End of Borehole
6 / 3		
8 / 4		
10 / 5		
12 / 6		
14 / 7		
16 / 8		
18 / 9		
20 / 10		
22 / 11		
24 / 12		
26 / 13		
28 / 14		
30 / 15		
32 / 16		

SAMPLE

Type	Number	Blow Counts	Blows/300mm	Recovery	PP (kgf/cm2)	U.Wt.(kN/m3)
SS	1	9 13 6 9	19			
SS	2	4 2 1 1	3			
SS	3	4 4 7	11			
SS	4	4 5 8	13			
SS	5	6 9 13	22			

Moisture Content w% (10, 20, 30, 40)

Standard Penetration Test blows/300mm (20, 40, 60, 80)



NOTES:

1. Borehole was advanced using hollow stem auger equipment on April 3, 2013 to termination at a depth of 4.3 metres due to cable wrapping around auger causing difficulty drilling.

2. Borehole was recorded as 'dry' upon completion of drilling and backfilled as per Ontario Regulation 903.

3. Soil samples will be discarded after 3 months unless otherwise directed by our client.

Drill Method: Solid Stem Augers

Drill Date: April 3, 2013

Hole Size: 150 mm

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e-mail: info@soil-mat.on.ca

Datum: Existing Road Surface

Checked by: IS

Sheet: 1 of 1

AGAT Laboratories

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CLIENT NAME: SOIL MAT ENGINEERS & CONSULTANTS LT
130 LANCING DRIVE
HAMILTON, ON L8W3A1
(905) 318-7440

ATTENTION TO: Ian Shaw

PROJECT NO: SM135013-G

AGAT WORK ORDER: 13H704295

SOIL ANALYSIS REVIEWED BY: Inesa Alizarchyk, Inorganic Lab Supervisor

TRACE ORGANICS REVIEWED BY: Oksana Gushyla, Analyst

DATE REPORTED: Apr 16, 2013

PAGES (INCLUDING COVER): 7

VERSION*: 1

Should you require any information regarding this analysis please contact your client services representative at (905) 712-5100

*NOTES

All samples will be disposed of within 30 days following analysis. Please contact the lab if you require additional sample storage time.

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Certificate of Analysis

AGAT WORK ORDER: 13H704295

PROJECT NO: SM135013-G

CLIENT NAME: SOIL MAT ENGINEERS & CONSULTANTS LT

ATTENTION TO: Ian Shaw

O. Reg. 153(511) - Metals & Inorganics (Soil)

DATE RECEIVED: 2013-04-09

DATE REPORTED: 2013-04-16

		SAMPLE DESCRIPTION:		BH1 SS1	BH2 SS2	BH3 SS1	BH4 SS2
		SAMPLE TYPE:		Soil	Soil	Soil	Soil
		DATE SAMPLED:		4/3/2013	4/3/2013	4/3/2013	4/3/2013
Parameter	Unit	G / S	RDL	4252936	4252939	4252941	4252943
Antimony	µg/g	1.3	0.8	<0.8	<0.8	<0.8	<0.8
Arsenic	µg/g	18	1	5	8	4	6
Barium	µg/g	220	2	116	72	73	113
Beryllium	µg/g	2.5	0.5	0.7	<0.5	0.8	1.0
Boron	µg/g	36	5	13	10	24	16
Boron (Hot Water Soluble)	µg/g	NA	0.10	0.44	<0.10	3.39	1.26
Cadmium	µg/g	1.2	0.5	<0.5	<0.5	<0.5	<0.5
Chromium	µg/g	70	2	21	13	8	11
Cobalt	µg/g	21	0.5	11.3	8.3	5.0	6.3
Copper	µg/g	92	1	37	58	28	49
Lead	µg/g	120	1	41	14	11	27
Molybdenum	µg/g	2	0.5	<0.5	0.5	<0.5	<0.5
Nickel	µg/g	82	1	23	14	7	10
Selenium	µg/g	1.5	0.4	<0.4	<0.4	0.6	0.6
Silver	µg/g	0.5	0.2	<0.2	<0.2	<0.2	<0.2
Thallium	µg/g	1	0.4	<0.4	<0.4	<0.4	<0.4
Uranium	µg/g	2.5	0.5	0.6	<0.5	0.5	0.6
Vanadium	µg/g	86	1	28	19	12	16
Zinc	µg/g	290	5	59	57	32	47
Chromium VI	µg/g	0.66	0.2	<0.2	<0.2	<0.2	<0.2
Cyanide	µg/g	0.051	0.040	<0.040	<0.040	<0.040	<0.040
Mercury	µg/g	0.27	0.10	<0.10	<0.10	<0.10	<0.10
Electrical Conductivity (2:1)	mS/cm	0.57	0.005	**5.05**	**0.778**	**0.768**	**1.55**
Sodium Adsorption Ratio	NA	2.4	NA	**55.3**	**14.4**	1.89	**8.79**
pH, 2:1 CaCl2 Extraction	pH Units		NA	8.05	7.99	9.28	8.49

Comments: RDL - Reported Detection Limit; G / S - Guideline / Standard: Refers to T1(ALL) - Current

4252936-4252943 EC & SAR were determined on the DI water extract obtained from the 2:1 leaching procedure (2 parts DI water:1 part soil). pH was determined on the 0.01M CaCl2 extract prepared at 2:1 ratio.

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Certificate of Analysis

AGAT WORK ORDER: 13H704295

PROJECT NO: SM135013-G

CLIENT NAME: SOIL MAT ENGINEERS & CONSULTANTS LT

ATTENTION TO: Ian Shaw

O. Reg. 153(511) - PHCs F1 - F4 (Soil)

DATE RECEIVED: 2013-04-09

DATE REPORTED: 2013-04-16

		SAMPLE DESCRIPTION:		BH1 SS1	BH2 SS2	BH3 SS1	BH4 SS2
		SAMPLE TYPE:		Soil	Soil	Soil	Soil
		DATE SAMPLED:		4/3/2013	4/3/2013	4/3/2013	4/3/2013
Parameter	**Unit**	**G / S**	**RDL**	**4252936**	**4252939**	**4252941**	**4252943**
Benzene	µg/g	0.02	0.02	<0.02	<0.02	<0.02	<0.02
Toluene	µg/g	0.2	0.08	<0.08	<0.08	<0.08	<0.08
Ethylbenzene	µg/g	0.05	0.05	<0.05	<0.05	<0.05	<0.05
Xylene Mixture	µg/g	0.05	0.05	<0.05	<0.05	<0.05	<0.05
F1 (C6 to C10)	µg/g		5	<5	<5	<5	<5
F1 (C6 to C10) minus BTEX	µg/g	25	5	<5	<5	<5	<5
F2 (C10 to C16)	µg/g	10	10	<10	<10	<10	<10
F3 (C16 to C34)	µg/g	240	50	<50	<50	<50	<50
F4 (C34 to C50)	µg/g	120	50	<50	<50	<50	**130**
Gravimetric Heavy Hydrocarbons	µg/g	120	50	NA	NA	NA	NA
Moisture Content	%		0.1	14.5	4.3	5.0	4.7
Surrogate	**Unit**	**Acceptable Limits**					
Terphenyl	%	60-140		126	64	86	85

Comments: RDL - Reported Detection Limit; G / S - Guideline / Standard: Refers to T1(ALL) - Current

4252936-4252943 Results are based on sample dry weight.
The soil sample was prepared in the lab using the Methanol extraction technique. The sample was not field preserved with methanol and an Encore was not provided for analysis.
The C6-C10 fraction is calculated using toluene response factor.
The C10 - C16, C16 - C34, and C34 - C50 fractions are calculated using the average response factor for n-C10, n-C16, and n-C34.
Gravimetric Heavy Hydrocarbons are not included in the Total C16-C50 and are only determined if the chromatogram of the C34 - C50 hydrocarbons indicates that hydrocarbons >C50 are present.
Total C6 - C50 results are corrected for BTEX contributions.
This method complies with the Reference Method for the CWS PHC and is validated for use in the laboratory.
nC6 and nC10 response factors are within 30% of Toluene response factor.
nC10, nC16 and nC34 response factors are within 10% of their average.
C50 response factor is within 70% of nC10 + nC16 + nC34 average.
Linearity is within 15%.
Extraction and holding times were met for this sample.
Fractions 1-4 are quantified with the contribution of PAHs. Under Ontario Regulation 153, results are considered valid without determining the PAH contribution if not requested by the client.
Quality Control Data is available upon request.

Certified By:

AGAT Laboratories

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Guideline Violation

AGAT WORK ORDER: 13H704295

PROJECT NO: SM135013-G

CLIENT NAME: SOIL MAT ENGINEERS & CONSULTANTS LT

ATTENTION TO: Ian Shaw

SAMPLEID	SAMPLE TITLE	GUIDELINE	ANALYSIS PACKAGE	PARAMETER	GUIDEVALUE	RESULT
4252936	BH1 SS1	T1(ALL) - Current	O. Reg. 153(511) - Metals & Inorganics (Soil)	Electrical Conductivity (2:1)	0.57	5.05
4252936	BH1 SS1	T1(ALL) - Current	O. Reg. 153(511) - Metals & Inorganics (Soil)	Sodium Adsorption Ratio	2.4	55.3
4252939	BH2 SS2	T1(ALL) - Current	O. Reg. 153(511) - Metals & Inorganics (Soil)	Electrical Conductivity (2:1)	0.57	0.778
4252939	BH2 SS2	T1(ALL) - Current	O. Reg. 153(511) - Metals & Inorganics (Soil)	Sodium Adsorption Ratio	2.4	14.4
4252941	BH3 SS1	T1(ALL) - Current	O. Reg. 153(511) - Metals & Inorganics (Soil)	Electrical Conductivity (2:1)	0.57	0.768
4252943	BH4 SS2	T1(ALL) - Current	O. Reg. 153(511) - Metals & Inorganics (Soil)	Electrical Conductivity (2:1)	0.57	1.55
4252943	BH4 SS2	T1(ALL) - Current	O. Reg. 153(511) - Metals & Inorganics (Soil)	Sodium Adsorption Ratio	2.4	8.79
4252943	BH4 SS2	T1(ALL) - Current	O. Reg. 153(511) - PHCs F1 - F4 (Soil)	F4 (C34 to C50)	120	130

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Quality Assurance

CLIENT NAME: SOIL MAT ENGINEERS & CONSULTANTS LT

AGAT WORK ORDER: 13H704295

PROJECT NO: SM135013-G

ATTENTION TO: Ian Shaw

Soil Analysis

RPT Date: Apr 16, 2013			DUPLICATE			Method Blank	REFERENCE MATERIAL			METHOD BLANK SPIKE			MATRIX SPIKE		
PARAMETER	Batch	Sample Id	Dup #1	Dup #2	RPD		Measured Value	Acceptable Limits		Recovery	Acceptable Limits		Recovery	Acceptable Limits	
								Lower	Upper		Lower	Upper		Lower	Upper
O. Reg. 153(511) - Metals & Inorganics (Soil)															
Antimony	1		1.00	1.05	4.9%	< 0.8	118%	70%	130%	86%	80%	120%	90%	70%	130%
Arsenic	1		2	2	0.0%	< 1	108%	70%	130%	104%	80%	120%	107%	70%	130%
Barium	1		73	76	4.0%	< 2	110%	70%	130%	112%	80%	120%	118%	70%	130%
Beryllium	1		< 0.5	< 0.5	0.0%	< 0.5	94%	70%	130%	100%	80%	120%	108%	70%	130%
Boron	1		5	5	0.0%	< 5	72%	70%	130%	104%	80%	120%	112%	70%	130%
Boron (Hot Water Soluble)	1	4252936	0.44	0.40	9.1%	< 0.10	108%	60%	140%	111%	70%	130%	98%	60%	140%
Cadmium	1		< 0.5	< 0.5	0.0%	< 0.5	100%	70%	130%	106%	80%	120%	100%	70%	130%
Chromium	1		55	57	3.6%	< 2	99%	70%	130%	110%	80%	120%	108%	70%	130%
Cobalt	1		3.5	3.2	9.0%	< 0.5	102%	70%	130%	109%	80%	120%	106%	70%	130%
Copper	1		33	33	0.0%	< 1	100%	70%	130%	114%	80%	120%	107%	70%	130%
Lead	1		21	18	15.4%	< 1	97%	70%	130%	105%	80%	120%	99%	70%	130%
Molybdenum	1		1.6	1.8	11.8%	< 0.5	101%	70%	130%	103%	80%	120%	104%	70%	130%
Nickel	1		6	7	15.4%	< 1	107%	70%	130%	111%	80%	120%	105%	70%	130%
Selenium	1		< 0.4	< 0.4	0.0%	< 0.4	100%	70%	130%	104%	80%	120%	104%	70%	130%
Silver	1		< 0.2	< 0.2	0.0%	< 0.2	84%	70%	130%	104%	80%	120%	99%	70%	130%
Thallium	1		< 0.4	< 0.4	0.0%	< 0.4	96%	70%	130%	97%	80%	120%	97%	70%	130%
Uranium	1		< 0.5	< 0.5	0.0%	< 0.5	95%	70%	130%	95%	80%	120%	94%	70%	130%
Vanadium	1		16	16	0.0%	< 1	100%	70%	130%	105%	80%	120%	110%	70%	130%
Zinc	1		94	103	9.1%	< 5	100%	70%	130%	110%	80%	120%	114%	70%	130%
Chromium VI	1	4252943	< 0.2	< 0.2	0.0%	< 0.2	95%	70%	130%	93%	80%	120%	95%	70%	130%
Cyanide	1		< 0.040	< 0.040	0.0%	< 0.040	99%	70%	130%	91%	80%	120%	102%	70%	130%
Mercury	1		< 0.10	< 0.10	0.0%	< 0.10	103%	70%	130%	98%	80%	120%	100%	70%	130%
Electrical Conductivity (2:1)	1	4252936	5.05	5.04	0.2%	< 0.005	NA	90%	110%	NA			NA		
Sodium Adsorption Ratio	1	4252936	55.3	56.1	1.4%	NA	NA			NA			NA		
pH, 2:1 CaCl2 Extraction	1		7.83	7.80	0.4%	NA	101%	90%	110%	NA			NA		

Certified By:

AGAT Laboratories

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Quality Assurance

CLIENT NAME: SOIL MAT ENGINEERS & CONSULTANTS LT

AGAT WORK ORDER: 13H704295

PROJECT NO: SM135013-G

ATTENTION TO: Ian Shaw

Trace Organics Analysis

RPT Date: Apr 16, 2013			DUPLICATE				REFERENCE MATERIAL			METHOD BLANK SPIKE			MATRIX SPIKE		
PARAMETER	Batch	Sample Id	Dup #1	Dup #2	RPD	Method Blank	Measured Value	Acceptable Limits		Recovery	Acceptable Limits		Recovery	Acceptable Limits	
								Lower	Upper		Lower	Upper		Lower	Upper
O. Reg. 153(511) - PHCs F1 - F4 (Soil)															
Benzene	1		< 0.02	< 0.02	0.0%	< 0.02	112%	50%	140%	108%	60%	130%	76%	50%	140%
Toluene	1		< 0.08	< 0.08	0.0%	< 0.08	115%	50%	140%	110%	60%	130%	79%	50%	140%
Ethylbenzene	1		< 0.05	< 0.05	0.0%	< 0.05	112%	50%	140%	115%	60%	130%	76%	50%	140%
Xylene Mixture	1		< 0.05	< 0.05	0.0%	< 0.05	118%	50%	140%	116%	60%	130%	83%	50%	140%
F1 (C6 to C10)	1		< 5	< 5	0.0%	< 5	103%	60%	140%	92%	80%	120%	98%	60%	140%
F2 (C10 to C16)	1		< 10	< 10	0.0%	< 10	112%	60%	140%	88%	80%	120%	86%	60%	140%
F3 (C16 to C34)	1		< 50	< 50	0.0%	< 50	102%	60%	140%	90%	80%	120%	107%	60%	140%
F4 (C34 to C50)	1		< 50	< 50	0.0%	< 50	93%	60%	140%	90%	80%	120%	89%	60%	140%

Certified By:

AGAT Laboratories

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Method Summary

CLIENT NAME: SOIL MAT ENGINEERS & CONSULTANTS LT **AGAT WORK ORDER: 13H704295**

PROJECT NO: SM135013-G **ATTENTION TO: Ian Shaw**

PARAMETER	AGAT S.O.P	LITERATURE REFERENCE	ANALYTICAL TECHNIQUE
Soil Analysis			
Antimony	MET-93-6103	EPA SW-846 3050B & 6020A	ICP-MS
Arsenic	MET-93-6103	EPA SW-846 3050B & 6020A	ICP-MS
Barium	MET-93-6103	EPA SW-846 3050B & 6020A	ICP-MS
Beryllium	MET-93-6103	EPA SW-846 3050B & 6020A	ICP-MS
Boron	MET-93-6103	EPA SW-846 3050B & 6020A	ICP-MS
Boron (Hot Water Soluble)	MET-93-6104	EPA SW 846 6010C; MSA, Part 3, Ch.21	ICP/OES
Cadmium	MET-93-6103	EPA SW-846 3050B & 6020A	ICP-MS
Chromium	MET-93-6103	EPA SW-846 3050B & 6020A	ICP-MS
Cobalt	MET-93-6103	EPA SW-846 3050B & 6020A	ICP-MS
Copper	MET-93-6103	EPA SW-846 3050B & 6020A	ICP-MS
Lead	MET-93-6103	EPA SW-846 3050B & 6020A	ICP-MS
Molybdenum	MET-93-6103	EPA SW-846 3050B & 6020A	ICP-MS
Nickel	MET-93-6103	EPA SW-846 3050B & 6020A	ICP-MS
Selenium	MET-93-6103	EPA SW-846 3050B & 6020A	ICP-MS
Silver	MET-93-6103	EPA SW-846 3050B & 6020A	ICP-MS
Thallium	MET-93-6103	EPA SW-846 3050B & 6020A	ICP-MS
Uranium	MET-93-6103	EPA SW-846 3050B & 6020A	ICP-MS
Vanadium	MET-93-6103	EPA SW-846 3050B & 6020A	ICP-MS
Zinc	MET-93-6103	EPA SW-846 3050B & 6020A	ICP-MS
Chromium VI	INOR-93-6029	SM 3500 B; MSA Part 3, Ch. 25	SPECTROPHOTOMETER
Cyanide	INOR-93-6052	MOE CN-3015 & E 3009 A;SM 4500 CN	TECHNICON AUTO ANALYZER
Mercury	MET-93-6103	EPA SW-846 3050B & 6020A	ICP-MS
Electrical Conductivity (2:1)	INOR-93-6036	McKeague 4.12, SM 2510 B	EC METER
Sodium Adsorption Ratio	INOR-93-6007	McKeague 4.12 & 3.26 & EPA SW-846 6010C	ICP/OES
pH, 2:1 CaCl2 Extraction	INOR-93-6031	MSA part 3 & SM 4500-H+ B	PH METER
Trace Organics Analysis			
Benzene	VOL-91-5009	EPA SW-846 5035 & 8260	P & T GC/MS
Toluene	VOL-91-5009	EPA SW-846 5035 & 8260	P & T GC/MS
Ethylbenzene	VOL-91-5009	EPA SW-846 5035 & 8260	P & T GC/MS
Xylene Mixture	VOL-91-5009	EPA SW-846 5035 & 8260	P & T GC/MS
F1 (C6 to C10)	VOL-91-5009	CCME Tier 1 Method	P & T GC/FID
F1 (C6 to C10) minus BTEX	VOL-91-5009	CCME Tier 1 Method	P & T GC/FID
F2 (C10 to C16)	VOL-91-5009	CCME Tier 1 Method, EPA SW846 8015	GC / FID
F3 (C16 to C34)	VOL-91-5009	CCME Tier 1 Method, EPA SW846 8015	GC / FID
F4 (C34 to C50)	VOL-91-5009	CCME Tier 1 Method, EPA SW846 8015	GC / FID
Gravimetric Heavy Hydrocarbons	VOL-91-5009	CCME Tier 1 Method	BALANCE
Moisture Content	VOL-91-5009	CCME Tier 1 Method	BALANCE
Terphenyl	VOL-91-5009		GC/FID

13H704295

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Chain of Custody Record

Laboratory Use Only
Arrival Temperature: 8.3, 8.7, 8.9
AGAT WO #:
Lab Temperature: 6.2 - 6.5 .58
Notes:

Client Information:

Company: Soil-Mat Engineers
Contact: Ian Shaw, P. Eng.
Address: 130 Lancing Drive, Hamilton
Phone: (905) 318 - 7440 Fax:
Project: SM 135013-G PO:
AGAT Quotation #:

Please note, if quotation number is not provided, client will be billed full price for analysis.

Regulatory Requirements:

- [x] Regulation 153/09 (reg. 511 Amend.)
  - Table 1 (Indicate one)
  - [ ] Ind/Com
  - [x] Res/Park
  - [ ] Agriculture
  - Soil Texture (check one): [ ] Coarse [ ] Fine
- [ ] Sewer Use
  - Region (Indicate one)
  - [ ] Sanitary
  - [ ] Storm
- [ ] Regulation 558
- [ ] CCME
- [ ] Other (specify)
- [ ] Prov. Water Quality Objectives (PWQO)
- [ ] None

Turnaround Time Required (TAT) Required*

Regular TAT
- [x] 5 to 7 Working Days

Rush TAT (please provide prior notification)
Rush Surcharges Apply
- [ ] 3 Working Days
- [ ] 2 Working Days
- [ ] 1 Working Day

OR
Date Required (Rush surcharges may apply):

*TAT is exclusive of weekends and statutory holidays

Invoice To:

Same: Yes [x] No [ ]
Company:
Contact:
Address:

Is this a drinking water sample? (potable water intended for human consumption) [ ] Yes [ ] No
If "Yes", please use the *Drinking Water Chain of Custody Form*

Is this submission for a Record of Site Condition? [ ] Yes [ ] No

Legend Matrix

GW Ground Water O Oil
SW Surface Water P Paint
SD Sediment S Soil

Report Information – reports to be sent to:

1. Name: Ian Shaw, P. Eng.
   Email: ian.shaw@soil-mat.on.ca
2. Name: Kyle Richardson
   Email: kyle.richardson@soil-mat.on.ca

Sample Identification	Date Sampled	Time Sampled	Sample Matrix	# of Containers	Comments Site/Sample Information	Metals and Inorganics	Metal Scan	Hydride Forming Metals	Client Custom Metals	ORPs: [ ] B-HWS [ ] Cl- [ ] CN- [ ] EC [ ] FOC [ ] Cr+6- [ ] SAR [ ] NO_3/NO_2 [ ] N-Total [ ] Hg [ ] pH	Nutrients: [ ] TP [ ] NH_3 [ ] TKN [ ] NO_3 [ ] NO_2 [ ] NO_3/NO_2	VOC: [ ] VOC [ ] THM [ ] BTEX	CCME Fractions 1 to 4	ABNs	PAHs	Chlorophenols	PCBs	Organochlorine Pesticides	TCLP Metals/Inorganics	TCLP:	Sewer Use
BH1 SS1	2013-04-03			2		X							X							
BH2 SS2	2013-04-03			2		X							X							
BH3 SS1	2013-04-03			2		X							X							
BH4 SS2	2013-04-03			2		X							X							

Samples Relinquished by (print name & sign):	Date/Time	Samples Received by (Print name & sign):	Date/Time
Kyle Richardson	Apr 9. 1050		Apr 9.2013 10:50
Samples Relinquished by (print name & sign):	Date/Time	Samples Received by (Print name & sign):	Date/Time
			Apr 9/13 2:30

White Copy – Client
Yellow + Golden Copy – AGAT
White Copy – AGAT

Page 1 of 1
NO:

Document ID: DIV-78-1511.006
Date Issued: July 20, 2011

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Certificate of Analysis

AGAT WORK ORDER: 13H704295
PROJECT NO: SM135013-G

CLIENT NAME: SOIL MAT ENGINEERS & CONSULTANTS LT

ATTENTION TO: Ian Shaw

O. Reg. 153(511) - Metals & Inorganics (Soil)

DATE RECEIVED: 2013-04-09

DATE REPORTED: 2013-04-16

SAMPLE DESCRIPTION:				BH1 SS1	BH2 SS2	BH3 SS1	BH4 SS2
SAMPLE TYPE:				Soil	Soil	Soil	Soil
DATE SAMPLED:				4/3/2013	4/3/2013	4/3/2013	4/3/2013
Parameter	Unit	G / S	RDL	4252936	4252939	4252941	4252943
Antimony	µg/g	7.5	0.8	<0.8	<0.8	<0.8	<0.8
Arsenic	µg/g	18	1	5	8	4	6
Barium	µg/g	390	2	116	72	73	113
Beryllium	µg/g	4	0.5	0.7	<0.5	0.8	1.0
Boron	µg/g	120	5	13	10	24	16
Boron (Hot Water Soluble)	µg/g	1.5	0.10	0.44	<0.10	3.39	1.26
Cadmium	µg/g	1.2	0.5	<0.5	<0.5	<0.5	<0.5
Chromium	µg/g	160	2	21	13	8	11
Cobalt	µg/g	22	0.5	11.3	8.3	5.0	6.3
Copper	µg/g	140	1	37	58	28	49
Lead	µg/g	120	1	41	14	11	27
Molybdenum	µg/g	6.9	0.5	<0.5	0.5	<0.5	<0.5
Nickel	µg/g	100	1	23	14	7	10
Selenium	µg/g	2.4	0.4	<0.4	<0.4	0.6	0.6
Silver	µg/g	20	0.2	<0.2	<0.2	<0.2	<0.2
Thallium	µg/g	1	0.4	<0.4	<0.4	<0.4	<0.4
Uranium	µg/g	23	0.5	0.6	<0.5	0.5	0.6
Vanadium	µg/g	86	1	28	19	12	16
Zinc	µg/g	340	5	59	57	32	47
Chromium VI	µg/g	8	0.2	<0.2	<0.2	<0.2	<0.2
Cyanide	µg/g	0.051	0.040	<0.040	<0.040	<0.040	<0.040
Mercury	µg/g	0.27	0.10	<0.10	<0.10	<0.10	<0.10
Electrical Conductivity (2:1)	mS/cm	0.7	0.005	5.05	0.778	0.768	1.55
Sodium Adsorption Ratio	NA	5	NA	55.3	14.4	1.89	8.79
pH, 2:1 CaCl2 Extraction	pH Units		NA	8.05	7.99	9.28	8.49

Comments: RDL - Reported Detection Limit; G / S - Guideline / Standard: Refers to T2(RPI) - Current
4252936-4252943 EC & SAR were determined on the DI water extract obtained from the 2:1 leaching procedure (2 parts DI water:1 part soil). pH was determined on the 0.01M CaCl2 extract prepared at 2:1 ratio.

Certified By:

AGAT Laboratories

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Certificate of Analysis

AGAT WORK ORDER: 13H704295

PROJECT NO: SM135013-G

CLIENT NAME: SOIL MAT ENGINEERS & CONSULTANTS LT

ATTENTION TO: Ian Shaw

O. Reg. 153(511) - PHCs F1 - F4 (Soil)

DATE RECEIVED: 2013-04-09

DATE REPORTED: 2013-04-16

		SAMPLE DESCRIPTION:		BH1 SS1	BH2 SS2	BH3 SS1	BH4 SS2
		SAMPLE TYPE:		Soil	Soil	Soil	Soil
		DATE SAMPLED:		4/3/2013	4/3/2013	4/3/2013	4/3/2013
Parameter	Unit	G / S	RDL	4252936	4252939	4252941	4252943
Benzene	µg/g	0.21	0.02	<0.02	<0.02	<0.02	<0.02
Toluene	µg/g	2.3	0.08	<0.08	<0.08	<0.08	<0.08
Ethylbenzene	µg/g	1.1	0.05	<0.05	<0.05	<0.05	<0.05
Xylene Mixture	µg/g	3.1	0.05	<0.05	<0.05	<0.05	<0.05
F1 (C6 to C10)	µg/g		5	<5	<5	<5	<5
F1 (C6 to C10) minus BTEX	µg/g	55	5	<5	<5	<5	<5
F2 (C10 to C16)	µg/g	98	10	<10	<10	<10	<10
F3 (C16 to C34)	µg/g	300	50	<50	<50	<50	<50
F4 (C34 to C50)	µg/g	2800	50	<50	<50	<50	130
Gravimetric Heavy Hydrocarbons	µg/g	2800	50	NA	NA	NA	NA
Moisture Content	%		0.1	14.5	4.3	5.0	4.7
Surrogate	Unit	Acceptable Limits					
Terphenyl	%	60-140		126	64	86	85

Comments: RDL - Reported Detection Limit; G / S - Guideline / Standard: Refers to T2(RPI) - Current

4252936-4252943 Results are based on sample dry weight.
The soil sample was prepared in the lab using the Methanol extraction technique. The sample was not field preserved with methanol and an Encore was not provided for analysis.
The C6-C10 fraction is calculated using toluene response factor.
The C10 - C16, C16 - C34, and C34 - C50 fractions are calculated using the average response factor for n-C10, n-C16, and n-C34.
Gravimetric Heavy Hydrocarbons are not included in the Total C16-C50 and are only determined if the chromatogram of the C34 - C50 hydrocarbons indicates that hydrocarbons >C50 are present.
Total C6 - C50 results are corrected for BTEX contributions.
This method complies with the Reference Method for the CWS PHC and is validated for use in the laboratory.
nC6 and nC10 response factors are within 30% of Toluene response factor.
nC10, nC16 and nC34 response factors are within 10% of their average.
C50 response factor is within 70% of nC10 + nC16 + nC34 average.
Linearity is within 15%.
Extraction and holding times were met for this sample.
Fractions 1-4 are quantified with the contribution of PAHs. Under Ontario Regulation 153, results are considered valid without determining the PAH contribution if not requested by the client.
Quality Control Data is available upon request.

Certified By:

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Guideline Violation

AGAT WORK ORDER: 13H704295

PROJECT NO: SM135013-G

CLIENT NAME: SOIL MAT ENGINEERS & CONSULTANTS LT

ATTENTION TO: Ian Shaw

SAMPLEID	SAMPLE TITLE	GUIDELINE	ANALYSIS PACKAGE	PARAMETER	GUIDEVALUE	RESULT
4252936	BH1 SS1	T2(RPI) - Current	O. Reg. 153(511) - Metals & Inorganics (Soil)	Electrical Conductivity (2:1)	0.7	5.05
4252936	BH1 SS1	T2(RPI) - Current	O. Reg. 153(511) - Metals & Inorganics (Soil)	Sodium Adsorption Ratio	5	55.3
4252939	BH2 SS2	T2(RPI) - Current	O. Reg. 153(511) - Metals & Inorganics (Soil)	Electrical Conductivity (2:1)	0.7	0.778
4252939	BH2 SS2	T2(RPI) - Current	O. Reg. 153(511) - Metals & Inorganics (Soil)	Sodium Adsorption Ratio	5	14.4
4252941	BH3 SS1	T2(RPI) - Current	O. Reg. 153(511) - Metals & Inorganics (Soil)	Boron (Hot Water Soluble)	1.5	3.39
4252941	BH3 SS1	T2(RPI) - Current	O. Reg. 153(511) - Metals & Inorganics (Soil)	Electrical Conductivity (2:1)	0.7	0.768
4252943	BH4 SS2	T2(RPI) - Current	O. Reg. 153(511) - Metals & Inorganics (Soil)	Electrical Conductivity (2:1)	0.7	1.55
4252943	BH4 SS2	T2(RPI) - Current	O. Reg. 153(511) - Metals & Inorganics (Soil)	Sodium Adsorption Ratio	5	8.79

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Certificate of Analysis

AGAT WORK ORDER: 13H704295

PROJECT NO: SM135013-G

CLIENT NAME: SOIL MAT ENGINEERS & CONSULTANTS LT

ATTENTION TO: Ian Shaw

O. Reg. 153(511) - Metals & Inorganics (Soil)

DATE RECEIVED: 2013-04-09

DATE REPORTED: 2013-04-16

		SAMPLE DESCRIPTION:		BH1 SS1	BH2 SS2	BH3 SS1	BH4 SS2
		SAMPLE TYPE:		Soil	Soil	Soil	Soil
		DATE SAMPLED:		4/3/2013	4/3/2013	4/3/2013	4/3/2013
Parameter	Unit	G / S	RDL	4252936	4252939	4252941	4252943
Antimony	µg/g	40	0.8	<0.8	<0.8	<0.8	<0.8
Arsenic	µg/g	18	1	5	8	4	6
Barium	µg/g	670	2	116	72	73	113
Beryllium	µg/g	8	0.5	0.7	<0.5	0.8	1.0
Boron	µg/g	120	5	13	10	24	16
Boron (Hot Water Soluble)	µg/g	2	0.10	0.44	<0.10	3.39	1.26
Cadmium	µg/g	1.9	0.5	<0.5	<0.5	<0.5	<0.5
Chromium	µg/g	160	2	21	13	8	11
Cobalt	µg/g	80	0.5	11.3	8.3	5.0	6.3
Copper	µg/g	230	1	37	58	28	49
Lead	µg/g	120	1	41	14	11	27
Molybdenum	µg/g	40	0.5	<0.5	0.5	<0.5	<0.5
Nickel	µg/g	270	1	23	14	7	10
Selenium	µg/g	5.5	0.4	<0.4	<0.4	0.6	0.6
Silver	µg/g	40	0.2	<0.2	<0.2	<0.2	<0.2
Thallium	µg/g	3.3	0.4	<0.4	<0.4	<0.4	<0.4
Uranium	µg/g	33	0.5	0.6	<0.5	0.5	0.6
Vanadium	µg/g	86	1	28	19	12	16
Zinc	µg/g	340	5	59	57	32	47
Chromium VI	µg/g	8	0.2	<0.2	<0.2	<0.2	<0.2
Cyanide	µg/g	0.051	0.040	<0.040	<0.040	<0.040	<0.040
Mercury	µg/g	3.9	0.10	<0.10	<0.10	<0.10	<0.10
Electrical Conductivity (2:1)	mS/cm	1.4	0.005	5.05	0.778	0.768	1.55
Sodium Adsorption Ratio	NA	12	NA	55.3	14.4	1.89	8.79
pH, 2:1 CaCl2 Extraction	pH Units		NA	8.05	7.99	9.28	8.49

Comments: RDL - Reported Detection Limit; G / S - Guideline / Standard: Refers to T2(ICC) - Current

4252936-4252943 EC & SAR were determined on the DI water extract obtained from the 2:1 leaching procedure (2 parts DI water:1 part soil). pH was determined on the 0.01M CaCl2 extract prepared at 2:1 ratio.

Certified By:

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Certificate of Analysis

AGAT WORK ORDER: 13H704295
PROJECT NO: SM135013-G

CLIENT NAME: SOIL MAT ENGINEERS & CONSULTANTS LT

ATTENTION TO: Ian Shaw

O. Reg. 153(511) - PHCs F1 - F4 (Soil)

DATE RECEIVED: 2013-04-09

DATE REPORTED: 2013-04-16

		SAMPLE DESCRIPTION:		BH1 SS1	BH2 SS2	BH3 SS1	BH4 SS2
		SAMPLE TYPE:		Soil	Soil	Soil	Soil
		DATE SAMPLED:		4/3/2013	4/3/2013	4/3/2013	4/3/2013
Parameter	Unit	G / S	RDL	4252936	4252939	4252941	4252943
Benzene	µg/g	0.32	0.02	<0.02	<0.02	<0.02	<0.02
Toluene	µg/g	6.4	0.08	<0.08	<0.08	<0.08	<0.08
Ethylbenzene	µg/g	1.1	0.05	<0.05	<0.05	<0.05	<0.05
Xylene Mixture	µg/g	26	0.05	<0.05	<0.05	<0.05	<0.05
F1 (C6 to C10)	µg/g		5	<5	<5	<5	<5
F1 (C6 to C10) minus BTEX	µg/g	55	5	<5	<5	<5	<5
F2 (C10 to C16)	µg/g	230	10	<10	<10	<10	<10
F3 (C16 to C34)	µg/g	1700	50	<50	<50	<50	<50
F4 (C34 to C50)	µg/g	3300	50	<50	<50	<50	130
Gravimetric Heavy Hydrocarbons	µg/g	3300	50	NA	NA	NA	NA
Moisture Content	%		0.1	14.5	4.3	5.0	4.7
Surrogate	Unit	Acceptable Limits					
Terphenyl	%	60-140		126	64	86	85

Comments: RDL - Reported Detection Limit; G / S - Guideline / Standard: Refers to T2(ICC) - Current

4252936-4252943 Results are based on sample dry weight.
The soil sample was prepared in the lab using the Methanol extraction technique. The sample was not field preserved with methanol and an Encore was not provided for analysis.
The C6-C10 fraction is calculated using toluene response factor.
The C10 - C16, C16 - C34, and C34 - C50 fractions are calculated using the average response factor for n-C10, n-C16, and n-C34.
Gravimetric Heavy Hydrocarbons are not included in the Total C16-C50 and are only determined if the chromatogram of the C34 - C50 hydrocarbons indicates that hydrocarbons >C50 are present.
Total C6 - C50 results are corrected for BTEX contributions.
This method complies with the Reference Method for the CWS PHC and is validated for use in the laboratory.
nC6 and nC10 response factors are within 30% of Toluene response factor.
nC10, nC16 and nC34 response factors are within 10% of their average.
C50 response factor is within 70% of nC10 + nC16 + nC34 average.
Linearity is within 15%.
Extraction and holding times were met for this sample.
Fractions 1-4 are quantified with the contribution of PAHs. Under Ontario Regulation 153, results are considered valid without determining the PAH contribution if not requested by the client.
Quality Control Data is available upon request.

Certified By:

AGAT Laboratories

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Guideline Violation

AGAT WORK ORDER: 13H704295

PROJECT NO: SM135013-G

CLIENT NAME: SOIL MAT ENGINEERS & CONSULTANTS LT

ATTENTION TO: Ian Shaw

SAMPLEID	SAMPLE TITLE	GUIDELINE	ANALYSIS PACKAGE	PARAMETER	GUIDEVALUE	RESULT
4252936	BH1 SS1	T2(ICC) - Current	O. Reg. 153(511) - Metals & Inorganics (Soil)	Electrical Conductivity (2:1)	1.4	5.05
4252936	BH1 SS1	T2(ICC) - Current	O. Reg. 153(511) - Metals & Inorganics (Soil)	Sodium Adsorption Ratio	12	55.3
4252939	BH2 SS2	T2(ICC) - Current	O. Reg. 153(511) - Metals & Inorganics (Soil)	Sodium Adsorption Ratio	12	14.4
4252941	BH3 SS1	T2(ICC) - Current	O. Reg. 153(511) - Metals & Inorganics (Soil)	Boron (Hot Water Soluble)	2	3.39
4252943	BH4 SS2	T2(ICC) - Current	O. Reg. 153(511) - Metals & Inorganics (Soil)	Electrical Conductivity (2:1)	1.4	1.55

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Certificate of Analysis

AGAT WORK ORDER: 13H704295
PROJECT NO: SM135013-G

CLIENT NAME: SOIL MAT ENGINEERS & CONSULTANTS LT

ATTENTION TO: Ian Shaw

O. Reg. 153(511) - Metals & Inorganics (Soil)

DATE RECEIVED: 2013-04-09

DATE REPORTED: 2013-04-16

		SAMPLE DESCRIPTION:		BH1 SS1	BH2 SS2	BH3 SS1	BH4 SS2
		SAMPLE TYPE:		Soil	Soil	Soil	Soil
		DATE SAMPLED:		4/3/2013	4/3/2013	4/3/2013	4/3/2013
Parameter	Unit	G / S	RDL	4252936	4252939	4252941	4252943
Antimony	µg/g	7.5	0.8	<0.8	<0.8	<0.8	<0.8
Arsenic	µg/g	18	1	5	8	4	6
Barium	µg/g	390	2	116	72	73	113
Beryllium	µg/g	4	0.5	0.7	<0.5	0.8	1.0
Boron	µg/g	120	5	13	10	24	16
Boron (Hot Water Soluble)	µg/g	1.5	0.10	0.44	<0.10	3.39	1.26
Cadmium	µg/g	1.2	0.5	<0.5	<0.5	<0.5	<0.5
Chromium	µg/g	160	2	21	13	8	11
Cobalt	µg/g	22	0.5	11.3	8.3	5.0	6.3
Copper	µg/g	140	1	37	58	28	49
Lead	µg/g	120	1	41	14	11	27
Molybdenum	µg/g	6.9	0.5	<0.5	0.5	<0.5	<0.5
Nickel	µg/g	100	1	23	14	7	10
Selenium	µg/g	2.4	0.4	<0.4	<0.4	0.6	0.6
Silver	µg/g	20	0.2	<0.2	<0.2	<0.2	<0.2
Thallium	µg/g	1	0.4	<0.4	<0.4	<0.4	<0.4
Uranium	µg/g	23	0.5	0.6	<0.5	0.5	0.6
Vanadium	µg/g	86	1	28	19	12	16
Zinc	µg/g	340	5	59	57	32	47
Chromium VI	µg/g	8	0.2	<0.2	<0.2	<0.2	<0.2
Cyanide	µg/g	0.051	0.040	<0.040	<0.040	<0.040	<0.040
Mercury	µg/g	0.27	0.10	<0.10	<0.10	<0.10	<0.10
Electrical Conductivity (2:1)	mS/cm	0.7	0.005	5.05	0.778	0.768	1.55
Sodium Adsorption Ratio	NA	5	NA	55.3	14.4	1.89	8.79
pH, 2:1 CaCl2 Extraction	pH Units		NA	8.05	7.99	9.28	8.49

Comments: RDL - Reported Detection Limit; G / S - Guideline / Standard: Refers to T3(RPI) - Current
4252936-4252943 EC & SAR were determined on the DI water extract obtained from the 2:1 leaching procedure (2 parts DI water:1 part soil). pH was determined on the 0.01M CaCl2 extract prepared at 2:1 ratio.

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AGAT WORK ORDER: 13H704295

PROJECT NO: SM135013-G

CLIENT NAME: SOIL MAT ENGINEERS & CONSULTANTS LT

ATTENTION TO: Ian Shaw

O. Reg. 153(511) - PHCs F1 - F4 (Soil)

DATE RECEIVED: 2013-04-09

DATE REPORTED: 2013-04-16

		SAMPLE DESCRIPTION:		BH1 SS1	BH2 SS2	BH3 SS1	BH4 SS2
		SAMPLE TYPE:		Soil	Soil	Soil	Soil
		DATE SAMPLED:		4/3/2013	4/3/2013	4/3/2013	4/3/2013
Parameter	Unit	G / S	RDL	4252936	4252939	4252941	4252943
Benzene	µg/g	0.21	0.02	<0.02	<0.02	<0.02	<0.02
Toluene	µg/g	2.3	0.08	<0.08	<0.08	<0.08	<0.08
Ethylbenzene	µg/g	2	0.05	<0.05	<0.05	<0.05	<0.05
Xylene Mixture	µg/g	3.1	0.05	<0.05	<0.05	<0.05	<0.05
F1 (C6 to C10)	µg/g		5	<5	<5	<5	<5
F1 (C6 to C10) minus BTEX	µg/g	55	5	<5	<5	<5	<5
F2 (C10 to C16)	µg/g	98	10	<10	<10	<10	<10
F3 (C16 to C34)	µg/g	300	50	<50	<50	<50	<50
F4 (C34 to C50)	µg/g	2800	50	<50	<50	<50	130
Gravimetric Heavy Hydrocarbons	µg/g	2800	50	NA	NA	NA	NA
Moisture Content	%		0.1	14.5	4.3	5.0	4.7
Surrogate	Unit	Acceptable Limits					
Terphenyl	%	60-140		126	64	86	85

Comments: RDL - Reported Detection Limit; G / S - Guideline / Standard: Refers to T3(RPI) - Current

4252936-4252943 Results are based on sample dry weight.
The soil sample was prepared in the lab using the Methanol extraction technique. The sample was not field preserved with methanol and an Encore was not provided for analysis.
The C6-C10 fraction is calculated using toluene response factor.
The C10 - C16, C16 - C34, and C34 - C50 fractions are calculated using the average response factor for n-C10, n-C16, and n-C34.
Gravimetric Heavy Hydrocarbons are not included in the Total C16-C50 and are only determined if the chromatogram of the C34 - C50 hydrocarbons indicates that hydrocarbons >C50 are present.
Total C6 - C50 results are corrected for BTEX contributions.
This method complies with the Reference Method for the CWS PHC and is validated for use in the laboratory.
nC6 and nC10 response factors are within 30% of Toluene response factor.
nC10, nC16 and nC34 response factors are within 10% of their average.
C50 response factor is within 70% of nC10 + nC16 + nC34 average.
Linearity is within 15%.
Extraction and holding times were met for this sample.
Fractions 1-4 are quantified with the contribution of PAHs. Under Ontario Regulation 153, results are considered valid without determining the PAH contribution if not requested by the client.
Quality Control Data is available upon request.

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Guideline Violation

AGAT WORK ORDER: 13H704295
PROJECT NO: SM135013-G

CLIENT NAME: SOIL MAT ENGINEERS & CONSULTANTS LT

ATTENTION TO: Ian Shaw

SAMPLEID	SAMPLE TITLE	GUIDELINE	ANALYSIS PACKAGE	PARAMETER	GUIDEVALUE	RESULT
4252936	BH1 SS1	T3(RPI) - Current	O. Reg. 153(511) - Metals & Inorganics (Soil)	Electrical Conductivity (2:1)	0.7	5.05
4252936	BH1 SS1	T3(RPI) - Current	O. Reg. 153(511) - Metals & Inorganics (Soil)	Sodium Adsorption Ratio	5	55.3
4252939	BH2 SS2	T3(RPI) - Current	O. Reg. 153(511) - Metals & Inorganics (Soil)	Electrical Conductivity (2:1)	0.7	0.778
4252939	BH2 SS2	T3(RPI) - Current	O. Reg. 153(511) - Metals & Inorganics (Soil)	Sodium Adsorption Ratio	5	14.4
4252941	BH3 SS1	T3(RPI) - Current	O. Reg. 153(511) - Metals & Inorganics (Soil)	Boron (Hot Water Soluble)	1.5	3.39
4252941	BH3 SS1	T3(RPI) - Current	O. Reg. 153(511) - Metals & Inorganics (Soil)	Electrical Conductivity (2:1)	0.7	0.768
4252943	BH4 SS2	T3(RPI) - Current	O. Reg. 153(511) - Metals & Inorganics (Soil)	Electrical Conductivity (2:1)	0.7	1.55
4252943	BH4 SS2	T3(RPI) - Current	O. Reg. 153(511) - Metals & Inorganics (Soil)	Sodium Adsorption Ratio	5	8.79

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Certificate of Analysis

AGAT WORK ORDER: 13H704295

PROJECT NO: SM135013-G

CLIENT NAME: SOIL MAT ENGINEERS & CONSULTANTS LT

ATTENTION TO: Ian Shaw

O. Reg. 153(511) - Metals & Inorganics (Soil)

DATE RECEIVED: 2013-04-09

DATE REPORTED: 2013-04-16

		SAMPLE DESCRIPTION:		BH1 SS1	BH2 SS2	BH3 SS1	BH4 SS2
		SAMPLE TYPE:		Soil	Soil	Soil	Soil
		DATE SAMPLED:		4/3/2013	4/3/2013	4/3/2013	4/3/2013
Parameter	Unit	G / S	RDL	4252936	4252939	4252941	4252943
Antimony	µg/g	40	0.8	<0.8	<0.8	<0.8	<0.8
Arsenic	µg/g	18	1	5	8	4	6
Barium	µg/g	670	2	116	72	73	113
Beryllium	µg/g	8	0.5	0.7	<0.5	0.8	1.0
Boron	µg/g	120	5	13	10	24	16
Boron (Hot Water Soluble)	µg/g	2	0.10	0.44	<0.10	3.39	1.26
Cadmium	µg/g	1.9	0.5	<0.5	<0.5	<0.5	<0.5
Chromium	µg/g	160	2	21	13	8	11
Cobalt	µg/g	80	0.5	11.3	8.3	5.0	6.3
Copper	µg/g	230	1	37	58	28	49
Lead	µg/g	120	1	41	14	11	27
Molybdenum	µg/g	40	0.5	<0.5	0.5	<0.5	<0.5
Nickel	µg/g	270	1	23	14	7	10
Selenium	µg/g	5.5	0.4	<0.4	<0.4	0.6	0.6
Silver	µg/g	40	0.2	<0.2	<0.2	<0.2	<0.2
Thallium	µg/g	3.3	0.4	<0.4	<0.4	<0.4	<0.4
Uranium	µg/g	33	0.5	0.6	<0.5	0.5	0.6
Vanadium	µg/g	86	1	28	19	12	16
Zinc	µg/g	340	5	59	57	32	47
Chromium VI	µg/g	8	0.2	<0.2	<0.2	<0.2	<0.2
Cyanide	µg/g	0.051	0.040	<0.040	<0.040	<0.040	<0.040
Mercury	µg/g	3.9	0.10	<0.10	<0.10	<0.10	<0.10
Electrical Conductivity (2:1)	mS/cm	1.4	0.005	5.05	0.778	0.768	1.55
Sodium Adsorption Ratio	NA	12	NA	55.3	14.4	1.89	8.79
pH, 2:1 CaCl2 Extraction	pH Units		NA	8.05	7.99	9.28	8.49

Comments: RDL - Reported Detection Limit; G / S - Guideline / Standard: Refers to T3(ICC) - Current

4252936-4252943 EC & SAR were determined on the DI water extract obtained from the 2:1 leaching procedure (2 parts DI water:1 part soil). pH was determined on the 0.01M CaCl2 extract prepared at 2:1 ratio.

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AGAT WORK ORDER: 13H704295
PROJECT NO: SM135013-G

CLIENT NAME: SOIL MAT ENGINEERS & CONSULTANTS LT

ATTENTION TO: Ian Shaw

O. Reg. 153(511) - PHCs F1 - F4 (Soil)

DATE RECEIVED: 2013-04-09

DATE REPORTED: 2013-04-16

		SAMPLE DESCRIPTION:		BH1 SS1	BH2 SS2	BH3 SS1	BH4 SS2
		SAMPLE TYPE:		Soil	Soil	Soil	Soil
		DATE SAMPLED:		4/3/2013	4/3/2013	4/3/2013	4/3/2013
Parameter	Unit	G / S	RDL	4252936	4252939	4252941	4252943
Benzene	µg/g	0.32	0.02	<0.02	<0.02	<0.02	<0.02
Toluene	µg/g	68	0.08	<0.08	<0.08	<0.08	<0.08
Ethylbenzene	µg/g	9.5	0.05	<0.05	<0.05	<0.05	<0.05
Xylene Mixture	µg/g	26	0.05	<0.05	<0.05	<0.05	<0.05
F1 (C6 to C10)	µg/g		5	<5	<5	<5	<5
F1 (C6 to C10) minus BTEX	µg/g	55	5	<5	<5	<5	<5
F2 (C10 to C16)	µg/g	230	10	<10	<10	<10	<10
F3 (C16 to C34)	µg/g	1700	50	<50	<50	<50	<50
F4 (C34 to C50)	µg/g	3300	50	<50	<50	<50	130
Gravimetric Heavy Hydrocarbons	µg/g	3300	50	NA	NA	NA	NA
Moisture Content	%		0.1	14.5	4.3	5.0	4.7
Surrogate	Unit	Acceptable Limits					
Terphenyl	%	60-140		126	64	86	85

Comments: RDL - Reported Detection Limit; G / S - Guideline / Standard: Refers to T3(ICC) - Current

4252936-4252943 Results are based on sample dry weight.
The soil sample was prepared in the lab using the Methanol extraction technique. The sample was not field preserved with methanol and an Encore was not provided for analysis.
The C6-C10 fraction is calculated using toluene response factor.
The C10 - C16, C16 - C34, and C34 - C50 fractions are calculated using the average response factor for n-C10, n-C16, and n-C34.
Gravimetric Heavy Hydrocarbons are not included in the Total C16-C50 and are only determined if the chromatogram of the C34 - C50 hydrocarbons indicates that hydrocarbons >C50 are present.
Total C6 - C50 results are corrected for BTEX contributions.
This method complies with the Reference Method for the CWS PHC and is validated for use in the laboratory.
nC6 and nC10 response factors are within 30% of Toluene response factor.
nC10, nC16 and nC34 response factors are within 10% of their average.
C50 response factor is within 70% of nC10 + nC16 + nC34 average.
Linearity is within 15%.
Extraction and holding times were met for this sample.
Fractions 1-4 are quantified with the contribution of PAHs. Under Ontario Regulation 153, results are considered valid without determining the PAH contribution if not requested by the client.
Quality Control Data is available upon request.

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Guideline Violation

AGAT WORK ORDER: 13H704295
PROJECT NO: SM135013-G

CLIENT NAME: SOIL MAT ENGINEERS & CONSULTANTS LT

ATTENTION TO: Ian Shaw

SAMPLEID	SAMPLE TITLE	GUIDELINE	ANALYSIS PACKAGE	PARAMETER	GUIDEVALUE	RESULT
4252936	BH1 SS1	T3(ICC) - Current	O. Reg. 153(511) - Metals & Inorganics (Soil)	Electrical Conductivity (2:1)	1.4	5.05
4252936	BH1 SS1	T3(ICC) - Current	O. Reg. 153(511) - Metals & Inorganics (Soil)	Sodium Adsorption Ratio	12	55.3
4252939	BH2 SS2	T3(ICC) - Current	O. Reg. 153(511) - Metals & Inorganics (Soil)	Sodium Adsorption Ratio	12	14.4
4252941	BH3 SS1	T3(ICC) - Current	O. Reg. 153(511) - Metals & Inorganics (Soil)	Boron (Hot Water Soluble)	2	3.39
4252943	BH4 SS2	T3(ICC) - Current	O. Reg. 153(511) - Metals & Inorganics (Soil)	Electrical Conductivity (2:1)	1.4	1.55