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CITY OF OTTAWA

Long-Term Strategy Review and Decommissioning Impact Study

Porters Island Pedestrian Bridge (SN013260)

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Executive Summary

The City of Ottawa (City) retained Dillon Consulting Limited (Dillon) to conduct a Long Term Strategy Review and Impact Assessment Study for the decommissioning of the Porters Island Pedestrian Bridge (SN013260). This report summarizes the current condition of the structure and results of the structural evaluation, provides assessment of the risk associated with maintaining the current structure functionality in its existing condition, summarizes the results of initial consultation with stakeholders, provides a summary of renewal options considered for the site, presents cost estimates for rehabilitation and decommissioning of the structure, and outlines next steps for decommissioning of the structure.

Porters Island Pedestrian Bridge is a two-span (38.4 m – 38.4 m) pin-connected wrought iron Pratt through-truss superstructure with a timber deck and was constructed in 1894. The bridge is supported on a stone masonry pier and abutments founded on bedrock. The bridge has an overall width of 4.1 m, clearance between railings of 3.2 m and a total height of 6.0 m. The bridge spans the south branch of the Rideau River in Ottawa, between Porters Island and St. Patrick Street. The structure is not currently designated, however it is listed on the Ontario Heritage Bridge List and the crossing is associated with the history of Porters Island serving as a former quarantine site. The structure is one of two bridges servicing Porters Island, and has been deemed redundant since there is a newer bridge that services both vehicular and pedestrian traffic. The bridge was closed to pedestrians in 2009 due to concerns associated with its condition and the structure still carries an active Enbridge gas main onto Porters Island.

The structure is overall in poor to fair condition. Significant defects include severe localized corrosion to truss members at the abutments, visual crack indications on several fracture critical truss members (eye-bars at diagonals, verticals and bottom-chord), severely deformed or uneven loading truss members, seized and corroded abutment bearings and severe weathering and rot of timber deck and stringers. The results of the structural evaluation conclude that several superstructure components are structurally deficient and do not meet the current CHBDC requirements in all loading scenarios. Based on the condition of the structure, the structure is a liability to the City if not properly maintained with medium to high risks to public safety and potential for unplanned disruption of the existing gas service (marginally acceptable risk).

Initial consultations revealed that several agencies had a desire to protect the heritage value of the structure. More specifically, the Councillor of the Rideau-Vanier Ward, the Lowertown Community Association, and the City of Ottawa Heritage Unit had a desire to protect and/or re-open the pedestrian bridge to the public.

Three renewal options were considered for the site:

- Decommissioning – Remove the existing structure and relocate the existing Enbridge gas main to another suitable location. The estimated cost for decommissioning is $271,000, which excludes costs associated with gas main relocation. The costs for gas main temporary support, protection, and relocation were developed by the City in consultation with Enbridge and are estimated at $650,000.

- Maintain Current Functionality – Repair and strengthening of the existing structure to maintain the current use of the existing structure in supporting the existing Enbridge gas main while remaining closed to vehicular and pedestrian traffic. The initial cost for the rehabilitation of the structure is estimated at $676,000, which excludes costs associated with gas main temporary support, protection or temporary relocation (as required). The costs for gas main temporary support and protection were developed by the City in consultation with Enbridge and is estimated at $20,000.
- Reinstate Pedestrian Crossing – Major rehabilitation of the existing structure to reinstate the functionality of the structure as a pedestrian crossing. The initial cost for the rehabilitation of the structure is estimated at $ 1,520,000, which excludes costs associated with gas main temporary support, protection or temporary relocation (as required). The costs for gas main temporary support and protection were developed by the City in consultation with Enbridge and is estimated at $200,000.

The results from the impact assessment confirmed that decommissioning of the structure is anticipated to have limited impacts to the natural and socio-economic environments, if the proposed mitigation measures are carried forward. The decommissioning meets the requirements of a Schedule A+ project (MCEA Appendix 1, Project # 39. Retirement of existing road and road related facilities) under the Municipal Class Environmental Assessment (EA) (2000, as amended in 2007, 2011 & 2015). Schedule A+ projects are considered pre-approved, however the public is to be advised prior to project implementation. Based on the age and the heritage significance of the structure, along with the history associated with Porters Island and interest from the public in protecting the heritage value of the structure, it is recommended that the City develop a Commemoration Strategy if the City proceeds with decommissioning of the structure. The Commemoration Strategy should include the preparation of a Cultural Heritage Documentation Report (CHDR) and an Open House. The Open House would provide an opportunity for the public to meet with City staff to review and provide input to the proposed Commemoration Strategy. The Commemoration Strategy could include salvage and reuse of heritage features in a commemorative monument that preserves some of the key elements of the structure's built heritage and pays tribute to history of the crossing and island.

Should the City consider rehabilitation of the structure, it is anticipated that the project would proceed under a Schedule B (MCEA Appendix 1, Project # 30. Reconstruction or alteration of a heritage structure) under the Municipal Class Environmental Assessment (EA) (2000, as amended in 2007, 2011 & 2015).

Additional proposed mitigation measures, precautions and/or recommendations for this structure as a result of the investigations include the following:

- Offsite dismantling of the superstructure is a feasible mitigation measure to limit the impact of construction activities during decommissioning. Removal and transportation of the entire superstructure following removal of the timber deck system would significantly reduce the impacts to the adjacent land and residents.

- Maintaining the existing masonry substructure in situ will lower the risks and limit the environmental impacts of the decommissioning. The remaining substructure would also preserve the heritage of the stone masonry.
- Continued correspondence with Enbridge (James Arbuthnott) is recommended to communicate the existing structure condition and results from the structural evaluation, potential hazards for inspection of the existing gas main, potential cost-sharing component with the City and to continue pursuing the relocation of the gas main.
- Due to the condition of the structure, it is recommended that the abutment bearing seats be cleaned to allow for proper inspection and monitoring of the structure. It is recommended that the structure be observed in cold weather to increase understanding of structure behaviour. Revisiting the current frequency of structure inspections may also be warranted (biennial instead of the current 5 year interval).
- Completion of an archaeological assessment is required if impacts to undisturbed areas are anticipated during construction.

1.0 Introduction

The City of Ottawa (City) has retained Dillon Consulting Limited (Dillon) to conduct a Long Term Strategy Review and Impact Assessment Study for the decommissioning of the Porters Island Pedestrian Bridge (SN013260). Engineering services associated with this assignment include completion of a visual inspection of the structure, environmental field assessment, a structural evaluation of the superstructure, a renewal options analysis and an impact and risk assessment for decommissioning of the bridge. This report provides a summary of all engineering services completed with focus on activities associated with decommissioning of the structure. A comprehensive presentation of the results from the structural evaluation and renewal options analysis have been presented under separate cover and are included in the appendices of this report.

The Ontario Structural Inspection Manual (OSIM) rating forms and site photographs of the existing structure condition and significant areas of deterioration and are included in **Appendix A**. The Natural Environment Memorandum summarizing the results of the environmental field assessment including a review of potential Species at Risk (SAR) is included in **Appendix B**. The Structural Evaluation Memorandum summarizing the results of the structural evaluation with calculations is provided in **Appendix C**. The Renewal Options Analysis Memorandum complete with detailed construction cost estimates for current renewal need and life-cycle cost estimates is included in **Appendix D**. A summary of all consultation completed for this assignment, including the Project Initiation Letter and complete distribution list and responses received to date is included in **Appendix E.** Background information on the existing Enbridge gas main currently utilizing the bridge is included in **Appendix F**. Results of the lead content testing completed on the existing structure coating is provided in **Appendix G**. Extracts from published material relating to the heritage value of this structure is provided in **Appendix H**. The City's Risk Management Evaluation Tables are included in **Appendix I**.

The following reference documents were provided by the City and were reviewed in preparation for this assignment:

- Rehabilitation Drawings (Railing System Replacement) – Old Porter's Island Bridge, Drawing No. DB-32603-1 to -3, *dated April 18, 1963*.
- Gas Main Installation Drawings – Old Porter's Island Bridge, Drawing No. B-33604-1, d*ated November 30, 1982*.
- Rehabilitation Drawings (Structural Steel Recoating) – Old Porter's Island Bridge, Drawing No. B-032605-1 to -2, *dated September 19, 1984*
- Rehabilitation Drawings (Timber Deck Repairs, Masonry Repointing) – Porters Island Pedestrian Bridge Repairs, Drawing No. B-032606-001 to -002, *dated August 1998.*
- OSIM Inspection Forms (September 2011)

2.0 Study Area

The Porters Island Bridge (SN013260) is a pedestrian bridge that crosses the south branch of the Rideau River between Porter Island and St. Patrick Street in the City of Ottawa. The limits of the study area are shown on Figure 1.

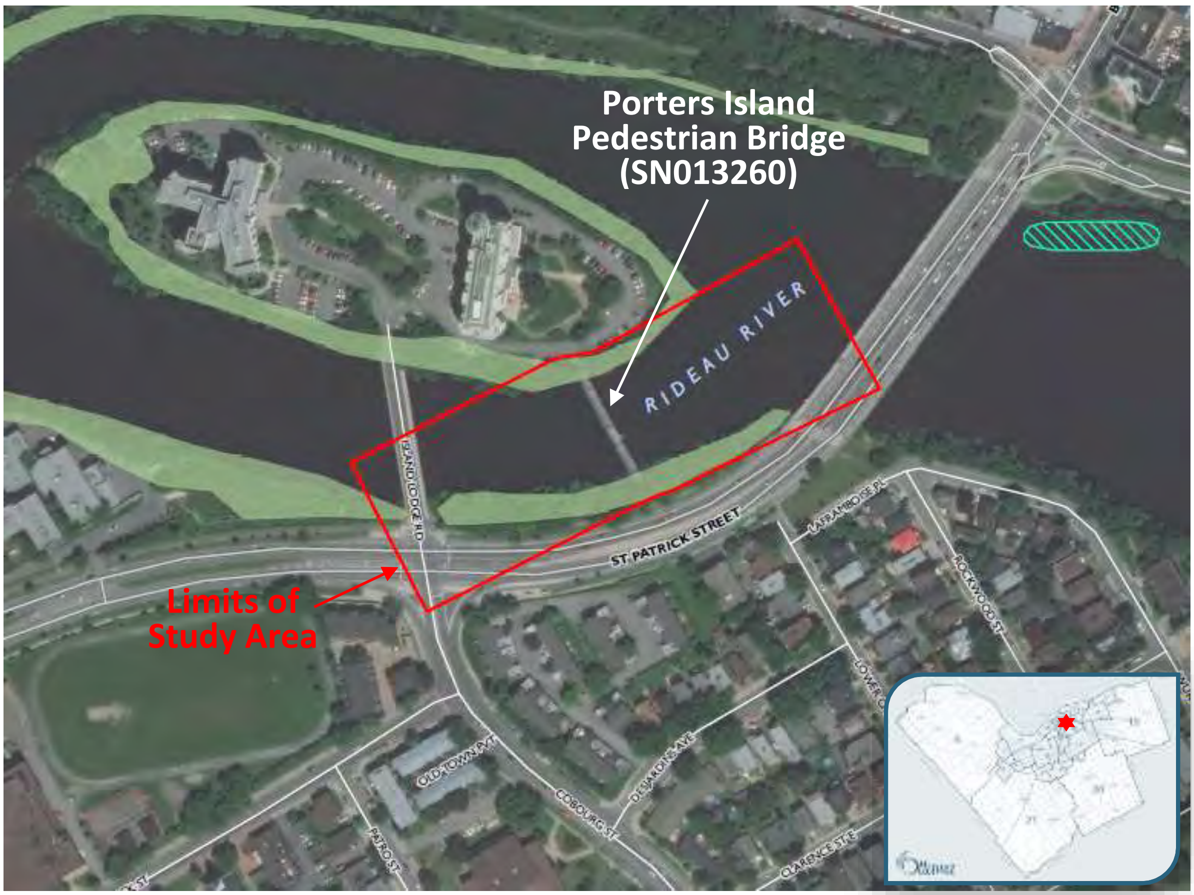

Figure 1: Key Plan

Porters Island currently houses two facilities, the Chartwell Rockcliffe Retirement Residence, and the Garry J Armstrong long term care home. The structure is one of two bridges servicing Porters Island, and has been deemed redundant since there is a newer bridge that services both vehicular and pedestrian traffic which was constructed in the 1960s.

3.0 Existing Structure

Porters Island Pedestrian Bridge is a two-span (38.4 m – 38.4 m) pin-connected wrought iron Pratt through-truss superstructure with a timber deck and was constructed in 1894. The structure is not currently not designated, however it is listed on the Ontario Heritage Bridge List. The bridge is supported on a stone masonry pier and abutments founded on bedrock. The bridge has an overall width of 4.1 m, clearance between railings of 3.2 m and a total height of 6.0 m. The bridge spans the south branch of the Rideau River in Ottawa, between Porters Island and St. Patrick Street.

The bridge has undergone several rehabilitations over its service life, with known rehabilitation history as follows:

- 1963: Railing System Replacement – replacement of original timber handrail with steel 3-pipe handrails
- 1982: Gas Main Installation
- 1984: Structural Steel Recoating – abrasive blast cleaning and recoating of entire superstructure
- 1998: Minor rehabilitation – removal and replacement of deteriorated timber deck planks, stringers and blocking and repointing of masonry piers and abutments

The bridge was closed to pedestrians in 2009 due to concerns associated with its condition and has been identified to be in 'poor' condition since that time. The structure still carries an active Enbridge gas main onto Porters Island.

3.1 Current Use

Porters Island Pedestrian Bridge has been closed to pedestrian use since 2009 and is currently used solely to support an Enbridge gas main servicing Porters Island. The City agreed to the use of the Porters Island Pedestrian Bridge to support the gas main in a memo dated December 1982 which is included in **Appendix F**. The memo also stipulated that Ottawa Gas (owner of the utility at the time) was to inspect the gas main at least annually and was not to use a vehicle weighing more than 1150 kg on the structure.

Access to the structure is restricted to the south end of the bridge through the use of a locked gate. The north end of the structure is completed barricaded. While no clear evidence of public use of the structure was noted at the time of the inspection, there is evidence and reports of the bridge being used as a shelter for the homeless.

3.2 Existing Structure Condition

The existing condition of the bridge was assessed through the completion of an OSIM inspection that was conducted as part of this assignment. The results of the OSIM inspection with site photographs are presented in **Appendix A** and the significant findings are summarized below.

- The truss members were found to vary in condition from poor to good. Significant defects and structural concerns in select truss members include:
  - Severe localized section loss on the bottom chord, end post, and cross bracing at the abutment pin connections;
  - Visual crack indications were on several loop-welded eye bars including bottom chords, diagonals, and verticals located at the forged lap of the eye bars near the pin connections;
  - Several deformed or entirely unloaded bottom chord members indicating that some bottom chord members were disengaged at the time of the inspection;
  - Uneven loading of individual eye-bars of the same truss member including bottom chord, diagonal and vertical members.
- Floorbeams were generally in good condition with localized corrosion of the top flange, particularly near the pin hanger connections.
- The roller bearings at the south abutment were seized, severely corroded, and surrounded by debris. North abutment was not accessible for inspection but is suspected to be in the same condition.
- Pier bearings were in good condition with exception of a cracked pin spacer with some medium to severe corrosion of the pin (east bearing of the south truss). Crack suspected due to rust jacking of pin below spacer.
- The structural steel coating was generally in good condition and tightly adhered to planar surfaces with surface corrosion on 10-15% of the truss members and floorbeams including complete coating failure at multiple truss nodes.
- The wood deck and stringers were generally in poor condition. Approximately 40% of the wood deck exhibited weathering, rotting, decay and 17 deck planks were missing or severely weathered. Approximately 40% of wood stringers showed signs of weathering, and rotting. Localized fire damage was observed on the stringers, deck and blocking near the south abutment. Medium to severe checking/splitting on outer stringers. Connection deficiencies noted between timber blocking and stringers.
- North and south abutments were in good overall condition. Deterioration limited to vertical narrow to wide cracks with a localized spalling of one stone at the north abutment. Mortar joints were generally in good condition. Loss of mortar was observed near waterline at North Abutment.
- Pier was in good overall condition. Deterioration limited to vertical narrow to wide cracks, with a localized spalling of one stone at the northwest corner of the pier and loss of mortar at joints near waterline.
- Dry stone retaining wall noted at northwest quadrant was in poor condition.

3.3 Structural Evaluation

A structural evaluation of the superstructure was completed in accordance with the Canadian Highway Bridge Design Code (CHBDC) CSA-S6-14. The truss members, floor beams and stringers were evaluated at Ultimate Limit States (ULS) in accordance with Section 3 of the CHBDC (Section 14 is not applicable for pedestrian crossings). Snow loads were considered in accordance with Section 16.7 of the MTO Structural Manual. The bridge superstructure was modelled using commercial software (SAP2000). The structure was modelled based on the original section properties and intended structural behavior to represent a baseline structural evaluation. Member capacities were reduced to account for observed material defects, deterioration and structural behaviour. The observed material defects and deterioration included section loss and crack indications. The observed structural behaviour included bowed and unloaded bottom chord members and unevenly loaded eye bar members in the bottom chord, diagonals, and verticals. The results of the structural evaluation were presented considering the following structure loading scenarios: 1) Unrestricted access to maintenance equipment and pedestrians, 2) Unrestricted access for pedestrians only (no maintenance vehicle permitted) and 3) Restricted access (structure closed to the public representing current functionality).

The structural evaluation concluded the following:

- Several superstructure components are structurally deficient and do not meet the CHBDC requirements in all loading scenarios. Depending on the intended future use of the structure, the extent of member replacement, modifications or strengthening varies, however significant retrofit repairs are required should the structure be reopened to pedestrian traffic (with or without maintenance vehicle access).
- Structural concerns under the current functionality (structure closed to pedestrians and carries gas main) include:
    - Presence of cracks indications on primary tension members;
    - Structural deficiency of bottom chord members with severe section loss;
    - Structural deficiency of end-posts and several pin connections;
    - Thermal and structural behaviour of structure (compromised bearings and unloaded / deformed members); and
    - Condition and capacity of deck system (for inspection purposes).
- If the structure is to be maintained or rehabilitated:
    - Replacement of the expansion bearings is recommended as bearing fixity is causing the structure to behave in an unintended manner and resulting in stress redistribution.
    - Additional investigation of the potential bottom chord bracing system loading including observing the structure in different thermal and loading conditions is recommended to properly assess and correct the structural behavior.
    - The visual crack indications and forging imperfections on this bridge should be assessed through Non-Destructive Testing (NDT) as primary tension members with active cracks should not remain in service if open to public.

    - Steel composition testing of the separate elements such as the rolled sections, loop-welded eye bar members, upset eye bar members and pins is recommended to more accurately model structure and repair needs.
- If the structure is to be demolished, it is recommended that the current structural behaviour and the anticipated seized bearing conditions be carefully considered in the development of any demolition and removal procedures.
- Based on the current condition of the structure, seasonal structure inspection (spring - fall) without the use of specialized access equipment remains feasible. However proper precautions including fall-arrest measures are required due to the poor condition of the timber decking.

A comprehensive presentation of the structural evaluation results is presented in **Appendix C.**

3.4 Renewal Options Analysis

A renewal options analysis was developed in order to provide a cost comparison between decommissioning of the structure and options that would allow for preservation of the structure through either maintaining the current structure functionality or reinstatement of the existing structure as a pedestrian crossing. The financial analysis for each renewal options included a life-cycle cost analysis with consideration for annual operations and maintenance costs. A description of each renewal option is listed below. A comprehensive presentation of the scope of work, listing of assumptions, structural considerations and costs for each renewal options is presented in **Appendix D** and summarized herein.

3.4.1 Renewal Options

Cost estimates were developed in accordance with the Infrastructure Services Department's guideline for Capital Cost Estimates and include allowances for engineering, City internal costs, miscellaneous and contingency. Costs associated with the existing Enbridge gas main such as relocation, temporary re-routing, temporary support or protection and reinstatement are not included in the life cycle analysis. The City has developed the costs associated with the existing Enbridge gas main in conjunction with Enbridge and these costs are provided separately for future reference. The initial construction cost of the different renewal options considered are summarized in Table 1 below.

Table 1: Renewal Options Capital Cost Estimate

Option	Description	Cost
1	Decommissioning	$ 271,000
2	Maintain Current Functionality	$ 676,000
3	Reinstate Pedestrian Crossing	$ 1,520,000

Decommissioning

The objective for this option is to remove the existing structure and relocate the existing Enbridge gas plant to another suitable location. The anticipated scope of work for decommissioning of this structure includes:

- Removal of deck system;
- Removal and salvaging of the steel superstructure;
- Relocation of gas main; and
- Modifications to approaches and embankments.

Construction for this option is anticipated to be completed in one construction season. The initial cost for decommissioning of the structure is estimated at $271,000, which includes a 15% allowance for engineering services and a 25% construction contingency, but excludes costs associated with gas main relocation. The costs for gas main temporary support, protection, and relocation were provided by the City in consultation with Enbridge and are estimated at $650,000.

Maintain Current Functionality

The objective for this option is to maintain the current use of the existing structure in supporting the existing Enbridge gas main while remaining closed to vehicular and pedestrian traffic. The rehabilitated structure should meet the requirements of applicable codes and standards for utility support structures and the required inspection activities. The results from the structural evaluation and OSIM inspection have confirmed that rehabilitation of the existing bridge is required to achieve this option objective. The approach for this option is to perform minimal rehabilitation to address current structural concerns and identified risks while lowering the operational and maintenance costs associated with the upkeep of the structure.

The anticipated scope of work under this option includes:

- Removal of timber deck system;
- Supply and installation of an inspection catwalk;
- Repair and strengthening of the bottom chord members with severe localized section loss (4 locations at abutments, and one pin location at the pier);
- Localized strengthening of the end post;
- Supply and installation of new abutment bearings (4 locations);
- Masonry repair;
- Localized coating touch-ups; and
- Repair and modifications at approaches and embankments.

Construction for this option is anticipated to be completed over one construction season. The initial cost for the rehabilitation of the structure is estimated at $676,000, which includes a 15% allowance for engineering services and a 25% construction contingency, but excludes costs associated with gas main temporary support, protection or temporary relocation (as required). The costs for gas main temporary support and protection were developed by the City in consultation with Enbridge and is estimated at $20,000.

Reinstate Pedestrian Crossing

The objective for this option is to reinstate the functionality of the structure as a pedestrian crossing, which requires a major rehabilitation of the existing bridge. The rehabilitated structure should meet the requirements of the applicable codes and standards for a pedestrian crossing including maintenance vehicle loading. The approach for this option is to perform a comprehensive rehabilitation of the structure to the requirements of current codes and standards for an anticipated design life of 75 years with limited required interventions on the rehabilitated structure.

The anticipated scope of work under this option includes:

- Removal of timber deck system;
- Temporary support or re-routing of gas main;
- Dismantling of truss members;
- Rehabilitation and/or reconstruction and/or strengthening of individual truss components;
- Supply and installation of new bearings (all locations);
- Reconstruction of truss superstructure;
- Recoating of entire truss; and
- Repair and modifications at approaches and embankments.

Construction for this option is anticipated to be completed over two construction seasons. The initial cost for the rehabilitation of the structure is estimated at $ 1,520,000, which includes a 15% allowance for engineering services and a 25% construction contingency, but excludes costs associated with gas main temporary support, protection or temporary relocation (as required). The costs for gas main temporary support and protection were developed by the City in consultation with Enbridge and is estimated at $200,000.

3.4.2 Options Life Cycle Cost Analysis

A life-cycle cost analysis of the three identified options was prepared as part of the Renewal Options Analysis included in **Appendix D**. The results of the life-cycle cost analysis are summarized in Table 2 below.

Table 2: Renewal Options Life Cycle Cost Estimates

Option	Description	Discount Rate		
		3.0%	5.0%	7.0%
1	**2019**: Structure decommissioning **2044**: Masonry abutment preservation (required to maintain soil retaining integrity) **2069**: Masonry abutment preservation **2094**: Masonry abutment preservation	$425,000 (-)	$354,400 (-)	$318,000 (-)

2	**2019:** Maintain Current Functionality with structural steel repairs, deck replacement/catwalk installation, coating repairs, masonry rehabilitation. **2044:** Substructure masonry repairs, Coating repairs **2069:** Substructure masonry repairs, truss repairs and catwalk replacement. **2094:** Structure decommissioning	$1,078,400 (154%)	$862,200 (143%)	$759,900 (139%)
3	**2019:** Reinstate pedestrian crossing **2034**: Boardwalk, railing and structure repairs **2044:** Substructure masonry repairs, truss recoating and boardwalk replacement. **2059:** Boardwalk, railing and structure repairs **2069:** Truss recoating and boardwalk replacement, substructure masonry repairs, and bearing replacement. **2084:** Boardwalk, railing and structure repairs **2094:** Structure decommissioning	$2,599,000 (512%)	$2,105,000 (494%)	$1,844,500 (480%)

Decommissioning

Following the removal and decommissioning of the structure, the only foreseen life-cycle intervention is masonry rehabilitation as required to maintain the soil-retaining performance of the existing abutments, particularly the north abutment.

Maintain Current Functionality

Required life cycle interventions for maintaining the existing functionality of the structure following the rehabilitation include masonry rehabilitation of the substructure, and future structural steel repairs and replacement of the inspection catwalk.

For the purposes of the life-cycle cost model, we have assumed that following the 75 year design life, the structure would be decommissioned.

Reinstate Pedestrian Crossing

Required life-cycle interventions for the reinstated pedestrian crossing functionality of the structure following the rehabilitation include masonry rehabilitation of the substructure, future timber boardwalk and structural steel repairs and complete recoating along with replacement of the deck and railings.

For the purposes of the life-cycle cost model, we have assumed that following the 75 year design life, the structure would be decommissioned.

3.5 Hazardous Substances

A formal hazardous substances survey was not completed as part of this assignment. The results presented herein do not represent a comprehensive hazardous substances assessment. It is recommended that a complete review of potential hazardous substances be reviewed in advance of structure decommissioning to assess site potential for all 'Designated Substances' identified in the Occupational Health and Safety Act, R.S.O. 1990, c. 0.1.

The 1985 rehabilitation drawings indicated an Inorganic Zinc/Vinyl/High-Build Vinyl coating system which may contain lead (stabilizer / inhibitor). The surface coating of the structure was tested for lead content. Samples were obtained by chipping the coating from both structural and non-structural components. Paracel Labs completed the lead content testing and the laboratory results are presented in **Appendix G** and summarized in Table 3.

The Surface Coating Materials Regulation (SOR/2016-193) states that the total lead present in a surface coating material must not be more than 90 mg/kg (90 PPM). Although the coating on this bridge was applied before this regulation was created, this limit defines a lead containing paint. Based on the results, all 5 samples contained over 90 PPM of lead and therefore the coating shall be considered as a lead containing coating.

Table 3: Coating Lead Content Result

Sample	Location	Result (PPM)	Classification
1	Vertical (North)	508	Lead Containing
2	Mid Span Hand Rail (North)	538	Lead Containing
3	Hand Rail near South abutment	317	Lead Containing
4	End Post at Pier (South)	431	Lead Containing
5	Vertical (South)	423	Lead Containing
AVERAGE		443	Lead Containing

The history of the timber deck is unknown including the preservation treatment used on the timber deck system (nailing strips, stringers, and deck boards). Preservation treatment of timber has historically included use of designated substances such as arsenic (contained in pressure treated lumber and creosote coatings). Samples and testing for arsenic were not included as part of the scope for this assignment.

4.0 Risk Assessment of Maintaining Existing Conditions

The following risk assessment summarizes a risk analysis of the existing structure, representing a condition whereby the structure remains in service with no future interventions (remains in current state). The risk assessment was generated based on the guidelines provided in the City Risk Management Framework including the risk impact measurement and future event likelihood rating. The City Risk Management Framework is included in **Appendix I**. Table 4 presents the impact rating of the major risk events considered, the likelihood of the assessed risk events and the risk impact rating and likelihood rating where then used to determine the risk score.

Table 4: Future Event Risk Impact Measurement

Event	Description	Primary Impact	Impact Rating	Likelihood Description	Likelihood Rating	Risk Score	Level of Risk		Rank
Temporary Disruption of Gas Main due to Structural Failure	Structural failure causing damage to the gas main and disrupting service until a repair is completed.	Operational – Interruption of an essential service to residents for a short duration.	4	The gas main can be impacted by the structural failure of a single member. Given the structural behaviour concerns and structural deficiencies revealed in the structural evaluation, this event is considered possible within a 10 year period.	3	12	Medium-High	Marginally Acceptable	1
Complete Disruption of Gas Main due to Structural Failure	Structural failure causing significant damage or rupturing the gas main requiring a new/temporary line to service residents.	Operational – Interruption of an essential service to residents for a prolonged period of time.	5	It is assumed that a more significant structural failure and overall deformation of the global structure would be required for a rupture of the gas main (or significant damage to required complete replace in order to re-establish service).	2	10	Medium-High	Marginally Acceptable	4
Structural Collapse Affecting Navigable Waterway	Structural collapse resulting in impacts to the navigability of the Rideau River.	Operational – Compromised navigability of the Rideau River South Branch.	2	Complete collapse would be required. Completed collapse of bridges is not a common failure mechanism even in non-redundant structures such as trusses.	1	2	Low	Negligible	8
Pedestrian Using Structure Experiences Injury	Member of the public ignoring the barriers to entry experiences injury due to current condition of timber deck.	Public Safety – Injury to member of the public on City Property. Clear barriers to access limit potential liability.	3	No sign of frequent use of the structure.	2	6	Medium	Marginally Acceptable	5
Worker Using the Structure Experiences Injury	Utility worker or City Staff using structure for O&M activities experiences injury due to current condition of timber deck.	Public Safety - Injury on poorly maintained City Property. No signage warning duly present staff members hazards (timber deck condition).	4	Yearly inspections of the gas plant are required. Bi-annual inspections of the structure. No indication of official notice to the utility owner about the current condition of the bridge.	3	12	Medium-High	Marginally Acceptable	2
Loss of Life of Bridge User due to Condition of the Bridge	Example: Loss of life through drowning due to condition of timber deck (failure/openings of timber boards) or structure collapse.	Public Safety – loss of life or critical injury poorly maintained on City Property. No signage warning of hazards (timber deck condition).	5	Clear barriers to public access and no sign of frequent use of the structure. Yearly inspections of the gas plant are required.	2	10	Medium-High	Marginally Acceptable	3
Structural Collapse/ Failure Affecting Fish and/or Fish Habitat	Structural collapse/failure releases debris into the Rideau River.	Environmental – Potential impact fisheries resources, especially if occurs during critical life processes (eg. spawning)	3	Complete collapse would be required. Completed collapse of bridges is not a common failure mechanism even in non-redundant structures such as trusses.	1	3	Low	Negligible	6
Structural Collapse Affecting Turtle Habitat	Structural collapse/failure releases debris into the Rideau River.	Environmental – Potential impact turtle overwintering habitat If collapse/failure occurs during winter.	2	Complete collapse would be required. Completed collapse of bridges is not a common failure mechanism even in non-redundant structures such as trusses.	1	2	Low	Negligible	7

5.0 Environmental Existing Conditions

In order to conduct the impact assessment, the natural, socio-economic and cultural features within the Study Area have been assessed and a high level impact assessment based on the decommissioning of the structure has been completed.

5.1 Natural Environment

A desktop background review for the site was completed to screen for significant natural features and for the potential presence of Species at Risk (SAR) and Species of Conservation Concern (SCC) within the Study Area.

Site reconnaissance was completed by Dillon Environmental staff on September 4, 2018. Access was limited to City owned and public ally accessible lands, with visual interpretation of adjacent lands supplementing a desktop analysis. Field investigations included the following:

- Field verification and refinements of vegetation communities.
- A migratory bird nest search and bat roosting habitat assessment.
- Identification of watercourses with the potential to provide fish habitat.
- Documentation of incidental wildlife and wildlife habitat encountered in the field.

Detailed results of our background review and site assessment are documented under separate cover (*Decommissioning of Porters Island Bridge – Species at Risk Screening*), and included in **Appendix B.**

5.1.1 Physiography and Soils

The surficial geology of the area is documented to consist of Champlain Sea sediments predominantly made up of clay and silt underlying erosional terraces. The upper portion of these marine deposits has typically been removed to variable depths by fluvial erosion, leaving uniform blue-grey clay. Some lenses, bars, and channel fills of sand and pockets of non-marine silt were formed during the terrace (or channel) cutting. Underlying the Champlain Sea sediments, the bedrock of the Ottawa Formation consists primarily of limestone with some shaly partings, and sandstone at depth (Geological Survey of Canada, 1979, Geological Survey of Canada, 1982).

5.1.2 Surface Water

The Study Area is located within the Lower Rideau River Sub watershed, approximately 1.4 km upstream of the Rideau River and Ottawa River confluence. The Lower Rideau River watershed drainage area encompasses 765 m^2 and flows through an agricultural landscape in its upstream reaches before flowing through urban land uses in the City of Ottawa and discharging into the Ottawa River (a designated Canadian Heritage River).

5.1.3 Terrestrial Features

5.1.3.1 Vegetation

Areas of woodland along the banks of the Rideau River consistent with City of Ottawa Official Plan mapping of natural heritage features were observed. As noted in the Natural Environment Memo (**Appendix B),** riparian habitat present on both the north and south ends of the pedestrian bridge consists primarily of deciduous treed banks, with no SAR vegetation observed. The observed vegetation is well established and the watercourse banks appear stable (eg. no obvious signs of slope failure or erosion).

5.1.3.2 Species at Risk (SAR)

Based on the presence of mature trees, the bridge structure itself, and the nature of the riparian area along the Rideau River, the following species have potential to be found within the Study Area:

- Barn Swallow:

  While potential habitat was identified through the background review for Barn Swallow on the bridge structure no individuals or nests were observed within the Study Area by Dillon staff during field investigations. There is a low potential for these species to be present, however the bridge should be screened for nesting activities prior to any construction activity.
- Blanding's Turtle:

  Although no individuals were observed, the Rideau River itself is known to provide habitat for Blanding's Turtle and therefore there is a high potential to encounter these species during nesting season.
- SAR bats:

  Although no individuals were observed, cavity trees along the banks of the Rideau River have a moderate potential to provide maternal roost habitat for SAR bat species.

As of April 1, 2019, the administration of the Endangered Species Act (ESA) transitioned responsibility from MNRF to the Ministry of the Environmental, Conservation and Parks (MECP). At this time, we are unaware of the impacts of this transition to the regulatory process and as a result the project.

Depending on impacts to SAR bat habitat along the watercourse banks and/or Blanding's Turtles habitat within the watercourse, an Information Gathering Form (IGF) may be required for submission to the MECP outlining the proposed works, anticipated impacts and proposed mitigation measures. MECP would then determine if further steps are required to avoid contravention of the ESA or if a permit is required. If a permit is required, it could take significant time (in some cases over a year), which should be taken into consideration as part of the project delivery schedule.

5.1.4 Fisheries and Aquatic Ecosystem

MNRF LIO, the Ontario Ministry of Agriculture, Food and Rural Affairs (OMAFRA) Agricultural Information Atlas, and the City of Ottawa Geomapping were reviewed for potential watercourses within the Study Area. The bridge crosses the Rideau River, and no other watercourses are located directly adjacent to the Study Area.

A review of Fisheries and Oceans Canada (DFO) Aquatic SAR Mapping was completed and there were no Threatened or Endangered aquatic species identified within the Study Area. The closest mapped aquatic SAR are located approximately 1.4 km downstream of the Study Area in the Ottawa River.

A review of LIO GIS data (Aquatic Resource Poly Segment, October 2018) identified a variety of warm water, cool water and cold water fish species in the Lower Rideau River including Alewife (*Alosa pseudoharengus*), Banded Killifish (*Fundulus diaphanus*), Black Crappie (*Pomoxis nigromaculatus*), Blackchin Shiner (*Notropis heterodon*), Bluegill (*Lepomis macrochirus*), Bluntnose Minnow (*Pimephales notatus*), Brown Bullhead (*Ameiurus nebulosus*), Common Carp (*Cyprinus carpio*), Emerald Shiner (*Notropis atherinoides*), Golden Shiner (*Notemigonus crysoleucas*), Greater Redhorse (*Moxostoma valenciennesi*), Johnny Darter (*Etheostoma nigrum*), Tesselated Darter (*Etheostoma olmstedi*), Largemouth Bass (*Micropterus salmoides*), Logperch (*Percina caprodes*) , Mottled Sculpin (*Cottus bairdii*), Muskellunge (*Esox masquinongy*), Northern Pike (*Esox lucius*), Pumpkinseed (*Lepomis gibbosus*), River Redhorse (*Moxostoma carinatum*), Rock Bass (*Ambloplites rupestris*), Shorthead Redhorse (*Moxostoma macrolepidotum*), Slimy Sculpin (*Cottus cognatus*), Smallmouth Bass (*Micropterus dolomieu*), Sunfishes (*Lepomis sp*.), Walleye (*Sander vitreus*), White Sucker (*Catostomus commersonii*) and Yellow Perch (*Perca flavescens*).

5.1.5 Waste and Contamination

Historically, the island is reported to have operated as a landfill used for the disposal of a variety of materials, including refuse and cinders from the Parliament Hill heating plant. Newspaper articles and previous environmental reports indicate that the island was used as a dump between at least 1906 and 1939. Refuse, ash, and fill material were deposited on the island to, in part, increase the elevation and reclaim portions that had been eroded by the river. Several environmental investigations have been completed at the island in conjunction with construction activities associated with the current and previous buildings. These investigations have identified the presence of garbage and miscellaneous fill material over the entire footprint of the island, with an overlying layer of cover material ranging between approximately 0.15 m and 0.45 m thick.

In addition to landfilling activities, the island was also historically used as a quarantine station for people with contagious diseases, an isolation hospital, and later a military hospital during World War II. The first senior's residence (former Allen House) was constructed in 1964 on the eastern half of the island, with the second facility (Bradford House) opening in 1972. The current Garry J Armstrong Home and Chartwell Rockcliffe Retirement Residence opened in 2005 and 2008 respectively, with Site Plan Application approvals granted in 2003 and 2006. A permit issued in March 1963 found in the City of Ottawa Tank Database and a 1998 Exterior Phase I and Limited Phase II Environmental Site Assessment (ESA) both indicated the presence of fuel storage tanks located near the southeast corner of the island adjacent to the former Allen House. In the 2004 Supplemental Phase II ESA completed by Paterson Group Inc., hydrocarbon impacts were also noted beneath the northeast corner of the same building.

5.2 Socio-Economic Environment

5.2.1 Political Jurisdiction

The Porters Island Pedestrian Bridge is located within the City of Ottawa, Ward 12 – Rideau Vanier.

5.2.2 Adjacent Lands and Traffic

The south end of the Porters Island Pedestrian Bridge formerly connected to a sidewalk on St. Patrick Street, with the north terminus formerly connecting to the parking lot and road network.

St. Patrick Street is a four-lane divided urban arterial roadway with an AADT of 39,700 in the vicinity of Porter Island. St. Patrick Street is not a designated truck route. OC Transpo operates routes 6, 7, 17, 19 between Cobourg Street and the Vanier Parkway. There are no transit routes between Cobourg Street and Beausoleil Drive. There are dedicated sidewalks and cycle track facilities located in the north and south boulevards.

The banks along the Rideau River are naturally vegetated and form part of the Natural Land, Parkland and Greenspace land uses, surrounded by residential and commercial development.

5.2.3 Communities, Residences and Commercial Development

Porters Island currently houses two facilities, the Garry J Armstrong Home (200 Island Lodge Road; home for 180 residents) and the Chartwell Rockcliffe Retirement Residence (100 Island Lodge Road; with 127 resident suites). Associated with these buildings are parking lots and driveways connecting vehicles to Island Lodge Road, with remaining lands landscaped with pedestrian paths and gardens.

Porters Island is accessed via the Island Lodge Road providing both vehicular and pedestrian access from St. Patrick Street to the south. All access to Porters Island, including emergency vehicles, is through the Island Lodge Road bridge spanning the south branch of the Rideau River.

5.2.4 Recreational and Tourism

No significant tourism and recreational activity has been identified within the study area.

5.2.4.1 Navigable Waterway

The Porters Island Pedestrian Bridge is on the south channel of the island; both the north and the south channels are navigable waterways with similar navigable characteristics. The Rideau River at this location is not significantly used by recreational users and this segment has not been identified as being used by touristic or otherwise commercial operations.

The Rideau River (from Lower Rideau Lake to the Ottawa River) is a scheduled waterway under the Navigation Protection Act (NPA) and therefore decommissioning of the structure may require approval from Transport Canada under the Act.

5.2.5 Noise

The City of Ottawa noise by-law is applicable (Noise By-Law No. 2017-255), restricting construction demolition noise between 8 pm and 7 am, weekdays, and between 7 pm and 9 am on weekends and holidays. Given the proximity of the site to the Chartwell Rockcliffe Retirement Residence, and the Garry J Armstrong long term care home, construction activities would be required to respect the noise by-law. A noise by-law exemption would be required for any construction work within this restricted time.

5.2.6 Utilities

The structure supports a natural gas plant that services the two facilities on Porter Island. Discussions with the gas line owner (Enbridge) are ongoing to explore alternatives to maintain service to the Island.

A Project Initiation Letter was circulated directly to the utility companies to identify any additional utilities that could be impacted by decommissioning activities. Based on the responses provided by the utility companies, there are no other utilities that are anticipated to be impacted by the decommissioning of the structure.

The known utilities as provided by the City are illustrated in the utility mapping included with the project correspondence in **Appendix E**.

5.3 Cultural Environment

A cursory review of published material relating to the heritage value of this structure has been performed to provide a high-level review of the heritage context of this structure. Extracts of published material is provided in **Appendix H**.

5.3.1 Built Heritage

The Porters Island Pedestrian Bridge was constructed in 1894 as a wrought iron Pratt through-truss superstructure with a timber deck. While not currently designated, it is listed on the Ontario Heritage Bridge List. The structure is a rare example of a multi-span pin-connected truss bridge that maintains historic integrity through minimal alterations (eg. original railings replaced). The website www.historicbridges.org gives this bridge a score of 8/10 for national historic significance and 9/10 for local historic significance; see **Appendix H** for the information published on the website.

The Lowertown Community Association (LCA) has approached the City of Ottawa, requesting that the Porters Island Pedestrian Bridge be restored and opened to pedestrian traffic and designated under the

Ontario Heritage Act. Designation under the Ontario Heritage Act would provide some protection from demolition to the structure and escalate the required Environmental Assessment and public consultation requirements. City staff are currently reviewing this request and will take into consideration the findings of this assessment in their determination.

5.3.2 Cultural Heritage Landscape

Porters Island Pedestrian Bridge lies to the northeast of the Lowertown Community, one of the oldest communities in the City of Ottawa. Based on the age of the community, it is home to numerous heritage buildings, along with businesses that have operated there for over a hundred years. (Lowertown Community Association, n.d.).

The Ottawa Citizen published an article on July 20, 2015 about the Islands of Ottawa; including Porters Island. The island was reportedly named after John Porter, Bytown's city engineer. Porter's Island served as a quarantine site to isolate community members infected with typhoid and smallpox in the late 1800's. In 1913 the Hopewell Isolation Hospital was built to replace the previous Smallpox Hospital known for its deplorable conditions, and operated until 1945.

Today, the pedestrian bridge may represent the last surviving piece of original construction associated with the use of the Island as a quarantine site. The early use of the island as a quarantine isolation site has been described as one of Ottawa's darker moments due to the living conditions at the isolation site before the construction of the Hopewell Isolation Hospital in 1913.

5.3.3 Archaeology

Based on the extensive history and occupation of the Rideau River banks and Porter Island, it is possible that undisturbed lands have the potential to retain archaeological resources. It is assumed that impacts to undisturbed lands would require an Archaeological Assessment, as confirmed by the response to the Project Initiation Letter from the Ministry of Tourism, Culture and Sport (MTCS).

MTCS also confirmed that they do not have any reported archaeological sites for Porters Island in their system (email October 12, 2018).

6.0 Consultation

The intent of the consultation included as part of this impact assessment is to allow the City to internally evaluate the heritage and aesthetic values of the structure prior to engaging the public and other stakeholders. The community has previously voiced their interest in preserving the heritage value of the existing bridge and any eventual Class EA process will provide an open and transparent process concerned stakeholders to voice interest and concerns. A Project Initiation Letter was prepared for internal circulation within the City and select external agencies (Federal, Provincial, Utility companies). The Project Initiation Letter is included in **Appendix E**, along with the complete distribution list and responses received to date and a summary table.

6.1 Consultation Response

Of the seventeen responses received, several agencies and stakeholders identified a desire to protect the heritage value of the structure, and ideally open it back up for pedestrian use. Specifically:

- Councillor Fleury noted that there is strong support within the community to re-open this bridge. He attached a copy of a letter from the Lowertown Community Association.
- The Lowertown Community Association provided a letter requesting the bridge be opened for pedestrian traffic. They note that the bridge had recently been added to the Heritage Register and has been on the Heritage Bridge List for awhile, noting its design and historical context make it eligible for designation under the Ontario Heritage Act.
- The City of Ottawa Heritage Unit provided a letter indicating that the bridge is an important heritage resource within the Lowertown community, is identified on the Historic bridge list and is on the City of Ottawa's Heritage Register. They also note that the community has recently submitted a request to designate the bridge under the Ontario Heritage Act to protect the bridge from demolition. This request is under review by the City's Heritage staff, who also confirm their opinion that the bridge has an important history and is an important landmark in the community.
- MTCS provided a letter confirming that the project should be screened for archaeological and marine archaeological potential to determine if an archaeological assessment is required. MTCS also notes that a Cultural Heritage Evaluation Report (CHER) should be completed to determine the cultural heritage value or interest of the structure.

Of the utility companies that responded, only Enbridge has a plant that has potential to be impacted by the decommissioning of the structure.

The City of Ottawa Remediation Unit confirmed that the island was formerly used as a landfill. This has the potential to impact any excavation requirements associated with the decommissioning.

7.0 Impact Assessment and Mitigation Measures

Given the existing engineering and environmental conditions, a high level impact assessment was conducted for the decommissioning of the Porter Island Pedestrian Bridge. Appropriate mitigation measures have been identified to mitigate impacts to the natural, socio-economic and cultural environments.

7.1 Natural Environment

7.1.1 Surface Water Contamination and Debris Accumulation

Decommissioning of this structure will require the containment of waste materials and fuels to ensure deleterious substances are not released into the Rideau River. Waste materials should be handled according to O. Reg 347 and disposed of accordingly. Fuelling and storage of chemicals should be a minimum of 30 m from the Rideau River and equipment should be maintained in good working order to prevent release of chemicals into the water.

Coating samples taken from the structure were sent for laboratory testing and all results indicated that the existing coating qualifies as containing lead as described in Section 3.4. When working with lead containing coatings, Ontario Regulations 490/09 and 833 state the airborne lead exposure limit as a 0.05 mg/m3 time weighted average (TWA) over 8 hours or a 40 hour week. Lead abatement measures may be required as described in the ministry of labour guideline “Lead on Construction Projects” which establishes measures and procedures to protect workers’ health based on the lead operation being completed.

The age of the existing timber deck system is not known. While many boards and some stringers have been replaced in previous rehabilitations, no records of a complete replacement has been provided by the City. As such, the preservation treatment of the existing timber deck system is not known and analysis of the timber for hazardous materials content such as arsenic and creosote should be undertaken prior to construction.

7.1.2 Terrestrial Features

7.1.2.1 Vegetation

Vegetation removal and/or trimming may be necessary to complete the decommissioning of the bridge. Impacts from vegetation and soil removal have potential to include:

- Increase vulnerability of areas cleared of vegetation to invasion by non-native species.
- Increase erosion and sedimentation of lands adjacent to the construction area causing vegetation dieback at the edge of natural features.
- Decreased shade and cover for wildlife.

- Localized temporary displacement of wildlife due to disturbance caused by clearing and construction activity.

These impacts can be mitigated by incorporating the following measures into the construction contract:

- Develop and implement an Erosion and Sedimentation Control Plan.
- Minimize the amount of vegetation removal to the extent possible.
- Vegetation removal will be done outside of sensitive breeding periods for birds (April 1 to August 31 of any given year).
- Follow tree felling and grubbing procedures as outlined in OPSS 201, Construction Specification for Clearing, Close Cut Clearing, Grubbing.
- Temporarily disturbed vegetated areas should be restored and/or re-vegetated to minimize invasion and colonization by non-native species, increase shade/cover for wildlife and mitigate edge disturbance effects.
- Areas cleared of vegetation to facilitate decommissioning of the structure will be stabilized (e.g., vegetated) prior to removal of erosion and sedimentation control measures.

7.1.2.2 Migratory Birds

Species protected under the federal *Migratory Birds Convention Act*, 1994, have the potential to occur within the Study Area. Destruction and disturbance of active nests (with eggs or young birds), as well as wounding and/or killing species, protected under the MBCA is prohibited. The bridge decommissioning may result in the following impacts to migratory birds:

- Exclusion of avian species from existing or potential nesting sites located within the Study Area due to vegetation clearing and removal of the structure.
- Potential destruction of bird nests, eggs or young during site preparation and/or construction.
- Harm or harassment of SAR and SCC that could occupy the Study Area and/or removal or disturbance to their potential habitat.

To protect migratory birds and comply with the legislation, the following measures should be incorporated into the construction contract:

- The project Study Area, including the underside of the existing Porters Island Pedestrian Bridge, be surveyed prior to decommissioning to inventory potential migratory birds nesting sites.
- For tree nesting species, vegetation removals should be completed outside of the migratory bird nesting window (April 1 to August 31 of any given year).
- Vegetation removal or culvert works can occur during restricted periods if a qualified Avian Biologist conducts a nest search of the area prior to work commencing (within 48 hours) and determines that active nests are not present in proximity to the work area.
- If breeding birds and/or nests are encountered, works should not continue in the location until after August 31, or as soon as the young have left the nest.

7.1.2.3 Species at Risk

Depending on impacts to SAR bat habitat along the watercourse banks and/or Blanding's Turtles habitat within the watercourse, an Information Gathering Form (IGF) may be required for submission to the MECP outlining the proposed works, anticipated impacts and proposed mitigation measures. MECP would then determine if further steps are required to avoid contravention of the ESA or if a Permit is required. Should a permit be required, it could take significant time, which should be taken into consideration as part of the project delivery schedule.

The following mitigation measures should be implemented during construction:

- Provide SAR Fact Sheets and detection protocols for Blanding's Turtle to the contractor prior to construction.
- To exclude SAR Reptiles from entering the work area, exclusionary fencing shall be installed OR an experienced biologist will be onsite:
  - Exclusionary fencing (using light duty silt fencing) shall be installed prior to work to prevent SAR reptiles from entering construction areas. Exclusion fences shall be maintained in place until October 1. The location of exclusionary fencing should be included on contract drawings.
  - A biologist experienced in the identification and handling of SAR reptiles maybe present during construction activities to remove any reptiles present of entering the work areas. All reptiles found shall be returned to suitable habitat nearby.
- If wildlife is encountered in the construction area, work must be temporarily suspended until the animals are out of harm's way. If suspected SAR species persist in the work area, a person qualified to handle these animals should be contacted to relocate the animal to suitable habitat outside of the construction area.
- If SAR birds or other migratory birds are observed to be nesting in the construction area and/or nests are encountered, works should not continue in that location until after August 31, or as soon as the young have left the nest.
- Temporary work space and construction staging areas shall not be located where protected species are potentially present.

7.1.3 Fish and Aquatic Ecosystem

If no in-water work is planned, it is anticipated that serious harm to fish can be avoided with appropriate design and mitigation measures (e.g. sediment and erosion control measures, Best Management Practices).

However, if the scope of this project includes in-water work, a fisheries assessment should be completed within the Study Area to determine if the project is likely to cause serious harm to fish and/or fish habitat and require a DFO Request for Review or subsequent Authorization under the *Fisheries Act*.
If it is anticipated that serious harm to fish can be avoided through appropriate design and mitigation measures (e.g., timing windows, in-water isolation, sediment and erosion control measures), a DFO

Request for Review will not be required. If serious harm to fish and/or fish habitat cannot be avoided or is unknown, a Request for Review should be submitted, which will allow DFO to determine if a *Fisheries Act* Authorization will be required.

The fish species noted to occur in the Rideau River generally spawn in the spring and summer. Therefore, the typical Southern Region spring spawning restricted activity timing window (no in-water work between March 15th and July 15th) is expected to be applicable. This timing window will need to be confirmed with MNRF if in-water work is anticipated.

7.1.4 Waste and Contamination

As the island has been identified as a former landfill, any excess soils generated from excavations, removal of abutments, etc. should be submitted for Toxic Characteristic Leaching Procedure (TCLP) analysis to confirm if hazardous materials are present, and confirm landfilling/disposal requirements.

Given the concerns of contaminated soil and remaining archeological potential, excavation of existing soil should be avoided when feasible. Should decommissioning activities result in excavation of the island soils, soil testing is recommended to confirm the presence/absence of contamination associated with historic land uses.

7.1.5 Erosion and Sediment Control

Surface erosion and sediment runoff resulting from the construction operations of decommissioning has potential to cause a detrimental impact to any downstream watercourse. An Erosion and Sediment Control Plan will be required to prevent sediment-laden runoff resulting from construction activities from entering all sewers and watercourses both within and downstream from the Working Area.

Based on the site condition and the anticipated scope of work, an erosion and Sediment Control Plan should be prepared and executed conforming to the requirements of the Governmental Regulatory Agencies having jurisdiction in the Working Area (MECP, the Ministry of Natural Resources and Forestry (MNRF), the City of Ottawa, Rideau Valley Conservation Authority).

The removal or disturbance of riparian vegetation should be minimized during construction.

The primary intent of these mitigation measures is to prevent erosion, where possible. The secondary intent is to capture sediment, should erosion occur. The Construction Contract should include the following measures and provisions to minimize potential erosion and capture any sedimentation:

- Minimize the disturbance of existing well vegetated ditches and slopes
- Protect undisturbed slopes and riparian habitat with silt fence or equivalent. These measures must remain in place until exposed soils are stabilized
- Place erosion control blanket or equivalent on 2:1 or greater slopes where height warrants its use

- A maximum of 45 days shall be permitted between the commencement of any work, which disturbs earth surfaces and the application of final cover.

7.2 Socio-Economic Environment

7.2.1 Adjacent Lands and Traffic

Given the close proximity of development and road networks to the bridge, construction staging areas, access and egress for construction equipment and contractor lay-down areas will be a challenge at this location for significant construction activities.

During construction, the active modes of transportation of St-Patrick Street will need to be maintained. The high traffic volumes of this four-lane divided urban arterial roadway would limit the ability to undertake lane closures during peak commute hours, ideally from a traffic perspective, lane closures would occur overnight, however noise bylaws and adjacent residential properties would be a concern. Any lane closure would require approval from the City.

Some of the stakeholders that may be impacted by traffic conditions on St-Patrick Street during construction include:

- Local residents and businesses;
- The Chinese Embassy;
- OC Transpo; and
- The Ecole Public DeLaSalle.

A construction staging and traffic management plan will need to be developed to minimize impacts to local traffic, island residents and additional stakeholders.

7.2.2 Communities, Residences and Commercial Development

Given the size and large number of residents and staff at the Chartwell Rockcliffe Retirement Residence, and the Garry J Armstrong long term care home, construction staging and contractor laydown areas may impact the parking lot and driveways of these facilities. Construction staging and traffic management plans would need to be developed, in consultation with the facilities management, to mitigate impacts to traffic and pedestrians, including access to the facilities by emergency services.

7.2.3 Recreational and Tourism

Under the Navigation Protection Act, a Permit may be required from Transport Canada for works that have potential to impact the navigability of the Rideau River.

Given the limited use of the Rideau River at the site and the available navigable channel on the north side of Porters Island, it is assumed that advanced signage to use the north waterway would be the only required mitigation should construction activities affect the navigable state of the south channel.

7.2.4 Noise

Construction noise impacts are temporary in nature and largely unavoidable. With adequate controls, impacts can be minimized; however, for some periods of time and types of work (e.g., demolition), construction noise will be noticeable. To minimize impacts on adjacent lands and the local residents, the following best practices related to noise shall be in place during construction:

- All equipment shall be maintained in an operating condition that prevents unnecessary noise, including non-defective muffler systems, properly secured components and the lubrication of moving parts.
- Idling of equipment shall be restricted to the minimum necessary to perform the specified work.

Construction activities shall be completed in accordance with the City of Ottawa Noise By-law (By-law 2017-255). The by-law prohibits operation of any equipment in connection with construction between 8 pm and 7 am, weekdays, and between 7 pm and 9 am on weekends and holidays. A Noise By-law exemption would be required for work outside these hours.

7.2.5 Air Quality and Dust

Dust generating activities during construction are anticipated to be demolition of existing bridge and general movement of construction equipment typical with any construction project.

Negative dust and air quality impacts on adjoining land uses are anticipated to be minimal and short in duration. Fugitive dust impacts to the local residents from construction activities are anticipated to be negligible. Potential impacts can be minimized by the inclusion of these general conditions during construction, including:

- Use well-maintained heavy equipment and machinery and comply with operating specifications.
- Minimize operation and idling of gas-powered equipment and vehicles, especially during smog advisories.
- Minimize vehicular traffic on exposed soils and stabilize high traffic areas with suitable cover material.
- Avoid excavation and other construction activities with potential to release airborne particulates during windy and prolonged dry periods.
- Cover or otherwise contain loose construction materials with potential to release airborne particulates during transport, installation or removal.
- Restore disturbed areas as soon as possible to minimize the duration of soil exposure.

7.2.6 Utilities

The City is currently in communications with Enbridge (James Arbuthnott) to pursue options to relocate the gas main. It is recommended that these discussions be continued as relocation of the gas main is required prior to decommissioning the structure. Given that Enbridge has the obligation to complete annual inspections of the gas main, Enbridge should be notified of the current condition of the structure and associated hazards with using the bridge (condition of deck system). Enbridge should also be notified of the results of the structural evaluation. The original gas main installation memo dated 1982 also states that the utility owner is to assume responsibility for maintenance, repairs, or replacement of the gas main, when necessary, at its own expense. Available information pertaining to the existing gas main is provided in **Appendix F**. The temporary support requirements for the gas main are outlined in the 'Third Party Requirements in the Vicinity of Natural Gas Facilities', which is included in Appendix F. Enbridge staff have identified that they inspect the gas main (with binoculars) on a yearly basis and carry out a detailed inspection every fifth year.

Electrical lighting conduit was noted on the truss for previous illumination of the existing structure which will need to be decommissioned. No additional utilities have been identified within close proximity of the structure and overhead wires were not observed within the study area. It is anticipated that some of the existing light standards on both side of the structure may require relocation and/or temporary removal to accommodate construction activities.

7.2.7 Emergency Access

The pedestrian bridge is not used for any emergency access. Emergency access to service the residents of Porters Island is provided exclusively by Island Lodge Road and complete or effective closure as a result of construction activity should be prohibited.

The planning and staging of any significant intervention on Porters Island Pedestrian Bridge may require considerations for fluid movement of emergency response vehicles on St-Patrick Street.

7.3 Cultural Heritage

7.3.1 Built Heritage

Given the expressed interest to preserve the heritage value of the existing structure by local residents, the City is evaluating the financial impact and feasibility of preserving the existing structure to either maintain the current functionality of carrying the gas main, or reinstating the pedestrian crossing functionality.

The financial analysis of the renewal options including maintenance costs and a life-cycle cost analysis are presented under a separate cover and included as **Appendix D**.

To mitigate impacts associated with the decommissioning of the structure, we recommend a Cultural Heritage Documentation Report (CHDR) be prepared to provide a heritage recording for future reference. The CHDR will document the historical context and cultural landscape of the structure, and identify construction elements that represent its key heritage attributes (similar to a CHER), however the CHDR would also include a commemoration strategy to preserve the heritage of the site if the structure is decommissioned.

It is assumed that the substructure elements would remain in place, including the in-water pier to avoid in-water work and potential impacts to aquatic resources and turtle overwintering habitat. This would also assist in preserving the built heritage of the existing structure.
Considerations for the potential heritage value impacts of the different renewal options are provided below.

Decommissioning of the Existing Structure
Decommissioning would remove the possibility of preservation or future use of the crossing in its existing configuration and location. As a result of the identified heritage value of this structure, the City may wish to decommission the structure in such a way as to salvage and preserve the structural components to potentially re-use the elements in a new setting.

For the purpose of the decommissioning impact assessment it has been assumed that the structure would be removed and dismantled in such a way that the structural components with heritage value (as would be identified through completion of a CHDR) would be identified, and salvaged for potential future use. It is assumed that the existing abutments and pier will be maintained to retain some of the heritage features in-situ.

Maintaining the Existing Functionality of the Structure
The approach for this option is to perform minimal rehabilitation to address current structural concerns and identified risks while lowering the operational and maintenance costs associated with the upkeep of the structure. This option has the potential to preserve many of the anticipated heritage attributes of the structure (as would be identified through the completion of a CHDR) in-situ.

Reinstating the Pedestrian Crossing Functionality of the Structure
The approach for this option is to perform a comprehensive rehabilitation of the structure to the requirements of current codes and standards for an anticipated design life of 75 years with limited required interventions on the rehabilitated structure. This option also has the potential to preserve many of the anticipated heritage attributes of the structure (as would be identified through the completion of a CHDR) in-situ.

7.3.2 Cultural Heritage Landscape

The existing structure is likely the last remaining piece of architecture tied to the history of the Island as an isolation site. As such, we recommend that the City develop a Commemoration Strategy for the decommissioning of the Porters Island Pedestrian Bridge including a CHDR as described in Section 7.3.1. The CHDR will document the cultural heritage landscape and the history of the structure and its association with the island. The CHDR will confirm heritage attributes to be addressed as part of the Commemoration Strategy.

7.3.3 Archaeology

The bridge site may retain archaeological potential. The scope of work for the decommissioning activities should be reviewed to identify and limit activities that may uncover or affect remaining archeological potential such as preserving the existing substructure (abutments and pier) to minimize or eliminate required site excavation. Completion of an archaeological assessment is required if impacts to undisturbed areas are anticipated during construction.

8.0 Conclusion and Next Steps

The Porter's Island Pedestrian Bridge is overall in poor to fair condition. Significant defects include severe localized corrosion to truss members at the abutments, visual crack indications on several fracture critical truss members (eye-bars at diagonals, verticals and bottom-chord), severely deformed or uneven loading truss members, seized and corroded abutment bearings and severe weathering and rot of timber deck and stringers. The results of the structural evaluation conclude that several superstructure components are structurally deficient and do not meet the current CHBDC requirements in all loading scenarios. Based on the condition of the structure, the structure is a liability to the City if not properly maintained with medium to high risks to public safety and potential for unplanned disruption of the existing gas service (marginally acceptable risk).

Initial consultations revealed that several agencies had a desire to protect the heritage value of the structure. More specifically, the Councillor of the Rideau-Vanier Ward, the Lowertown Community Association, and the City of Ottawa Heritage Unit had a desire to protect and/or re-open the pedestrian bridge to the public.

Three renewal options were considered for the site:

- <u>Decommissioning</u> – Remove the existing structure and relocate the existing Enbridge gas main to another suitable location. The estimated cost for decommissioning is $271,000, which excludes costs associated with gas main relocation. The costs for gas main temporary support, protection, and relocation were developed by the City in consultation with Enbridge and are estimated at $650,000.
- <u>Maintain Current Functionality</u> – Repair and strengthening of the existing structure to maintain the current use of the existing structure in supporting the existing Enbridge gas main while remaining closed to vehicular and pedestrian traffic. The initial cost for the rehabilitation of the structure is estimated at $676,000, which excludes costs associated with gas main temporary support, protection or temporary relocation (as required). The costs for gas main temporary support and protection were developed by the City in consultation with Enbridge and is estimated at $20,000.
- <u>Reinstate Pedestrian Crossing</u> – Major rehabilitation of the existing structure to reinstate the functionality of the structure as a pedestrian crossing. The initial cost for the rehabilitation of the structure is estimated at $ 1,520,000, which excludes costs associated with gas main temporary support, protection or temporary relocation (as required). The costs for gas main temporary support and protection were developed by the City in consultation with Enbridge and is estimated at $200,000.

The results from the impact assessment confirmed that decommissioning of the structure is anticipated to have limited impacts to the natural and socio-economic environments, if the proposed mitigation measures are carried forward. The decommissioning meets the requirements of a Schedule A+ project (MCEA Appendix 1, Project # 39. Retirement of existing road and road related facilities) under the Municipal Class Environmental Assessment (EA) (2000, as amended in 2007, 2011 & 2015). Schedule A+ projects are considered pre-approved, however the public is to be advised prior to project implementation. Based on the age and the heritage significance of the structure, along with the history associated with Porters Island and interest from the public in protecting the heritage value of the structure, it is recommended that the City develop a Commemoration Strategy if the City decides to proceed with decommissioning. The Commemoration Strategy should include the preparation of a Cultural Heritage Documentation Report (CHDR) and an Open House. The Open House would provide an opportunity for the public to meet with City staff to review and provide input to the proposed Commemoration Strategy. The Commemoration Strategy could include salvage and reuse of heritage features in a commemorative monument that preserves some of the key elements of the structure's built heritage and pays tribute to history of the crossing and island.

Should the City consider rehabilitation of the structure, it is anticipated that the project would proceed under either a Schedule B (MCEA Appendix 1, Project # 30. Reconstruction or alteration of a heritage structure) under the Municipal Class Environmental Assessment (EA) (2000, as amended in 2007, 2011 & 2015).

Additional proposed mitigation measures, precautions and/or recommendations for this structure as a result of the investigations include the following:

- Offsite dismantling of the superstructure is a feasible mitigation measure to limit the impact of construction activities during decommissioning. Removal and transportation of the entire superstructure following removal of the timber deck system would significantly reduce the impacts to the adjacent land and residents.
- Maintaining the existing masonry substructure in situ will lower the risks and limit the environmental impacts of the decommissioning. The remaining substructure would also preserve the heritage of the stone masonry.
- Continued correspondence with Enbridge is recommended to communicate the existing structure condition and results from the structural evaluation, potential hazards for inspection of the existing gas main, potential cost-sharing component with the City and to continue pursuing the relocation of the gas main. James Arbuthnott is the main point of contact from Enbridge.
- Due to the condition of the structure, it is recommended that the abutment bearing seats be cleaned to allow for proper inspection and monitoring of the structure. It is recommended that the structure be observed in cold weather to increase understanding of structure behaviour. Revisiting the current frequency of structure inspections may also be warranted (biennial instead of the current 5 year interval).
- Completion of an archaeological assessment is required if impacts to undisturbed areas are anticipated during construction.

Prepared by:

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MAY 14/2019
PROVINCE OF ONTARIO

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PROVINCE OF ONTARIO

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9.0 References

http://www.lowertown-basseville.ca/our-community--notre-communauteacute.html

Geological Survey of Canada, 1982. Surficial Geology of Ottawa map area, Ontario and Quebec, Map 1506A

Geological Survey of Canada, 1979. Generalized Bedrock Geology, Ottawa – Hull, Ontario and Quebec, Map 1508A

Note that additional references are included within **Appendix H** from available documents relating to the heritage value of this structure.

Appendix A

OSIM Forms and Photographs

OSIM Inspection Form

SECTION A: GENERAL DATA

Final or Draft Copy?	FINAL		
Structure Number:	013260	Asset:	4888630
Contractor ID:	313453	Work Order:	11373541

Inventory Data:

Structure Name:	013260, Porters Island Ped Bridge
Year Built	1894
Last Rehab Year:	1998
Location:	Ped bridge to Porters Island, RF Con D Lot A
Road Name:	ST. PATRICK ST
Intersections:	
Municipality:	OO
Ward:	12
Y Latitude:	5033308.594
X Longitude	368901.418
Total Width	3.65
Total Span Length:	77.2
Total Span Area:	281.7
Structure Type:	TRUSS
Structure Material:	STEEL_TIMBER
Number of Spans:	2
Orientation:	NORTH_SOUT
Skew Angle in degrees:	0

Overall Structure Inspection Notes

Inspection Type:	VISUAL
Date of Inspection (YYYY-MM-DD):	2018-08-24
Inspector:	Nathan Bakker, P. Eng.
Other Inspector:	Mazen Chaaraoui, E.I.T.
Access Equipment:	Ladder
Recommended Work Type:	
Recommended Work Timing:	
Significant Findings:	Severe section loss observed at bottom chord connection and bracing at abutment bearings. Roller Bearings at abutments are seized. Suspected to be affecting truss behaviour. Severe weathering, rotting and decay of timber deck planks and stringers. Disengaged bottom chord and uneven loading of truss memebrs. Crack indications in some eye bars. Truss steel components in overall Fair material condition. Masonry abutments and pier in good condition. Bridge closed to the public, renewal options currently being evaluated

Additional Investigation Notes

Concrete Substructure Condition Survey:	
Detailed Coating Condition Survey:	
Detailed Deck Condition Survey:	
Detailed Timber Investigation:	
Fatigue Investigation:	NORMAL
Monitoring Crack Widths:	
Monitoring of Deformations, Settlements and Movements:	NORMAL
Non-Destructive Delamination Survey of Asphalt-Covered Deck:	
Seismic Investigation:	
Structure Evaluation:	
Underwater Investigation:	
Post-Tensioned Strand Investigation:	
Investigation Notes:	- Non-destructive testing of the forged eye-bars recommended if structure rehabilitation pursed to further evaluate crack indications at the intersection of the loop-welded forge (diagonals / verticals and bottom cord members). - Monitoring of structural behavior in cold weather to increase understanding of possible load path sharing.

OSIM Inspection
Element Results

Element: 013260, ABUTMENT, ABUTM

Work Order	11373548
Asset Number	4920820
Element Group	ABUTMENTS
Element Name	ABUTMENT WALLS
Environment	BENIGN
Limited Insp.	N
Protection System	None
Units of Measure	Sq.m.
Qty. In Excellent Condition	
Qty. In Good Condition	17.81
Qty. In Fair Condition	
Qty. In Poor Condition	0.60
Total Quantity	18.40

Recommended Work	Recommended Timing	Maintenance Need	Maintenance Timing	Deficiencies Performance	Deficiencies Material
MINOR REHAB	1-5 YEAR	2-Bridge Cleaning			7-Cracks
					33-Spalling
					21-Loss of material

Recommended Description	Maintenance Description	Deficiencies Description
Repoint stone if bridge rehabilitation being pursued.	Exterior bearing seat at bearings full of debris. Cleaning recommended to minimize corrosion of truss components.	

Comments

North and South Abutments in good overall condition. Deterioration limited to vertical narrow to wide cracks with a localized spalling of one stone at the North Abutment. Mortar joints generally in good condition. Loss of mortar observed near waterline at North Abutment. 2.38 m of vertical cracks, 0.5 m2 stone spalled, 1.96 m joints with loss of mortor.

Element Specifications

Location	North / South Abutment Walls
Type	Gravity wall and bearing seat
Material	MASONRY
Length	0.00
Width	5.00
Height	2.40
Count	2

Please do not change dimensions if the difference is < 2%

Element: 013260, BEARING, ABUTMENTS, BEARINGS

Work Order	11373559
Asset Number	4922117
Element Group	ABUTMENTS
Element Name	BEARINGS
Environment	BENIGN
Limited Insp.	Y
Protection System	N/A
Units of Measure	Each
Qty. In Excellent Condition	
Qty. In Good Condition	
Qty. In Fair Condition	
Qty. In Poor Condition	4.00
Total Quantity	4.00

Recommended Work	Recommended Timing	Maintenance Need	Maintenance Timing	Deficiencies Performance	Deficiencies Material
REPLACE	1-5 YEAR	2-Bridge Cleaning		5-Seized Bearings	6-Corrosion

Recommended Description	Maintenance Description	Deficiencies Description
Replacement recommended if rehabilitation of structure pursued.	Cleaning of bearing seat and bearing assembly recommended. Replacement required as capital work.	Bearings are seized. Suspected to be affecting the behaviour of the bottom chord.

Comments

South Abutment rollers are seized, severely corroded, and surrounded by debris. North Abutment was not accessible for inspection but is likely in the same condition

Element Specifications

Location	North & South Abutments
Type	Roller
Material	STEEL_PLAT
Length	0.00
Width	0.00
Height	0.00
Count	4

Please do not change dimensions if the difference is < 2%

Element: 013260, BEARING, PIERS, BEARINGS

Work Order	11373558
Asset Number	4922116
Element Group	PIERS
Element Name	BEARINGS
Environment	BENIGN
Limited Insp.	N
Protection System	Coating
Units of Measure	Each
Qty. In Excellent Condition	
Qty. In Good Condition	3.00
Qty. In Fair Condition	
Qty. In Poor Condition	1.00
Total Quantity	4.00

Recommended Work	Recommended Timing	Maintenance Need	Maintenance Timing	Deficiencies Performance	Deficiencies Material
MAJOR REHAB	1-5 YEAR				6-Corrosion
					7-Cracks

Recommended Description	Maintenance Description	Deficiencies Description
Pin repair/replacement with pin spacer replacement if rehabiliation of structure pursued.		

Comments

Cracked pin spacer with some medium to severe corrosion of the pin (east bearing of the south truss). Crack suspected due to rust jacking of pin below spacer. Other bearing components and pins in good condition.

Element Specifications

Location	Center Pier
Type	Pin
Material	STEEL_PLAT
Length	0.00
Width	0.00
Height	0.00
Count	4

Please do not change dimensions if the difference is < 2%

Element: 013260, DECK WEARING SURFACE, DECKS, WEARING SURFACE

Work Order	11373566
Asset Number	4925951
Element Group	DECKS
Element Name	WEARING SURFACE
Environment	BENIGN
Limited Insp.	N
Protection System	None

Units of Measure	Sq.m.
Qty. In Excellent Condition	
Qty. In Good Condition	
Qty. In Fair Condition	169.00
Qty. In Poor Condition	112.70
Total Quantity	281.70

Recommended Work	Recommended Timing	Maintenance Need	Maintenance Timing	Deficiencies Performance	Deficiencies Material
REPLACE	1-5 YEAR			8-Pedestrian/vehicular hazard	22-Missing Element
				1-Load carrying capacity	29-Rot/Decay

Recommended Description	Maintenance Description	Deficiencies Description
Replacement of entire wearing surface (deck planks) and stringers recommended if structure rehabiliation pursued.		Unsafe to pedestrians unless deck system is replaced.

Comments

40% of the deck exhibits signs of weathering, rotting, and decay. 17 deck planks are missing or severley weathered.

Element Specifications

Location	Deck
Type	Timber Deck Planks
Material	WOOD
Length	77.19
Width	3.65
Height	0.00
Count	0

Please do not change dimensions if the difference is < 2%

Element: 013260, EMBANKMENT, EMBANKMENTS AND STREAMS, EMBANKMENTS

Work Order	11373546
Asset Number	4919464
Element Group	EMBANKMENTS AND STREA
Element Name	EMBANKMENTS
Environment	BENIGN
Limited Insp.	N
Protection System	N/A

Units of Measure	Each
Qty. In Excellent Condition	4.00
Qty. In Good Condition	
Qty. In Fair Condition	
Qty. In Poor Condition	
Total Quantity	4.00

Recommended Work	Recommended Timing	Maintenance Need	Maintenance Timing	Deficiencies Performance	Deficiencies Material

Recommended Description	Maintenance Description	Deficiencies Description

Comments

No defects noted.

Element Specifications

Location	Abutments
Type	
Material	OTHER
Length	0.00
Width	0.00
Height	0.00
Count	4

Please do not change dimensions if the difference is < 2%

Element: 013260, FLOOR BEAM, BEAMS/MAIN LONGITUDINAL ELEMENTS, FLOOR BEAMS

Work Order	11373568
Asset Number	4925953
Element Group	BEAMS/MAIN LONGITUDINAL
Element Name	FLOOR BEAMS
Environment	BENIGN
Limited Insp.	Y
Protection System	Coating

Units of Measure	Sq.m.
Qty. In Excellent Condition	
Qty. In Good Condition	39.46
Qty. In Fair Condition	3.43
Qty. In Poor Condition	1.50
Total Quantity	44.39

Recommended Work	Recommended Timing	Maintenance Need	Maintenance Timing	Deficiencies Performance	Deficiencies Material
MINOR REHAB	1-5 YEAR				6-Corrosion
					15-Flaking Paint

Recommended Description	Maintenance Description	Deficiencies Description
Repair of top flange, removal of corrosion, and recoating.		

Comments

Localized corrsion observed on top flange of floorbeams at the deck curb line - typical condition. Corrosion generally light to medium (limited inspection), but medium to very severe corrosion, with perforations noted at one floorbeam location in south span closest to south abutment. The remainder of the steel member is generally in good condition with some areas of light corrosion and no observed section loss. Poor condition reflects an estimated 30% of the top flange with (1.5m2) of medium to severe section. Fair condition reflects the condition of the remainder of the top flange (3.43 m2) with light to medium corrosion.

Element Specifications

Location	Truss Panel points
Type	S-Shapes
Material	STEEL
Length	4.11
Width	0.10
Height	0.30
Count	12

Please do not change dimensions if the difference is < 2%

OSIM Inspection

Element Results

Element: 013260, FLOOR BEAM, BEAMS/MAIN LONGITUDINAL ELEMENTS, STRINGERS

Work Order	11373567
Asset Number	4925952
Element Group	BEAMS/MAIN LONGITUDINAL
Element Name	STRINGERS
Environment	BENIGN
Limited Insp.	Y
Protection System	None / Pressure Treated (new)
Units of Measure	Each
Qty. In Excellent Condition	
Qty. In Good Condition	11.00
Qty. In Fair Condition	56.00
Qty. In Poor Condition	45.00
Total Quantity	112.00

Recommended Work	Recommended Timing	Maintenance Need	Maintenance Timing	Deficiencies Performance	Deficiencies Material
REPLACE	1-5 YEAR			1-Load carrying capacity	3-Checks,Splits, shakes
					14-Fire/Chemical Damage
					29-Rot/Decay

Description (Recommended)	Description (Maintenance)	Description (Deficiencies)
Replacement of stringers in poor condition. Consider full replacement.		Unsafe for pedestrian use in current state.

Comments

Light to medium rotting / weathering noted at several stringers (estimated 40%). Localized light to medium fire damage noted on stringers and blocking in the first bay near the south abutment. Medium to severe checking/splitting on outer stringers. Connection deficiencies noted between timber blocking and stringers.

Element Specifications

Location	Floor system
Type	Rectangular beams
Material	WOOD
Length	5.49
Width	0.10
Height	0.30
Count	112

Please do not change dimensions if the difference is < 2%

Element: 013260, FOUNDATION, FOUNDATIONS, FOUNDATION (BELOW GROUND LEVEL)

Work Order	11373547
Asset Number	4919465
Element Group	FOUNDATIONS
Element Name	FOUNDATION (BELOW GRO
Environment	BENIGN
Limited Insp.	Y
Protection System	None
Units of Measure	N/A
Qty. In Excellent Condition	
Qty. In Good Condition	1.00
Qty. In Fair Condition	
Qty. In Poor Condition	
Total Quantity	1.00

Recommended Work	Recommended Timing	Maintenance Need	Maintenance Timing	Deficiencies Performance	Deficiencies Material

Description (Recommended)	Description (Maintenance)	Description (Deficiencies)
		Monitor for potential movement at pier.

Comments

Evidence of potential past settlement at pier as spacer plates were noted below the baseplate of railing at the pier. This may be due to original construction, however could also be an indication of past settlement . No rotations or continued settlement suspected at abutments or pier.

Element Specifications

Location	Abutments and Pier
Type	
Material	UNKNOWN
Length	0.00
Width	0.00
Height	0.00
Count	1

Please do not change dimensions if the difference is < 2%

Element: 013260, PIER, PIERS, SHAFTS/COLUMNS/PIER BENTS

Work Order	11373543
Asset Number	4918101
Element Group	PIERS
Element Name	SHAFTS/COLUMNS/PIER BE
Environment	BENIGN
Limited Insp.	N
Protection System	None
Units of Measure	Sq.m.
Qty. In Excellent Condition	
Qty. In Good Condition	72.50
Qty. In Fair Condition	2.80
Qty. In Poor Condition	2.80
Total Quantity	78.10

Recommended Work	Recommended Timing	Maintenance Need	Maintenance Timing	Deficiencies Performance	Deficiencies Material
MINOR REHAB	1-5 YEAR	2-Bridge Cleaning	1-YEAR		21-Loss of material
					7-Cracks
					33-Spalling

Description (Recommended)	Description (Maintenance)	Description (Deficiencies)
Repoint stone if bridge rehabilitation being pursued.	Remove vegetation from pier shaft/bull nose.	

Comments

Pier in good condition overall. Deterioration limited to vertical narrow to wide cracks (7.5m) with a localized spalling of one stone at the north west corner of the pier (0.3 m2) and loss of mortar at joints near waterline (2.5m).

Element Specifications

Location	Centre Pier
Type	Rectangular shaft
Material	MASONRY
Length	2.10
Width	5.00
Height	5.50
Count	1

Please do not change dimensions if the difference is < 2%

OSIM Inspection

Element Results

Element: 013260, RAILING, BARRIERS, HAND RAILINGS

Work Order	11373560
Asset Number	4924724
Element Group	BARRIERS
Element Name	HAND RAILINGS
Environment	BENIGN
Limited Insp.	Y
Protection System	Coating
Units of Measure	m.
Qty. In Excellent Condition	0.00
Qty. In Good Condition	154.60
Qty. In Fair Condition	0.00
Qty. In Poor Condition	0.00
Total Quantity	154.60

Recommended Work	Recommended Timing	Maintenance Need	Maintenance Timing	Deficiencies Performance	Deficiencies Material
					6-Corrosion
Description		Description		Description	

Comments

Majority of steel hand rail in good condition with light corrosion on the underside rails.

Element Specifications

Location	East & West sides of Deck
Type	4-Pipe Handrail
Material	STEEL
Length	77.30
Width	0.00
Height	0.00
Count	2

Please do not change dimensions if the difference is < 2%

Element: 013260, RAILING, BARRIERS, POSTS

Work Order	11373562
Asset Number	4924726
Element Group	BARRIERS
Element Name	POSTS
Environment	BENIGN
Limited Insp.	N
Protection System	Coating
Units of Measure	Sq.m. (each if Wood)
Qty. In Excellent Condition	
Qty. In Good Condition	113.00
Qty. In Fair Condition	
Qty. In Poor Condition	1.00
Total Quantity	114.00

Recommended Work	Recommended Timing	Maintenance Need	Maintenance Timing	Deficiencies Performance	Deficiencies Material
				2-Excessive deformations (deflections & rotations)	9-Deformation
					6-Corrosion
Description		Description		Description	

Comments

Majority of posts in good condition with deterioration limited to light corrosion. One post near north end of structure, west side is misaligned, suspected to be due to impact.

Element Specifications

Location	East & West sides of Deck
Type	4-Pipe Handrail
Material	STEEL
Length	0.03
Width	0.11
Height	1.20
Count	114

Please do not change dimensions if the difference is < 2%

Element: 013260, RAILING, BARRIERS, RAILING SYSTEMS

Work Order	11373561
Asset Number	4924725
Element Group	BARRIERS
Element Name	RAILING SYSTEMS
Environment	BENIGN
Limited Insp.	N
Protection System	Galvanized
Units of Measure	m.
Qty. In Excellent Condition	
Qty. In Good Condition	0.00
Qty. In Fair Condition	0.00
Qty. In Poor Condition	19.05
Total Quantity	19.05

Recommended Work	Recommended Timing	Maintenance Need	Maintenance Timing	Deficiencies Performance	Deficiencies Material
REPLACE					29-Rot/Decay
Description		Description		Description	
Replace wood posts					

Comments

Steel beam guide rail in good condition, with majority of wooden posts exhibiting severe rot, checks and splits.

Element Specifications

Location	SE & SW Corners of Structure
Type	Steel Beam Guiderail, Wooden Posts
Material	STEEL
Length	3.81
Width	0.00
Height	0.60
Count	5

Please do not change dimensions if the difference is < 2%

Element: 013260, RAILING, COATINGS, RAILING SYSTEMS / HAND RAILINGS

Work Order	11373563
Asset Number	4924727
Element Group	COATINGS
Element Name	RAILING SYSTEMS / HAND R
Environment	BENIGN
Limited Insp.	N
Protection System	None
Units of Measure	Sq.m.
Qty. In Excellent Condition	
Qty. In Good Condition	65.00
Qty. In Fair Condition	33.00
Qty. In Poor Condition	33.00
Total Quantity	131.00

Recommended		Maintenance		Deficiencies	
Work	Timing	Need	Timing	Performance	Material
					6-Corrosion
Description		Description		Description	

Comments

Majority of hand rail coating in good condition with minimal surface rusting (Category 1 and 2), with some areas (primarily on the underside of the rails) with medium to severe surface rust (Category 3 and 4).

Element Specifications

Location	East & West sides of Deck
Type	4-Pipe Handrail
Material	PAINT_COATING
Length	
Width	
Height	
Count	

Please do not change dimensions if the difference is < 2%

Element: 013260, SIGNAGE, ACCESSORIES (ATTACHMENTS AND SIGNS), SIGNS

Work Order	11373542
Asset Number	4918100
Element Group	ACCESSORIES (ATTACHMEI
Element Name	SIGNS
Environment	
Limited Insp.	N
Protection System	None
Units of Measure	Each
Qty. In Excellent Condition	
Qty. In Good Condition	
Qty. In Fair Condition	
Qty. In Poor Condition	2.00
Total Quantity	2.00

Recommended		Maintenance		Deficiencies	
Work	Timing	Need	Timing	Performance	Material
Description		Description		Description	

Comments

No signage evident of bridge closure.

Element Specifications

Location	
Type	
Material	
Length	0.00
Width	0.00
Height	0.00
Count	2

Please do not change dimensions if the difference is < 2%

Element: 013260, TRUSS MEMBER, COATINGS, STRUCTURAL STEEL

Work Order	11373545
Asset Number	4919463
Element Group	COATINGS
Element Name	STRUCTURAL STEEL
Environment	BENIGN
Limited Insp.	Y
Protection System	None
Units of Measure	Sq.m.
Qty. In Excellent Condition	
Qty. In Good Condition	267.84
Qty. In Fair Condition	57.40
Qty. In Poor Condition	57.40
Total Quantity	382.64

Recommended		Maintenance		Deficiencies	
Work	Timing	Need	Timing	Performance	Material
MAJOR REHAB	1-5 YEAR				6-Corrosion
					15-Flaking Paint
Description		Description		Description	
Recoating of truss to be considered as part of rehabiliatation strategy. Could include zone coating repairs.					

Comments

Majority of coating in good condition with areas of light surface rust (Category 2), however areas of medium to severe surface rust noted on approximately 15% of truss components (Category 3 and 4 surface rust). Peeling/flaking observed at several floor beams. A few top and bottom chord connections observed complete top coat failure with primer exposed or locations with severe surface rust. Undercutting observed at a few locations.

Element Specifications

Location	All
Type	
Material	PAINT_COATING
Length	0.00
Width	0.00
Height	0.00
Count	0

Please do not change dimensions if the difference is < 2%

OSIM Inspection

Element Results

Element: 013260, TRUSS MEMBER, TRUSSES/ARCHES, BOTTOM CHORDS

Work Order	11373549
Asset Number	4920821
Element Group	TRUSSES/ARCHES
Element Name	BOTTOM CHORDS
Environment	BENIGN
Limited Insp.	Y
Protection System	Coating
Units of Measure	Sq.m.
Qty. In Excellent Condition	
Qty. In Good Condition	10.54
Qty. In Fair Condition	5.28
Qty. In Poor Condition	5.28
Total Quantity	21.10

Recommended Work	Recommended Timing	Maintenance Need	Maintenance Timing	Deficiencies Performance	Deficiencies Material
MAJOR REHAB	1-5 YEAR	2-Bridge Cleaning		2-Excessive deformations (deflections & rotations)	6-Corrosion
				1-Load carrying capacity	

Recommended Description	Maintenance Description	Deficiencies Description
Repair / replacement of bottom chord if structure rehabiliation pursued.	Clean bearing seats / bottom chord connection at abutments.	Monitor corrosion. Monitor bottom chord deformation with recommended inspection in cooler (winter) temperatures to develop understanding of truss behaviour.

Comments

Minimal section loss with expection of bottom chord at abutment bearing connections where severe corrosion and upto 50% section loss was oberseved at the South Abutment. North Abutment bearings/bottom chord connection not accessible but similar condition likely. Deformation (bowing) and kinks observed at eight rod locations. Corrision at abutments due to collection of debris. Crack indications at the loop welded forged eyebars.

Element Specifications

Location	End panels at Abutments & Pier
Type	Square Rods
Material	STEEL
Length	5.49
Width	0.03
Height	0.03
Count	32

Please do not change dimensions if the difference is < 2%

Element: 013260, TRUSS MEMBER, TRUSSES/ARCHES, BOTTOM CHORDS

Work Order	11373550
Asset Number	4920821
Element Group	TRUSSES/ARCHES
Element Name	BOTTOM CHORDS
Environment	BENIGN
Limited Insp.	Y
Protection System	Coating
Units of Measure	Sq.m.
Qty. In Excellent Condition	
Qty. In Good Condition	4.40
Qty. In Fair Condition	11.00
Qty. In Poor Condition	11.00
Total Quantity	26.40

Recommended Work	Recommended Timing	Maintenance Need	Maintenance Timing	Deficiencies Performance	Deficiencies Material
MAJOR REHAB	1-5 YEAR			2-Excessive deformations (deflections & rotations)	

Recommended Description	Maintenance Description	Deficiencies Description
Repair or replacement of bottom chord if structure rehabiliation pursued.		Monitor bottom chord deformation with recommended inspection in cooler (witner) temperatures to develop understanding of truss behaviour.

Comments

Surface corrosion noted throughout but minimal section loss observed. Deformation (bowing) observed at ten rod locations. Some surface defects noted at the connection.

Element Specifications

Location	Interior Panels
Type	Rectangular Rods
Material	STEEL
Length	5.49
Width	0.02
Height	0.08
Count	24

Please do not change dimensions if the difference is < 2%

Element: 013260, TRUSS MEMBER, TRUSSES/ARCHES, CONNECTIONS

Work Order	11373555
Asset Number	4920823
Element Group	TRUSSES/ARCHES
Element Name	CONNECTIONS
Environment	BENIGN
Limited Insp.	Y
Protection System	Coating
Units of Measure	Each
Qty. In Excellent Condition	
Qty. In Good Condition	44.00
Qty. In Fair Condition	2.00
Qty. In Poor Condition	2.00
Total Quantity	48.00

Recommended Work	Recommended Timing	Maintenance Need	Maintenance Timing	Deficiencies Performance	Deficiencies Material
MAJOR REHAB	1-5 YEAR	2-Bridge Cleaning			

Recommended Description	Maintenance Description	Deficiencies Description
Repair or replacement of connection if structure rehabiliation pursued.	Clean bearing seat bottom chord connection. Clean debris from top chord to end post connection.	

Comments

Majority of connections are in good condition with two localized areas of coating failure (peeling, primer exposed) and light corrosion of rivets and batten plates. Debris present at top chord to end post connection of south truss. Severe corrision noted at end post to bearing connection at the South Abutment (North Abutment assumed similar condition).

Element Specifications

Location	
Type	Rivets, pin, nuts
Material	STEEL
Length	0.00
Width	0.00
Height	0.00
Count	48

Please do not change dimensions if the difference is < 2%

Element: 013260, TRUSS MEMBER, TRUSSES/ARCHES, TOP CHORDS

Work Order	11373557
Asset Number	4920824
Element Group	TRUSSES/ARCHES
Element Name	TOP CHORDS
Environment	BENIGN
Limited Insp.	Y
Protection System	Coating
Units of Measure	ea
Qty. In Excellent Condition	
Qty. In Good Condition	8.00
Qty. In Fair Condition	
Qty. In Poor Condition	
Total Quantity	8.00

Recommended Work	Recommended Timing	Maintenance Need	Maintenance Timing	Deficiencies Performance	Deficiencies Material

Description (Recommended)	Description (Maintenance)	Description (Deficiencies)

Comments

Majority of top chord bracing in good condition with minimal surface rusting (Category 1 and 2). One brace was noted to have complete coating failure with Category 4 surface rust but minimal section loss.

Element Specifications

Location	Lateral Bracing
Type	I Section
Material	STEEL
Length	3.65
Width	0.08
Height	0.18
Count	8

Please do not change dimensions if the difference is < 2%

Element: 013260, TRUSS MEMBER, TRUSSES/ARCHES, TOP CHORDS

Work Order	11373556
Asset Number	4920824
Element Group	TRUSSES/ARCHES
Element Name	TOP CHORDS
Environment	BENIGN
Limited Insp.	Y
Protection System	Coating
Units of Measure	Sq.m.
Qty. In Excellent Condition	
Qty. In Good Condition	123.00
Qty. In Fair Condition	
Qty. In Poor Condition	
Total Quantity	123.00

Recommended Work	Recommended Timing	Maintenance Need	Maintenance Timing	Deficiencies Performance	Deficiencies Material

Description (Recommended)	Description (Maintenance)	Description (Deficiencies)

Comments

Good condition with general observation of minimal surface rusting (Category 1 and 2). There are a few locations with complete coating failure and Category 3 and 4 surface rust but no section loss noted.

Element Specifications

Location	Top chord
Type	Back-to-Back Channels
Material	STEEL
Length	5.49
Width	0.05
Height	0.18
Count	40

Please do not change dimensions if the difference is < 2%

Element: 013260, TRUSS MEMBER, TRUSSES/ARCHES, VERTICALS/DIAGONALS

Work Order	11373554
Asset Number	4920822
Element Group	TRUSSES/ARCHES
Element Name	VERTICALS/DIAGONALS
Environment	BENIGN
Limited Insp.	Y
Protection System	Coating
Units of Measure	Sq.m.
Qty. In Excellent Condition	
Qty. In Good Condition	70.20
Qty. In Fair Condition	
Qty. In Poor Condition	
Total Quantity	70.20

Recommended Work	Recommended Timing	Maintenance Need	Maintenance Timing	Deficiencies Performance	Deficiencies Material
					6-Corrosion

Description (Recommended)	Description (Maintenance)	Description (Deficiencies)

Comments

Good condition with deterioration generally limited to minimal surface rusting (Category 2). A few locations with coating failure and exposed primer. Corrosion of end post to bottom chord connection at abutments.

Element Specifications

Location	Diagonals (End Posts)
Type	Back-to-Back Channels
Material	STEEL
Length	7.84
Width	0.05
Height	0.18
Count	16

Please do not change dimensions if the difference is < 2%

Element: 013260, TRUSS MEMBER, TRUSSES/ARCHES, VERTICALS/DIAGONALS

Work Order	11373553
Asset Number	4920822
Element Group	TRUSSES/ARCHES
Element Name	VERTICALS/DIAGONALS
Environment	BENIGN
Limited Insp.	Y
Protection System	Coating
Units of Measure	Sq.m.
Qty. In Excellent Condition	
Qty. In Good Condition	60.20
Qty. In Fair Condition	6.70
Qty. In Poor Condition	
Total Quantity	66.90

Recommended Work	Recommended Timing	Maintenance Need	Maintenance Timing	Deficiencies Performance	Deficiencies Material
					6-Corrosion

Recommended Description	Maintenance Description	Deficiencies Description

Comments

Verticals in good condition. Areas with potential light to medium corrosion. Coating condition varies from Category 1 and 2 (majority of member area) to Category 4 with complete coating failure at a few connection locations.

Element Specifications

Location	Verticals
Type	I-Section
Material	STEEL
Length	5.65
Width	0.12
Height	0.13
Count	16

Please do not change dimensions if the difference is < 2%

Element: 013260, TRUSS MEMBER, TRUSSES/ARCHES, VERTICALS/DIAGONALS

Work Order	11373552
Asset Number	4920822
Element Group	TRUSSES/ARCHES
Element Name	VERTICALS/DIAGONALS
Environment	BENIGN
Limited Insp.	N
Protection System	Coating
Units of Measure	Sq.m.
Qty. In Excellent Condition	
Qty. In Good Condition	
Qty. In Fair Condition	3.60
Qty. In Poor Condition	3.60
Total Quantity	7.20

Recommended Work	Recommended Timing	Maintenance Need	Maintenance Timing	Deficiencies Performance	Deficiencies Material
MAJOR REHAB	1-5 YEAR			1-Load carrying capacity	

Recommended Description	Maintenance Description	Deficiencies Description
Repair / replacement of eye bars should structure rehabilitation be pursued.		Monitor crack indications and uneven loading conditions.

Comments

Uneven loading of vertical rods with minimal tension observed at a few locations. Minor kink present in one rod. Light surface rust but no section loss. Possible initiation of cracking at loop welded forged eye bars throughout. Poor condition reflects kinked member and unevenly loaded members.

Element Specifications

Location	Verticals
Type	Square Rods
Material	STEEL
Length	5.65
Width	0.02
Height	0.02
Count	16

Please do not change dimensions if the difference is < 2%

Element: 013260, TRUSS MEMBER, TRUSSES/ARCHES, VERTICALS/DIAGONALS

Work Order	11373551
Asset Number	4920822
Element Group	TRUSSES/ARCHES
Element Name	VERTICALS/DIAGONALS
Environment	BENIGN
Limited Insp.	N
Protection System	Coating
Units of Measure	Sq.m.
Qty. In Excellent Condition	
Qty. In Good Condition	60.20
Qty. In Fair Condition	
Qty. In Poor Condition	
Total Quantity	60.20

Recommended Work	Recommended Timing	Maintenance Need	Maintenance Timing	Deficiencies Performance	Deficiencies Material

Recommended Description	Maintenance Description	Deficiencies Description
		Monitor crack indications.

Comments

Light to medium suface rust but not section loss observed. Possible initiation of cracking at loop welded forged eye bars on all diagonals.

Element Specifications

Location	Diagonals
Type	Square Rods
Material	STEEL
Length	7.84
Width	0.04
Height	0.04
Count	48

Please do not change dimensions if the difference is < 2%

Element: 013260, TRUSS SWAY/LATERAL BRACING, BRACING, BRACINGS

Work Order	11373570
Asset Number	4927166
Element Group	BRACING
Element Name	BRACINGS
Environment	BENIGN
Limited Insp.	Y
Protection System	Coating
Units of Measure	Each
Qty. In Excellent Condition	
Qty. In Good Condition	4.00
Qty. In Fair Condition	
Qty. In Poor Condition	
Total Quantity	4.00

Recommended Work	Recommended Timing	Maintenance Need	Maintenance Timing	Deficiencies Performance	Deficiencies Material

Recommended Description	Maintenance Description	Deficiencies Description

Comments

Light to medium surface rust but no section loss observed.

Element Specifications	
Location	Sway Bracing (End Posts)
Type	Built up Angles
Material	STEEL
Length	3.96
Width	
Height	
Count	4

Please do not change dimensions if the difference is < 2%

Element: 013260, TRUSS SWAY/LATERAL BRACING, BRACING, BRACINGS

Work Order	11373569
Asset Number	4927166
Element Group	BRACING
Element Name	BRACINGS
Environment	BENIGN
Limited Insp.	Y
Protection System	Coating
Units of Measure	Each
Qty. In Excellent Condition	
Qty. In Good Condition	44.00
Qty. In Fair Condition	
Qty. In Poor Condition	4.00
Total Quantity	48.00

Recommended Work	Recommended Timing	Maintenance Need	Maintenance Timing	Deficiencies Performance	Deficiencies Material
MAJOR REHAB	1-5 YEAR			1-Load carrying capacity	6-Corrosion

Recommended Description	Maintenance Description	Deficiencies Description
Replacement / repair of end panel bottom chord bracing if structure rehabilitation pursued.		Suspected that bottom chord cross bracing is contributing to disengaged bottom chord. Monitor truss behaviour to develop understanding in cooler temperatures.

Comments

Most members observed with light to medium surface rust with no section loss. Severe corrosion and > 30% section loss of brace connected to west bearing at South Abutment. Medium to severe section loss also noted at east bearing of South Abutment. North abutment bearing seat not accessible for inspection, but similar condition assumed. It was noted that the braces were connected to a plate was welded to the bearing plate at the pier and indicates a retrofit.

Element Specifications	
Location	Diag. Bracing (Top & Bot. Chords)
Type	Round Rods
Material	STEEL
Length	6.60
Width	0.00
Height	0.00
Count	48

Please do not change dimensions if the difference is < 2%

Element: 013260, UTILITIES, ACCESSORIES (ATTACHMENTS AND SIGNS), UTILITIES

Work Order	11373564
Asset Number	4925949
Element Group	ACCESSORIES (ATTACHMEI
Element Name	UTILITIES
Environment	BENIGN
Limited Insp.	Y
Protection System	Coating
Units of Measure	Each
Qty. In Excellent Condition	
Qty. In Good Condition	1.00
Qty. In Fair Condition	
Qty. In Poor Condition	
Total Quantity	1.00

Recommended Work	Recommended Timing	Maintenance Need	Maintenance Timing	Deficiencies Performance	Deficiencies Material

Recommended Description	Maintenance Description	Deficiencies Description

Comments

Gasmain and support brackets appear intact.

Element Specifications	
Location	
Type	Natural Gas Pipeline
Material	STEEL
Length	0.00
Width	0.00
Height	0.00
Count	1

Please do not change dimensions if the difference is < 2%

OSIM Inspection

Element Results

Element: 013260, WALL OR WALL PANEL, RETAINING WALLS, WALLS

Work Order	11670161
Asset Number	5258314
Element Group	RETAINING WALLS
Element Name	WALLS
Environment	BENIGN
Limited Insp.	YES
Protection System	None

Units of Measure	Sq.m.
Qty. In Excellent Condition	
Qty. In Good Condition	
Qty. In Fair Condition	8.40
Qty. In Poor Condition	
Total Quantity	8.40

Recommended Work	Recommended Timing	Maintenance Need	Maintenance Timing	Deficiencies Performance	Deficiencies Material

Description (Recommended)	Description (Maintenance)	Description (Deficiencies)
		No visible indication of stability issues

Comments

limitted access and visibility due to vegetation.

Element Specifications

Location	NW quadrant
Type	Dry Stone Retaining Wall
Material	STONE
Length	3.50
Width	
Height	2.40
Count	1

Please do not change dimensions if the difference is < 2%

Element: 013260, WATERCOURSE, EMBANKMENTS AND STREAMS, STREAMS AND WATERWAYS

Work Order	11373565
Asset Number	4925950
Element Group	EMBANKMENTS AND STREA
Element Name	STREAMS AND WATERWAY
Environment	
Limited Insp.	N
Protection System	

Units of Measure	All
Qty. In Excellent Condition	
Qty. In Good Condition	1.00
Qty. In Fair Condition	
Qty. In Poor Condition	
Total Quantity	1.00

Recommended Work	Recommended Timing	Maintenance Need	Maintenance Timing	Deficiencies Performance	Deficiencies Material

Description (Recommended)	Description (Maintenance)	Description (Deficiencies)

Comments

No observed material defects.

Element Specifications

Location	
Type	
Material	OTHER
Length	0.00
Width	0.00
Height	0.00
Count	1

Please do not change dimensions if the difference is < 2%

Element: 013260, WINGWALL, ABUTMENTS, WINGWALLS

Work Order	11373544
Asset Number	4918102
Element Group	ABUTMENTS
Element Name	WINGWALLS
Environment	BENIGN
Limited Insp.	Y
Protection System	None

Units of Measure	Sq.m.
Qty. In Excellent Condition	
Qty. In Good Condition	30.50
Qty. In Fair Condition	
Qty. In Poor Condition	1.00
Total Quantity	31.50

Recommended Work	Recommended Timing	Maintenance Need	Maintenance Timing	Deficiencies Performance	Deficiencies Material
MINOR REHAB	1-5 YEAR				7-Cracks
					21-Loss of material
					33-Spalling

Description (Recommended)	Description (Maintenance)	Description (Deficiencies)
Repoint stone if bridge rehabiliation is pursued.		

Comments

South Abutment wingwalls are buried (no inspection). North abutment wingwalls in good condition with vertical cracks, loss of mortar and light spalling of a few stones noted. Dry stone retaining wall noted at NW quadrant in poor condition (not rated under this component).

Element Specifications

Location	NE & NW Wingwalls
Type	Gravity wall
Material	MASONRY
Length	0.00
Width	3.50
Height	4.50
Count	2

Please do not change dimensions if the difference is < 2%

Photograph 1: West Elevation

Photograph 2: South Entrance from St. Patrick Street

Photograph 3: Cross section of structure looking north at the pier.

Photograph 4: Cross section of structure looking south at the pier.

Photograph 5: Typical condition and general view of truss members.

Photograph 6: Typical condition of end post.

Photograph 7: Typical top chord to end post connection. Debris/nesting was noted at southeast corner of the structure.

Photograph 8: Interior vertical and brace configuration. Coating failure noted at this connection (north span).

Photograph 9: North end of structure with blocked access. Note vegetation on end post.

Photograph 10: Typically pitting corrosion on truss verticals at previous railing connection.

Photograph 11: Typical configuration and condition of diagonals.

Photograph 12: Kinked exterior vertical at north end of north span.

Photograph 13: Possible crack initiation at loop welded forged eye bar. Typical condition noted at several eye bar locations for verticals and diagonals.

Photograph 14: Typical exterior panel pin and hanger connection

Photograph 15: Typical interior panel pin and hanger connection.

Photograph 16: Severe flaking of coating on interior panel vertical at middle of North span.

Photograph 17: Typical surface defect on bottom chord members at pin connections.

Photograph 18: End panel square rod bottom chord members within south span at pier. The bottom chord appeared engaged at this location.

Photograph 19: Bowed and disengaged bottom chord at an interior truss panel. This deformation was observed at several locations.

Photograph 20: Deformed / disengaged bottom chord at end panel near South Abutment.

Photograph 21: Bottom chord connection at South Abutment (east side).

Photograph 22: Close up of Photograph 21. Note approximately 50% section loss of one of the rods.

Photograph 23: Typical condition of deck.

Photograph 24: Close up of deck condition. Note that several planks are damaged, severely weathered and rotting.

Photograph 25: Typical condition of hand rails and posts.

Photograph 26: Deformed post near North Abutment.

Photograph 27: Light to medium checking and splitting of replaced outer stringers (typical condition).

Photograph 28: Typical condition of underside of deck and cross bracing.

Photograph 29: Deck underside at pier. Note new stingers vs. original.

Photograph 30: Light to medium fire damage to stringers and blocking near South Abutment.

Photograph 31: Typical condition of floor beams. Floor beams generally in fair to good condition with corrosion typically limited to deck curb line and localized coating failure (peeling, light to severe surface rust).

Photograph 32: Typical corrosion of top flange at floor beam ends (below curb line).

Photograph 33: Close up of Photograph 34, showing severe corrosion and perforation of floor beam top flange near South Abutment.

Photograph 34: Evidence of retrofit due to welded plate connecting cross brace to bearing plate and pier.

Photograph 35: Severe (> 25%) section loss of cross brace at South Abutment.

Photograph 36: Typical abutment roller bearing. Southeast bearing shown. Bearings are suspected to be seized.

Photograph 37: Close up of Photograph 36.

Photograph 38: Severe corrosion and rust jacking of end post at South Abutment pin connection.

Photograph 39: Typical condition of Pier bearings.

Photograph 40: Cracked and corroded spacer on southwest pin at Pier.

Photograph 41: South Abutment.


Photograph 42: North Abutment.

Photograph 43: West wingwall and dry stone masonry retaining wall at the North Abutment.

Photograph 44: Close up of the west wingwall showing some vertical cracks and localized spalling of stone.

Photograph 45: South face of Pier.

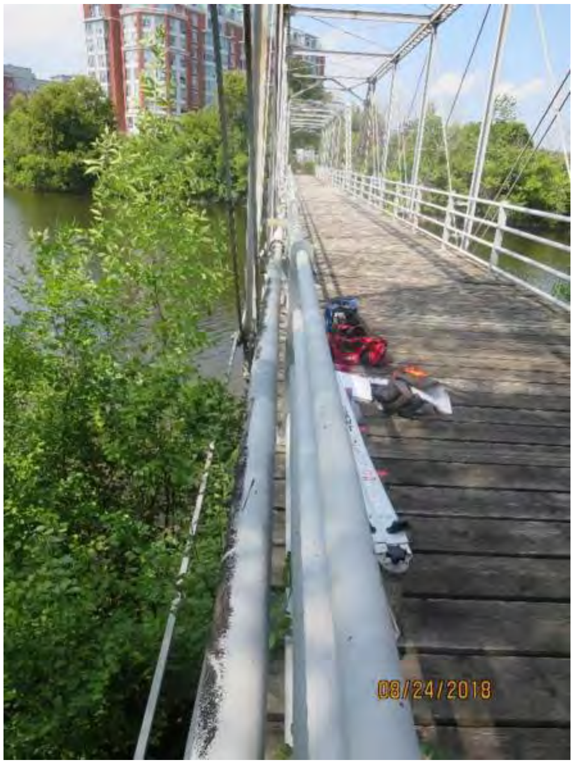
Photograph 46: North face of Pier.

Photograph 47: Pier bearing seat.

Photograph 48: Vertical cracks and loss of mortar at Pier.

Photograph 49: General view looking west on structure.

Photograph 50: General view looking east on structure.



Photograph 51: Gas line on west side of deck.

Photograph 52: Start of gas line at south end.

Appendix B

Natural Environment Memorandum

MEMO

DILLON CONSULTING

TO: Kosta Karadakis, City of Ottawa; Assets Management Branch
FROM: Whitney Moore, Dillon Consulting Limited
cc: Nathan Bakker, Project Manager, Dillon Consulting Limited
DATE: January 10, 2019
SUBJECT: Decommissioning of Porters Island Bridge – Species at Risk Screening
OUR FILE: 188142

Dillon Consulting Limited (Dillon) conducted a high-level screening for Species at Risk (SAR), listed as *endangered* or *threatened* under the Ontario Endangered Species Act, 2007 (ESA) and the federal Species at Risk Act (SARA); as well as other natural heritage features as part of the Porters Island Bridge Decommissioning project. The bridge is a closed pedestrian crossing (SN013260) that spans the south branch of the Rideau River in Ottawa, between Porters Island and St. Patrick Street at approximate UTM 18 T 446778 E, 5031663 N (the 'Study Area') (Figure 1, **Appendix A**). While once used as a pedestrian crossing, the bridge is currently only used to carry an Enbridge gas main onto Porters Island. The surrounding area primarily consists of treed riparian cover, roadways and commercial areas with paved parking lots. It should be noted that, as a decommissioning project, it is assumed that there will be no in-water work required; and therefore, as the potential for aquatic SAR will be noted, no impacts to fish habitat would be anticipated.

Approach

A desktop review of mapping and aerial imagery was conducted for the Study Area to determine potential for SAR and other natural heritage features within the immediate vicinity of the Study Area. The background information reviewed included the following sources:

- Aerial and roadside photography and satellite imagery (GoogleEarth, GoogleMaps Street View)
- Significant Wildlife Habitat Technical Guide (MNRF 2000)
    - Eco-region 6E Criterion Schedule (MNRF 2015)
- Online data sets including the following:
    - Ministry of Natural Resources and Forestry (MNRF) Natural Heritage Information Centre (NHIC)
    - MNRF Land Information Ontario (LIO)
    - MNRF's SAR website
    - The Ontario Breeding Bird Atlas (OBBA)
    - The Ontario Reptile and Amphibian Atlas
    - Fisheries and Oceans Canada (DFO) Aquatic Species at Risk Mapping (2015-2016).

In addition, an Information Request was submitted to the MNRF Kemptville District in September 2018 in order to confirm the potential for SAR to be present within the vicinity of the Study Area.

In order to confirm whether suitable habitat for SAR exists within the Study Area, an environmental field assessment was completed by Dillon in September 2018. Results of our background review and site assessment are outlined below.

Results of Background Review

The Study Area includes the adjacent riparian areas approximately 120 m on either side of the bridge along the Rideau River. The Rideau River provides habitat for numerous plant, wildlife, and fish species, including several SAR. More specifically, the potential for several SAR were identified through background review within the Study Area, and are listed in **Table 1**.

Table 1: SAR Records within the vicinity of the Study Area

SCIENTIFIC NAME	COMMON NAME	SARA[1]	ESA[2]	S-RANK[3]	INFO SOURCE[4]
PLANTS					
Juglans cinerea	Butternut	END	END	S3?	MNRF
BIRDS					
Caprimulgus vociferus	Eastern Whip-poor-will	THR	THR	S4B	MNRF
Chaetura pelagica	Chimney Swift	THR	THR	S4B,S4N	MNRF, OBBA
Dolichonyx oryzivorus	Bobolink	THR	THR	S4B	MNRF, OBBA
Hirundo rustica	Barn Swallow	THR	THR	S4B	MNRF, OBBA
Ixobrychus exilis	Least Bittern	THR	THR	S4B	MNRF
Riparia riparia	Bank Swallow	THR	THR	S4B	MNRF
Sturnella magna	Eastern Meadowlark	THR	THR	S4B	MNRF, OBBA
FISH					
Acipenser fulvescens pop. 3	Lake Sturgeon (Great Lakes - Upper St. Lawrence River population)	---	END	S2	MNRF
MAMMALS					
Myotis leibii	Eastern Small-footed Myotis	---	END	S2S3	MWH
Myotis lucifugus	Little Brown Myotis	END	END	S4	MWH
Myotis septentrionalis	Northern Myotis	END	END	S3	MWH
Pipistrellus subflavus	Tri-colored Bat	END	END	S3?	MWH
HERPETOZOA					
Emydoidea blandingii	Blanding's Turtle	THR	THR	S3	MNRF
Pantherophis spiloides	Gray Ratsnake (Frontenac Axis population)	THR	THR	S3	OHA

[1]SARA= Federal Species at Risk Act 2004 (THR= Threatened, END= Endangered); [2]ESA= Ontario Endangered Species Act 2007 (THR= Threatened, END= Endangered); [3]S-Rank is an indicator of commonness in the Province of Ontario. A scale between 1 and 5, with 5 being very common and 1 being the least common. [4]Information sources include: MNRF = Ministry of Natural Resources and Forestry's Online SAR Mapping; NHIC= MNRF's Natural Heritage Information Centre; MWH = Digital Distribution Maps of the Mammals of the Western Hemisphere; OBBA = Ontario Breeding Bird Atlas; --- denotes no information.

A response was received from Kemptville District MNRF on December 31, 2018. It should be noted that the MNRF in Kemptville will no longer provide a site-specific screening of SAR, but will provide a comprehensive list of historic SAR for the Ottawa area. As this information is readily available online, no additional relevant species were identified by MNRF that have not been identified through our desktop background review.

Due to the nature of the surrounding area (paved roads, development, etc.), the pedestrian bridge and riparian banks within the Study Area are not likely to provide suitable habitat for most SAR. However, based on the presence of mature trees, the bridge structure itself, and the nature of the riparian area of long the Rideau River, the following species have potential to be found within the Study Area:

- Barn Swallow;
- Butternut;
- Blanding's Turtle; and,
- SAR bats.

A review of the LIO database also indicates that there are areas of woodland along the banks of the Rideau River; however, these would not meet the definition of woodlands as per the Forestry Act due to their size and configuration (minimum stem counts and density not met) (**Figure 1, Appendix A**). No other natural heritage features were identified as a result of the desktop screening.

Results of Site Investigations

Riparian habitat present on both the north and south ends of the pedestrian bridge consists primarily of deciduous treed banks (refer to site photos in **Appendix B**). The canopy of the southern bank, is dominated by Manitoba Maple (*Acer negundo*), Slippery Elm (*Ulmus rubra*), and Eastern Cottonwood (*Populus deltoides ssp. deltoides*); while thick undergrowth of Common Buckthorn (*Rhamnus cathartica*), Green Ash (*Fraxinus pennsylvanica*), and Slippery Elm (*Ulmus rubra*) comprise the sub canopy. The composition of the north bank is similar, however also contains Sugar Maple (*Acer saccharum*). Several cavity trees (Sugar Maples) were observed within the northern treed bank, on the eastern side of the pedestrian bridge (**Appendix B**).

Barn Swallow

While potential habitat was identified through the background review for Barn Swallow on the bridge structure, no individuals or nests were observed within the Study Area by Dillon staff during field investigations. There is low potential for Barn Swallow to nest on this structure, however if future activities have potential to impact the underside of the structure; the structure should be assessed again by a biologist to confirm potential nesting activity.

Butternut

Field investigations yielded no observations of Butternut within the Study Area.

Blanding's Turtle

The Rideau River itself is known to provide habitat for Blanding's Turtle. As a result, the Study Area has high potential to provide SAR turtle habitat and should the species be present, would be considered Category 2 Habitat for the species in accordance with the General Habitat Description for Blanding's Turtle (MNRF).

SAR Bats

Although no individuals were observed, cavity trees along the banks of the Rideau River have moderate potential to provide maternal roost habitat for SAR bat species.

Recommendations

Depending on impacts to SAR bat habitat along the river banks and/or Blanding's Turtles habitat within the river, an Information Gathering Form (IGF) may be required for submission to the MNRF Kemptville District outlining the proposed works, anticipated impacts and proposed mitigation measures. MNRF would then determine if further steps are required to avoid contravention of the ESA or if a permit is required. If a permit is required, it could take significant time (in some cases over a year), which should be taken into consideration as part of the project delivery schedule.

If these species are present, the following mitigation measures are proposed to minimize impacts to SAR and their habitat:

- Contract package to include timing windows to avoid habitat during key life processes
    - Blanding's Turtle – avoid in-water work between April 30 and September 15 when turtles may be overwintering
    - SAR bats – avoid removal of snag trees with potential to provide Maternity Roost Habitat between May 1 and October 31
- Contract package to include exclusionary fencing to prevent SAR turtles from entering the work area on the banks of the watercourse. To be installed prior to May 1 and maintained until September 30
- Contractor to conduct visual survey of underside of structure to confirm no evidence of bird nesting,
- Provide a SAR Contractor Awareness package for all personnel on-site
- Environmental monitoring during construction should include visual surveys of suitable habitat for the presence of SAR, and confirm exclusionary fencing is maintained and functioning effectively.
- If SAR are encountered during construction, work in that area would stop until the species could be confirmed by a qualified biologist and relocated to suitable habitat outside the work area
- All SAR observations will be documented and reported to the City and Contract Administrator for reporting to MNRF

Should you have any questions please contact Whitney Moore at 613-745-2213 ext. 3040 or wmoore@dillon.ca.

Thank you very much,

DILLON CONSULTING LIMITED

Whitney Moore

Whitney Moore, B.Sc.
Biologist

Note to file: As of April 1, 2019, the administration of the Endangered Species Act (ESA) transitioned responsibility from MNRF to the Ministry of the Environmental, Conservation and Parks (MECP). At this time, we are unaware of the impacts of this transition to the regulatory process and as a result the project.

Appendix A

Study Area

PORTERS ISLAND PEDESTRIAN BRIDGE OTTAWA, ON

FIGURE 1 PROJECT LOCATION

Study Area
Unevaluated Wetland
Woodland

MAP DRAWING INFORMATION:
DATA PROVIDED BY MNRF

MAP CREATED BY: GM
MAP CHECKED BY: WM
MAP PROJECTION: NAD 1983 UTM Zone 18N

DILLON CONSULTING

PROJECT: 1878142
STATUS: DRAFT
DATE: 2018-09-14

FILE LOCATION: I:\GIS\188142 - Porters Island Pedestrian Bridge\mxd\Figure 1 Project Location.mxd

Appendix B

Site Photos

Photo 1: Sept. 4, 2018 Northward view of entrance to closed pedestrian bridge from St. Patrick Street.	
Photo 2: Sept. 4, 2018 Southern view of St. Patrick Street and treed fencerow from closed pedestrian bridge.	

Photo 3: Sept. 4, 2018 Northward view of Porters Island and Rideau River from closed pedestrian bridge.	
Photo 4: Sept. 4, 2018 View of treed fencerow and closed pedestrian bridge exit on south-east shore of Porters Island.	

Photo 5:

Sept. 4, 2018

Westerly view of St. Patrick Street and treed fencerow south of Rideau River and closed pedestrian bridge.

Photo 6:

Sept. 4, 2018

Eastern view of St. Patrick Street and treed fencerow south of Rideau River and closed pedestrian bridge.

Photo 7: Sept. 4, 2018 South-west view of Island Lodge Road and treed fencerow north of Rideau River and closed pedestrian bridge.	
Photo 8: Sept. 4, 2018 South shoreline and open water of Rideau River below closed pedestrian bridge.	

Photo 9: Sept. 4, 2018 Northern shoreline of Rideau River, west of closed pedestrian bridge.	
Photo 10: Sept. 4, 2018 South-east view of treed fencerow on south shoreline (Patrick Street) from closed pedestrian bridge.	

Photo 11: Sept. 4, 2018 Canopy of southern shoreline of closed pedestrian bridge (along St. Patrick Street).	
Photo 12: Sept. 4, 2018 Understory vegetation present within southern shoreline of closed pedestrian bridge (along St. Patrick Street).	

Photo 13: Sept. 4, 2018 Understory vegetation present within southern shoreline of closed pedestrian bridge (along St. Patrick Street).	
Photo 14: Sept. 4, 2018 Canopy of treed fencerow on south-east shoreline of Porters Island, north-west of closed pedestrian bridge.	

Photo 15: Sept. 4, 2018 Canopy and cavity trees observed in treed fencerow of south-east shoreline of Porters Island, north-east of closed pedestrian bridge.	
Photo 15: Sept. 4, 2018 Understory vegetation and cavity trees observed in treed fencerow north-east of closed pedestrian bridge.	

Appendix C

Structural Evaluation Memorandum

MEMO

DILLON CONSULTING

TO: Kosta Karadakis, P. Eng., City of Ottawa, Assets Management Branch
FROM: Marc-Andre Chainey, P. Eng., Dillon Consulting Limited
cc: Nathan Bakker, P. Eng., Project Manager, Dillon Consulting Limited
DATE: May 13, 2019
SUBJECT: Decommissioning of Porters Island Bridge – Structural Evaluation Memo
OUR FILE: 188142

The City of Ottawa (City) is investigating the possibility of decommissioning the Porters Island Bridge (SN013260). The bridge is a two-span (38.4 m; 38.4 m), pin-connected steel Pratt through-truss that spans the south branch of the Rideau River in Ottawa, between Porters Island and St. Patrick Street. The bridge was constructed in 1894 and is currently closed to all pedestrian traffic and is used solely to carry an Enbridge gas main onto Porters Island.

Dillon Consulting Limited (Dillon) completed a structural evaluation of the existing structure as part of the Impact Assessment for the Decommissioning of the Porters Island Bridge. This memo presents the findings of the structural evaluation. This memorandum should be read in conjunction with the *Impact Assessment Report (2019)* and *2018 OSIM Report*.

Available Information and Literature Review

The following reference documents are available for the Porters Island Bridge and were reviewed in preparation for the structural evaluation:

- Rehabilitation Drawings (Railing System Replacement) – Old Porter's Island Bridge, Drawing No. DB-32603-1 to -3, *dated April 18, 1963*.
- Gas Main Installation Drawings – Old Porter's Island Bridge, Drawing No. B-33604-1, d*ated November 30, 1982*.
- Rehabilitation Drawings (Structural Steel Recoating) – Old Porter's Island Bridge, Drawing No. B-032605-1 to -2, *dated September 19, 1984*
- Rehabilitation Drawings (Timber Deck Repairs, Masonry Repointing) – Porters Island Pedestrian Bridge Repairs, Drawing No. B-032606-001 to -002, *dated August 1998.*
- OSIM Inspection Forms (September 2011)

There were no original drawings available for the structure; however, the member sizes and properties were established through a combination of field measurements, information provided on available structure drawings and applicable reference documents. Available drawings used in this evaluation are presented in Appendix A.

Due to the type of structure and potential historical significance, a literature review was conducted to ensure the unique behaviour of pin-connected truss bridges was appropriately considered in the analysis and evaluation of the structure. The following documents were reviewed:

- Bakht, B. (1988). *Bridge Testing – A Surprise Every Time,* Ministry of Transportation of Ontario.
- Loss, H. V. (1893). *The Forging of Eyebars and the flow of metal in closed dies.*
- Maniar, D et al., (2003). *Evaluation and Rehabilitation of Historic Metal Truss Bridges: A Case Study of an Off-System Historic Metal Truss Bridge in Shackelford County, Texas*, The University of Texas at Austin.
- Mckell, W et al., (2006). *Best Practices for the Rehabilitation and Moving of Historic Metal Truss.Bridges,* Virginia Department of Transportation and Virginia Transportation Research Council.
- Waddell, J. (1891). *The Designing of Ordinary Iron Highway Bridges,* John Wiley & Sons.

Load Capacity Evaluation

A structural evaluation of the superstructure was completed in accordance with the Canadian Highway Bridge Design Code (CHBDC) CAN/CSA-S6-14. The truss members, floor beams and stringers were evaluated at Ultimate Limit States (ULS) for applied dead, pedestrian, temperature, wind and a maintenance vehicle load in accordance with Sections 3 and 14 of the CHBDC. Snow loads were considered in accordance with Section 16.9.7 of the MTO Structural Manual. Given the age and setting of the structure, and because there is no evidence of serviceability-related defects, the evaluation did not consider the serviceability limit state (SLS) as prescribed in the CHBDC (14.5.2.5). Pedestrian bridges are typically not subject to stress cycles of a sufficient number or magnitude to induce fatigue concerns and no guidance appropriate for an existing structure of this type is provided. The bridge superstructure was modeled as a 2-D and 3-D truss using SAP2000 commercial software (Figures 1 and 2). All members except the end posts were modeled with pinned connections.

Factored resistances were calculated in accordance with Sections 9 and 10 of the CHBDC. The evaluation was undertaken in two phases: 1) Baseline Evaluation and 2) Existing Conditions Evaluation. The Baseline Evaluation is based on the original section properties and intended structural behaviour (including free articulation of the bearings) to represent a baseline structural evaluation. The Existing Conditions Evaluation used reduction factors to account for observed deterioration and structural behaviour.

Both the north and south bridges are identical and symmetric about their respective centrelines. Consequently, results are presented for a 'single span truss' except cases where the structure existing conditions vary between spans. Truss joint and member designations are provided in Figure 1. The bridges are oriented in the north-south direction.

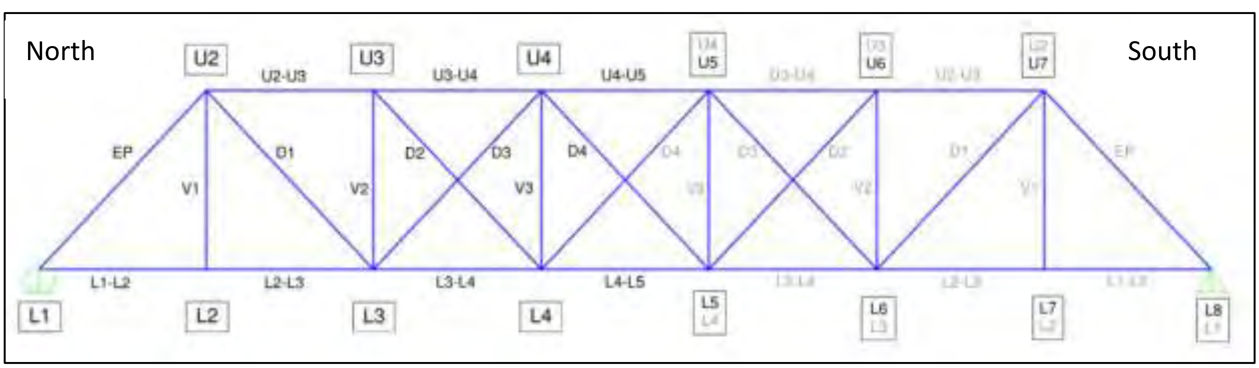


FIGURE 1: 2D TRUSS & NODE IDENTIFICATION

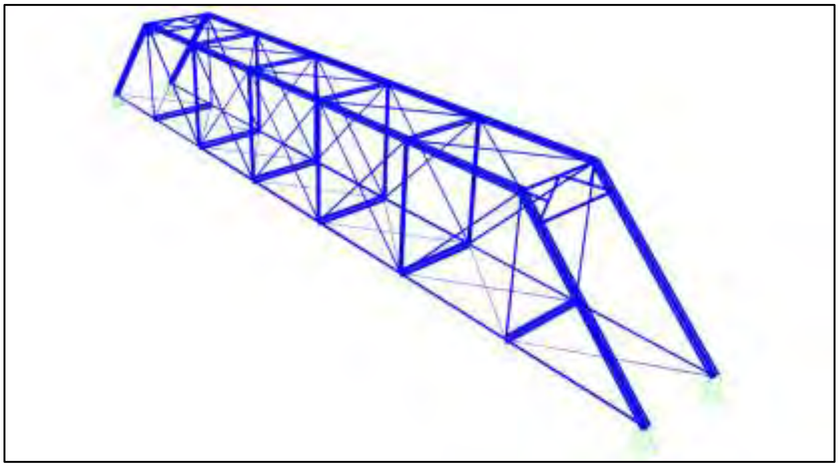


FIGURE 2: 3D SAP2000 MODEL

Material Properties

There are no original structure drawings available for assessment of the material properties of the steel components of the structure. Similarly the history of the timber deck is unknown, with partial replacement of stringers and deck planks in 1998 with No. 2 Spruce Pin-Fir (SPF). The material properties were therefore developed based on literature review and on recommendations from the CHBDC Clause 14.7.

Based on the original date of construction and the structure type, the truss members are suspected to be comprised of wrought iron. The yield strength of wrought iron used for eyebar manufacturing during this period is published as being 180-205 MPa[1,2] with a minimum ultimate strength of 250 MPa. The lower range of the published material strength agrees with 180 MPa yield strength of steel pre-dating 1905 as specified in the CHBDC (Clause 14.7.4.2). Conversely, the ultimate strength of wrought iron is specified as 360 MPa in the CHBDC for steel predating 1905. This variation in ultimate strength is a function of the anisotropic behaviour of wrought iron due to the composite inclusion of slag in the form of iron silicate fibers distributed throughout the iron and aligned in the direction of rolling. The ultimate strength of the steel sections was not used in the structural evaluation (elastic behavior only and Category 3 sections was considered).

Material properties used in this evaluation are summarized in **Table 1**.

TABLE 1: MATERIAL PROPERTIES

Item	Material	Value
F_y – Yield Stress	*Iron/Steel*	*180 MPa*
E_p – Modulus of Elasticity	*Iron/Steel*	*200,000 MPa*
F_{bu} – Bending Strength	*No.2 SPF*	*8.4 MPa*
F_v – Shear Strength	*No.2 SPF*	*1.2 MPa*
E_{50} – Modulus of Elasticity	*No.2 SPF*	*8500 MPa*

[1] Waddell, J. (1891). *The Designing of Ordinary Iron Highway Bridges,* John Wiley & Sons.
[2] Maniar, D et al., (2003). *Evaluation and Rehabilitation of Historic Metal Truss Bridges: A Case Study of an Off-System Historic Metal Truss Bridge in Shackelford County, Texas*, The University of Texas at Austin

Section Properties

The structure rehabilitation drawings from 1963 provided several member designations that were supplemented by detailed field measurements to determine the section properties of each member. A summary of the primary structural member dimensions evaluated is presented in Table 2, with supplemental sketches and calculated section properties in Appendix B as part of the structural evaluation calculations.

TABLE 2: CROSS SECTION DIMENSIONS

Element	Type	Depth (mm)	Width (mm)	Flange Thickness (mm)	Web Thickness (mm)	Back to Back Distance (mm)
Floorbeams	I-Section	305	133	14	10	-
Lateral Brace	I-Section	181	82	11	11	-
Vertical	I-Section	98	116	11	10	-
Top Chord / End Post	Double Channel	181	51	11	8	194
Bottom Chord	Eye-Bar	76	38	-	-	-
Bottom Chord	Eye-Bar	76	41	-	-	-
Diagonal / Bottom Chord	Square Rod	32	32	-	-	-
Diagonal / Top X-Brace	Square Rod	22	22	-	-	-
Diagonals	Square Rod	19	19	-	-	-
Bottom X-Brace	Circular Rod	35 (diameter)		-	-	-
Bottom X-Brace	Circular Rod	32 (diameter)		-	-	-
Bottom X-Brace	Circular Rod	29 (diameter)		-	-	-
Bottom X-Brace	Circular Rod	25 (diameter)		-	-	-
Stringer	Sawn Lumber	286	89	-	-	-

Eyebars

Iron eyebar tension members were widely used in bridges of this era and were typically fabricated using one of 3 separate forging techniques as follows:

- Loop-Welded eyebars;
- Formed eyebars through upsetting [3] using piling and forging method; and
- Formed eyebars through upsetting [3] using closed die forging method.

Two distinct types of eyebars are found on the Porters Island Bridge:

- Loop-welded eyebars with a square cross-sections based on the configuration of the eyelet; and

[3] Loss, H. V. (1893). *The Forging of Eyebars and the flow of metal in closed dies*

- Upset eyebars with a rectangular cross section which appear to be fabricated through piling forging process based on the observed surface defects on the forged eyebar head.

Eyebar members may be comprised of a single eyebar element or multiple individual eyebars elements. Individual eyebar elements of the same member are not interconnected and are loaded through the pin-connections only. Eyebar members will buckle under compressive forces and are considered tension only members.

Loads

The following subsections detail the loads that were considered in the analysis. It is noted that pedestrian structures are excluded from reliability-based load factor reduction (in accordance with Section 14) and therefore the full load factors detailed in Section 3 (Table 3.1) of the CHBDC were utilized.

Dead Load

The following dead loads were considered in the analysis of the structure:

- Self-weight of iron truss members (increased by 15% to account for miscellaneous steel such as connections, lattice, cross bracing, gas main, etc.);
- Self-weight of steel floor beams; and
- Self-weight of timber stringers and deck planks.

Live Load

The live load was comprised of the pedestrian load as specified in Section 3.8.9 of the CHBDC, and the maintenance vehicle load from Section 3.8.11 of the CHBDC. The pedestrian and maintenance vehicle loads are not be considered to act simultaneously.

Wind Load

The wind load was determined in accordance of Section 3.10 of the CHBDC. From Annex A3.1 of CHBDC the 50 year baseline wind load for Ottawa, Ontario is determined to be 410 Pa.

Snow Load

According to Section 16 of the MTO Structural Manual, snow loads must be considered for pedestrian bridges and are to be calculated using the National Building Code (NBCC). Snow loads are evaluated in conjunction with ULS2, ULS3, and in a separate load case with the factored dead loads. From the climatic data tables in the NBCC, the 1:50y site-specific snow load was determined to be 1.8 kPa.

Thermal Load

The thermal load effects were calculated in accordance with Section 3.9.4 of the CHBDC. The superstructure is identified as being a truss system above the deck and is classified as Type A. The change in temperature for both the summer and winter case were applied uniformly across all elements.

Load Factors

The load factors and combinations were developed in accordance with Section 3 of the CHBDC and are presented in Table 3. It is noted that ULS Load Cases 5, 6, 7, and 8 were determined not to govern and have been excluded. An additional load case comprised of the full factored dead load and 1.5 times the snow load was also added in accordance with the MTO Structural Manual. The 'D+1.5S' combination is considered the load case most representative of the current structure functionality (closed to pedestrians and not maintained in the winter).

TABLE 3: LOAD CASE FACTORS

Load Case	ULS1 (VEH)	ULS1 (PED)	ULS2 (VEH)	ULS2 (PED)	ULS3 (VEH)	ULS3 (PED)	ULS4	ULS9	D + 1.5S
DEAD	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.35	1.1
LIVE	1.7	0	1.6	0	1.4	0	0	0	0
PED	0	1.7	0	1.6	0	1.4	0	0	0
SDL	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.35	1.2
THERMAL (+)	0	0	1.15	1.15	1.0	1.0	1.25	0	0
THERMAL (-)	0	0	1.15	1.15	1.0	1.0	1.25	0	0
WIND	0	0	0	0	0.45	0.45	1.4	0	0
SNOW	0	0	0.5	0.5	0.5	0.5	0	0	1.5

Baseline Structural Evaluation Results

The baseline structural evaluation consisted of modeling and analyzing the structure as originally designed (with free articulation and no section loss) to assess the capacity of the structure if the identified structural deficiencies are addressed in a subsequent rehabilitation. Table 4 summarizes the results of the baseline evaluation. The table identifies the member, load effect, and factored load over resistance ratios (D/C) for the governing vehicle load case, governing pedestrian load case, and the factored dead load and snow load combination. D/C values greater than 1.0 indicate that the member is structurally deficient.

TABLE 4: BASELINE EVALUATION RESULTS

			LOAD CASE (D/C)		
Element	**Load Effect**	**Member**	**VEH**	**PED**	**D+1.5S**
Top Chord	Compression	U1-U2	0.41	0.53	0.36
		U2-U3	0.50	0.64	0.43
		U3-U4	0.47	0.64	0.43
Bottom Chord	Tension	L1-L2	0.40	0.52	0.35
		L2-L3	0.29	0.52	0.35
		L3-L4	0.34	0.61	0.41
		L4-L5	0.36	0.67	0.45
Diagonals	Tension	D1	0.44	0.51	0.34
		D2	0.62	0.54	0.36
		D3	0.33	0.04	0.03
		D4	0.52	0.05	0.00
Verticals	Tension	V1	0.59	0.35	0.23

			LOAD CASE (D/C)		
Element	**Load Effect**	**Member**	**VEH**	**PED**	**D+1.5S**
	Compression	V2	0.57	0.49	0.35
	Tension	V3	0.05	0.01	0.01
End Post	Compression and Bending	EP	**1.82 (ULS 4 governs)**		
Floor Beams	Shear	FB	0.39	0.20	0.12
	Bending	FB	**1.06**	0.63	0.40
Stringers	Shear	S	**1.53**	0.34	0.22
	Bending	S	**3.72**	0.92	0.60
Pins	Combined Shear and Bending*	L1	-	**1.10**	0.68
		L2	-	0.59	0.38
		L3	-	**1.12**	0.90
		L4	-	**1.14**	0.68
		U2	-	**1.20**	0.74
		U3	-	0.35	0.23
		U4	-	0.01	0.01

**Detailed analysis of pinned connections for moving loads is outside of a typical structural evaluation and outside of scope for this assignment. The pin connections of the structure are considered deficient based on the results of the pedestrian loading and additional analysis is not warranted at this stage.*

The results of the baseline evaluation conclude the following:

- End post is structurally deficient with D/C of 1.82 due to imposed wind loading (ULS 4).
- The stringers and floorbeams are structurally deficient under the vehicle load case.
- The pins are structurally deficient and are the governing structural component for the truss.

The end-posts are considered structurally deficient due to the combined axial and bending demand driven largely by the lateral loading of the wind. All connections are modeled as pinned connection, however the partial fixity of the connections between the bracing systems the truss member and the floor system will provide some additional lateral stability. This contribution is not considered in a structural evaluation. It is not uncommon for older truss bridges to require strengthening of compression members with significant bending stresses such as the end-posts.

Pins of this era were typically sized based on empirical ratios and designed for shear only. Additionally, the allowable working stress for pin design was based on the ultimate strength of the pins. The pins were evaluated in accordance with Clause 10.20.2.3 of CAN/CSA S6-14 which is calibrated for von Mises yield criterion taking into consideration combined bending and shear stresses. A D/C exceeding 1.0 in the pins does not meet current code requirements and suggest that some yielding of the pins may occur, but it is not necessarily associated with a brittle failure mechanismCurrent codes do not provide guidance on calculating the ultimate strength of pins.

Considerations for Existing Conditions

Based on the results from the updated OSIM inspection, modification factors were applied to the baseline structural evaluation results to account for observed material defects, deterioration and structural behavior. The observed material defects and deterioration include section loss and crack indications. The observed structural behaviour includes bowed and unloaded bottom chord members and unevenly loaded eyebar members in the bottom chord, diagonals, and verticals. Reduction factors have been developed to account for the associated reduction in the member capacity and are presented in Tables 5 and 6.

Section Loss

The baseline structural evaluation is based on original section properties without consideration for section loss. Due to the age of the structure and previous abrasive blast cleaning for structure recoating, nominal section loss (or wear at pins) has been assumed to have occurred on most members. The material condition of the structural steel elements is generally good given limited exposure to de-icing chemicals over the life of the structure. Severe corrosion with notable impact on member capacity is limited to a few localized structural members. A summary of the applied reduction factors is detailed below:

- All Structural Steel Members: A factor of 0.95 to account for nominal section loss or wear (or wear at pins).
- Bottom Chord (L1-L2): A factor of 0.65 is applied to account for the observed severe section loss at the east chord at the south abutment bearing.
- Floorbeams: A factor of 0.85 is applied to floor beams to account for the corrosion observed on the top flange of several floor beams;
- Abutment and Pier Pins (Node L1 / L8): A factor of 0.80 is applied to pins at the bearings to account for deterioration of the pins observed at the abutments (severe corrosion and rust jacking) and pier (cracked spacer and rust jacking).

The condition of the timber deck elements was highly variable, with severe weathering and rotting noted at several locations. Complete replacement of the existing wooden deck system is warranted if the structure were to remain in service and therefore reduction factors were not applied to these elements.

TABLE 5: MATERIAL REDUCTION FACTORS

Element	Material Reduction Factor
Chord L1-L2	0.65
Floor Beams	0.85
Timber	N/A
Pin L1	0.80
All Other	0.95

Eyebar Crack Indications

Visual indications of cracks were noted on multiple eyebar members which is a common defect noted for this material/structure type. All eyebar members on this structure are considered fracture critical and therefore the presence of crack indications warrants further review. Non-destructive testing (NDT) has not been performed to confirm the presence and extent of the possible cracks. Any cracks confirmed by NDT should be assessed and repaired if the structure is to remain in service. The structural evaluation has not taken into consideration the presence of cracks for reduced member capacity. Primary tension members with active cracks shall not remain in service.

Thermal Behaviour

The behaviour of the truss has been significantly impacted by the seized abutment bearings. A bounded analysis was conducted where the roller bearings modeled as being restrained. The tension chord is subjected to significant compression forces in the summer. The tension chord is comprised of dual eye bars and will buckle when subjected to compression. During the winter the opposite occurs, and the bottom chord is subjected to significant tensile forces until displacement occurs relieving the thermal stress.

Figure 3 and Figure 4 show the truss forces (Dead + Thermal) in the baseline condition on the left and the seized condition on the right. The results of this bounded analysis support the observed existing condition.

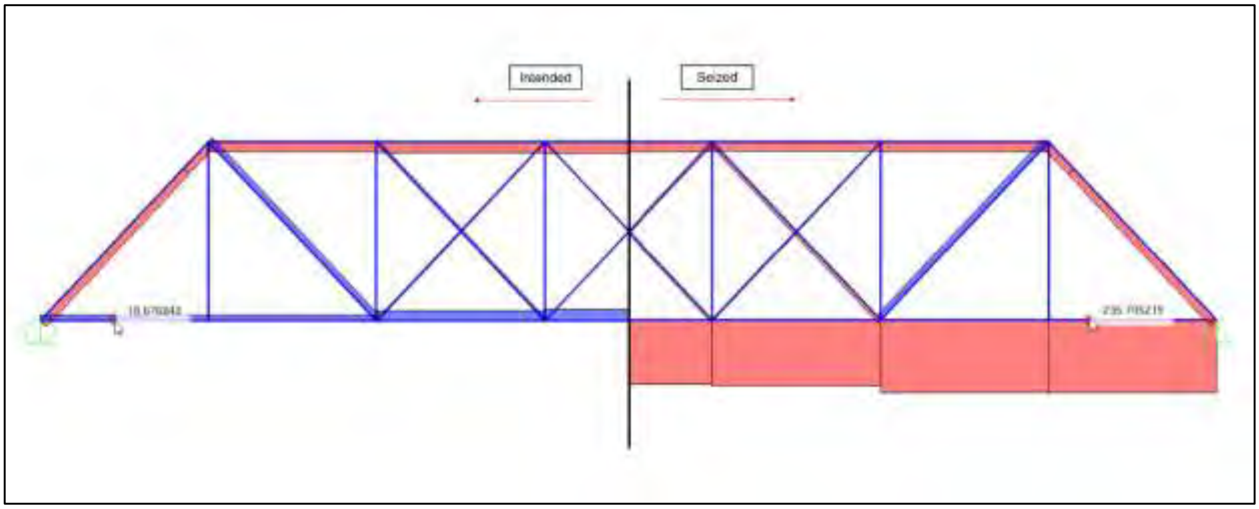


FIGURE 3: INTENDED ARTICULATION VS SEIZED SUMMER CONDITION (T+)

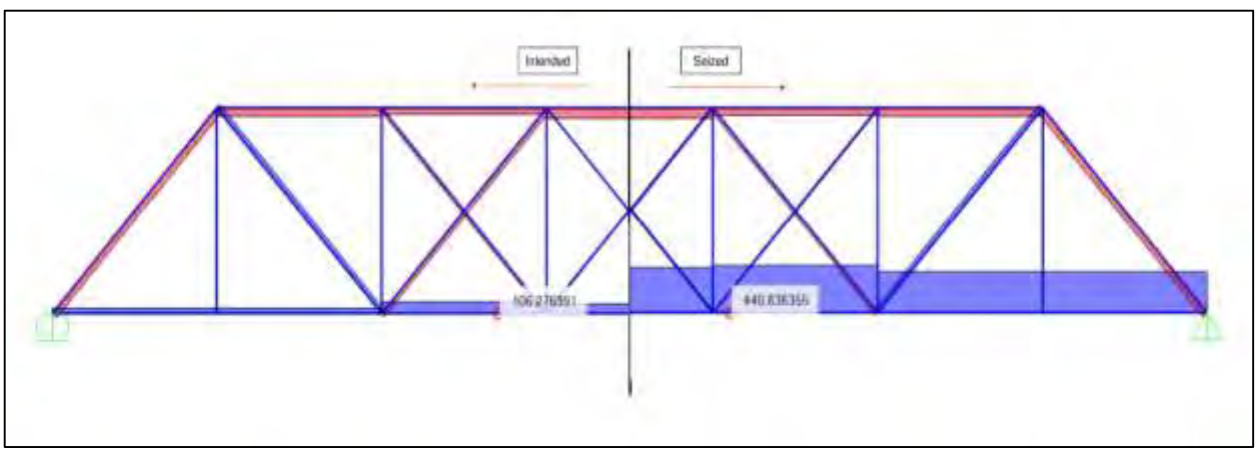


FIGURE 4: INTENDED ARTICULATION VS SEIZED WINTER CONDITION (T-)

Disengaged Bottom Chord Members

Some of the bottom chord members were noted as being partially or fully disengaged at the time of the inspection. This structural behaviour is suspected to be related to a few factors including the seized abutment bearings and the existing configuration of the bottom chord cross bracing. Correction of this behaviour may be relieved by reinstating the intended thermal movement of the abutment bearings. However, the potential loading of the bottom chord bracing system may require additional investigation including observing the structure in different thermal and loading conditions is to properly assess and correct the structural behavior through retrofit of the bottom chord bracing system.

Load Sharing of Pin-Connected Members

Field observations indicated varying levels of differential loading between two eyebars of the same member at multiple truss members including verticals, diagonals, and bottom chords. This behaviour is in agreement with the findings and recommendations of published literature on the behaviour of pin connected trusses[4], indicating that tension members comprised of two individual eyebars may not share the load equally with one another.

The baseline structural evaluation results have been adjusted to account for this behaviour as detailed below:

- A performance reduction factor of 0.5 was applied to all truss members comprised of 2 individual eyebars;
- A performance reduction factor of 0.6 was applied to all pins connecting eyebars comprised of 2 individual members.

TABLE 6: PERFORMANCE REDUCTION FACTORS

Element	Load Sharing Factor
Bottom Chord	0.5
Diagonals D1 &D2	0.5
Verticals V1	0.5
Pins with Dual Eyebars	0.6
All Others	1

It should be noted that some jurisdictions have developed methods to assess and address uneven load sharing of eyebar members. Eyebar response frequency can be used to determine the load sharing between the individual eyebars of a member[5] and AREMA provides a procedure to adjust the load sharing through flame shortening of the target eyebars (*AREMA Section 15-8.2*).

Structural Evaluation Results - Existing Conditions

The reduction factors established above were applied to the results of the baseline structural evaluation to account for the observed deterioration and structural behaviour taken into consideration. The adjusted evaluation results are presented in Table 7. The table identifies the member, load effect, and factored load over resistance ratios (D/C) for the governing maintenance vehicle load case, governing pedestrian load case, and the factored dead load and snow load combination. D/C values greater than 1.0 indicate that the member is structurally deficient.

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[4]Bakht, B. (1988). *Bridge Testing – A Surprise Every Time,* Ministry of Transportation of Ontario.
[5] Mazurek, D. F. (2011). Measuring Dead Load Stress Of Eyebars In Steel Railroad Bridges, AREMA

TABLE 7: EXISTING CONDITION EVALUATION RESULTS

			Reduction Factors		LOAD CASE (D/C)		
Element	**Load Effect**	**Member**	**Material**	**Performance**	**VEH**	**PED**	**D+1.5S**
Top Chord	Compression	U1-U2	0.95	1	0.43	0.56	0.38
		U2-U3	0.95	1	0.53	0.67	0.45
		U3-U4	0.95	1	0.49	0.67	0.45
Bottom Chord	Tension	L1-L2	0.65	0.5	**1.14**	**1.49**	**1.00**
		L2-L3	0.95	0.5	0.61	**1.09**	0.74
		L3-L4	0.95	0.5	0.72	**1.28**	0.86
		L4-L5	0.95	0.5	0.76	**1.41**	0.95
Diagonals	Tension	D1	0.95	0.5	0.93	**1.07**	0.72
		D2	0.95	0.5	**1.31**	**1.14**	0.76
		D3	0.95	1	0.35	0.04	0.03
		D4	0.95	1	0.55	0.05	0.00
Verticals	Tension	V1	0.95	0.5	**1.24**	0.74	0.48
	Compression	V2	0.95	1	0.60	0.52	0.37
	Tension	V3	0.95	1	0.05	0.01	0.01
End Post	Compression and Bending	EP	0.95	1	**1.92 (ULS 4 governs)**		
Floor Beams	Shear	FB	0.85	1	0.46	0.24	0.14
	Bending	FB	0.85	1	**1.25**	0.74	0.47
Stringers	Shear	S	N/A - Replace				
	Bending	S	N/A - Replace				
Pins	Combined Shear and Bending*	L1	0.80	0.6	-	**2.29**	**1.42**
		L2	0.95	0.6	-	**1.04**	0.67
		L3	0.95	0.6	-	**1.96**	**1.58**
		L4	0.95	0.6	-	**2.00**	**1.19**
		U2	0.95	0.6	-	**2.11**	**1.30**
		U3	0.95	0.6	-	0.61	0.40
		U4	0.95	1	-	0.01	0.01

** Detailed analysis of pinned connections for moving loads is outside of a typical structural evaluation. The pin connections of the structure are considered deficient based on the results of the pedestrian loading and additional analysis is not required at this stage.*

Summary of Findings and Recommendations

Structurally Deficient Members

The structural evaluation determined that numerous components are structurally deficient and do not meet the CHBDC requirements. The deficient members are summarized in Table 8. Depending upon the intended future use of the structure, the extent of member replacement, modifications or strengthening varies, and it is clear that significant retrofit repairs are required should the structure be reopened to pedestrian traffic. The "D+1.5S" load case is considered the load case most representative of the current functionality of the bridge which is closed to pedestrian traffic. It is noted that based on the current condition of the structure, seasonal structure inspection (spring-fall) without the use of specialized access equipment remains feasible provided that the inspector takes proper precautions, including fall arrest measures, due to the poor condition of the timber decking.

TABLE 8: SUMMARY OF STRUCTURALLY DEFICIENT MEMBERS

Element	Load Case		
	VEH	PED	D+1.5S
Bottom Chord	L1-L2	L1-L2	L1-L2
		L2-L3	
		L3-L4	
		L4-L5	
Diagonals		D1	
	D2	D2	
Verticals	V1		
End Post	ALL	ALL	ALL
Floor Beam	ALL		
Stringer	ALL	ALL	ALL
Pins	-	L1	L1
	-	L2	
	-	L3	L3
	-	L4	L4
	-	U2	U2

Thermal Stress

Bearing fixity is causing the structure to behave in an unintended manner and resulting in stress redistribution. Consequently, replacement of the expansion bearings is recommended if the structure is to be maintained or rehabilitated.

Bottom Chord Cross Bracing

Indications that the bottom chord bracing system may be sharing the truss tension was observed. Additional investigation of the potential bottom chord bracing system loading including observing the structure in different thermal and loading conditions is recommended if the structure is to be maintained or rehabilitated.

Eyebar Crack Indications

Visual Indications of cracks have been noted on multiple eyebar member which are fracture critical members. The visual crack indications and forging imperfections on this bridge should be assessed if the structure is to be maintained or rehabilitated. Non-Destructive Testing (NDT) of the visual indication is recommended should the function of the structure be maintained.

Steel Composition

The determination of the truss material as wrought iron is based on the age of the structure and construction type. Steel composition testing of the separate elements such as the rolled sections, loop-welded eyebar members, upset eyebar members and pins should be completed should the structure be maintained or rehabilitated.

Substructure Elements and Seismic Evaluation

Assessment of the substructure elements and a seismic evaluation have not been included as part of this analysis. If the City elects to maintain the structure, a geotechnical consultant should be retained to undertake a desktop review based on available *GeoCres* data and experience in the area. Given the original drawings are not available and there is limited information related to the existing foundations, a comprehensive seismic and geotechnical investigation is likely not feasible without completion of detailed site investigations. It is recommended that a risk assessment be conducted to determine the likelihood of impact and vulnerability of the structure if subjected to a seismic event. The risk assessment should take into consideration the performance of the gas main supported by the existing structure.

Concerns for Demolition or Removal

Stability of the structure during removal and demolition is critical in the safe execution of a decommissioning. The use of eye-bar members and the pin-connected construction of the truss provides a relatively delicate structure for un-usual loading events such as those that could be expected during demolition or removal activities. Unexpected loading and releases are also possible triggers for crack propagation in tension members, in particular, tension members with imperfections or crack indications such as the visual crack indications observed on several of the loop-welded forged eyebars.

Development of any demolition and removal procedures will require precautions for the stability of the pin-connections and eyebars as well as considerations for potential locked in stressed and load redistribution as a result of the unusual structural behaviour observed and the anticipated seized bearing conditions.

Prepared by:

Marc-André Chainey, P.Eng.
Associate, Structural Engineer

Structural Evaluation by:

Andrew Krisciunas, P. Eng.
Associate, Structural Engineer

Reviewed by:

Nathan Bakker, P. Eng.
Associate, Structural Engineer

Appendix A

Drawings of the Existing Structure

DB 032603-1

NOTE

1. EXISTING 3"x5" TIMBER HANDRAIL, INCLUDING POSTS SHALL BE REMOVED.
2. EXISTING CURBS AND CURB FILLER BLOCKS SHALL REMAIN IN PLACE
3. EXISTING 3"x10" TIMBER PLANK DECK, 4"x 12" STRINGERS AND 3"x 8" NAILING STRIP SHALL REMAIN IN PLACE

Nº	REVISIONS	BY	DATE

CITY OF OTTAWA
PLANNING & WORKS DEPARTMENT
DESIGN & SPECIAL PROJECTS BR.

OLD PORTER'S ISLAND BRIDGE

EXISTING STRUCTURE

DESIGNED	F. E. AYERS P. Eng.
DRAWN S WALTER	Director of Planning & Works
CHECKED	
DATE Apr 18/63	Eng. i/c Design & Special Projects.
SCALE 1/8"-1'-0"	DRG. Nº DB 184-1

DB-326.3-1

DB 032603-2

Nº	REVISIONS	BY	DATE

CITY OF OTTAWA
PLANNING & WORKS DEPARTMENT
DESIGN & SPECIAL PROJECTS BR.

OLD PORTER'S ISLAND BRIDGE
EXISTING CROSS-SECTIONS
AND
DETAILS FOR NEW HANDRAIL

DESIGNED	F E AYERS P. Eng
DRAWN S Wolfer	Director of Planning & Works
CHECKED	
DATE March 1963	Eng i/c Design & Special Projects
SCALE As Shown	DRG Nº DB 184 - 2

DB-032603-2

DB-032603-3

Nº	REVISIONS	BY	DATE

CITY OF OTTAWA
PLANNING & WORKS DEPARTMENT
DESIGN & SPECIAL PROJECTS BR.

OLD PORTER'S ISLAND BRIDGE
PROPOSED RECTANGULAR
STEEL TUBING HANDRAIL

DESIGNED	F. E. AYERS P. Eng
DRAWN S. Walter	Director of Planning & Works
CHECKED	
DATE March. 1963	Eng. i/c Design & Special Projects
SCALE As Shown	DRG Nº DB 184 - 3

DB-32603-3

M-372-3

GENERAL NOTES : PAINTING

1. THE ENTIRE SUPERSTRUCTURE STRUCTURAL STEEL (EXCLUDING GAS MAIN) AND EXPOSED METAL AREAS AT BEARINGS SHALL BE CLEANED AND SANDBLASTED TO A WHITE METAL FINISH IN ACCORDANCE WITH SPECIFICATION S.S.P.C. SP.5-82.
2. THE SANDBLASTED AREAS SHALL BE PAINTED AS PER MTC FORM 1706 AND AS FOLLOWS :

COAT No.	PAINT TYPE	SPECIFICATION	COLOUR	MIN. D.F.T. ✱
1	PRIME COAT	CGSB 1-GP-171M		2.8 mils
2	WASH COAT	CGSB 1-GP 121M		0.4 mils
3	HIGH BUILD (VINYL)	CGSB 1-GP-199M	501-109 (GREY)	3.0 mils
4	HIGH BUILD (VINYL)	CGSB 1-GP-199M	501-107 (GREY)	2.8 mils
			TOTAL	9.0 mils

✱ DRY FILM THICKNESS

3. THE COLOUR OF THE INTERMEDIATE COAT OF PAINT SHALL BE OF SLIGHTLY DIFFERENT TINT THAN THAT OF TOP COAT IN ORDER THAT THE INSPECTOR CAN DIFFERENTIATE BETWEEN THE TWO COATS OF PAINT.
4. THE CONTRACTOR IS ADVISED THAT THE INDIVIDUAL PAINT THICKNESS SPECIFIED ABOVE ARE THE MINIMUM REQUIREMENTS, ANY ADDITIONAL COATS, IF NECESSARY, TO OBTAIN THE SPECIFIED THICKNESS SHALL BE DEEMED TO BE INCLUDED IN THE PRICE AS BID.
5. METRIC CONVERSIONS IN BRACKETS BASED ON 1.0ft. = 0.3048 m.
6. THE CONTRACTOR IS TO TAKE MEASURES TO PROTECT THE EXISTING NPS 4 ST GAS MAIN DURING ALL SAND BLASTING AND PAINTING OPERATIONS.
7. NO DEBRIS SHALL BE PERMITTED IN THE RIDEAU RIVER.

NO	REVISION	BY	DATE

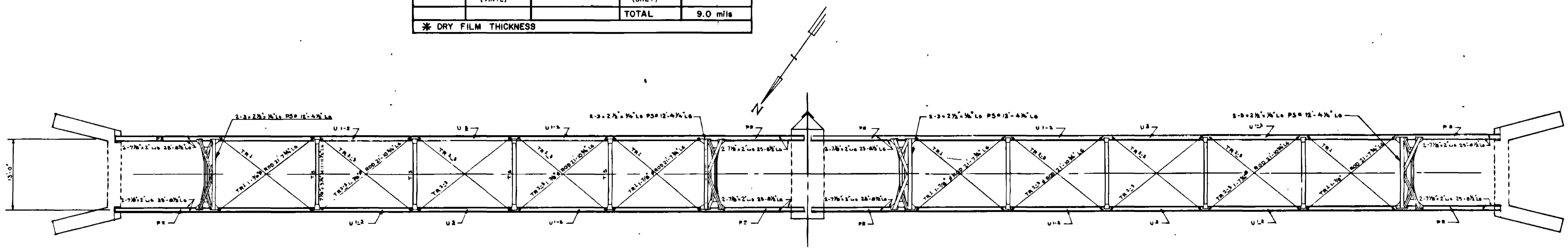
THE REGIONAL MUNICIPALITY OF OTTAWA-CARLETON
TRANSPORTATION DEPARTMENT
Design & Construction Division

OLD PORTER S ISLAND BRIDGE STRUCTURE No.326

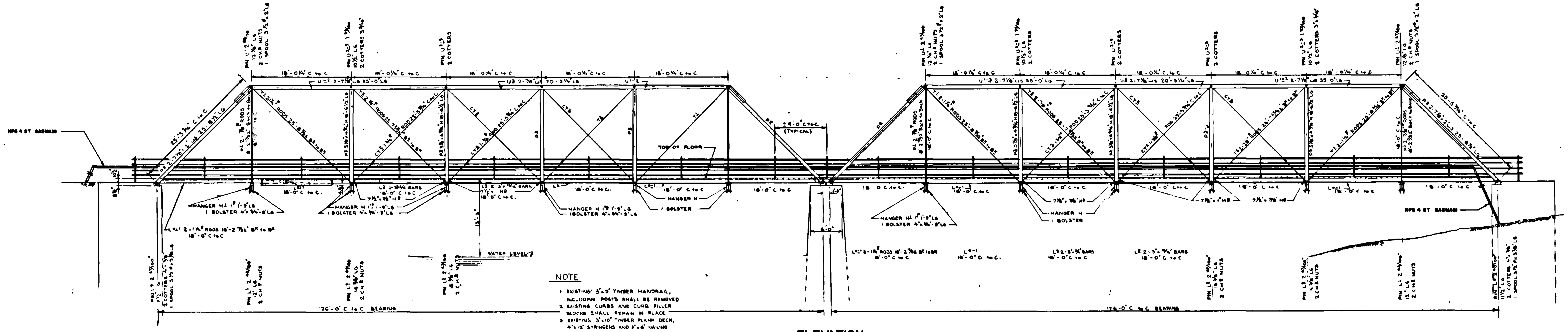
PLANS AND ELEVATION

L.G. MORLEY — *Director Design & Constr*
D.C. MARETT P.ENG. — *Chief Structural Engineer*

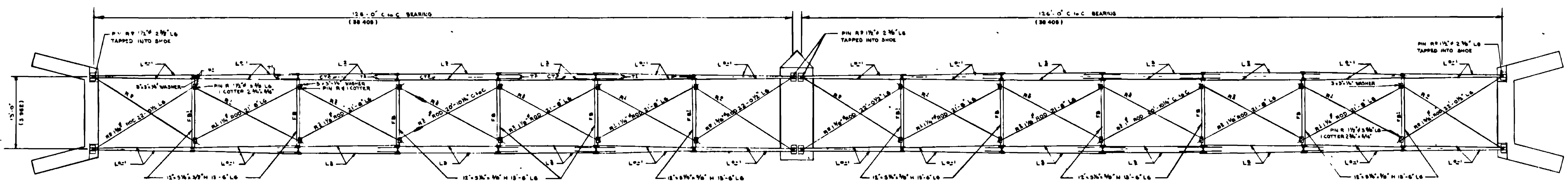
DWG. NO. B-032605-1
SHEET 1 OF 2
CONTRACT NO. 84-538
Des J.B.E. Chkd J.B.E.
Dwn C.M.C. Chkd J.B.E.
Date SEPT. 84
Scale Horiz Vert 1:125



PLAN TOP CHORD



ELEVATION



PLAN BOTTOM CHORD

TYPE-B DWG. FRAME: 790mm x 574mm.

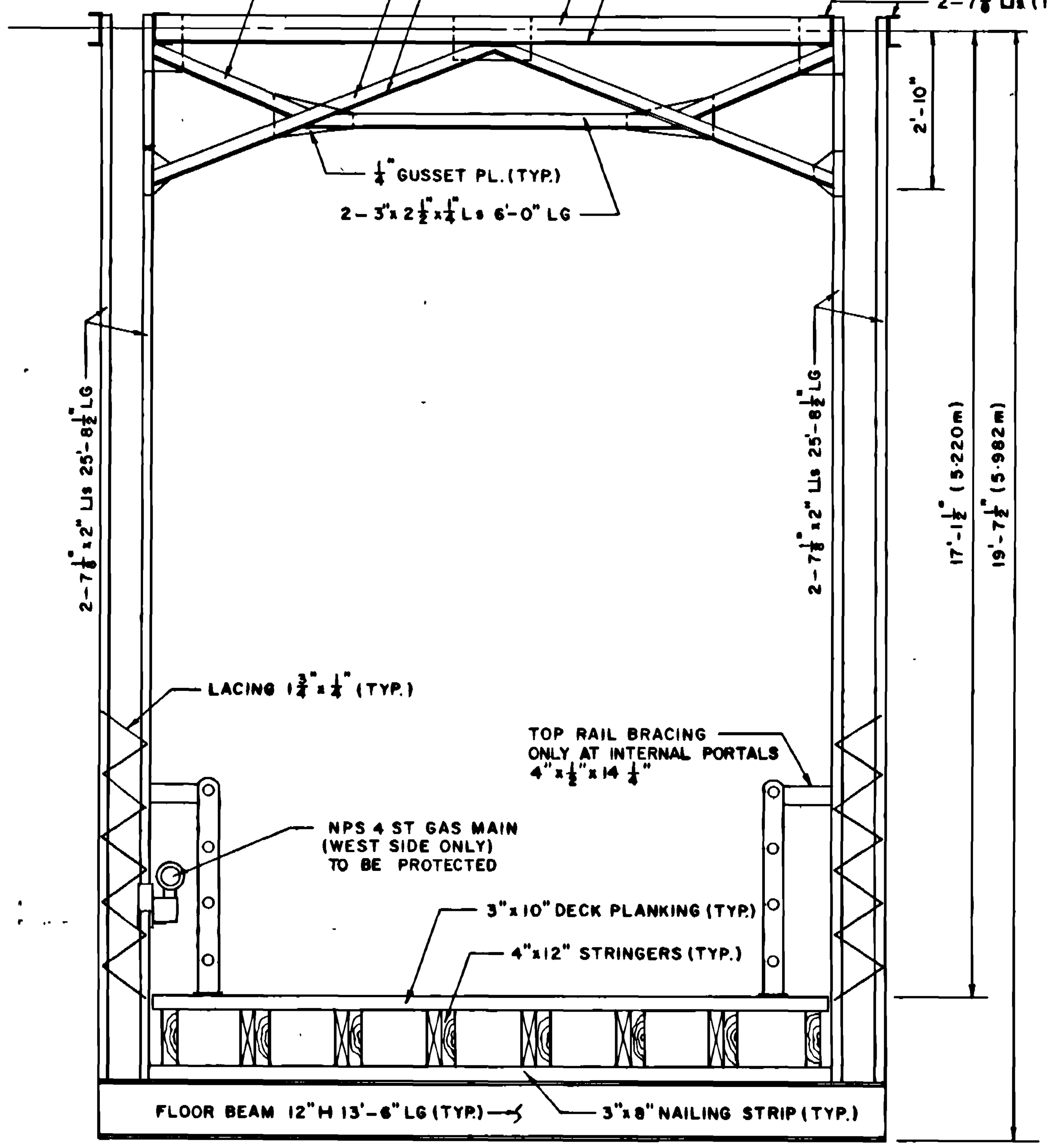
B032605-1

B-032605-2

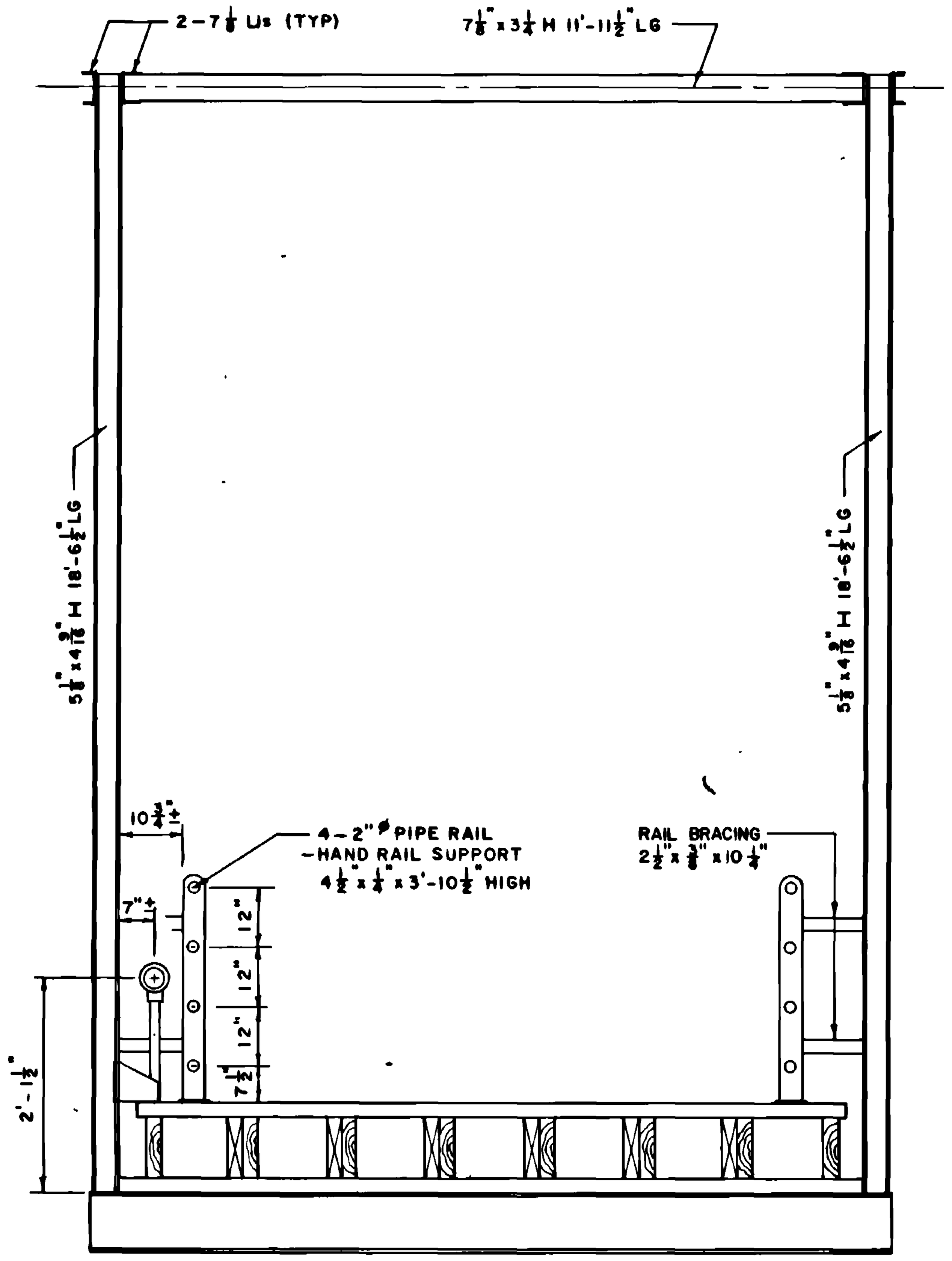
M-372-3

NO	REVISION	BY	DATE

THE REGIONAL MUNICIPALITY OF OTTAWA-CARLETON TRANSPORTATION DEPARTMENT Design & Construction Division	DWG. NO. B-032605-2
OLD PORTER'S ISLAND BRIDGE STRUCTURE No. 326	SHEET 2 OF 2 CONTRACT NO. 84-538
DETAILS	Des J.B.E. Chkd J.A.E. Dwn R.C. Chkd J.A.E. Date SEPT. 84
L.G. MORLEY, Director Design & Constr. — D.C. MARETT P. ENG., Chief Structural Engineer	Scale: Horiz / Vert ½" = 1'-0



SECTION AT TYPICAL END POST



SECTION AT TYPICAL VERTICAL H POST

M-372-1

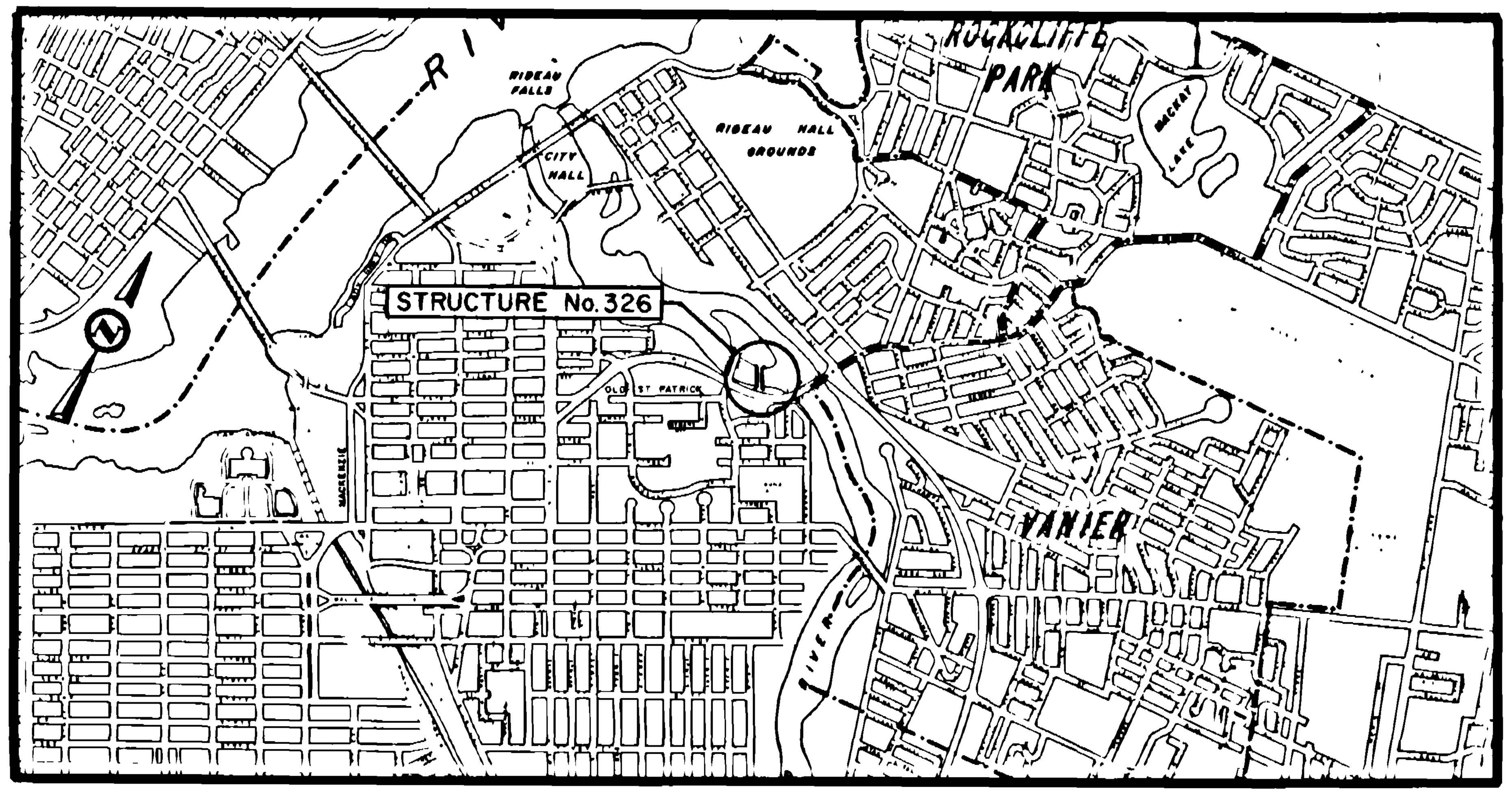
B-032605

THE REGIONAL MUNICIPALITY OF
OTTAWA – CARLETON
TRANSPORTATION DEPARTMENT

M. J. E. SHEFLIN, P. ENG.
TRANSPORTATION COMMISSIONER

SEPT. 19, 1984
DATE

L. MORLEY
DIRECTOR DESIGN & CONSTRUCTION



CITY OF OTTAWA

LIST OF DRAWINGS

PLANS AND ELEVATION	B-032605-1
DETAILS	B-032605-2

OLD PORTER'S ISLAND BRIDGE
STRUCTURE No. 326
STRUCTURAL STEEL PAINTING

CONTRACT NO. 84–538

SCOPE OF WORK

◇1 – REMOVE AND REPLACE DETERIORATED TIMBER DECK PLANKS

◇2 – REMOVE AND REPLACE DETERIORATED TIMBER STRINGERS

◇3 – REMOVE AND REPLACE DETERIORATEO TIMBER BLOCKING

◇4 – INSTALL GROUT IN MASONRY JOINTS

GENERAL NOTES

MATERIALS

1. ALL TIMBER TD BE S–P–F CONSTRUCTION GRAOE (No. 2) DR BETTER. ALL TIMBER TO BE PRESSURE TREATED IN ACCORDANCE WITH CSA OBD–SERIES 97. ALL FIELD CUTS & HOLES TO BE LIBERALLY PAINTED IN ACCORDANCE WITH OPSS 16D1
2. ALL NAILS, SPIKES, SCREWS AND BOLTS TO BE GALVANIZED IN ACCORDANCE WITH CSA G16–M92
3. NAILS AND SPIKES SHALL CONFORM TO CSA B111–1974
4. BOLTS SHALL CONFORM TO ASTM A3D7 DR CAN/CSA G40.2D/G4D.21–M92
5. LAG SCREWS SHALL CONFORM TO CSA B34
6. MORTAR FOR MASONRY JOINT REPAIRS SHALL CONFORM TO CSA–A179–94, TYPE M

CONSTRUCTION NOTES

GENERAL

1. CONTRACTOR TO VERIFY IN FIELD ALL OIMENSIONS PRIOR TO START OF WORK ANO NOTIFY ENGINEER OF ANY OISCREPANCIES FROM ORAWINGS

MASONRY MORTAR WORK

1. DO MASONRY MORTAR WORK IN ACCORDANCE WITH CSA–A179–94 USING ONLY THOROUGHLY TRAINED AND SKILLED MASONS EXPERIENCED IN THE TYPE OF WORK OF THIS CONTRACT
2. OO COLD WEATHER WORK IN ACCORDANCE WITH CSA–A371–94 AND MAINTAIN TEMPERATURE OF MORTAR BETWEEN 5 °C ANO 50 °C UNTIL USED
3. PREHYDRATE MASONRY MORTAR BY MIXING INGREDIENTS DRY, THEN MIX AGAIN ADDING JUST ENOUGH WATER TO PROOUCE OAMP UNWORKABLE MIX THAT WILL RETAIN ITS FORM WHEN PRESSED INTO BALL. ALLDW TO STAND FOR NOT LESS THAN 1 HOUR ANO NO MORE THAN 2 HOURS THEN REMIX WITH SUFFICIENT WATER TO PRODUCE MORTAR DF PROPER CONSISTENCY
4. WET JOINTS THOROUGHLY BEFORE PLACING MORTAR. COMPLETELY FILL JOINTS WITH MORTAR TO THE PRESCRIBED DEPTH. MIX MORTAR ON AN EQUAL WEIGHT BASIS WITH THE SAND AND SUFFICIENT WATER TO FORM A STIFF, WORKABLE MORTAR TO BE PLACED IN THE STONE MASONRY JOINTS. MIX ONLY ENOUGH MATERIAL REQUIRED FOR USE WITHIN THE TIME LIMITS SPECIFIED IN CSA–A179–94

   THE COLOUR OF THE MORTAR SHALL BE ADJUSTED TO MATCH EXISTING APPEARANCE OF THE STONE WORK
5. PACK IN MORTAR WITH A SET–IN OR CAULKING TOOL AND FINISH JOINT FLUSH AND SMOOTH WITH A BEADING TOOL
6. REMOVE MORTAR DROPPING FROM FACE OF STONE BEFORE MORTAR IS SET. SPDNGE STONE FREE OF MORTAR ALONG JOINTS AS WORK PROGRESSES
7. AFTER MORTAR HAS COMPLETELY SET BRUSH STONE WORK WITH STIFF BRUSH USING MILD ALKALINE ABRASIVE CLEANER THAT CONTAINS NO CAUSTIC OR HARSH FILLERS. RINSE WITH CLEAN WATER TO REMOVE FOREIGN MATERIAL

B. UPDN COMPLETION OF THIS PORTION OF WORK, VISUALLY INSPECT ALL SURFACES AND REMOVE ALL TRACES OF MORTAR FROM EXPOSED STDNE MASONRY FACES

LEGEND

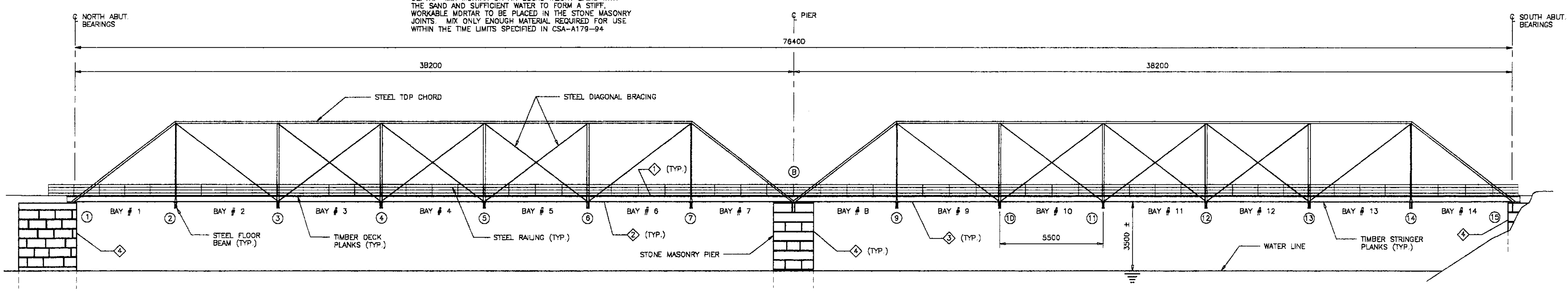
(hatched)	TIMBER PLANKS TO BE REPLACED
(cross-hatched)	TIMBER BLOCKING TD BE REPLACED
(blank)	TIMBER STRINGERS TO BE REPLACED
(dotted)	SCORCHED AREA

NOTE: ACTUAL MEMBERS FOR REPLACEMENT WILL BE MARKED IN FIELD BY ENGINEER

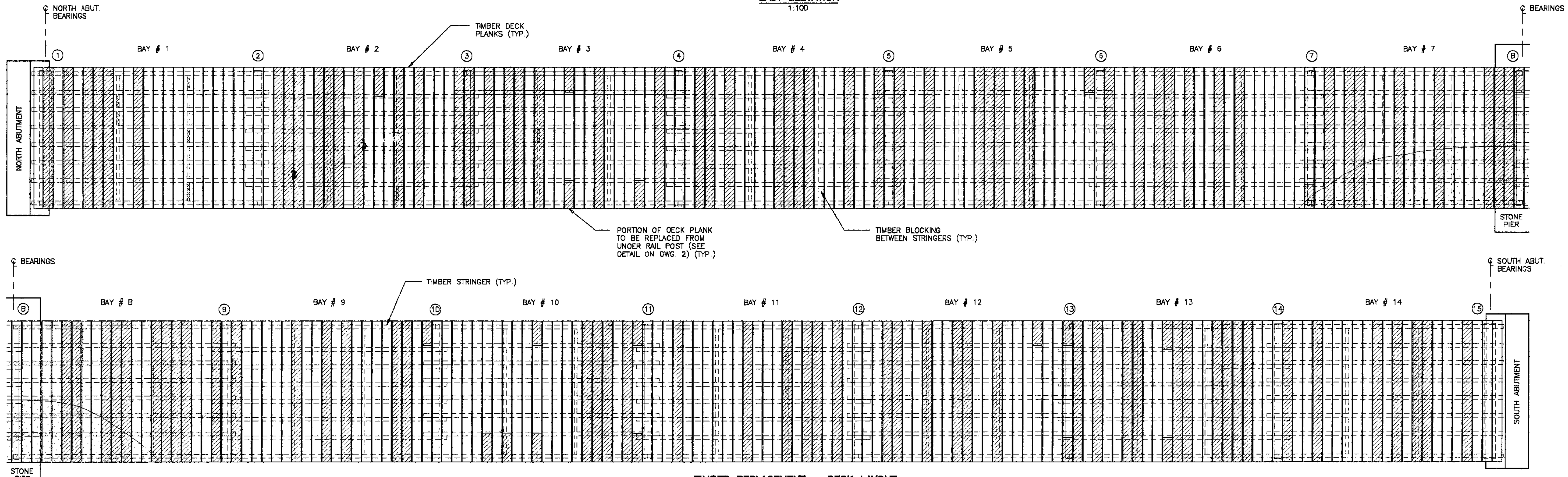
NO	REVISION	BY	DATE

Ottawa-Carleton		DWG. NO 1
		SHEET 1 OF 2
PORTERS ISLAND PEDESTRIAN BRIDGE REPAIRS		CONTRACT NO. CZ-0380
		Des A.S.W. / Chkd
GENERAL LAYOUT		Dwn K.C. / Chkd A.S.W.
		Date AUG. 1998
J. MILLER, P. ENG. A/Director Infrastructure Capital	M. J. RICHARDS, P. ENG. Manager Transitway Projects	Scale Horiz Vert AS NOTED
Wylie & Ufnal consulting engineers		

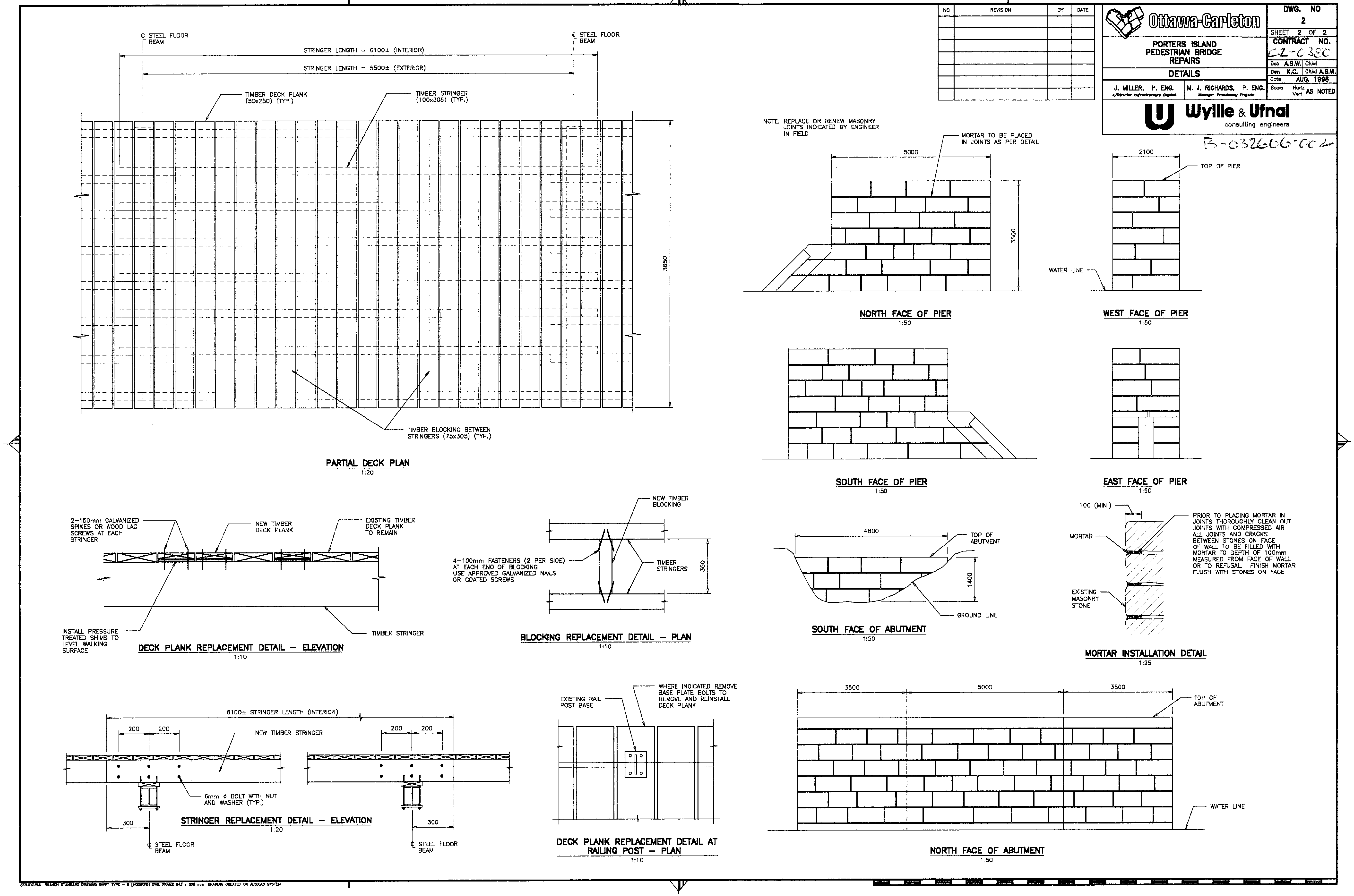
B-032606-001



EAST ELEVATION
1:100



TIMBER REPLACEMENT – DECK LAYOUT
1:50



NO
REVISION
BY
DATE
Ottawa-Carleton
PORTERS ISLAND
PEDESTRIAN BRIDGE
REPAIRS
DETAILS
J. MILLER, P. ENG.
M. J. RICHARDS, P. ENG.
DWG. NO
2
SHEET 2 OF 2
CONTRACT NO.
CZ-0380
Des A.S.W.
Chkd
Dwn K.C.
Chkd A.S.W.
Date AUG. 1998
Scale Horiz Vert AS NOTED
Wylie & Ufnal
consulting engineers
B-032666-002
℄ STEEL FLOOR BEAM
STRINGER LENGTH = 6100± (INTERIOR)
STRINGER LENGTH = 5500± (EXTERIOR)
TIMBER DECK PLANK (50x250) (TYP.)
TIMBER STRINGER (100x305) (TYP.)
3650
TIMBER BLOCKING BETWEEN STRINGERS (75x305) (TYP.)
PARTIAL DECK PLAN
1:20
NOTE: REPLACE OR RENEW MASONRY JOINTS INDICATED BY ENGINEER IN FIELD
MORTAR TO BE PLACED IN JOINTS AS PER DETAIL
5000
3500
NORTH FACE OF PIER
1:50
2100
TOP OF PIER
WATER LINE
WEST FACE OF PIER
1:50
SOUTH FACE OF PIER
1:50
EAST FACE OF PIER
1:50
2-150mm GALVANIZED SPIKES OR WOOD LAG SCREWS AT EACH STRINGER
NEW TIMBER DECK PLANK
EXISTING TIMBER DECK PLANK TO REMAIN
INSTALL PRESSURE TREATED SHIMS TO LEVEL WALKING SURFACE
TIMBER STRINGER
DECK PLANK REPLACEMENT DETAIL – ELEVATION
1:10
NEW TIMBER BLOCKING
4–100mm FASTENERS (2 PER SIDE) AT EACH END OF BLOCKING USE APPROVED GALVANIZED NAILS OR COATED SCREWS
TIMBER STRINGERS
350
BLOCKING REPLACEMENT DETAIL – PLAN
1:10
4800
TOP OF ABUTMENT
1400
GROUND LINE
SOUTH FACE OF ABUTMENT
1:50
100 (MIN.)
MORTAR
PRIOR TO PLACING MORTAR IN JOINTS THOROUGHLY CLEAN OUT JOINTS WITH COMPRESSED AIR ALL JOINTS AND CRACKS BETWEEN STONES ON FACE OF WALL TO BE FILLED WITH MORTAR TO DEPTH OF 100mm MEASURED FROM FACE OF WALL OR TO REFUSAL. FINISH MORTAR FLUSH WITH STONES ON FACE
EXISTING MASONRY STONE
MORTAR INSTALLATION DETAIL
1:25
6100± STRINGER LENGTH (INTERIOR)
200
200
NEW TIMBER STRINGER
6mm ø BOLT WITH NUT AND WASHER (TYP.)
300
℄ STEEL FLOOR BEAM
STRINGER REPLACEMENT DETAIL – ELEVATION
1:20
EXISTING RAIL POST BASE
WHERE INDICATED REMOVE BASE PLATE BOLTS TO REMOVE AND REINSTALL DECK PLANK
DECK PLANK REPLACEMENT DETAIL AT RAILING POST – PLAN
1:10
3500
5000
3500
TOP OF ABUTMENT
WATER LINE
NORTH FACE OF ABUTMENT
1:50

Appendix B

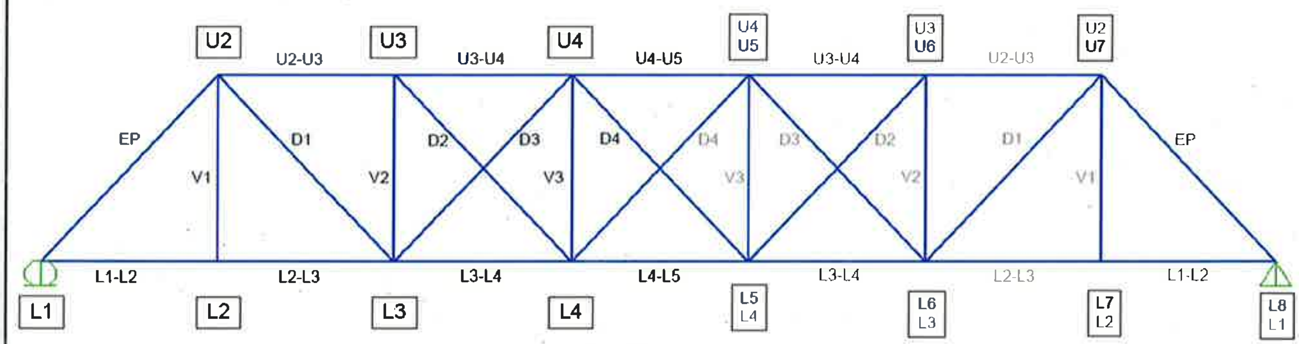
Evaluation Calculations

Contents

DILLON CONSULTING

Project	Proj. No.	Page of
Porters Island	188142	2 of 83
	Notes By: MC	Date: 10/2018
Subject: Naming Convention	Checked By: ARK	Date: 10/2018

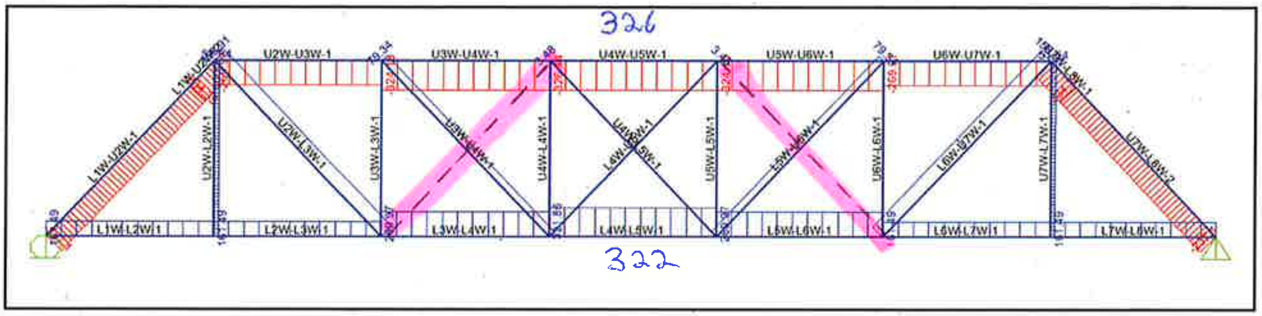
Naming Convention:



DILLON CONSULTING

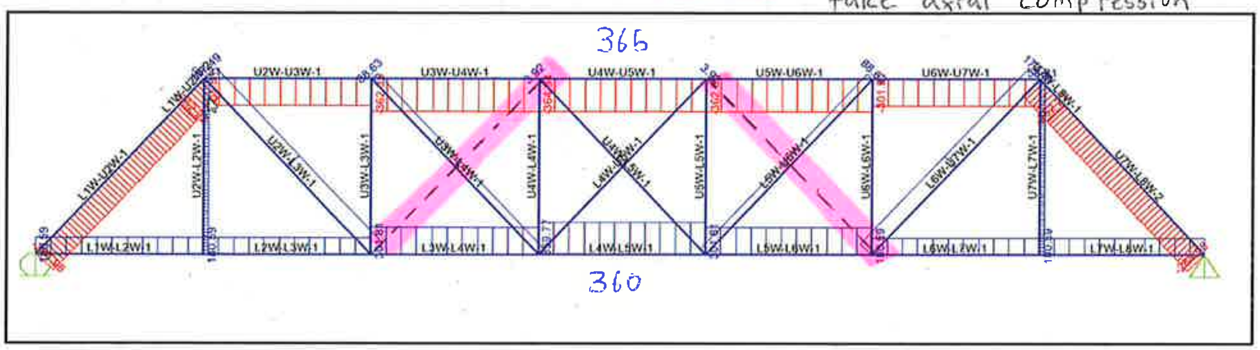
Project	Proj. No.	Page / of
Porters Island	188142	3 of 83
	Notes By: MC	Date: 10/2018
Subject: Force Diagrams	Checked By: ARK	Date: 10/2018

ULS1:

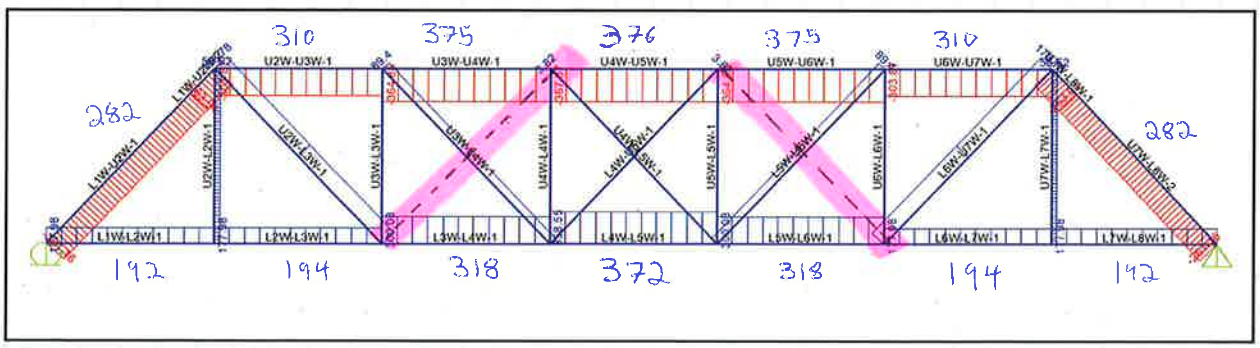


ULS2+0.5S:

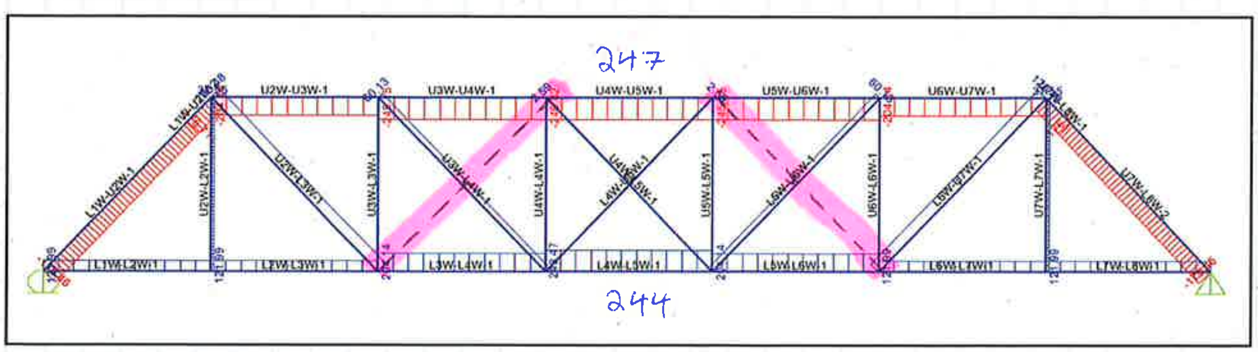
= Members that cannot take axial compression



ULS3+0.5S:



ULS DEAD+1.5S:



C: ARK D: MC

Summary of Demand over Capacity ratios (D/C)

Element	Load Effect	Member	VEH	PED/WIND	D+1.5S
Top Chord	Compression	U2-U3	0.41	0.53	0.36
		U3-U4	0.50	0.64	0.43
		U4-U5	0.47	0.64	0.43
Bottom Chord	Tension	L1-L2	0.40	0.52	0.35
		L2-L3	0.29	0.52	0.35
		L3-L4	0.34	0.61	0.41
		L4-L5	0.36	0.67	0.45
Diagonals	Tension	D1	0.44	0.51	0.34
		D2	0.62	0.54	0.36
		D3	0.33	0.04	0.03
		D4	0.52	0.05	0.00
Verticals	Tension	V1	0.59	0.35	0.23
	Compression	V2	0.57	0.49	0.35
	Tension	V3	0.05	0.01	0.01
End Post	Compression and Bending	EP	1.82 (ULS 4 Governs)		
Floor Beams	Shear	FB	0.39	0.20	0.12
	Bending	FB	1.06	0.63	0.40
Stringers	Shear	S	1.53	0.34	0.22
	Bending	S	3.72	0.92	0.60
Pins	Combined Shear and Bending	L1	-	1.10	0.68
		L2	-	0.59	0.38
		L3	-	1.12	0.90
		L4	-	1.14	0.68
		U2	-	1.20	0.74
		U3	-	0.35	0.23
		U4	-	0.01	0.01

Materials

Project	Proj. No.	Page	of
Porters Island	188142	6	83
	Notes By: MC	Date: 10/2018	
Subject: Materials	Checked by: ARK	Date: 10/2018	

Material Properties

Steel

Steel properties are not indicated on structural drawings
∴ Properties will be estimated using the date of construction (§ 14.7.4)

Construction Date = 1894

From Table 14.1 (Before 1905) : $F_y = 180$ MPa
$F_u = 360$ MPa

Wrought Iron

Typically Eye-Bars & Sections that are not "Rolled" were made from wrought Iron.

Wrought Iron Material Properties Sourced from Texas DOT :

$F_y = 27 - 30$ ksi (186 – 207) MPa
$F_u = 48 - 60$ ksi (330 – 345) MPa
$E_s = 28\,000$ ksi (193 053) MPa

Since the properties are simmilar to that of steel, the conservative approach will be to utilize the steel properties for all iron sections. ($F_y = 180$ MPa)

Wood

NO. 2 SPF	f_{bu}	f_{vu}	f_{pu}	f_{qu}	f_{tu}	E_{50}	E_{05}
Table 9.12 (MPa)	8.4	1.2	6.7	3.0	3.9	8500	5800

$\gamma = 420\ kg/m^3$

Wrought Iron Material Properties:

Reference:

Maniar, D et al., (2003). Evaluation and Rehabilitation of Historic Metal Truss Bridges: A Case Study of an Off-System Historic Metal Truss Bridge in Shackelford County, Texas, The University of Texas at Austin

C.5.1 Tensile Properties

The tensile properties of wrought iron are largely those of ferrite plus the strengthening effect of any phosphorous content which adds approximately 1000 psi for each 0.01% above 0.10% of contained phosphorous. Strength, elasticity, and ductility are affected to some degree by small variations in the metalloid content and in even greater degree by the amount of the incorporated slag and the character of its distribution. Nickel, molybdenum, copper and phosphorous are added to wrought iron to increase yield and ultimate strengths without materially detracting from toughness as measured by elongation and reduction in area.

The tensile strength of a given wrought iron depends to a considerable extent upon the direction of stress with respect to the "grain" of the iron. The tensile strength of wrought iron, in the direction of rolling, ranges from about 45 to over 50 ksi. The size of cross-section of a tensile specimen affects the strength to some extent and this fact can be taken into consideration by decreasing the minimum limit of tensile strength of specimens above certain sizes when full-size sections of bars are employed for testing. The yield point of wrought iron is strongly indicated in testing by the "drop of the beam" or "halt of the gage" of the testing machine, and occurs at from 50 percent to somewhat over 60 percent of the tensile strength. The ductility of wrought iron undergoing tension is less than that of very low carbon steel, owing to the presence of the slag. The elongation in the direction of rolling will vary from about 20 percent to about 30 percent. The typical physical properties of wrought iron in the longitudinal and transverse direction are given in the Table C.5.

Table C.5: Longitudinal and transverse tensile properties of wrought iron

Property	Longitudinal	Transverse
Tensile strength, ksi	48-50	36-38
Yield point, ksi	27-30	27-30
Elongation in 8 in., %	18-25	2-5
Reduction of area, %	35-45	3-6

The tensile strength and ductility of wrought iron at right angles to the direction of rolling are considerably less than the longitudinal strength and ductility. This is to be expected, since the continuity of the metal in a direction transverse to the direction of rolling is interrupted by numerous strands of slag, which are comparatively weak. The tensile strength of wrought iron in a transverse direction has usually been found to be between 0.6 to 0.9 of the strength in the

Section Properties

C: ARK. D: MC

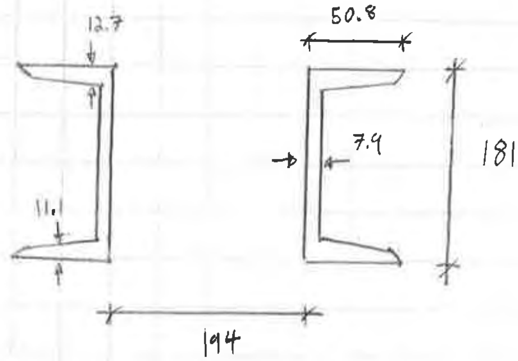
Dimensions

Section properties were obtained from the 1963 rehabilitation drawing and validated via field measurements.

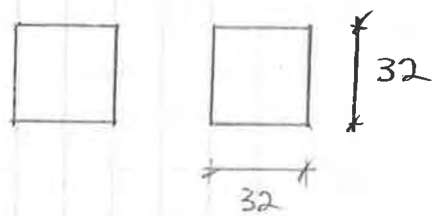
Section Label	Material	Type	Depth/ Diameter (mm)	Width (mm)	Flange Thickness (mm)	Web Thickness (mm)	Back to Back Distance (mm)	Member
S-305x133	Steel	I-Section	305	133	13.5	9.5		Floor Beam
S-181x82	Steel	I-Section	181	82	/	/		Lateral Brace
S-127x116	Steel	I-Section	127	116	10.7	9.5		Verticals
DC-181x51	Steel	Double Channel	181	51	11.1	7.9	193.7	Top Chord/End Posts
E2-76x19	Wrought Iron	Eyebar	76	19				Bottom Chord Panel 3
E2-76x22	Wrought Iron	Eyebar	76	22				Bottom Chord Panel 4
SQ2-32	Wrought Iron	Square Rod	32	32				Diagonals, Bottom Chord Panel 1&2
SQ-22	Wrought Iron	Square Rod	22	22				Verticals, Diagonals
SQ-19	Wrought Iron	Square Rod	19	19				Diagonals
R-35	Wrought Iron	Circular Rod	35					Cross Braces
R-32	Wrought Iron	Circular Rod	32					Cross Braces
R-29	Wrought Iron	Circular Rod	29					Cross Braces
R-25	Wrought Iron	Circular Rod	25					Cross Braces
DL-76x63	Steel	Double L	76	127	6	6	0	Lateral Brace/Portal
L-76x63	Steel	L-Section	76	63	6	6		Portal
DL-76x63	Steel	Double L	76	63	6	6	0	Portal
Pins	Steel	Pin	60					Pins at Nodes
Hanger	Wrought Iron	Square rod	25	25				Hangers at Nodes
Stringer	No.2 SPF	Timber	286	89				Stringers

Porters Island Bridge Member Cross Sections

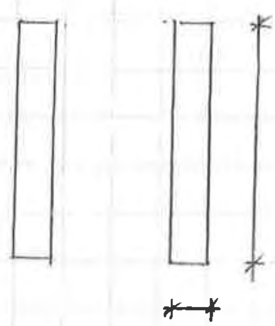
End Post / Top Chord:



Bottom Chord - Exterior Panels (L1-L2, L2-L3):



Bottom Chord - Interior Panels (L3-L4), (L4-L5)



L3-L4 = 19

L4-L5 = 20.6

DILLON CONSULTING

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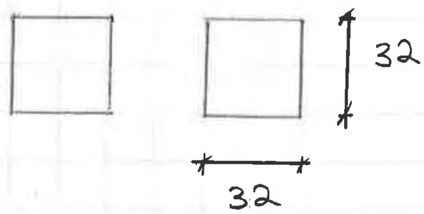
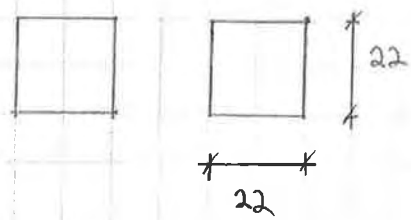
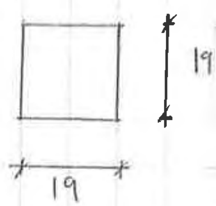
Diagonals (D1)



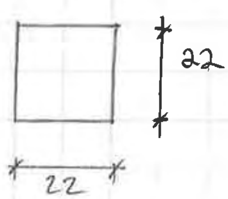
Diagonals (D2)



Diagonals (D3)



Diagonals (D4)



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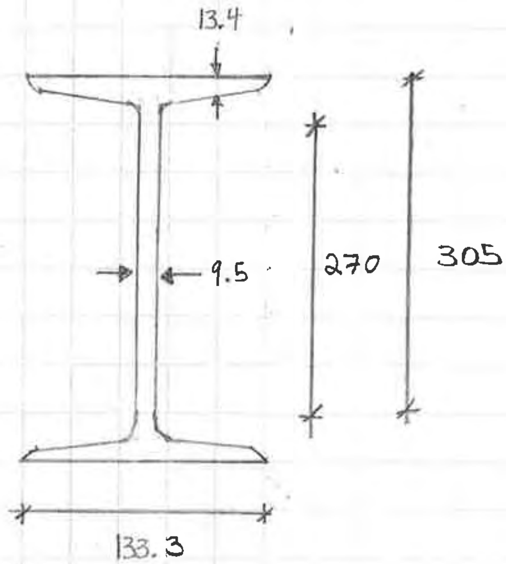
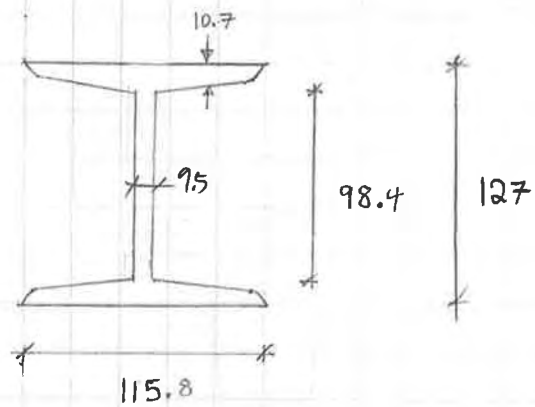
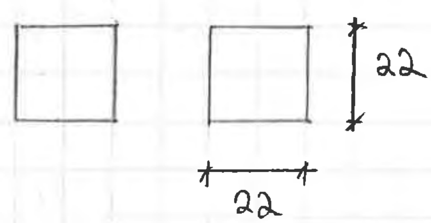
Floor Beams



Verticals (V2, V3)



Verticals (V1)



C: ARK D: MC

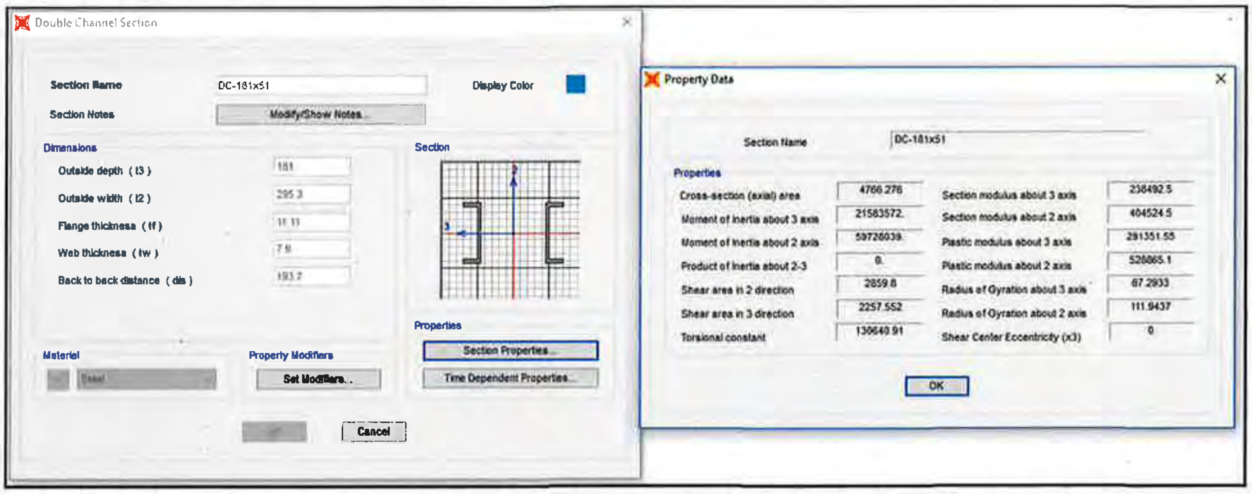
Section Properties

Section Properties were obtained by using SAP2000.

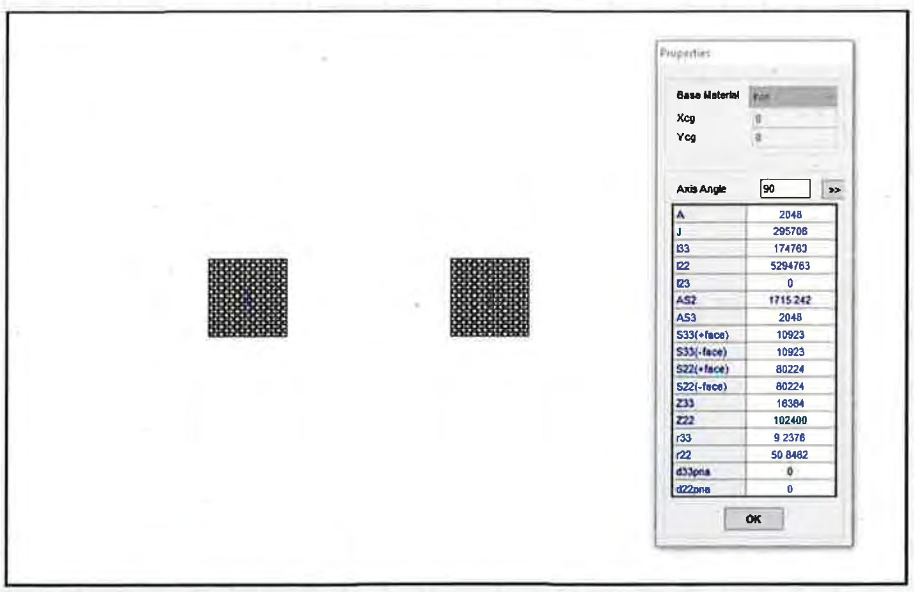
Section Label	Area (mm2)	Ix (mm4)	Zx (mm3)	Sx (mm3)	rx (mm)	Iy (mm4)	Zy (mm3)	Sy (mm3)	ry (mm)	J (mm4)
S-305x133	6135	9.12E+07	6.92E+05	5.89E+05	122	4.90E+06	1.19E+05	7.37E+04	28	2.75E+05
S-181x82	3465	1.64E+07	2.18E+05	1.81E+05	69	1.02E+06	4.09E+04	2.46E+04	17	1.23E+05
S-127x116	3480	9.33E+06	1.70E+05	1.47E+05	52	2.78E+06	7.41E+04	4.79E+04	28	1.17E+05
SQ2-32	2048	3.49E+05	2.32E+04	1.54E+04	13	3.49E+05	2.32E+04	1.54E+04	13	5.90E+05
SQ-32	1024	8.74E+04	8.19E+03	5.46E+03	9	8.74E+04	8.19E+03	5.46E+03	9	1.48E+05
SQ2-22	968	7.81E+04	7.53E+03	5.02E+03	9	7.81E+04	7.53E+03	5.02E+03	9	1.32E+05
SQ-22	484	1.95E+04	2.66E+03	1.77E+03	6	1.95E+04	2.66E+03	1.77E+03	6	3.30E+04
SQ-19	361	1.09E+04	1.71E+03	1.14E+03	5	1.09E+04	1.71E+03	1.14E+03	5	1.84E+04
R-35	962	7.37E+04	7.15E+03	4.21E+03	9	7.37E+04	7.15E+03	4.21E+03	9	1.47E+05
R-32	804	5.15E+04	5.46E+03	3.22E+03	8	5.15E+04	5.46E+03	3.22E+03	8	1.03E+05
R-29	661	3.47E+04	4.06E+03	2.39E+03	7	3.47E+04	4.06E+03	2.39E+03	7	6.94E+04
R-25	491	1.92E+04	2.60E+03	1.53E+03	6	1.92E+04	2.60E+03	1.53E+03	6	3.83E+04
DC-181x51	4766	2.16E+07	2.91E+05	2.38E+05	67	5.97E+07	5.29E+05	4.05E+05	112	1.31E+05
E2-76x19	2888	1.39E+06	5.49E+04	3.66E+04	22	3.48E+05	2.74E+04	1.83E+04	11	9.54E+05
E2-76x20	3131	1.51E+06	5.95E+04	3.97E+04	22	4.43E+05	3.23E+04	2.15E+04	12	1.17E+06
DL-76x63	1290	7.64E+05	2.77E+04	1.63E+04	24	1.47E+05	9.22E+03	4.64E+03	11	1.65E+04
L-76x63	847	4.88E+05	1.67E+04	9.20E+03	24	3.09E+05	1.19E+04	6.62E+03	19	1.10E+04
DL-76x63	1290	7.64E+05	2.77E+04	1.63E+04	24	1.47E+05	9.22E+03	4.64E+03	11	1.65E+04

SECTION PROPERTIES

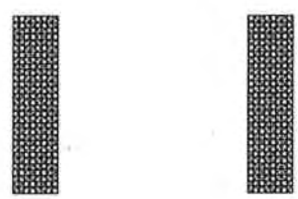
Top Chord & End Post:



Bottom Chord (L1-L2 & L2-L3):



Bottom Chord (L3-L4):



Properties

Base Material

Xcg 0

Ycg 0

Axis Angle 90

A	2888
J	293542
I33	1390091
I22	7306881
I23	0
AS2	2416.7593
AS3	2888
S33(+face)	36581
S33(-face)	36581
S22(+face)	122605
S22(-face)	122605
Z33	54872
Z22	144400
r33	21.9393
r22	50.2999
d33pna	0
d22pna	0

OK

Bottom Chord (L4-L5):

Properties

Base Material

Xcg 0

Ycg 0

Axis Angle 90

A	3131.2
J	368243
I33	1507151
I22	7936730
I23	0
AS2	2622.4442
AS3	3131.2
S33(+face)	39662
S33(-face)	39662
S22(+face)	131654
S22(-face)	131654
Z33	59493
Z22	156560
r33	21.9383
r22	50.3524
d33pna	0
d22pna	0

OK

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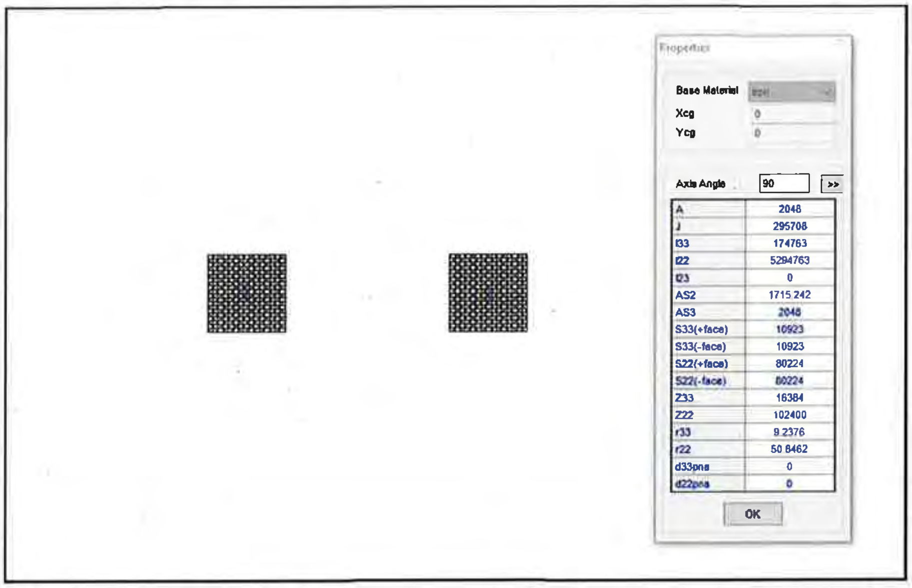
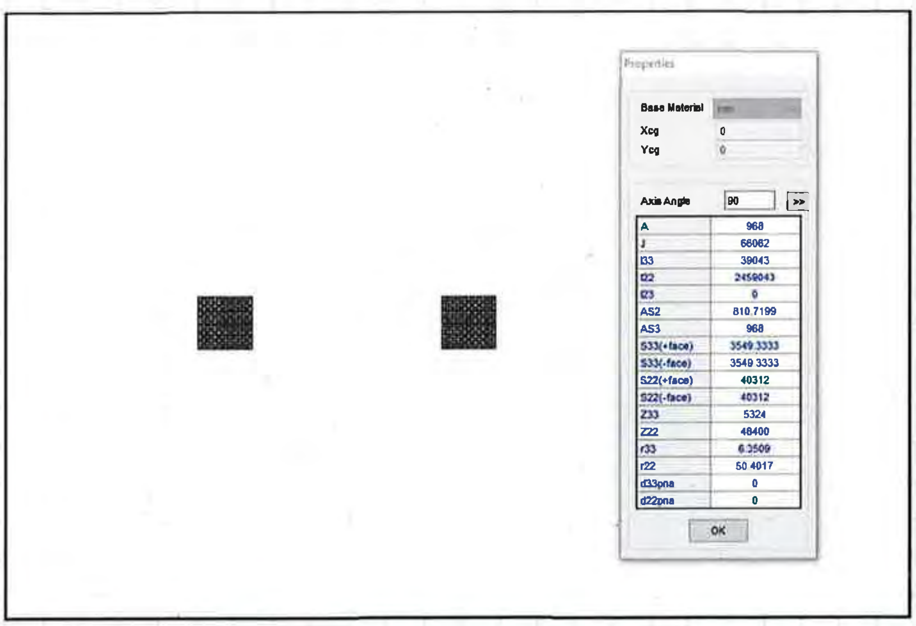
Diagonals (D1):



Properties	
Base Material	
Xcg	0
Ycg	0
Axis Angle	90
A	2048
J	295708
I33	174763
I22	5294763
I23	0
AS2	1715.242
AS3	2048
S33(+face)	10923
S33(-face)	10923
S22(+face)	80224
S22(-face)	80224
Z33	16384
Z22	102400
r33	9.2376
r22	50.8462
d33pna	0
d22pna	0

OK

Diagonals (D2):



Properties	
Base Material	
Xcg	0
Ycg	0
Axis Angle	90
A	968
J	66082
I33	39043
I22	2459043
I23	0
AS2	810.7199
AS3	968
S33(+face)	3549.3333
S33(-face)	3549.3333
S22(+face)	40312
S22(-face)	40312
Z33	5324
Z22	48400
r33	6.3509
r22	50.4017
d33pna	0
d22pna	0

OK

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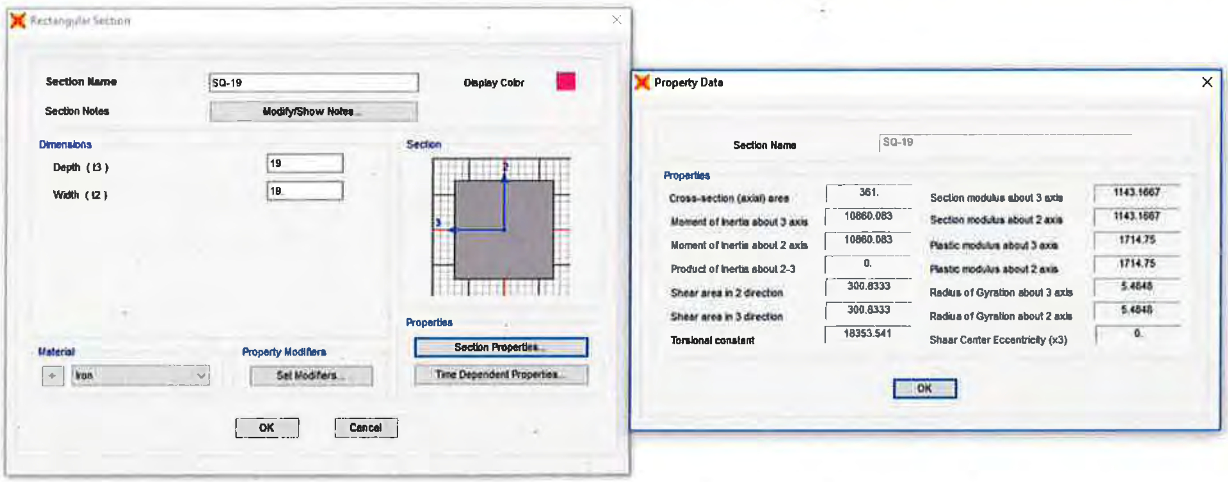
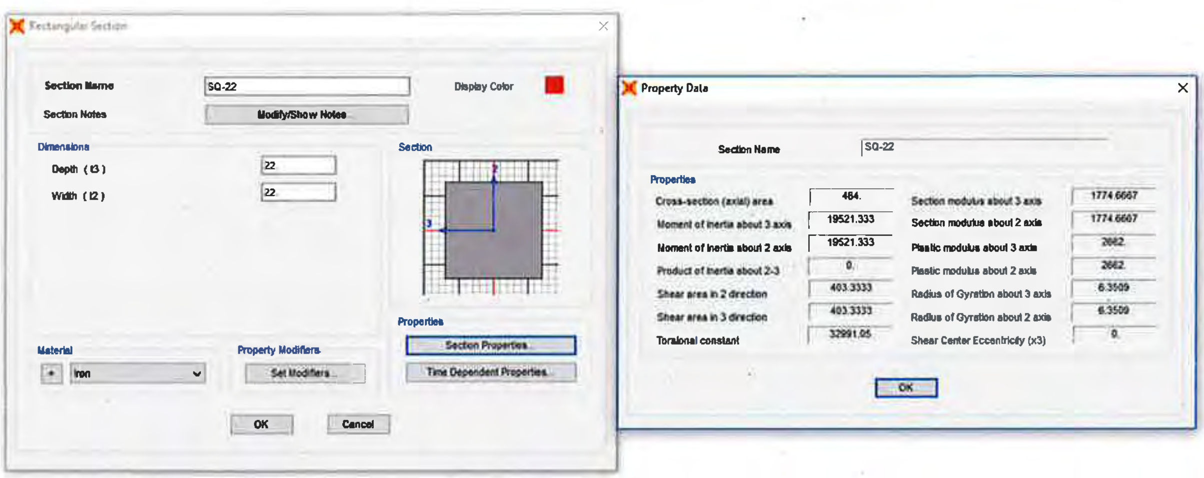
Diagonals (D3):



Diagonals (D3):



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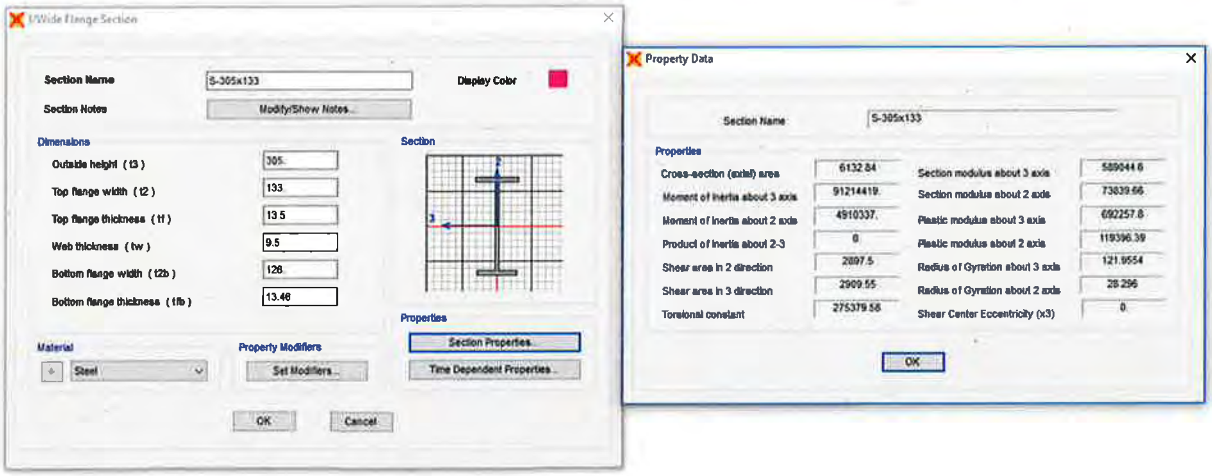
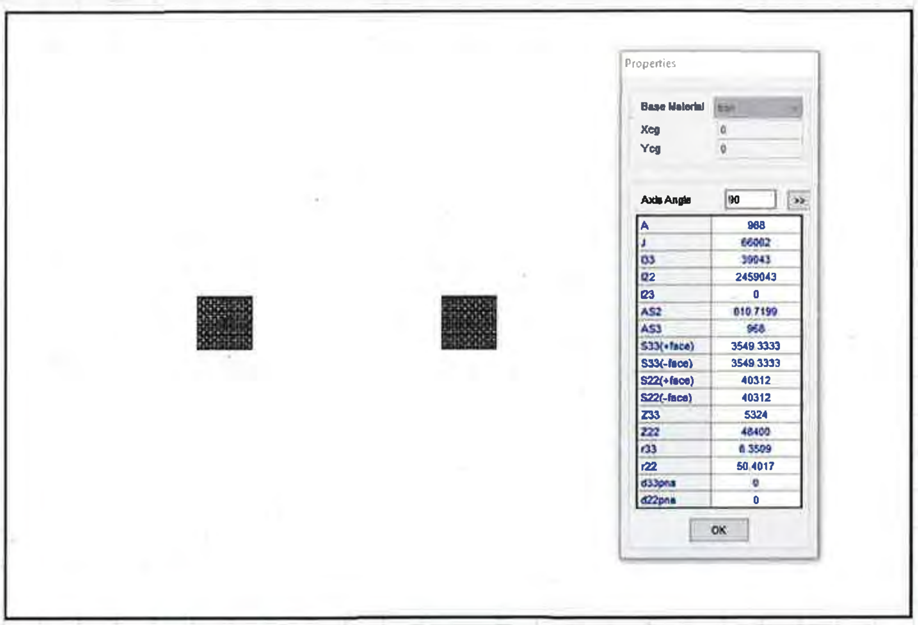
Floor Beams [Average]:



Verticals (V1):



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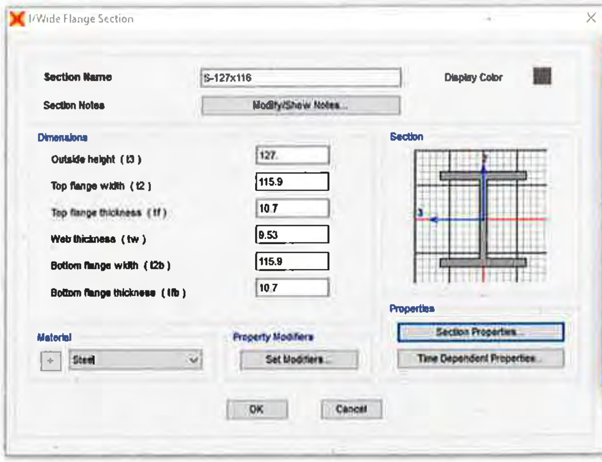
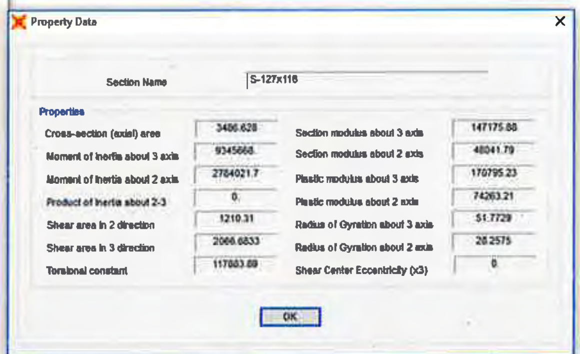
	Notes By: MC	Date: 09/18
Subject: Section Properties	Checked By: ARK	Date: 10/20/18

Verticals [Average] (V2, V3):





Model

C: ARK D: MC

Modelling

The structure was modelled using SAP2000 from CSI. All truss members were modeled as pinned at their ends.

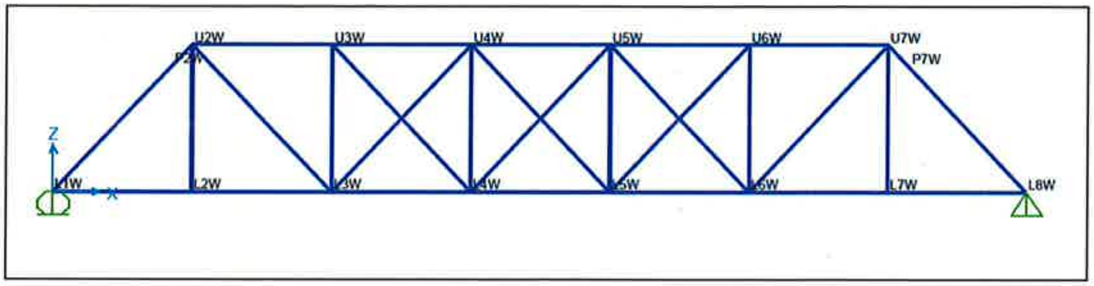


Figure 1: Bridge Elevation

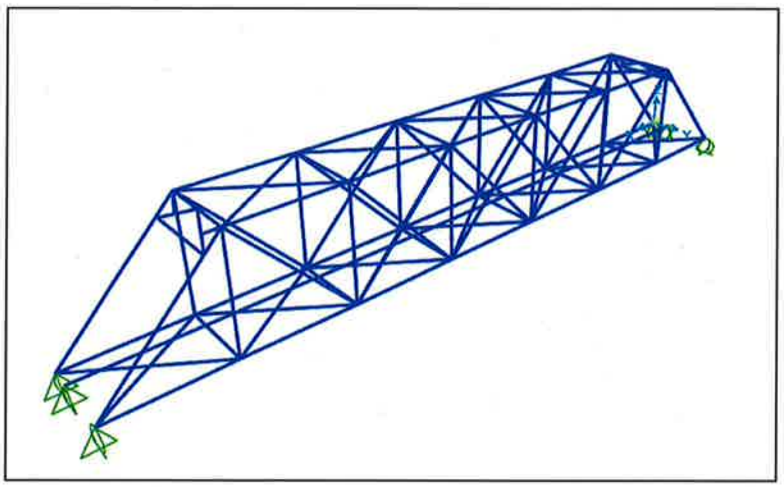
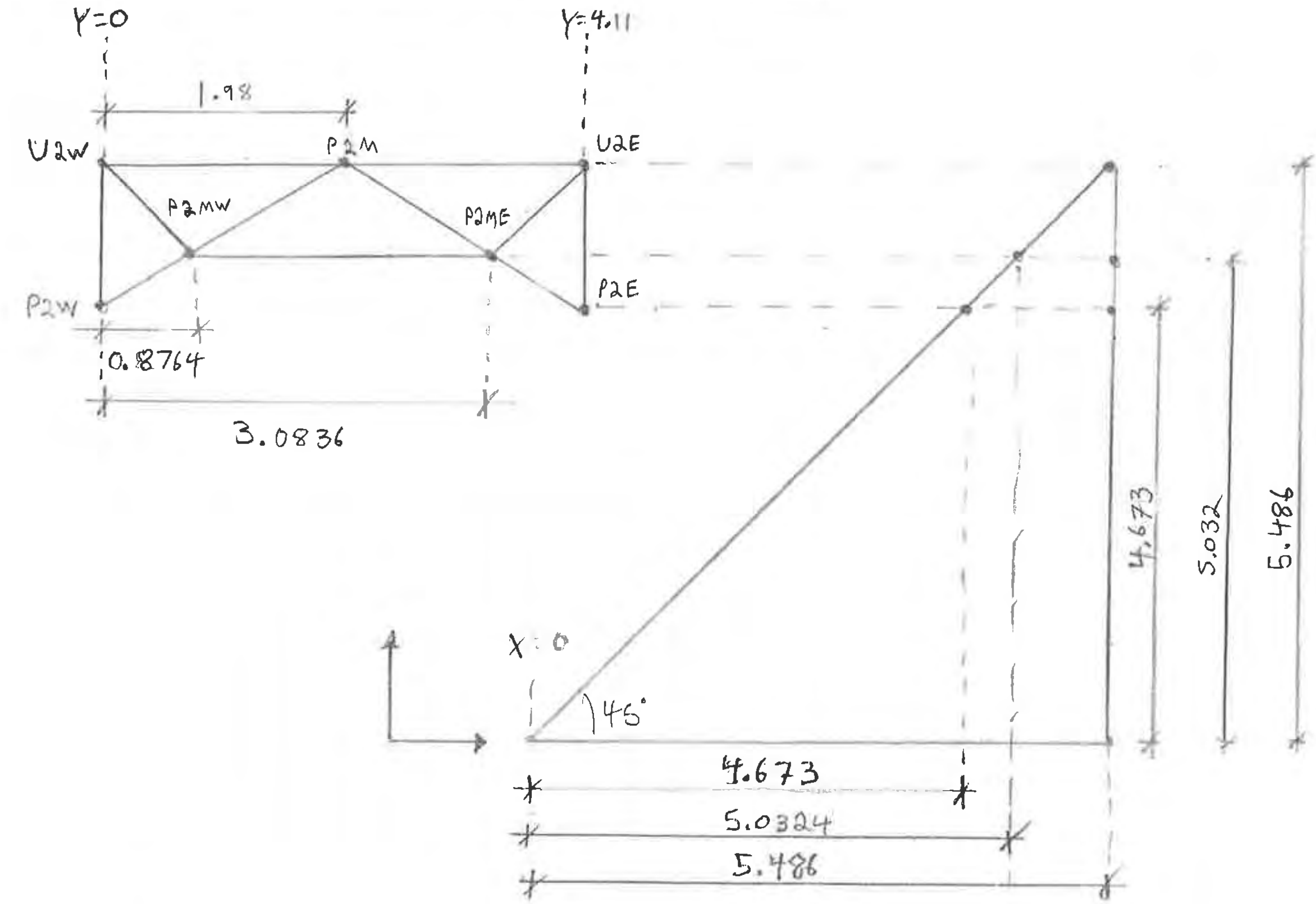


Figure 2: 3D Model

Portal Frame Modelling Dimensions



Joint	X (m)	Y (m)	Z (m)
P2W	4.673	0	4.673
P2MW	5.0324	0.8764	5.0324
P2M	5.486	1.98	5.486
P2ME	5.0324	3.0836	5.0324
P2E	4.673	3.96	4.673
P7W	33.729	0	4.673
P7MW	33.3696	0.8764	5.0324
P7M	32.916	1.98	5.486
P7ME	33.3696	3.0836	5.0324
P7E	33.729	3.96	4.673

Loads

Dead Loads

- Truss Members, Bracing, & Floor Beams Modeled in SAP2000

$$\gamma_{steel} = 7850\ Kg/m^3 \times 1.15 = 9030\ Kg/m^3$$

* Weight of steel has been increased by 15% to account for lattice bars & miscellaneous steel

Commentary 14.8.2.1 of CHBDC suggests a 20% allowance for through trusses. However this allowance includes the weights of members that have been modelled explicitly.

Wood Stringers

8 - 4" x 12" (89 x 286) mm
$L = 6100$ mm
$\gamma = 6\ kN/m^3$ (CHBDC T3.4, Softwood)

$$W_{string} = 8 \times (89\,mm \times 286\,mm) \times 6100\,mm \times 6\ kN/m^3 \times \frac{m^3}{1000^3\,mm^3}$$
$$= 7453\ N$$

$$q_{string} = 7453\ N / (L_{string} \times L_{floor\ beam}) = 5117\ N / (6.1\,m \times 4.11\,m)$$
$$= \underline{\underline{0.297\ KPa}}$$

Wood Deck

22 - 50 x 250 mm (38 x 235) mm (22 - Planks between Floor Beams)
$L = 3650$ mm (5.49 m floor beam spacing)

$$q_{Deck} = 5.5\,m \times 3.65\,m \times 0.038\,m \times 6.0\ kN/m^3 / 2 = \underline{\underline{0.23\ KPa}}$$

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Live Load

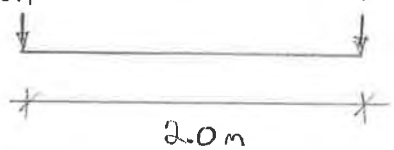
Maintenance Vehicle Load

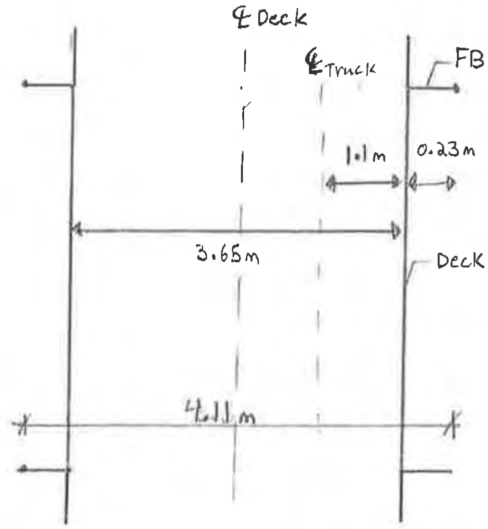
Wheel: ~~12~~ 28 kN

Axel: ~~24~~ 56 kN

Gross = 80 kN

CHBDC 3.8.11





Distance from Bridge to ℄ of Truck $= 0.3 + \frac{1.6}{2} = 1.1$ m

(30 cm between wheel & bridge)

Total Distance (Y) = 1.255 m

Pedestrian Load

$$P = 5.0 - \frac{S}{30} = 5.0 - \frac{76.4}{30} = 2.45 \text{ kPa}$$

Tributary Width = 5.48 m

Pedestrian Load on Floor Beam = 2.45 kPa × 5.49 × 3.65 / 4.11 = 11.97 kN/m

Pedestrian Load on Stringer = 2.45 kPa × 0.52 m = 1.27 kN/m

Wind Loads

Bridge Span Length = 76.8 m
Return Period = 50 Years (℄ 3.10.1.2 (b))

q = 410 Pa (TA3.1.1, Ottawa)

C_G = 2.5 (℄ 3.10.1.3, Pedestrian)
C_e = 1.0 (℄ 3.10.1.4, H = 9.5 m)
C_h = 2.0 (℄ 3.10.2.2)
C_v = 1.0 (℄ 3.10.2.3)

Horizontal Wind Load

$F_h = q\,C_e\,C_g\,C_h = 410 \times 1.0 \times 2.5 \times 2.0 = 2.05$ kPa   windward & Leeward

Top Chord Depth	= 181 mm	W_{TC}	= 0.370 KN/m
Bot Chord Depth	= 76 mm	W_{BC_1}	= 0.156 KN/m
	32 mm	W_{BC_2}	= 0.066 KN/m
Verticals Width	= 98 mm	W_{V_1}	= 0.201 KN/m
	22 mm	W_{V_2}	= 0.045 KN/m
Diagonals width	: 32 mm x 2	W_{D1}	= 0.131 KN/m
	22 mm x 2	W_{D2}	= 0.090 KN/m
	32 mm	W_{D3}	= 0.066 KN/m
	22 mm	W_{D4}	= 0.045 KN/m
	19 mm	W_{D5}	= 0.039 KN/m

Vertical Wind Load

$F_v = q\,C_e\,C_g\,C_v = 410 \times 1.0 \times 2.5 \times 1.0 = 1.025$ kPa

Wind Load on Floor Beams = 1.025 × 5.49 = 5.63 KN/m
Wind Load on Stringer = 1.025 × 0.51 = 0.53 KN/m

Thermal Load

Location: Ottawa, Ontario

Super Structure: Type. A (℄ 3.9.3, Truss Systems above deck)

From Table 3.8 (Type A): + 25c above mean daily temperature
- 15°c below mean daily temperature

Depth of Truss members & Deck are Small ∴ Modifications efffective temperatures from figure 3.5 = 0

Effective Construction Temperature = 15°C (℄ 3.9.4.2)

From Figure A3.1.1 ⟶ $T_{max} = +30°C$

From Figure A3.1.2 ⟶ $T_{min} = -32°C$

Maximum Effective Temperature = 30°C + 25°C − 0°C = 55°C

Minnimum Effective Temperature = −32°C − 15°C + 0°C = −47°C

$\Delta T_{summer} = 55°C - 15°C = 40°C$

$\Delta T_{winter} = -47°C - 15°C = -62°C$

* ΔT to be Applied uniformally Across All Members

Snow Load

According to ℄ 16.9.7 of the MTO Structural Manual pedestrian bridges shall consider snow accumulation.

SLS1 + 1.0 S
ULS2 + 0.5 S
ULS 3 + 0.5 S

Full Factored Dead Load + 1.5 S

$S_s = 2.4$ kPa } Climatic Data Tables
$S_r = 0.4$ kPa } (Ottawa, City Hall)

$I_s = 1.0$ (NBCC 2010, Table 4.1.6.2, Normal Importance)

$l_c = 2w - w^2/l$
$= 2(3.65m) - 3.65m^2/38.4m$
$= 6.95$

(w = Smaller Dimension = Deck Width)
(l = longer Dimension = Bridge Span)

$6.95 \leq 70$ ∴ Small Roof (℄ 4.1.6.3)

$C_b = 0.8$ (Small Roof)
$C_w = 0.75$ (Open Terrain)
$C_s = 1.0$ ($\alpha < 30°$)
$C_a = 1.0$ (Uniform)

$S = I_s [S_s (C_b C_w C_s C_a) + S_r]$
$= 1.0 [2.4 kPa (0.8 \times 0.75 \times 1 \times 1) + 0.4 kPa]$
$= 1.84$ kPa

Line Load on Stringers = 1.84 kPa × 0.52 m = 0.956 kN/m
Line Load on Floor Beams = 1.84 kPa × 5.49 m × 3.65 m / 4.11 m = 8.97 kN/m

Snow Load Reference

NBCC 2010 Cl 4.1.6.2

2) The basic roof snow load factor, C_b, shall be 0.8, except that for large roofs it shall be

a) $1.0 - (30/l_c)^2$, for roofs with $C_w = 1.0$ and l_c greater than or equal to 70 m, or

b) $1.3 - (140/l_c)^2$, for roofs with $C_w = 0.75$ or 0.5 and l_c greater than or equal to 200 m,

where

l_c = characteristic length of the upper or lower roof, defined as $2w - w^2/l$, in metres,

w = smaller plan dimension of the roof, in metres,

l = larger plan dimension of the roof, in metres.

3) Except as provided for in Sentence (4), the wind exposure factor, C_w, shall be 1.0.

4) For *buildings* in the Low and Normal Importance Categories as set out in Table 4.1.2.1., the wind exposure factor given in Sentence (3) may be reduced to 0.75, or to 0.5 in exposed areas north of the treeline, where

a) the *building* is exposed on all sides to wind over open terrain as defined in Clause 4.1.7.1.(5)(a), and is expected to remain so during its life,

b) the area of roof under consideration is exposed to the wind on all sides with no significant obstructions on the roof, such as parapet walls, within a distance of at least 10 times the difference between the height of the obstruction and $C_bC_wS_s/\gamma$ metres, where γ is the unit weight of snow on roofs (see Appendix A), and

c) the loading does not involve the accumulation of snow due to drifting from adjacent surfaces.

NBCC 2010 Commentary G

Roof Snow Load Factors

9. The factors C_b, C_w, C_s and C_a were not obtained by rigorous statistical analyses due to the lack of data, but they have been found to give acceptable and conservative designs.

10. Basic roof snow load factor, C_b. The basic roof snow load has been set at 80% of the ground load (i.e. $C_b = 0.8$). This percentage is based on the results of a countrywide survey of snow loads on roofs carried out by the Institute for Research in Construction and a number of volunteers. The wind is less effective in removing snow from large roofs due to the greater quantities involved and because snow may drift from one area to another.[19] Increased values of C_b are therefore specified in NBC Clauses 4.1.6.2.(2)(a) and (b) to account for this effect in the case of large roofs.

11. Wind exposure factor, C_w. Observations in many areas of Canada have shown that where a roof or a part of it is fully exposed to wind, some of the snow is blown off or prevented from accumulating, thus reducing the average snow load.

12. Therefore, for roofs fully exposed to the wind, the wind exposure factor, C_w, may be taken as equal to 0.75 rather than 1.0 (or 0.5 rather than 1.0 for exposed sites north of the treeline). This substitution applies under the following conditions:

(a) the building is on open level terrain containing only scattered buildings, trees or other such obstructions, open water or shorelines thereof, and is expected to remain so during its service life;

(b) the area of roof under consideration is exposed to the wind on all sides and does not have any significant obstructions, such as parapet walls, within a distance of at least 10 times the difference between the height of the obstruction and $C_bC_wS_s/\gamma$ metres, where the applicable value of C_w is either 0.75 or 0.5, as provided in NBC Sentence 4.1.6.2.(4);

(c) the loading case under consideration does not involve the accumulation of snow due to drifting from adjacent surfaces such as, for example, the other side of a gable roof; and

(d) the buildings are not in the High or Post-disaster Importance Categories described in NBC Table 4.1.2.1.

A value of 1.0 for C_w must be applied to other loadings than the ones marked Case I in Figures G-1 to G-4.

Forces

C: ARK D: MC

Factored Loads

When the bridge is behaving as designed in its original state, thermal effects are negligible as the bridge is free to expand and shorten at the abutments. ULS5, ULS6, ULS7, and ULS8 have been determined not to govern using Engineering judgment. Load cases are factored as follows:

Load Case	ULS1-VEH	ULS1-PED	ULS2-VEH	ULS2-PED	ULS3-VEH	ULS3-PED	ULS4	ULS9	D+1.5S
DEAD	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.35	1.1
LIVE	1.7	0	1.6	0	1.4	0	0	0	0
PED	0	1.7	0	1.6	0	1.4	0	0	0
SDL	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.35	1.2
THERMAL (Summer)	0	0	1.15	1.15	1	1	1.25	0	0
THERMAL (Winter)	0	0	1.15	1.15	1	1	1.25	0	0
WIND	0	0	0	0	0.45	0.45	1.4	0	0
SNOW	0	0	0.5	0.5	0.5	0.5	0	0	1.5

C: ARK D: MC

Factored Axial Loads

Axial Loads

Frame Label	Type	ULS1-VEH	ULS1-PED	ULS2-VEH	ULS2-PED	ULS3-VEH	ULS3-PED	ULS4	ULS9	Dead+ Snow	Case	Max Force
EP	End Post	-174.8	-237.2	-206.3	-265.1	-177.4	-281.8	-180.4	-69.2	-179.5	ULS3 -PED	-281.8
U2-U3	Top Chord	-198.4	-270.1	-234.4	-301.9	-208.1	-310.5	-172.5	-78.2	-204.2	ULS3 -PED	-310.5
U3-U4	Top Chord	-237.4	-324.3	-280.7	-362.5	-251.3	-374.9	-213.7	-94.1	-245.3	ULS3 -PED	-374.9
U4-U5	Top Chord	-223.7	-326.1	-268.2	-364.6	-239.8	-376.5	-213.3	-94.4	-246.6	ULS3 -PED	-376.5
L1-L2	Bottom Chord	118.8	161.5	140.4	180.6	130.9	192.1	122.7	46.4	122.0	ULS3 -PED	192.1
L2-L3	Bottom Chord	118.8	161.5	140.4	180.6	133.1	194.3	129.5	46.4	122.0	ULS3 -PED	194.3
L3-L4	Bottom Chord	198.4	270.1	234.4	301.9	215.3	317.7	195.1	78.2	204.2	ULS3 -PED	317.7
L4-L5	Bottom Chord	221.4	322.5	265.3	360.5	236.7	371.7	209.4	93.7	244.0	ULS3 -PED	371.7
D1	Diagonals	135.3	159.0	155.2	177.6	134.0	178.9	90.5	47.0	120.6	ULS3 -PED	178.9
D2	Diagonals	94.3	79.4	102.8	88.7	89.1	89.5	45.5	23.4	60.2	ULS2 -VEH	102.8
D3	Diagonals	28.6	2.8	27.4	3.2	23.3	2.6	-0.4	0.7	2.1	ULS1 -VEH	28.6
D4	Diagonals	34.0	0.0	32.0	3.0	27.9	-0.1	-0.2	0.0	0.0	ULS1 -VEH	34.0
V1	Verticals	94.0	51.5	98.3	58.3	84.4	58.6	26.1	10.8	37.5	ULS2 -VEH	98.3
V2	Verticals	-74.2	-63.3	-80.3	-70.1	-70.4	-70.7	-38.9	-22.5	-49.3	ULS2 -VEH	-80.3
V3	Verticals	-26.2	-7.4	-25.4	-7.7	-22.4	-7.2	-5.1	-5.9	-6.9	ULS1 -VEH	-26.2
BCB1	Bottom Cross Bracing	4.4	0.6	4.2	0.5	17.3	14.1	42.6	0.1	0.1	ULS4 -S	42.6
BCB2	Bottom Cross Bracing	19.3	42.4	18.6	40.3	24.8	43.8	30.8	7.3	7.0	ULS3 -PED	43.8
BCB3	Bottom Cross Bracing	20.1	44.3	19.4	42.1	21.7	41.6	19.3	7.7	7.4	ULS1 -PED	44.3
BCB4	Bottom Cross Bracing	15.9	35.4	15.4	33.7	14.2	30.2	6.0	6.2	6.0	ULS1 -PED	35.4
TCB1	Top Cross Bracing	0.0	0.0	0.0	0.0	1.8	1.8	5.6	0.0	0.0	ULS4 -S	5.6

C: AFK D: MC

Factored Axial Loads

Frame Label	Type	ULS1-VEH	ULS1-PED	ULS2-VEH	ULS2-PED	ULS3-VEH	ULS3-PED	ULS4	ULS9	Dead+ Snow	Case	Max Force
TCB1	Top Cross Bracing	0.0	0.0	0.0	0.0	1.8	1.8	5.6	0.0	0.0	ULS4 -S	5.6
TCB2	Top Cross Bracing	0.0	0.0	0.0	0.0	4.5	4.5	14.1	0.0	0.0	ULS4 -W	14.1
TCB3	Top Cross Bracing	0.0	0.0	0.0	0.0	5.4	5.4	16.8	0.0	0.0	ULS4 -W	16.8
LB1	Lateral Bracing	0.0	0.0	-0.2	-0.2	-1.9	-2.1	-5.9	0.0	-0.4	ULS4 -W	-5.9
LB2	Lateral Bracing	0.0	0.0	-0.2	-0.2	-3.0	-3.1	-9.2	0.0	-0.4	ULS4 -S	-9.2
P1	Portal	-0.2	-0.3	-0.2	-0.3	-23.7	-23.8	-73.5	-0.1	-0.2	ULS4 -S	-73.5
P2	Portal	0.0	0.0	0.0	0.0	-28.6	-28.6	-89.5	-0.1	-0.2	ULS4 -S	-89.5

Tension Resistance

C: ARK D: MC

Tension Members

Factor	Value
Phi	0.9
fy (MPa)	180 MPa

Frame Label	Section Label	Area (mm2)	Tr (kN)	Tf (kN)	Tf/Tr	Notes
L1-L2	SQ2-32	2048	350.1	192.1	**0.55**	Bottom Chord
L2-L3	SQ2-32	2048	350.1	194.3	**0.55**	Bottom Chord
L3-L4	E2-76x19	2888	493.8	317.7	**0.64**	Bottom Chord
L4-L5	E2-76x20	3131	536.9	371.7	**0.69**	Bottom Chord
D1	SQ2-32	2048	350.1	178.9	**0.51**	Diagonals
D2	SQ2-22	968	165.5	102.8	**0.62**	Diagonals
D3	SQ-19	361	61.7	34.0	**0.55**	Diagonals
D4	SQ-22	484	82.8	28.6	**0.35**	Diagonals
V1	SQ2-22	968	165.5	98.3	**0.59**	Verticals
BCB1	R-25	491	83.9	35.4	**0.42**	Bottom Cross Bracing
BCB2	R-29	661	112.9	44.3	**0.39**	Bottom Cross Bracing
BCB3	R-32	804	137.5	48.3	**0.35**	Bottom Cross Bracing
BCB4	R-35	962	164.5	59.7	**0.36**	Bottom Cross Bracing
TCB1	SQ-22	484	82.8	5.6	**0.07**	Top Cross Bracing
TCB2	SQ-22	484	82.8	14.1	**0.17**	Top Cross Bracing
TCB3	SQ-22	484	82.8	16.8	**0.20**	Top Cross Bracing
P1	L76x63	847	144.8	73.2	**0.51**	Portal
P2	DL-76x63	1690	289.6	89.5	**0.31**	Portal
Hanger	SQ-25*	355.5	121	97	**0.8**	Hanger, threaded at base, A=0.551*A

Compression Resistance

C: ARK D: MC

Compression Members

FACTOR	VALUE
Phi	0.9
fy (MPa)	180 MPa
Es	200000 MPa
K	1
n	1.34

Frame Label	Section Label	Area (m2)	Unbraced Length X (m)	Unbraced Length Y (m)	r min (m)	λy	Cry (kN)	Cf (kN)	Cf/Cry	Notes
EP	DC-181x51	4766	7751	6540	67	1.1	416.0	-281.8	0.7	End Post *
U2-U3	DC-181x51	4766	5490	5490	67	0.8	567.1	-310.5	0.5	Top Chord
U3-U4	DC-181x51	4766	5486	5486	67	0.8	567.4	-374.9	0.7	Top Chord
U4-U5	DC-181x51	4766	5490	5490	67	0.8	567.1	-376.5	0.7	Top Chord
V2	S-98x116	3208	5486	5486	29	1.8	141.8	-80.3	0.6	Verticals
V3	S-98x116	3208	5486	5486	29	1.8	141.8	-26.2	0.2	Verticals
P1	L-76x63	847	1180	1180	19	0.9	116.7	-73.2	0.6	Portal
P2	DL-76x63	847	1980	1980	24	0.8	200.0	-89.5	0.45	Portal
LB1	S-181x82	3465	3960	3960	17	2.2	115.1	-5.9	0.1	Lateral Bracing
LB2	S-181x82	3465	3960	3960	17	2.2	115.2	-9.2	0.1	Lateral Bracing
FB1	S-305x133	6135	3960	3960	28	1.3	419.1	-10.6	0.0	Floor Beams
FB2	S-305x133	6135	3960	3960	28	1.3	419.1	-14.3	0.0	Floor Beams
FB3	S-305x133	6135	3960	3960	28	1.3	419.1	-18.1	0.0	Floor Beams

* 1.92 IN COMBINED AXIAL COMPRESSION & BENDING
(SEE HAND CALCS)

Flexural & Shear Members

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Flexural and Shear Members

For detailed calculations refer to the hand calculations in Appendix A. The most critical member for each element is displayed below.

Property	Value (MPa)
fy	180
Es	200000
Gs	77000
fbu	8.4
fvu	1.2
Ew	8500

Element	Section	Material	Mf	Mr	Mf/Mr	Vf	Vr	Vf/Vr
Floor Beams	S-305x133	Steel	98	92.5	1.06	116	286	0.41
Stringers	4'x12'	Timber	48	12	4.0	61	24	2.5
End Post	DC-181x51	Steel	84.1	67	1.26	71	222	0.32 *

d/c = 1.86 IN COMBINED AXIAL COMPRESSION & BENDING. (SEE HAND CALCS).

Hand Calculations

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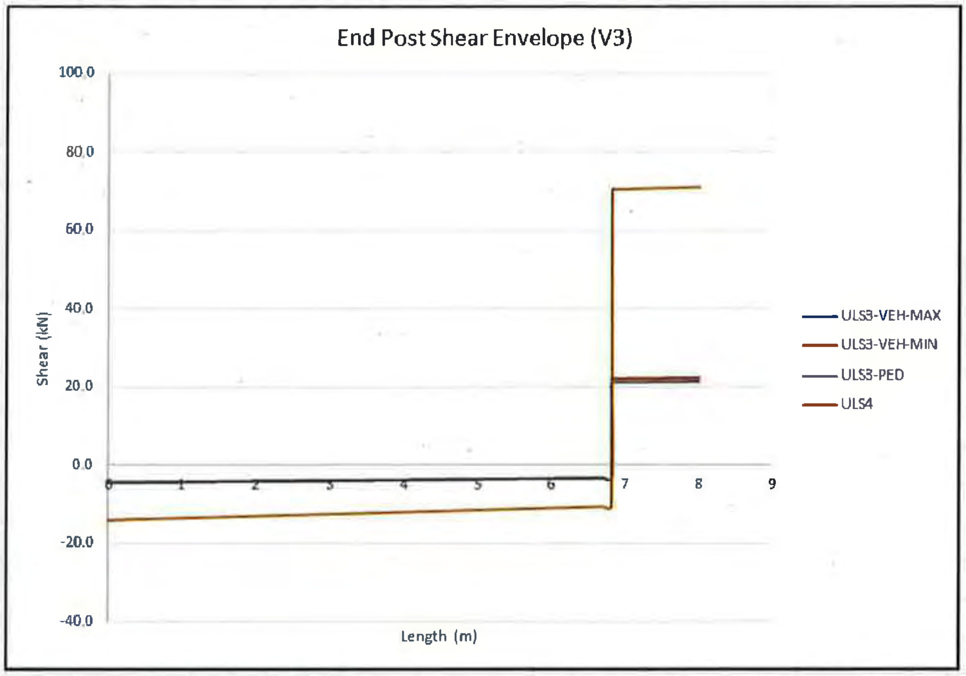
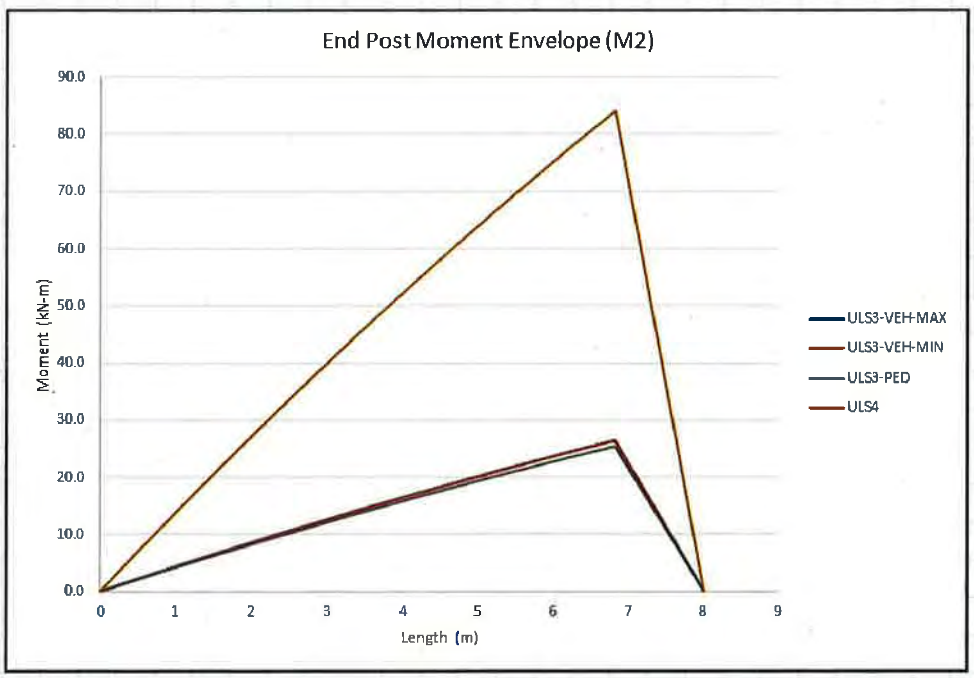
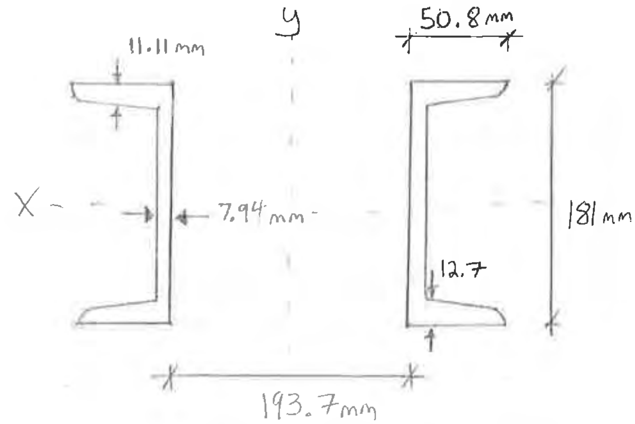




End Post

Member : EP
Section : DC-181 x 51
Material : Steel (f_y = 180 MPa)



Loads (Axial)

Dead = -33.8 kN
Live = -64.2 kN
Ped = -100.9 kN
SDL = -23.7 kN
Wind = -82.0 kN
Snow = -75.9 kN

$A_x = 4766\ mm^2$
$I_x = 2.16 \times 10^7\ mm^4$
$S_x = 2.38 \times 10^5\ mm^3$
$r_x = 67\ mm$

$I_y = 5.97 \times 10^7\ mm^4$
$S_y = 4.05 \times 10^5\ mm^3$
$r_y = 112\ mm$
$J = 1.31 \times 10^5\ mm^4$
$C_w = 1.85 \times 10^{11}\ mm^6$

Governing Load Case = ULS 3 - Ped

$C_f = 1.1(33.8) + 1.4(100.9) + 1.2(23.7) + 0.45(82) + 0.5(75.9) = \underline{\underline{281.8\ kN}}$

Section Class (compression)

$b/t = 50.8/11.1 = 4.57$
$h/w = 155.6/7.9 = 20$

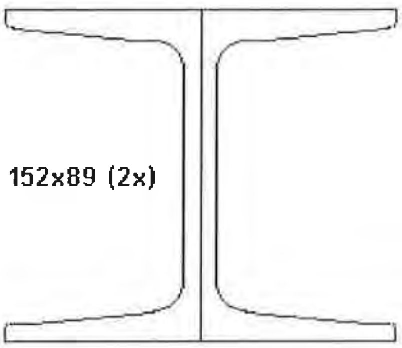
	Flange	Web
Class 1 :	—	$20 \leq 670/\sqrt{180}$ $20 \leq 49.9$ ✓ ∴ Class 1 Web (compression)
Class 2 :	—	
Class 3 :	$4.57 \leq 200/\sqrt{180}$ $4.57 \leq 14.9$ ✓ ∴ Class 3 Flange (compression)	→ Section is Class 3

Issued 07 Sep 2018

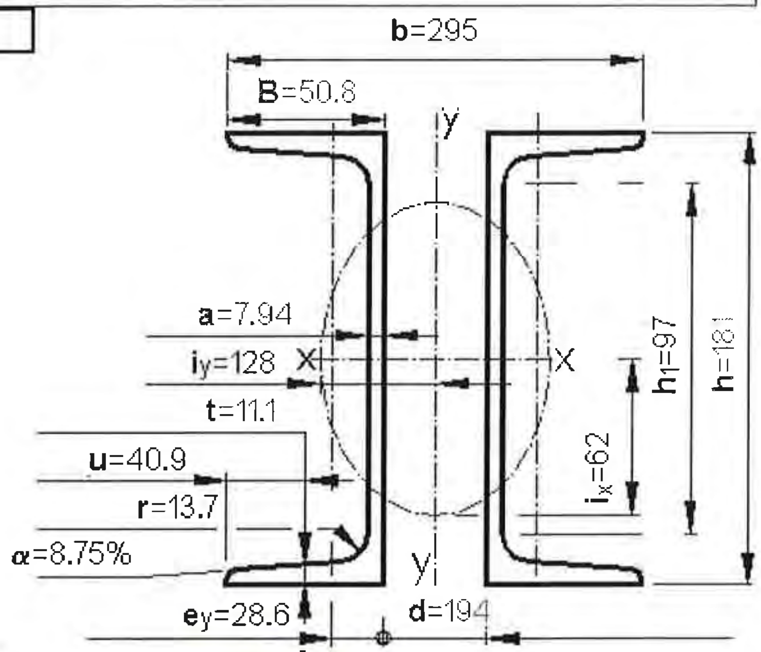
Units: **SI**

Properties of plane area: Standard channels: with tapered flanges: two beams back-to-back

Standard: **CB:BS4:1980**



152x89 (2x)

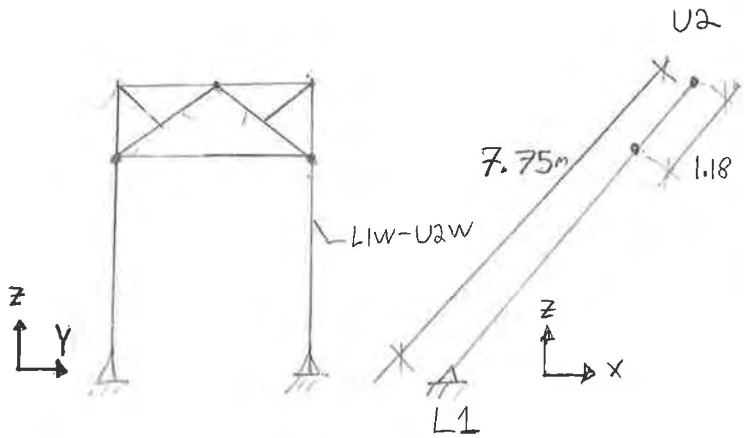


1	Painting surface: Perimeter of section:	U=1.05 m^2/m	
2	Section area:	A=60.7 cm^2	
3	Beam mass per unit length:	p=47.7 kg/m	
4	Section warping constant:	C_W=185000 cm^6	
5	Torsional inertia constant:	K=14.2 cm^4	
6	Torsional section modulus: elastic:	Z_t=12.8 cm^3	
7	Torsional section modulus: plastic:	S_t=22.2 cm^3	
8	Torsional shape factor: plastic/elastic:	f_t=1.74	

			x-x	y-y
9	Second moment of area:	cm^4	I_x=2330	I_y=9980
10	Section modulus: elastic:	cm^3	Z_x=306	Z_y=676
11	Section modulus: plastic:	"	S_{px}=277	S_{py}=761
12	Shape factor: plastic/elastic:		f_x=0.91	f_y=1.13
13	Shear factor:		F_x=1.67	F_y=0.01
14	Shear effective area:	cm^2	A_{rx}=26.7	A_{ry}=277

www.xcalcs.com Sheet: **1 /1**

Compression Resistance



Length = 7.75 m

Unbraced Length$_x$ = 7.75 m

Unbraced Length$_y$ = 6.54 m

K = 1.0 Pin-Pin (Table 9.6)

$$\text{Slenderness}_x = \frac{KL_x}{r_x} = \frac{1.0 \times 7.75\,m}{0.06729\,m} = 115.2 < 120 \checkmark \quad (\text{§ } 10.9.1.3)$$

$$\text{Slenderness}_y = \frac{KL_y}{r_y} = \frac{1.0 \times 6.54\,m}{0.11194\,m} = 58.4 < 120 \checkmark \quad (\text{§ } 10.9.1.3)$$

$$\lambda_x = \frac{KL_x}{r_x}\sqrt{\frac{F_y}{\pi^2 E_s}} = 115.2\sqrt{\frac{180\,MPa}{\pi^2 \times 200\,000\,MPa}} = 1.1$$

$$\lambda_y = \frac{KL_y}{r_y}\sqrt{\frac{F_y}{\pi^2 E_s}} = 58.4\sqrt{\frac{180\,MPa}{\pi^2 \times 200\,000\,MPa}} = 0.56$$

$\phi_s = 0.9$

$n = 1.34$

$$Cr_x = \phi_s A_s F_y \left(1 + \lambda^{2n}\right)^{-1/n}$$
$$= 0.9 \times 47.66 \times 10^{-4} m^2 \times 180 \times 10^6 Pa \left(1 + 1.1^{2 \times 1.34}\right)^{-1/1.34}$$
$$= 416\,kN$$

(§ 10.9.3.1, Flexural Buckling)

$$Cr_y = 0.9 \times 47.66 \times 10^{-4} m^2 \times 180 \times 10^6 Pa \left(1 + 0.56^{2 \times 1.34}\right)^{-1/1.34}$$
$$= 670\,kN$$

$Cr_x = 416\,kN > 281\,kN \checkmark$ $\quad Cf/Cr_x = 0.68$

$Cr_y = 670\,kN > 281\,kN \checkmark$ $\quad Cf/Cr_y = 0.42$

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Moment Resistance

Flange = Class 3

Web → $h/w = 20$ Class 1 = $1100/\sqrt{180} = 81.98 > 20$ ∴ Web is class 1

Section = Class 3

$M_{fy} = 84.1$ kN-m (ULS 4)

Portal Bracing is connected to both top & bottom bracing
∴ use $L = 6.82$ m for Lateral torsional Buckling

$M_y = f_y S_y = 180 \times 4.05 \times 10^{-4} = 72.9$ kN-m

$\omega_2 = 1.0$ (Simply Supported)

$$M_u = \frac{\omega_2 \pi}{L}\sqrt{E_s I_x G_s J + \left(\frac{\pi E_s}{L}\right)^2 I_x C_w}$$ (§ 10.10.2.3 doubly Symmetric)

$$= \frac{1.0\,\pi}{6.82\,m}\sqrt{200\times10^9\,Pa \times 2.16\times10^{-5} \times 77\times10^9 \times 1.31\times10^{-7}\,m^4 + \left(\frac{\pi\times200\times10^9\,Pa}{6.82}\right)^2 \times (2.16\times10^{-5}\,m^4)\times1.85\times10^{-7}\,m^6}$$

$$= 0.461\sqrt{4.357\times10^{16} + 3.392\times10^{16}}$$

$= 128.3$ kN-m

$M_u > 0.67 M_y = 0.67 \times 72.9 = 48.8$ kN-m ✓ ∴ use § 10.10.3.3(a)

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$$M_r = 1.15\,\phi_s M_y\left[1 - \frac{0.28 M_y}{M_u}\right] \leq \phi_s M_y \qquad (\text{Ȼ } 10.10.3.3)$$

$$M_r = 1.15 \times 0.95 \times 72.9\left[1 - \frac{0.28\,(72.9)}{128.3}\right] \leq 0.95 \times 128.3$$

$$= 67 \text{ kN-m}$$

$$M_r = 67 < 84.1 \text{ kN-m}$$

Shear Resistance

Web is Unstiffened ∴ $K_v = 5.34$ (¢ 10.10.5.1)

$h/w = 155.6 / 7.94 = 19.6$

Case (a): $19.6 \le 502\sqrt{K_v/F_y}$
$19.6 \le 502\sqrt{5.34/180}$
$19.6 \le 86.46$ ✓ ∴ $F_{cr} = 0.577\,f_y$
$F_t = 0$

$F_s = F_{cr} + F_t = 0.577(180) + 0 = 103.86$ MPa

$A_w = 4 \times 50.8 \times 11.11 = 2257.55$

$V_r = \phi A_w F_s = 0.95 \times 2257.6\ mm^2 \times 103.86$ MPa
$= 222.75$

$V_r > V_f$
$222.7 > 71.0$ ✓ $V_f/V_r = 0.32$

Axial Compression & Bending (ULS 4)

$C_f = 180$ kN
$M_{fx} = 0$ kN
$M_{fy} = 84$ kN-m

Case (a)

(i) Cr as specified in 10.9.3.1 with $\lambda = 0$

$$C_r = \phi_s A_s F_y (1 + \lambda^{2n})^{-\frac{1}{n}}$$
$$= 0.9 \times 47.66 \times 10^{-4} m^2 \times 180 \text{ MPa} (1+0)^{-\frac{1}{1.34}}$$
$$= 772 \text{ kN}$$

(ii) Mrx & Mry as specified in 10.10.3.2 & 10.10.3.5 as Class 3

$$M_{r_y} = 67 \text{ kN}$$

(iii) U_{1x} & U_{1y} as specified in 10.9.4.2 but not less than 1

$\omega_1 = 1.0$ (10.9.4.3, distributed loads or series of point Loads)

$$C_{ey} = \frac{\pi^2 E I_y}{(KL)^2} = \frac{\pi^2 \times 200\,000 \text{ MPa} \times 5.97 \times 10^7 \text{ mm}^4}{(1.0 \times 6540 \text{ mm})^2} \times 10^{-3}$$
$$= 2775 \text{ kN}$$

$$U_{1y} = \frac{\omega_{1y}}{1 - \frac{C_f}{C_{ey}}} = \frac{1.0}{1 - \frac{282}{2775}} = 1.11$$

$$\frac{C_f}{C_r} + \frac{U_{1x} M_{fx}}{M_{rx}} + \frac{U_{1y} M_{fy}}{M_{ry}} \leq 1.0$$

$$\frac{180}{772} + 0 + \frac{1.11 \times 84}{67} \leq 1.0$$

$$0.233 + 1.392 \rightarrow 1.62 > 1.0 \quad \times$$

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Case (b)

(i) Cr as specified 10.9.3.1 with $K=1$

$C_{ry} = 670$ kN (bending about Y-Axis)

(ii) Mr as in Case a

$M_{ry} = 67$ kN-m

(iii) U_{1x} & U_{1y} as in Case (a) for braced frames

$U_{1y} = 1.11$

$$\frac{180}{670} + 0 + \frac{1.11 \times 84}{67} \leq 1.0$$

$$0.27 + 1.39 \leq 1.0$$

$$1.66 > 1.0 \quad \times$$

Case (c)

(i) C_r Based on weak Axis Bending

$C_{r_x} = 416$ kN

(ii) M_{rx} & M_{ry} as specified in 10.10.3.3 & 10.10.3.5

$M_{ry} = 67$ kN-m

(iii) U_{1x} & U_{1y} as specified in 10.9.4.2 for Braced Frames

$U_{1y} = 1.11$

$$\frac{180 \text{ kN}}{416 \text{ kN}} + 0 + \frac{1.11 \times 84 \text{ kN-m}}{67 \text{ kN-m}} \leq 1.0$$

$$0.43 + 1.392 = 1.82 > 1.0 \quad ✗$$

Case (c) Lateral Torsional Buckling Governs for the Endposts $\frac{D}{C} = 1.82$

Axial Compression & Bending (ULS3 -Ped)

$C_f = 281.8$ kN
$M_{fx} = 0$
$M_{fy} = 26.4$ kN-m

Case (a)

$$\frac{281.8}{772} + 0 + \frac{1.11 \times 26.4}{67} = 0.365 + 0.437 = 0.8 < 1 \checkmark$$

Case (b)

$$\frac{281.8}{670} + 0 + \frac{1.11 \times 26.4}{67} = 0.42 + 0.437 = 0.86 < 1 \checkmark$$

Case (c)

$$\frac{281.8}{416} + 0 + \frac{1.11 \times 26.4}{67} = 0.68 + 0 + 0.44 = 1.12 > 1 \times$$

Case (c) governs for ULS3, but ULS4 Governs overall

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Subject: Top Chord	Checked by: ARK	Date: 10/2018

Top Chord

Member : U4-U5
Section : DC-181 x 51
Material : Steel (f_y = 180 MPa)

Governing Load Case = ULS3-Ped
C_f = 376.5 kN

Length = 5490 mm
K = 1.0
r_{min} = 67 mm

$$\text{Slenderness} = \frac{KL}{r} = \frac{1.0 \times 5490}{67} = 81.9 < 120 \checkmark$$

$$\lambda = \frac{KL}{r}\sqrt{\frac{F_y}{\pi^2 E_s}} = 81.9\sqrt{\frac{180\ \text{MPa}}{\pi^2 \times 200\,000\ \text{MPa}}} = 0.78$$

$\phi = 0.9$
$n = 1.34$

$$C_r = \phi_s A_s F_y \left(1 + \lambda^{2n}\right)^{-\frac{1}{n}}$$
$$= 0.9 \times 47.66 \times 10^{-4}\ m^2 \times 180 \times 10^6\ \text{Pa}\left(1 + 0.78^{2 \times 1.34}\right)^{-\frac{1}{1.34}}$$
$$= 566\ \text{kN}$$

C_r = 566 kN > C_f = 376.5 kN ✓ $\quad \frac{C_f}{C_r} = 0.7$

Floor Beam Analysis

$A_{FB} = 6135\ mm^2$

$\gamma = 7850\ Kg/m^3 \times 1.15 = 9030\ Kg/m^3$

$W_{Dead} = 9030\ Kg/m^3 \times 9.81\ m/s^2 \times 6.135 \times 10^{-3}$

$= 0.543\ KN/m$

$W_{SDL} = 2.75\ KN/m$

$W_{ped} = 11.95\ KN/m$ (calibrated)

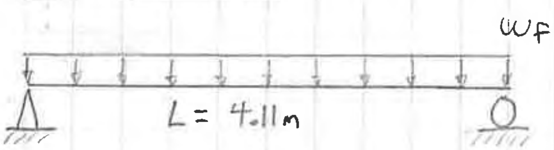
$W_{snow} = 8.97\ KN/m$ (calibrated)

$W_{wind} = 5.63\ KN/m$

Governing Pedestrian Case : ULS 3 - Ped

Governing Maintenance Case : ULS 2 - Veh

ULS 3 - Ped



$\alpha_D = 1.1$

$\alpha_{SDL} = 1.2$

$\alpha_{Ped} = 1.4$

$\alpha_{wind} = 0.45$

$\alpha_{Snow} = 0.5$

$W_{fD} = 0.60\ KN/m$

$W_{fSDL} = 3.30\ KN/m$

$W_{fPed} = 16.73\ KN/m$

$W_{fwind} = 2.53\ KN/m$

$W_{fsnow} = 4.49\ KN/m$

$W_f = 27.65\ KN/m$

$V_f = \frac{wl}{2} = 56.8\ KN$ d/c = 0.2

$M_f = \frac{wl^2}{8} = 58.4\ KN/m$ d/c = 0.63

D_{fi} + 1.5 S

$W_{f\,Dead} = 0.6\ KN/m$

$W_{f\,SDL} = 3.3\ KN/m$

$W_{f\,Snow} = 1.5 \times 8.97 = 13.46\ KN/m$

$W_f = 17.36\ KN/m$

$V_f = wl/2 = 35.6\ KN$ d/c = 0.12

$M_f = wl^2/8 = 36.6\ KN \cdot m$ d/c = 0.40

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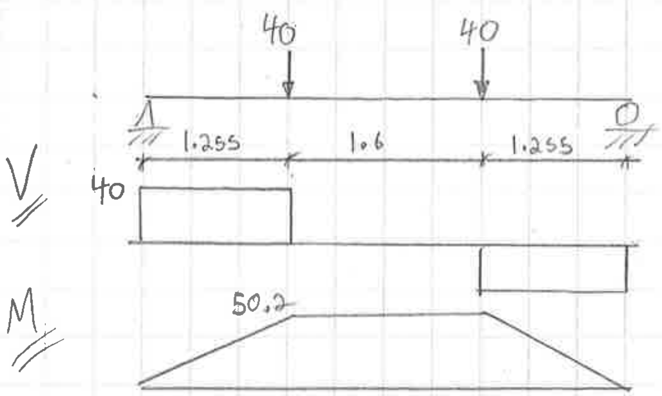
ULS 2 - Veh

Full vehicle fits within the tributary width of the floor beam

Tributary Width = 5.49 m
Maintenance Vehicle Length = 2.0 m < 5.49

∴ Point Load on floor beam = Rear Wheel + Front wheel
= 12 kN + 28 kN
= 40 kN

Max Moment Configuration



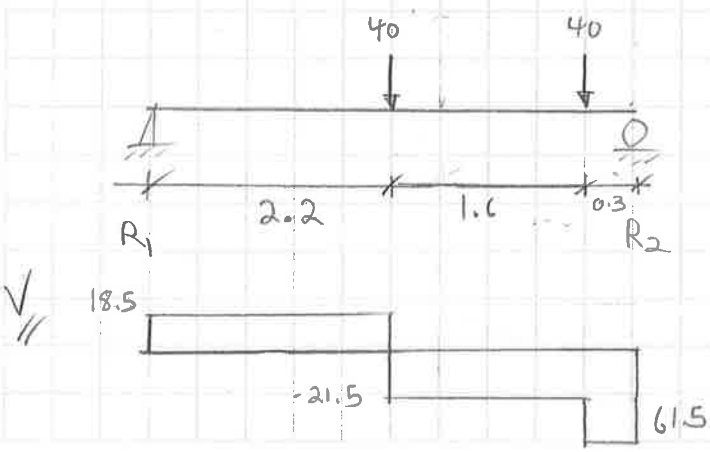
$W_{Dead} = 1.1 \times 0.543 = 0.60$ kN/m
$W_{SDL} = 1.2 \times 2.75 = 3.3$ kN/m
$W_{Snow} = 0.5 \times 8.97 = 4.49$ kN/m

$W_f = 8.39$

$M_f = 1.6 \times 50.2 + \frac{8.39 \times 4.1^2}{8}$

$= \underline{\underline{98 \text{ kN-m}}}$ $d/c = 1.05$

Max Shear Configuration



$R_1 = \frac{40 \times 1.9 + 40 \times 0.3}{4.1} = 21.4$ kN

$R_2 = 80 - 21.4 = 58.6$ kN

$V_f = 1.6 \times 58.6 + 8.39 \times 4.1 / 2$

$= \underline{\underline{111.0 \text{ kN}}}$

$d/c = 0.39$

ULS 2-Veh governs for Shear & Moment

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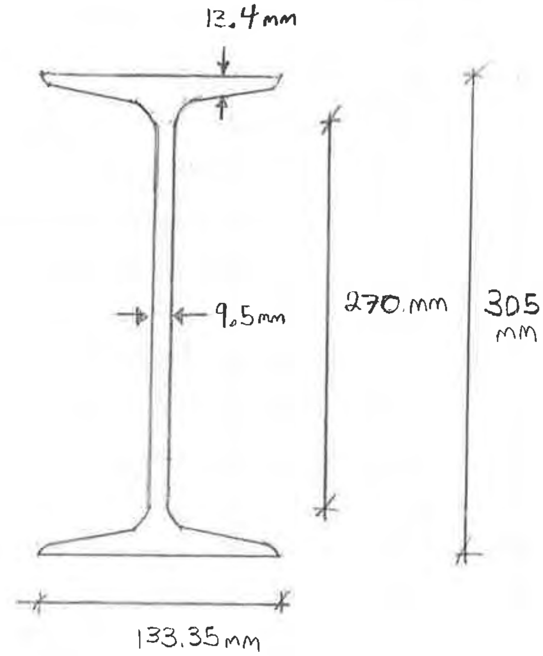
Subject: Floor Beams	Checked by: ARK	Date: 10/2018

Floor Beams

Section : S- 305 x 133
Material : Steel
Length = 3.96 m
Spacing = 5.49 m



Governing Forces

$V_f = 115.6$ kN (ULS2 - Veh)
$M_f = 98$ kN-m (ULS2 - Veh)

Section Class

$h/w = 270 / 9.5 = 28.4$
$b/t = 66.68 / 13.46 = 4.9$

$A_s = 6135\ mm^2$
$I_x = 9.12 \times 10^7\ mm^4$
$S_x = 5.89 \times 10^5\ mm^3$
$r_x = 122\ mm$

$I_y = 4.9 \times 10^6\ mm^4$
$S_y = 7.37 \times 10^4\ mm^3$
$r_y = 28\ mm$
$J = 2.75 \times 10^5\ mm^4$

Web :
Class 1 $< 1100/\sqrt{180} = 81.98$ ✓ (Flexure)
$< 670/\sqrt{180} = 49.9$ ✓ (compression)

Flange :
Class 1 $< 145/\sqrt{180} = 10.8$ ✓

Section is class 1 but will be analyzed as a Class 3 section

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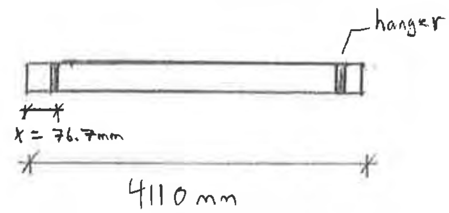
Moment Resistance



Beam is NOT Latteraly Supported

$$C_w = \frac{(d-t)^2 b^3 t}{24} \quad \text{(Galambos 1968)}$$

$$= \frac{(305 - 13.46)^2 \times 133.35^3 \times 13.46}{24}$$

$$= 1.13 \times 10^{11} \, mm^6$$

$$= 1.13 \times 10^{-7} \, m^6$$

$L_u = 3956 \, mm = 3.96 \, m$

$\omega_2 = 1.0$ (Simply Supported)

$$M_u = \frac{\omega_2 \pi}{L} \sqrt{E_s I_y G_s J + \left(\frac{\pi E_s}{L}\right)^2 I_y C_w} \quad \text{(4 10.10.2.3 - doubly Symmetric)}$$

$$= \frac{1.0\,\pi}{3.96m} \sqrt{200 \times 10^9 \, Pa \times 4.9 \times 10^{-6} m^4 \times 77 \times 10^9 \, Pa \times 2.75 \times 10^{-7} m^4 + \left(\frac{\pi \times 200 \times 10^9 \, Pa}{3.96 \, m}\right)^2 \times 4.9 \times 10^{-6} m^4 \times 1.13 \times 10^{-7} m^6}$$

$$= 0.793 \sqrt{2.075 \times 10^{10} + 1.39 \times 10^{10}}$$

$$= 147.7 \, kN\text{-}m$$

$M_y = f_y \times S_x = 180 \, MPa \times 5.89 \times 10^{-4} m^4 = 106 \, kN\text{-}m$

$M_u > 0.67 M_y$ ✓

∴ use 4 10.10.3.3(a)

$$M_r = 1.15 \phi_s M_y \left[1 - \frac{0.28 M_y}{M_u}\right] \leq \phi_s M_y$$

$$M_r = 1.15 \times 0.95 \times 106 \, kN\text{-}m \left[1 - \frac{0.28 \times 106 \, kN\text{-}m}{147.7 \, kN\text{-}m}\right] \leq 0.95 \times 106 \, kN\text{-}m$$

$M_r = 92.5 \, kN\text{-}m \leq 98$ (ULS2) ✗

$d/c = 1.05$

Floor beams fail in Flexure

Shear Resistance

Web is unstiffened ∴ $k_v = 5.34$ (§ 10.10.5.1)

$h/w = 270/9.5 = 28.42$

Case (a): $28.42 \leq 502\sqrt{k_v/F_y}$
$28.42 \leq 502\sqrt{5.34/180}$ ✓
$28.42 \leq 86.46$

∴ $F_{cr} = 0.577\,F_y$
$F_t = 0$

$F_s = F_{cr} + F_t = 0.577(180) + 0 = 103.86$ MPa

$A_w = d \times t_w = 305 \times 9.5 = 2897.5\ mm^2$ (d, since rolled shape)

$V_r = \phi A_w F_s = 0.95 \times 2897.5\ mm^2 \times 103.86$ MPa
$= 286.$ kN

$V_r > V_f$
286. > 115.6 kN (ULS 2-Veh) ✓ d/c = 0.40
> 56.8 kN (ULS 3-Ped) ✓ d/c = 0.20

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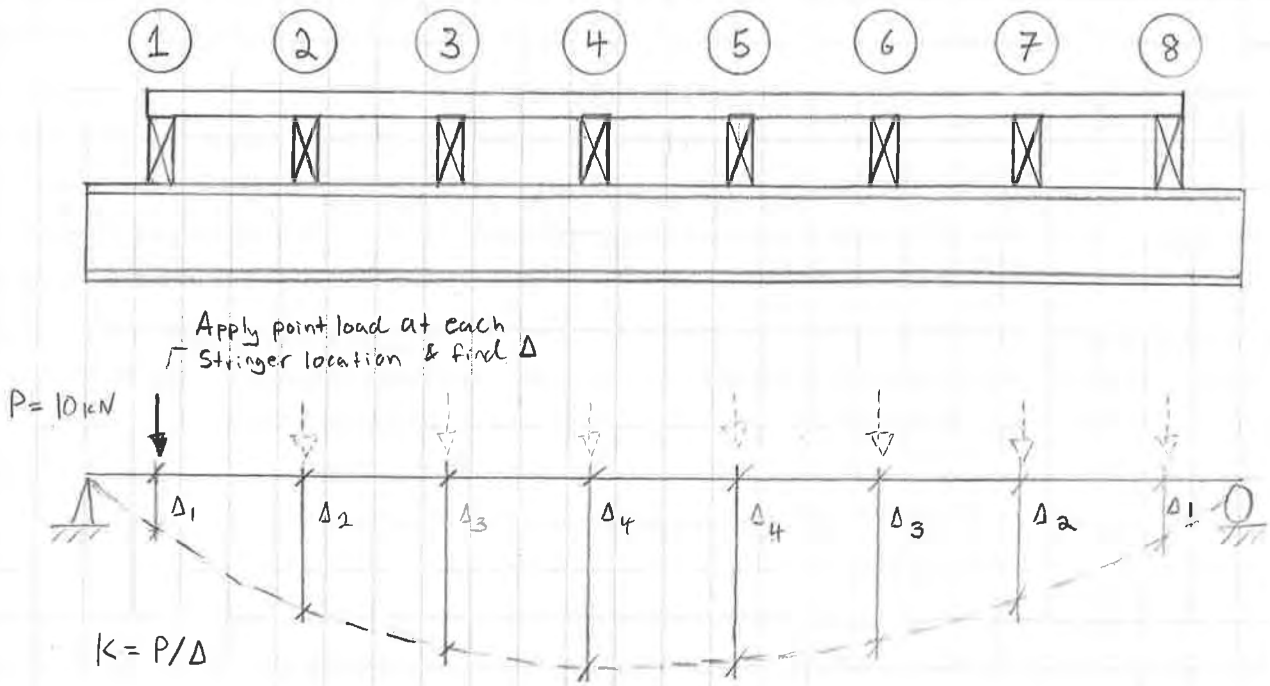
Stringer Analysis

A grillage analysis is used to determine the load sharing factor for the stringers. Since the stringers are supported on the floor beams which also deflect, the stringers will be modeled on Linear elastic spring supports based on the stiffness of the floorbeam @ the location of each stringer



$K = P/\Delta$

1. $x = 270$ mm , $\Delta = 0.083$ mm $\qquad K_1 = 1.205 \times 10^7$ N/mm
2. $x = 780$ mm , $\Delta = 0.459$ mm $\qquad K_2 = 2.17 \times 10^6$ N/mm
3. $x = 1290$ mm, $\Delta = 0.876$ mm $\qquad K_3 = 1.14 \times 10^6$ N/mm
4. $x = 1800$ mm, $\Delta = 1.135$ mm $\qquad K_4 = 8.81 \times 10^5$ N/mm

Summary:

Stringers fail in moment & shear for maintenance vehicle loading (ULS1) but pass for pedestrian loading (ULS3-Ped)

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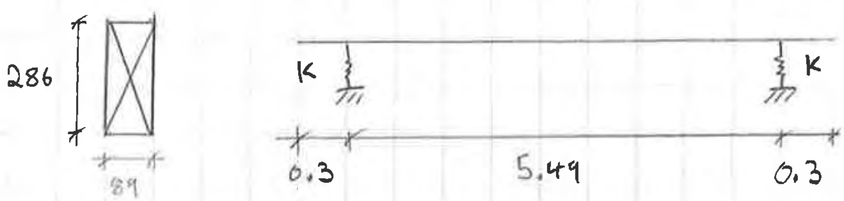
Grillage Analysis

Material: NO.2 SPF

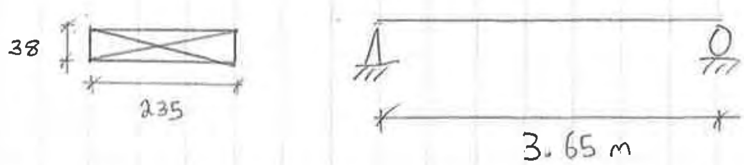
- $F_b = 8.4$ MPa
- $F_v = 1.2$ MPa
- $E_{50} = 8500$ MPa

Stringers: (89 x 286) mm



n = 8
Spacing = 0.52 m

Deck: (235 x 38) mm



n = 25
Spacing = 0.25

℄ 5.734, Distribute wheel load using larger of 0.25 m or plank width

Results

→ Exterior Stringer Loaded with Maintenance Vehicle Wheel Load

With Load Sharing: $M = 24.3$ kN-m
$V = 32.2$ kN

Without Load Sharing: $M = 42.9$
$V = 33.4$ kN

$F_m = 24.3 / 42.9 = 0.57 \approx$ 40% reduction
$F_v = 32.2 / 33.4 = 0.964 \approx$ No reduction

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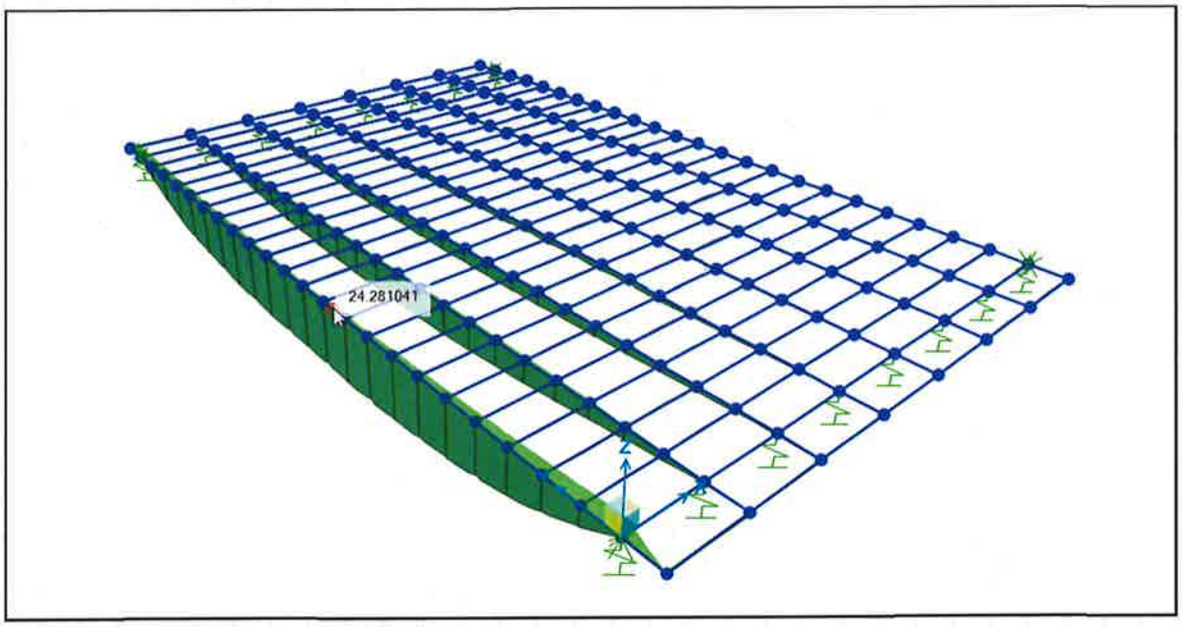
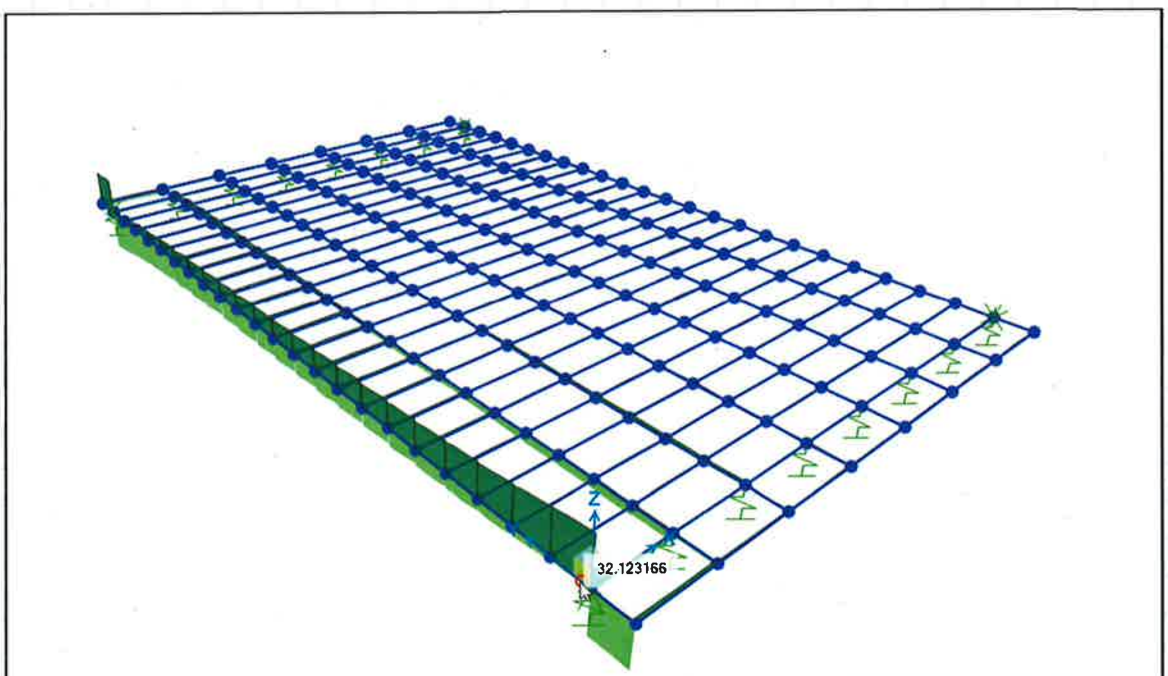
Grillage Moment Distribution:



Grillage Shear Distribution:



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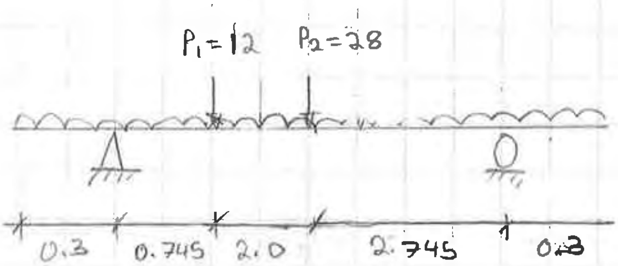
Stringer Analysis (Exterior)

$F_m = 0.6$
$F_v = 1.0$

Stringer Spacing = 0.52 m
Exterior Trib width = 0.26m



$W_{dead} = 0.089 \times 0.286 \times 6\, kN/m^3 = 0.15\ kN/m$
$W_{deck} = 0.23\ kPa \times 0.26m = 0.06\ kN/m$
$W_{ped} = 2.45\ kPa \times 0.26m = 0.64\ kN/m$
$W_{wind} = 1.025\ kPa \times 0.26m = 0.27\ kN/m$
$W_{snow} = 1.84\ kPa \times 0.26m = 0.48\ kN/m$

ULS 1

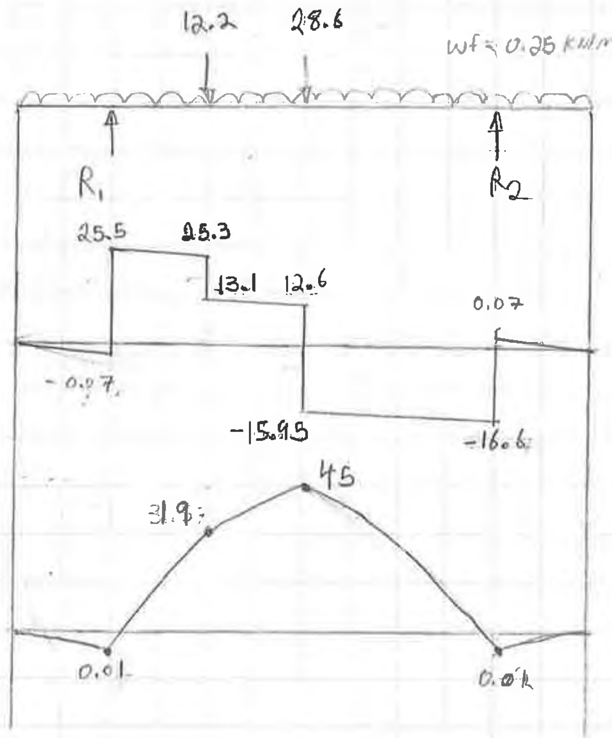
$W_f = 1.2(0.15 + 0.06) = 0.25\ kN/m$
$P_{f_1} = 1.7 \times 0.6 \times 12 = 12.2$
$P_{f_2} = 1.7 \times 0.6 \times 28 = 28.6$

$\circlearrowleft + \Sigma M_{R_1} = -12.2 \times 0.745 - 28.6 \times 2.745$
$- 0.25 \times 5.49 \times 2.745 + 0.25 \times 0.3 \times 0.15$
$- 0.25 \times 0.3 \times 5.64 + R_2 \times 5.49$

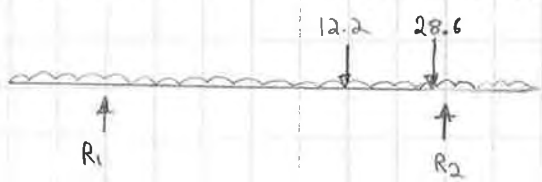
$R_2 = \dfrac{(9.1 + 78.5 + 3.77 - 0.011 + 0.42)}{5.49}$

$R_2 = 16.7\ kN$

$R_1 = 12.2 + 28.6 + 0.25 \times 6.1 - 16.7$
$R_1 = 25.6\ kN$



* Shear is maximum when wheel near support



$R_2 = 28.6 + 12.2 \times \dfrac{3.49}{5.49} + 0.25 \times 5.49/2 = 37\ kN$

$V_f = 37\ kN$ $D/C = 1.53$
$M_f = 45\ kN$ $D/C = 0.75$

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ULS 2 - Veh

$W_f = 1.2\,(w_{dead} + w_{Deck}) + 0.5\, w_{snow}$

$= 1.2\,(0.15 + 0.06) + 0.5\,(0.48)$

$= 0.25 + 0.24$

$= 0.49$ kN > 0.25 but not significant $0.49 \times 6.1 = 2.99$ kN

$P_{f_1} = 1.6 \times 0.6 \times 12 = 11.5 < 12.2$ (ULS 1)

$P_{f_2} = 1.6 \times 0.6 \times 28 = 26.9 < 28.6$ (ULS 1) ∴ ULS 1 Governs

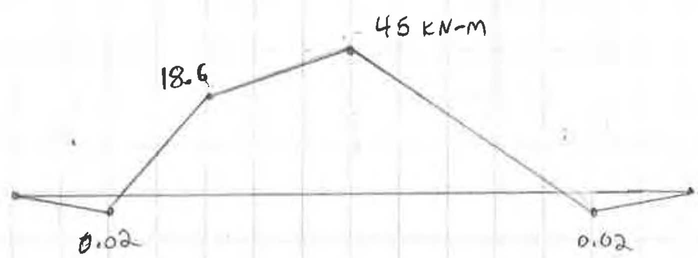
$$R_2 = \frac{(11.5 \times 0.745 + 26.9 \times 2.745 + 0.49 \times 5.49 \times 2.745 + 0.49 \times 0.3 \times 1.5 - 0.49 \times 0.3 \times 5.64)}{5.49}$$

$R_2 = 16.2$ kN

$R_1 = 11.5 + 26.9 + 0.49 \times 6.1 - 16.2$

$R_1 = 25.2$ kN

M



* Shear is Maximum near the support

$V_f = R_1 = 25.2 + 11.5 \times \frac{3.49}{5.49} + 0.49 \times 6.1/2 = 34$ kN

$M_f = 45$ kN $= 45$ kN (ULS 1)

$V_f = 34$ kN < 37 kN (ULS 1) ∴ ULS 1 Governs

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Stringer Analysis (Interior)

$W_{dead} = 0.089 \times 0.286 \times 6\ kN/m^3 = 0.3\ kN/m$

$W_{deck} = 0.23\ kPa \times 0.52\ m = 0.12\ kN/m$

$W_{Ped} = 2.45\ kPa \times 0.52\ m = 1.27\ kN/m$

$W_{wind} = 1.025\ kPa \times 0.52\ m = 0.533\ kN/m$

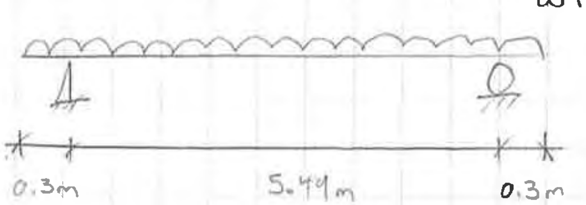
$W_{snow} = 1.84\ kPa \times 0.52\ m = 0.96\ kN/m$

Maintenance Vehicle case Most Critical @ exterior Stringers
Pedestrian case Most Critical @ interior Stringers

* Maintenance vehicle will govern for Interior & Exterior

Governing Pedestrian Case: ULS 3 - Ped

ULS 3 - Ped



$\alpha_d = 1.1$ $\quad W_{FD} = 0.33\ kN/m$

$\alpha_{SDL} = 1.2$ $\quad W_{F_{SDL}} = 0.144\ kN/m$

$\alpha_{Ped} = 1.4$ $\quad W_{f\,Ped} = 1.8\ kN/m$

$\alpha_{wind} = 0.45$ $\quad W_{f\,wind} = 0.24\ kN/m$

$\alpha_{Snow} = 0.5$ $\quad W_{f\,snow} = 0.48\ kN/m$

$W_f = 2.97\ kN/m$

$R_1 = R_2 = 2.97 \times 6.1 / 2 = 9.05\ kN$

$M_f = \dfrac{2.97 \times 2.745^2}{2} + 2.97 \times 0.3 \times 2.9 - 9.05 \times 2.745$

$M_f = 11.2\ kN + 2.58\ kN = 24.8$

$M_f = \underline{\underline{11.0\ kN\text{-}M}}$ $\qquad D/C = 0.92$ ✓

$V_f = 9.05 - 2.97 \times 0.3 = \underline{\underline{8.16\ kN}}$ $\qquad D/C = 0.34$ ✓

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Governing Loads

$V_f = 37$ kN (ULS 1)
$M_f = 45$ kN-m (ULS 1)

Moment Resistance

$K_{sb} = 1.1$ (Table 9.4, Smaller Dim = 89, Larger Dim = 286)

$K_d = 1.0$ (℄ 9.5.3, Dead & Live, ULS 1)

$D_e = 1.75$ m (Table 9.3, Stringer of Sawn Timber)
$K_m = 1.20$ (Table 9.2, $n = 3$ → Spacing = 0.5 m, $n = 1.75/0.5 = 3$)

$K_{ls} = 1.0$ (℄ 9.6.3, Stingers Latteraly supported by Deck)

$f_{bu} = 8.4$ MPa,

$$M_r = \phi K_d K_{ls} K_m K_{sb} f_{bu} S_x = 0.9 \times 1 \times 1 \times 1.2 \times 1.1 \times 8.4 \times 1.21 \times 10^6 \text{ mm}^3$$
$$= 12 \text{ kN-m}$$

$M_r \leq M_f$
12 < 45 kN-m ✗ D/C = 3.75

12 > 10.5 kN-m ✓ (ULS 3-Ped) D/C = 0.88

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Shear Resistance

$K_d = 1.0$
$K_m = 1.2$
$K_{sv} = K_{sb} = 1.1$

$f_{vu} = 1.2$

$V_r = \phi K_d K_m K_{sv} f_{vu} A / 1.5$
$V_r = 0.9 \times 1 \times 1.2 \times 1.1 \times 1.2\ MPa \times 25{,}454\ mm^2 / 1.5 = \underline{\underline{24.2\ kN}}$

$V_r < V_f$
$24.19\ kN < 37\ kN$ ✗ $d/c = 1.53$

$24.2 > 7.5\ kN$ ✓ (ULS3-Ped) $d/c = 0.31$

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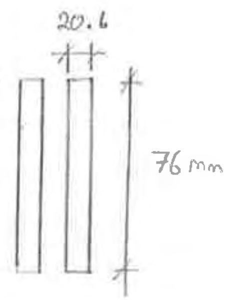
	Notes By: MC	Date: 10/2018
Subject: Bottom Chord	Checked by: ARK	Date: 10/2018

Bottom Chord

Member : L4 - L5
Section : E2 - 76 x 20
Material : Wrought Iron



$A_g = 3140 \text{ mm}^2$
$L = 5490 \text{ mm}$
$F_y = 180 \text{ MPa}$

Loads (Axial)

Dead = 45.5 kN
Live = 77.9 kN
Ped = 137.4 kN
SDL = 32.3 kN
Wind = 86.1 kN
Snow = 103.4 kN

Governing Load Case = ULS 3 - Ped

$T_f = 1.1(45.5) + 1.4(137.4) + 1.2(32.3) + 0.45(86.1) + 0.5(103.4) = 371.6 \text{ kN}$

Tension Resistance

$\phi_s = 0.95$ (℄ 10.5.7, Tension)

$\text{Slenderness} = \frac{L}{r_x} = \frac{5.49 \text{ m}}{0.0219 \text{ m}} = 250.7 > 200$ X fail (℄ 10.8.1.2)

$T_r = \phi_s A_g f_y = 0.95 \times 3140 \times 180 \text{ MPa} \times 10^{-3} = \underline{\underline{536.9 \text{ kN}}}$

$T_r > T_f$
$537 > 372$ ✓ Okay

$T_f / T_r = 0.69$

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Subject: Verticals	Checked by: ARK	Date: 10/2018

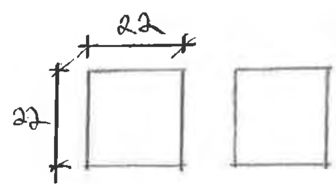
Verticals

Critical Vertical Members:

U2-L2, U7-L7 (V1): SQ2-22 (Tension)
U3-L3, U6-L6 (V2): S-98x116 (Compression)

U2-L2/U7-L7 (V1)

Governing Load case = ULS2 - Veh
T_f = 98.3 kN



$A_g = 968\ mm^2$
$r_x = 9\ mm$
$L = 5490\ mm$

$f_y = 180$ MPa

Tension Resistance

$\phi_s = 0.95$

$$\text{Slenderness} = \frac{L}{r_x} = \frac{5.49}{0.00898} = 611 > 200 \quad \times \text{ fail } (\S 10.8.1.2)$$

$$T_r = \phi_s A_g f_y = 0.95 \times 968 mm^2 \times 180 MPa \times 10^{-3} = \underline{\underline{165\ kN}}$$

$T_r > T_F$
165 kN > 98.3 kN ✓ okay

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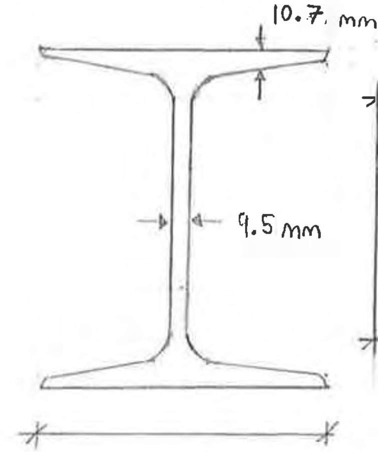
U3-L3/U6-L6

Section: S-98x116
Material: Steel



Governing Forces

C_f = 80.3 kN (ULS 2-Veh)
M_f = 1.2 kN-m (ULS 4)
V_f = 0.82 kN-m (ULS 4)

Section Class

$b/t = 57.9/10.67 = 5.43$
$h/w = 98.4/9.53 = 10.33$

$A_s = 3208\ mm^2$
$I_x = 5.15 \times 10^6\ mm^4$
$S_x = 1.05 \times 10^5\ mm^3$
$r_x = 40\ mm$

$I_y = 2.77 \times 10^6\ mm^4$
$S_y = 4.79 \times 10^4\ mm^3$
$r_y = 29\ mm$
$J = 1.09 \times 10^5\ mm^4$

Web:

Compression

Class 1 < $670/\sqrt{180} = 49.9$ ✓

Flexure

$1100/\sqrt{180} = 81.98$ ✓

Flange:

Class 1 < $145/\sqrt{180} = 10.8$ ✓

Section is Class 1 for Flexure & Compression, however the Section will be analysed as a Class 3 Section to be Conservative

* Since the Maximum Moment & Shear in the Section is negligible, Hand Calculations these Resistances are not Provided

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Compression Resistance

Length = 5.49 m

Unbraced $Length_x$ = 5.49 m
Unbraced $Length_y$ = 5.49 m

K = 1.0 Pin-Pin (Table 9.6)

$$Slenderness_x = \frac{KL_x}{r_x} = \frac{1.0 \times 5.49}{0.04\,m} = 137.2 > 120 \times \quad (\text{℄ } 10.9.1.3)$$

$$Slenderness_y = \frac{KL_y}{r_y} = \frac{1.0 \times 5.49}{0.0294\,m} = 186.7 > 120 \times \quad (\text{℄ } 10.9.1.3)$$

Buckling in the Y-Axis Governs

$$\lambda_y = \frac{KL_y}{r_y}\sqrt{\frac{F_y}{\pi^2 E_s}} = 186.7\sqrt{\frac{180}{\pi^2 \times 200\,000}} = 1.78$$

$$Cr = Cr_y = \phi_s A_s F_y (1+\lambda^{2n})^{-\frac{1}{n}}$$
$$= 0.9 \times 0.003208 \times 180 (1+1.78^{2\times1.34})^{-\frac{1}{1.34}} \times 10^6$$
$$= 141.8\ kN$$

(℄ 10.9.3.1, Flexural Buckling)

Crx = 141.8 kN > 80.3 kN ✓

$Cf / cr_y = 0.57$

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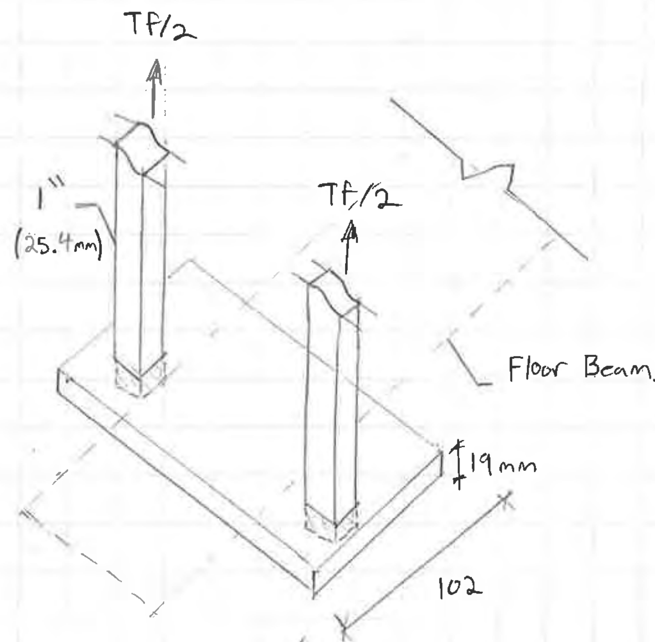
Hangers



$A_s = 25.4\,mm \times 25.4\,mm$
$= 645.16\ mm^2$

* Base of Hanger is threaded

from Portland Bolt:
- 1" Coarse
- $A_{min} = 0.551\ A$
  $= 0.551\ (645.16)$
  $= 355.5\ mm^2$

$Tf_{max} - Ped = 65.7\ kN$ (ULS-3-Ped) $d/c = 0.54$ ✓
$Tf_{max} - Veh = 97.2\ kN$ (ULS-2-Veh) $d/c = 0.8$ ✓

$Tr = \phi_s A_s F_y = 0.95 \times 355 \times 180 \times 2$ Hangers
$= \underline{\underline{121\ kN}}$

$A_v = 19 \times [102 - (25+4)] = 1387\ mm^2$

$h \approx 19\ mm$ $\quad h/w = 19/102 < 502\sqrt{\frac{K_v}{F_y}}$
$w \approx 102\ mm$ $\quad = 0.186 < 502\sqrt{\frac{5.34}{180}}$
$= 0.186 < 86.4$ $\quad \therefore F_{cr} = 0.577\,f_y$
$F_t = 0$

$V_r = \phi\ A_v\ 0.577\ f_y$
$= 0.95 \times 1387\,mm^2 \times 0.577 \times 180\ MPa \times 10^{-3}$
$= 137\ MPa$

$V_r = 137\ MPa > 97.2/2 = 48.6\ kN$ ✓ $d/c = 0.35$

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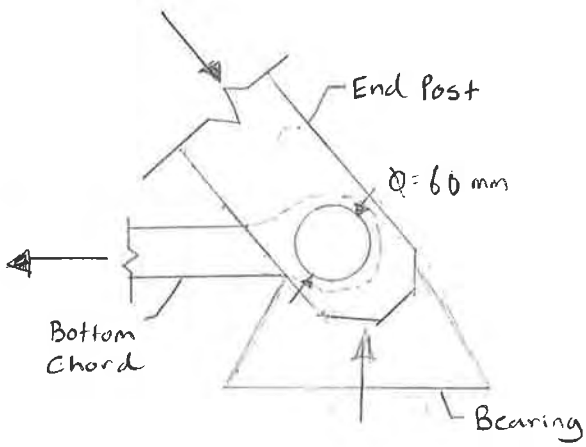
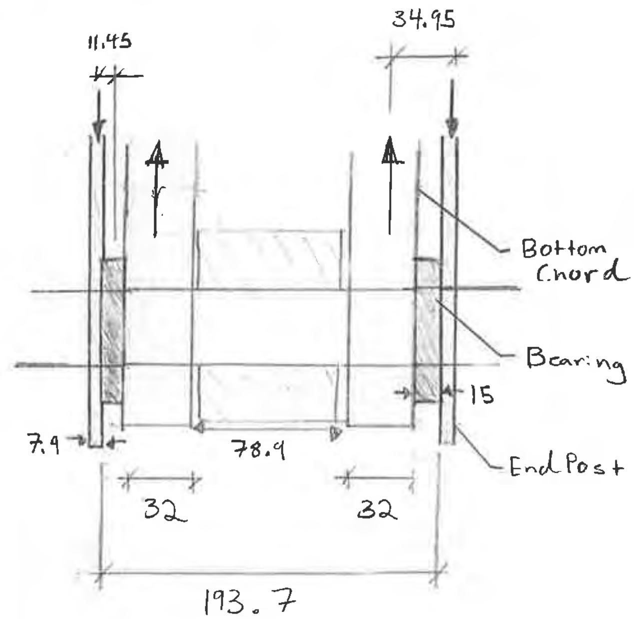
Pin at Pier / Abutment (L1)





$Area = \pi (60/2)^2 = 2827\ mm^2$

$S = \pi (60)^3 / 32 = 21205\ mm^3$

$F_y = 180\ MPa$

$M_r = \phi_s S F_y = 0.95 \times 21205\ mm^3 \times 180\ MPa \times 10^{-6}$ (cl 10.20.1.2)

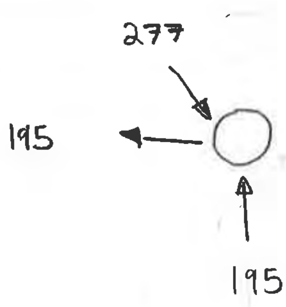
$= 3.63\ kN\text{-}m$

$V_r = 0.6 \phi_s A F_y = 0.6 \times 0.95 \times 2827\ mm^2 \times 180\ MPa \times 10^{-3}$ (cl 10.20.2.2)

$= 290\ kN$

Max Tension in Bottom Chord $= T_f = 195\ kN$ (ULS 3 - Ped)

Max Compression in End Post $= C_f = 277\ kN$ (ULS 3 - Ped)



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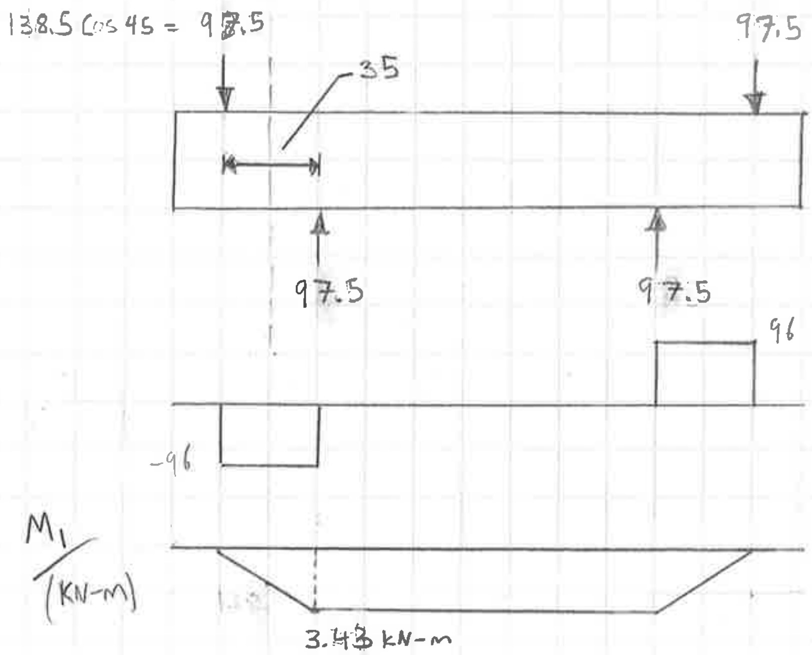
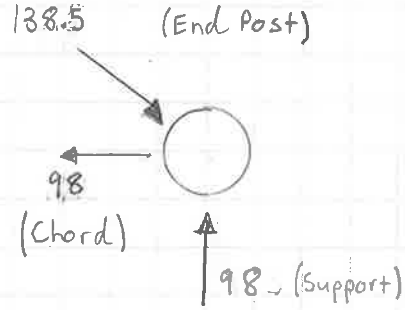
Shear Moment Diagrams (LI)

Horizontal Plane (X)



P/2

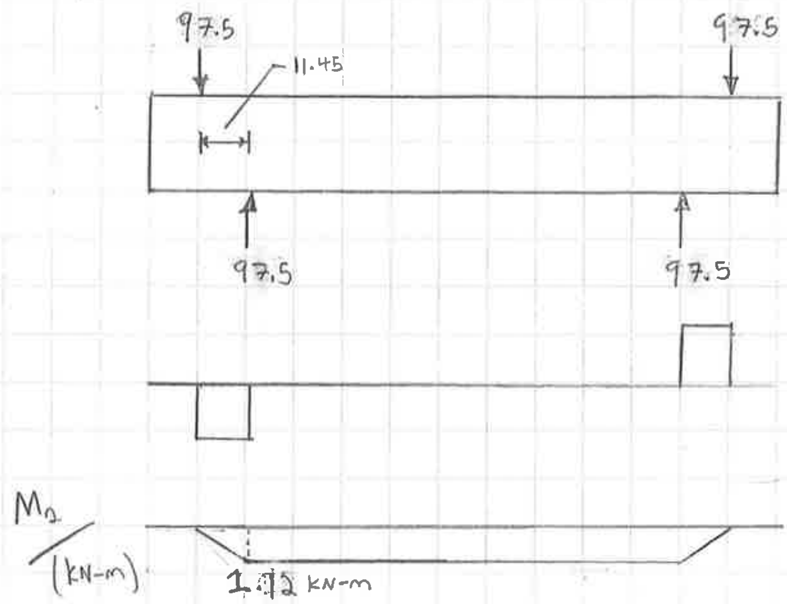


Vf = 136.5 kN

Mf = 3.[illegible] kN-m

Super Imposed Moment

Vertical Plane (Y)



Mr = 3.63 > 3.56 ✓

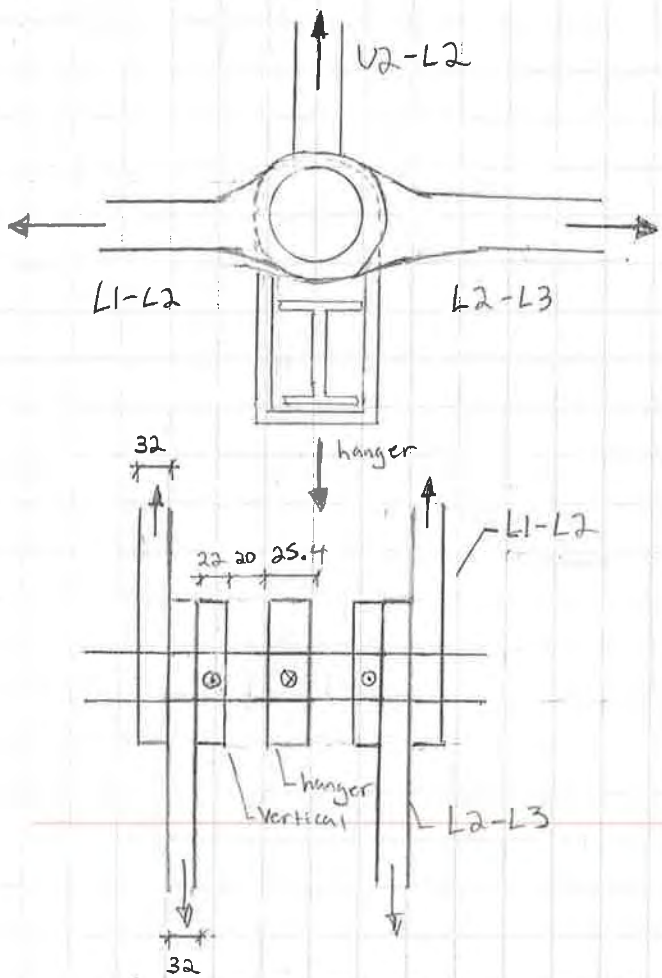
Vr = 260 > 136.5 ✓

$$\frac{M_f}{M_r} + \left(\frac{V_f}{V_r}\right)^3 = \frac{3.6}{3.63} + \left(\frac{136.5}{290}\right)^3$$

$= 1.10 > 1.$ X

Pin fails in combined Shear & Bending

Pin at L2



ULS3-Ped

Element	Force
L_1-L_2	195.3
L2-L3	195.3
U2-L2	57
Hanger	57

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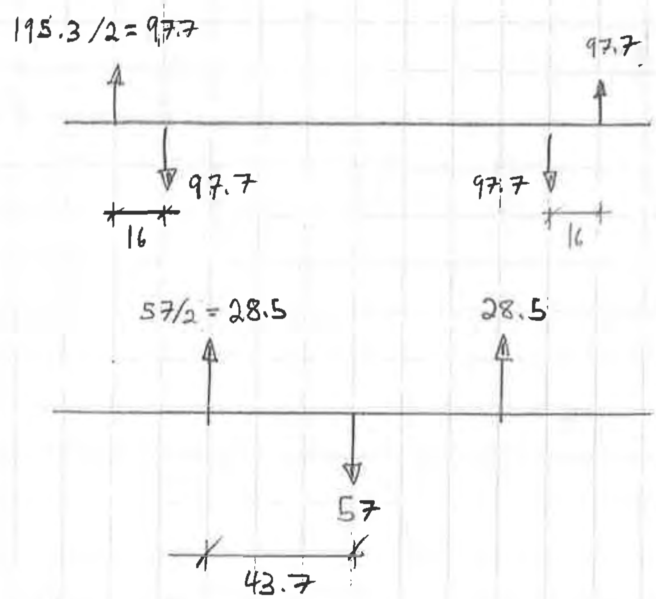
Shear & Moment in Pin L2

ULS 3 - Ped:

X - Axis:



$V_f = 98$ kN

$M_{f_{x\,mid}} = 98 \times 0.016 = 1.5$ kN-m

$M_{f_{y\,mid}} = 28.5 \times 0.0437 = 1.25$ kN-m

$M_f = \sqrt{1.57^2 + 1.25^2} = 2$ kN-m

$V_r = 260$ kN > 98 kN ✓

$M_r = 3.63$ kN > 2 kN-m ✓

$$\frac{M_f}{M_r} + \left(\frac{V_f}{V_r}\right)^3 = \frac{2}{3.63} + \left(\frac{98}{290}\right)^3$$

$$= 0.59 < 1.0 \checkmark$$

Pins @ L2 are okay

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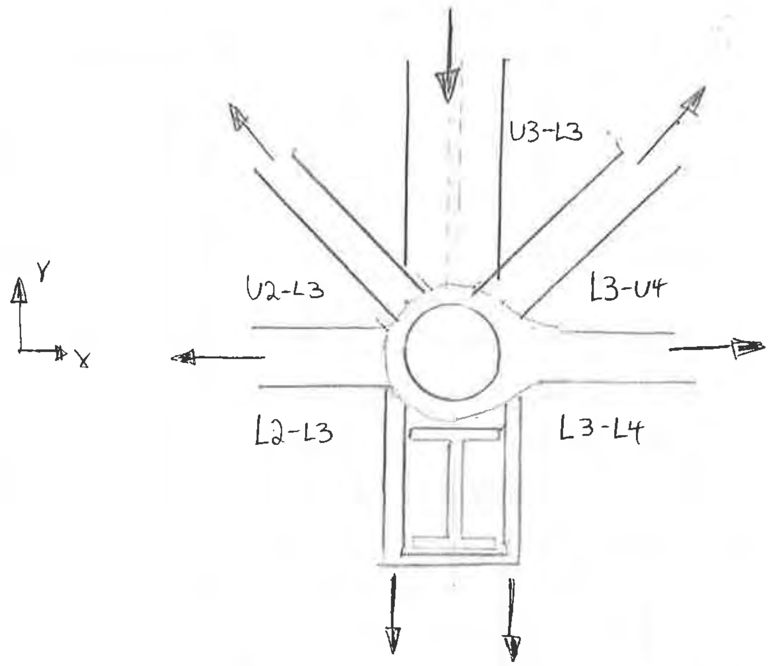
Pin at Joint L3



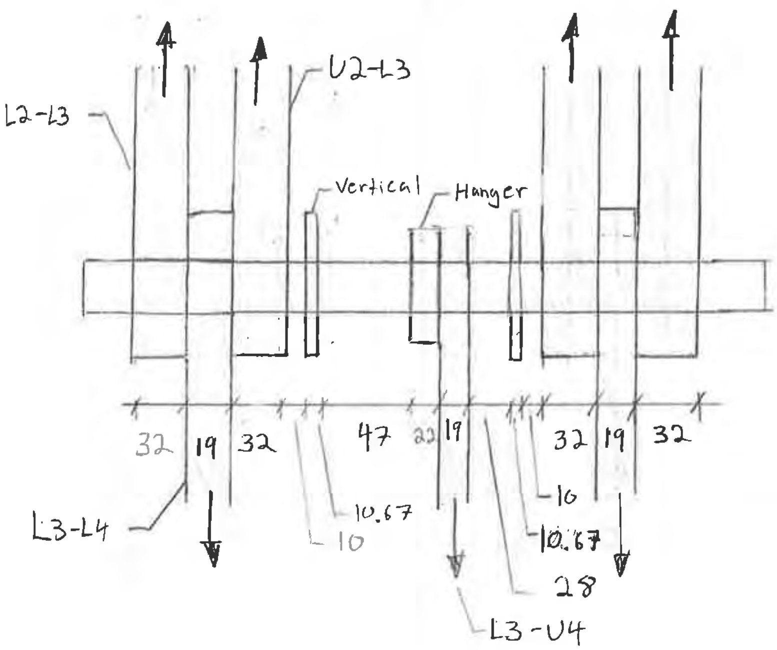
Element	Max Force	Case
L2-L3	195.8	ULS3-Ped
L3-L4	324.2	ULS3-Ped
U2-L3	182[illegible]	ULS3-Ped
L3-U4	0	ULS3-Ped
U3-L3	-70	ULS3-Ped

Shear in X-Plane will govern

Pin diamater = 60 mm

M_r = 3.63 kN-m

V_r = 290 kN



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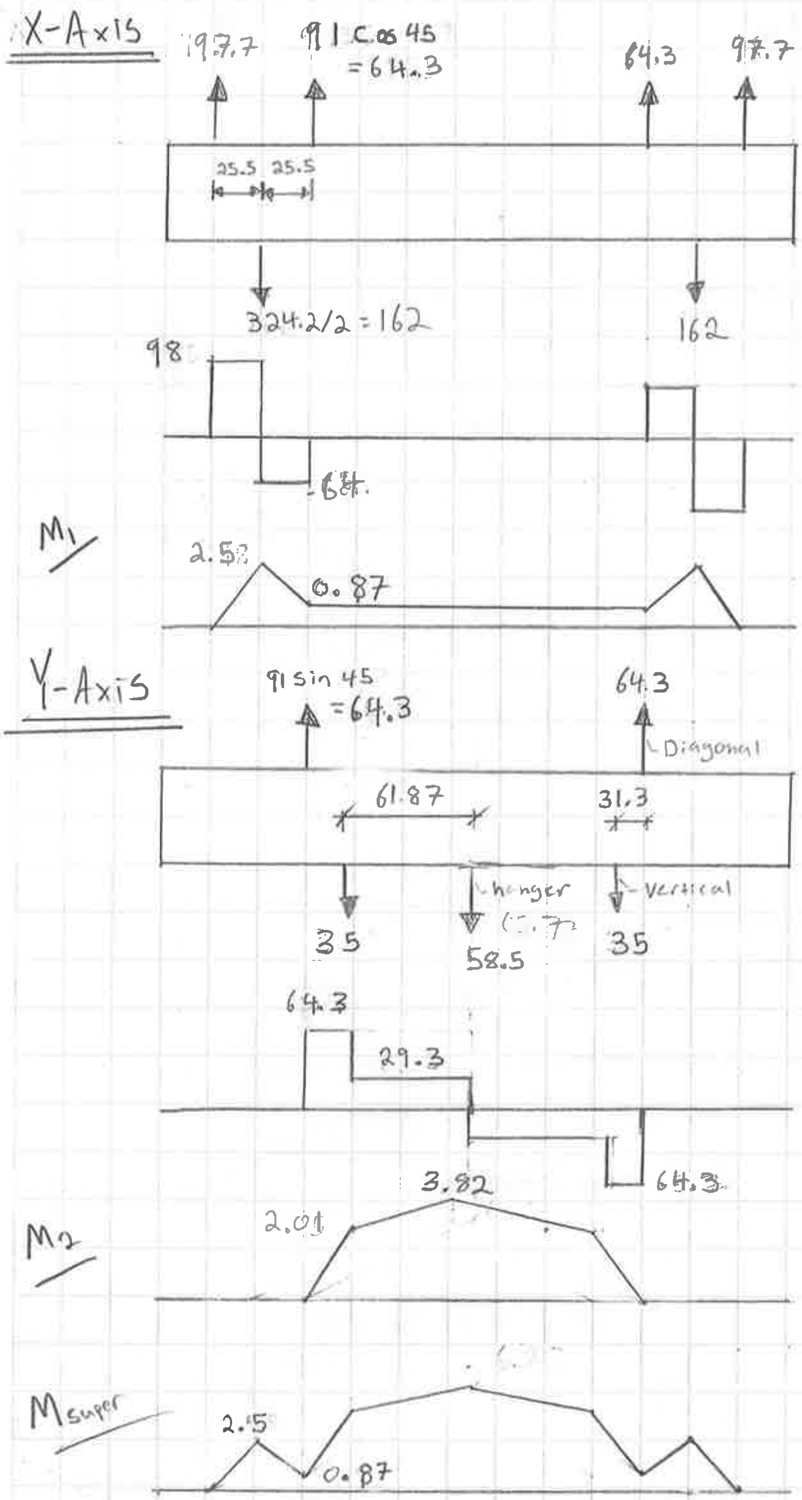
Shear & Moment Diagrams (L3)



$V_f = 97.7$ kN (X-Axis)

$M_f = \sqrt{0.87^2 + 3.82^2} = 3.92$

$M_r = 3.63 < 3.92$ ✗

$V_r = 260 > 97.7$ ✓

$$\frac{M_f}{M_r} + \left(\frac{V_f}{V_r}\right)^3 = \frac{3.92}{3.63} + \left(\frac{97.7}{290}\right)^3 = 1.12$$

Pins at L3 fail in Bending

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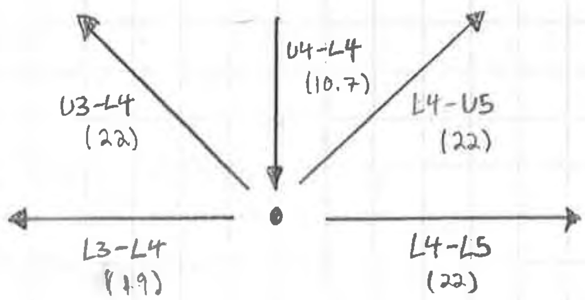
Pin at L4

* Simmilar to L3

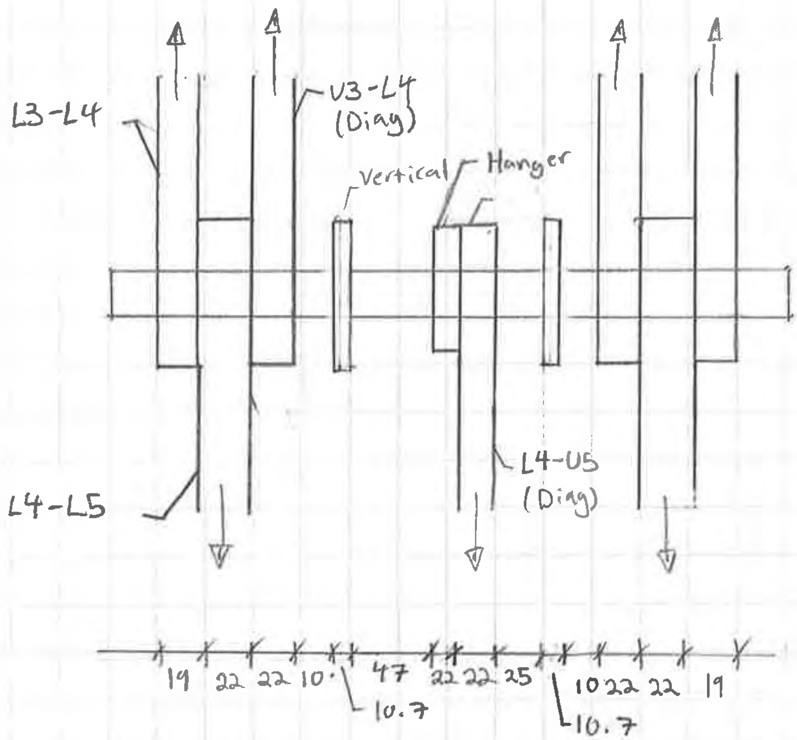


Case: ULS 3-Ped

Element	Max Force
L3-L4	324
L4-L5	386
U3-L4	91
L4-U5	3.6
U4-L4	-7

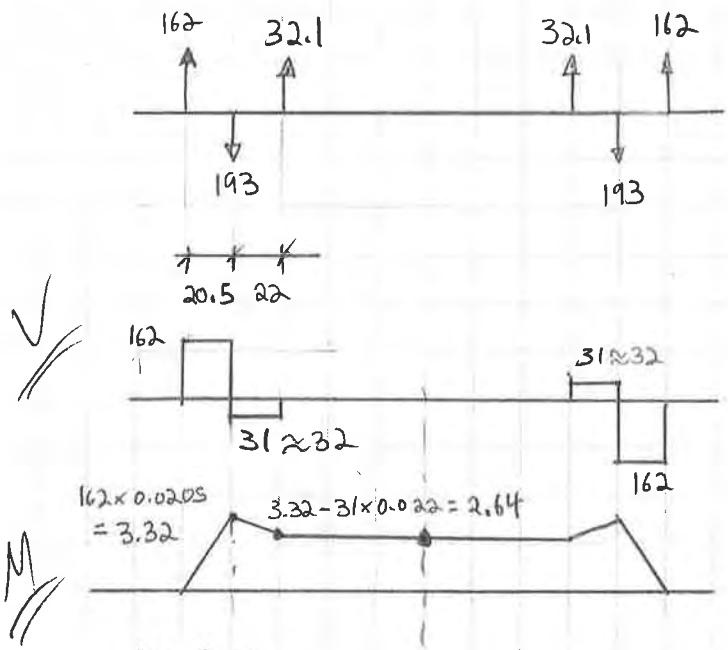
Shear in the Horizontal (x) Plane will govern

(xx) : Thickness mm

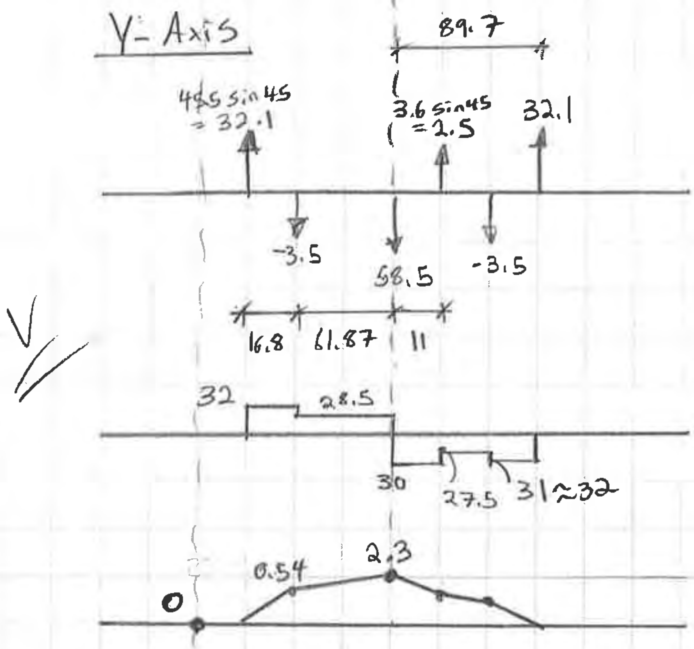


Pin at L4

X-Axis



Y-Axis



Max Super Imposed Moment occurs @ Midspan

$M_F = \sqrt{2.64^2 + 2.3^2} = 3.5$ kN-m

$V_F = 162$ kN (x-Plane)

$\frac{3.5}{3.63} + \left(\frac{162}{290}\right)^3 = 1.14$

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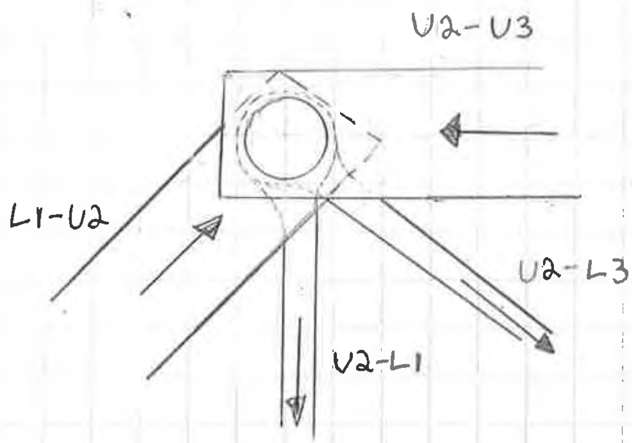
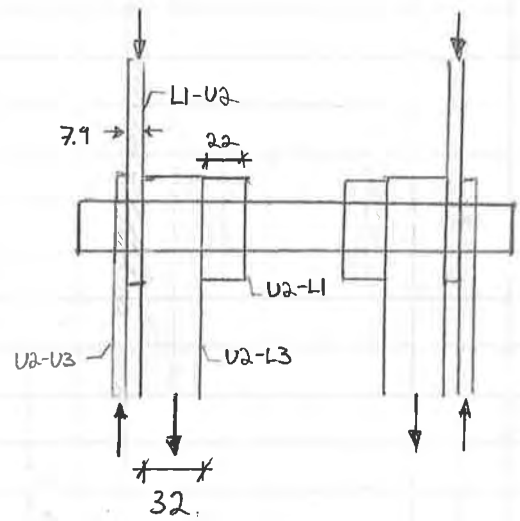
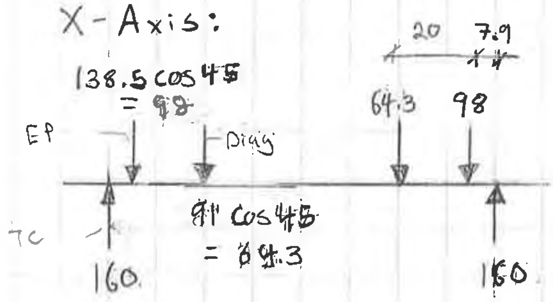
Pin at U2

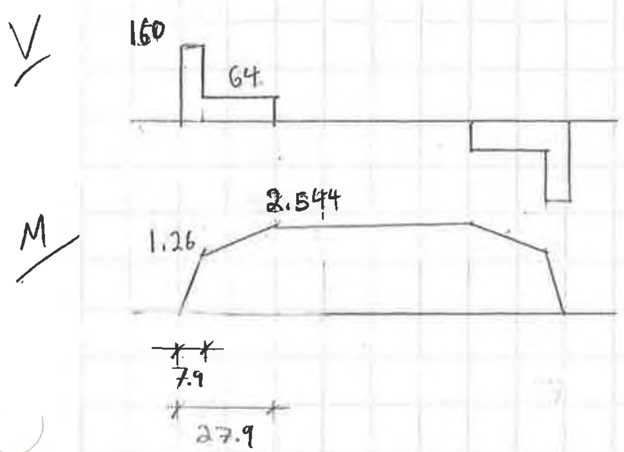




ULS3 - Ped

X-Axis:





Case = ULS3 - Ped

Element	Force (kN)
L1-U2	277
U2-U3	320
U2-L3	182
U2-L2	58.5

$e_1 = 7.9$

$e_2 = 7.9/2 + 32/2 = 20$

$M_{1x} = 160 \times 0.0079 = 1.26 \text{ kN-m}$

$M_{2x} = M_{1x} + 63 \times 0.02 = 2.54 \text{ kN-m}$

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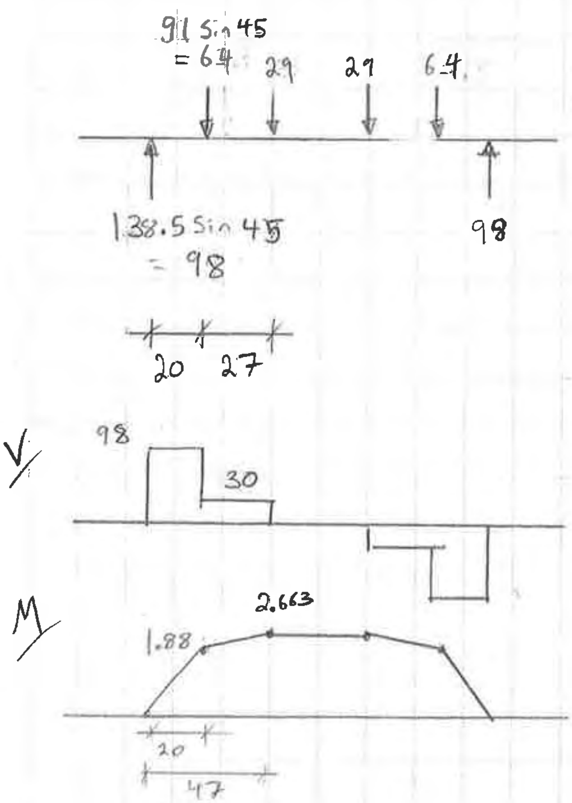
Shear & Moment in Pin U2

Y-Axis :



$e_1 = 20$

$e_2 = 32/2 + 22/2 = 27$

$M_{1y} = 98 \times 0.02 = 1.96$

$M_{2y} = M_{1y} + 29 \times 0.027 = 2.74$

Max Super Imposed Moment @ Midspan

$M_f = \sqrt{2.74^2 + 2.54^2}$

$= 3.76$ KN-m

VF = 160 KN (X-Axis)

$M_r = 3.63$ kN-m $> M_f = 3.59$ kN-m ✓

$V_r = 290$ kN $> V_f = 153$ kN

$\frac{M_f}{M_r} + \left(\frac{V_f}{V_r}\right)^3 = \frac{3.76}{3.63} + \left(\frac{160}{290}\right)^3$

$= 1.2 > 1$ ✗

Pin fails in combined Shear & Moment

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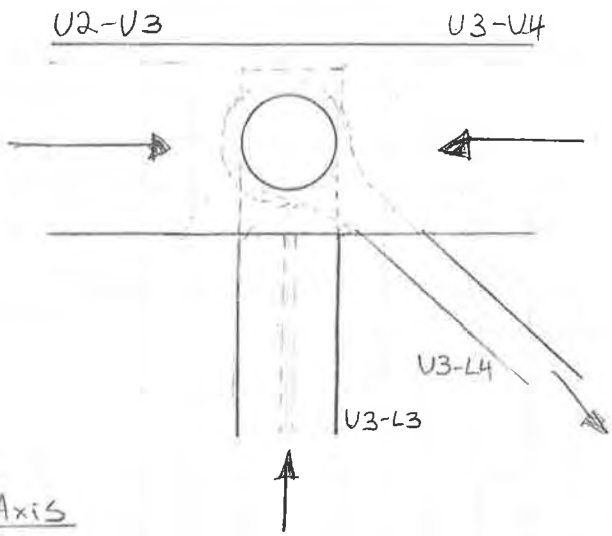
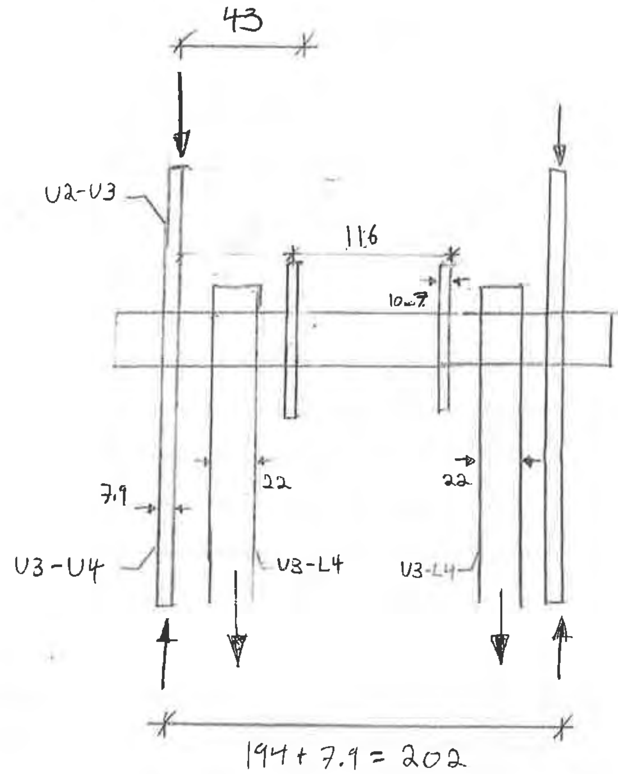
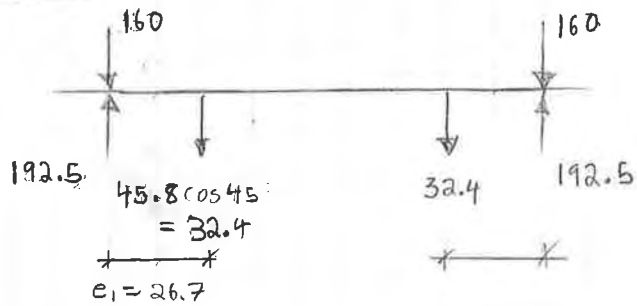
Pin at U3





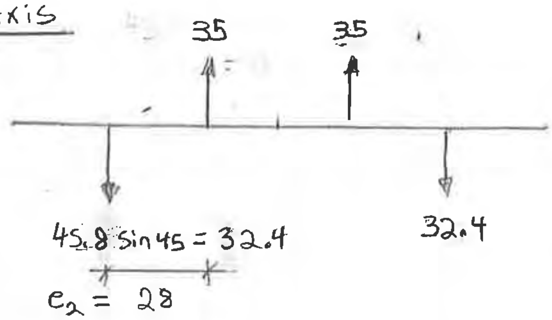
X-Axis



Case = ULS3-Ped

Element	Force
U2-U3	320
U3-U4	385
U3-L4	91.5
U3-L3	70

Y-Axis



e_1 : worst case when Diagonal against vertical

$\rightarrow e_1 = 26.7$

e_2 : worst case when Diagonal against web of Top chord

$\rightarrow e_2 = 28$

$V_f = 32.4\ kN < V_r = 290\ kN$ ✓

$M_{f_x} = 32.4 \times 0.0267 = 0.87$

$M_{f_y} = 32.4 \times 0.028 = 0.91$

$M_f = \sqrt{0.87^2 + 0.91^2} \rightarrow 1.26\ kN\text{-}m < M_r = 3.63\ kN\text{-}m$ ✓

$\frac{1.26}{3.63} + \left(\frac{32.4}{290}\right)^3 = 0.35$

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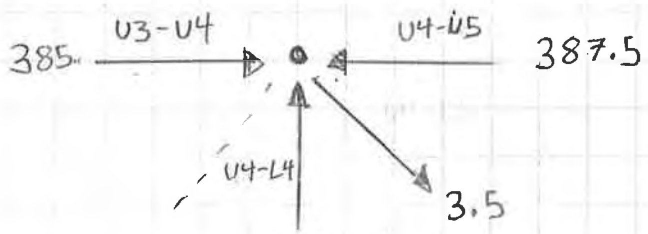
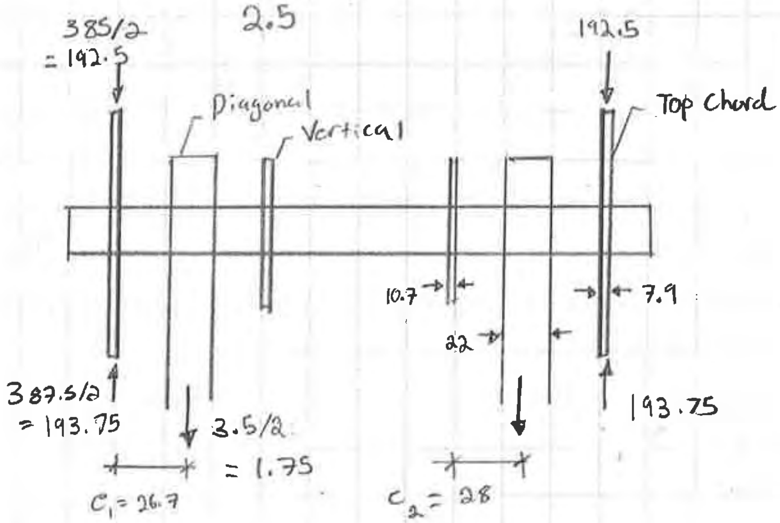
Pin at U4

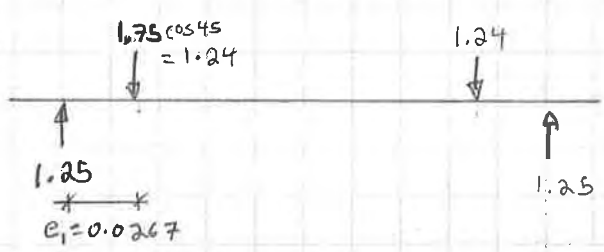
* Same Members & eccentricity as Pin U3

Case: ULS 3 - Ped

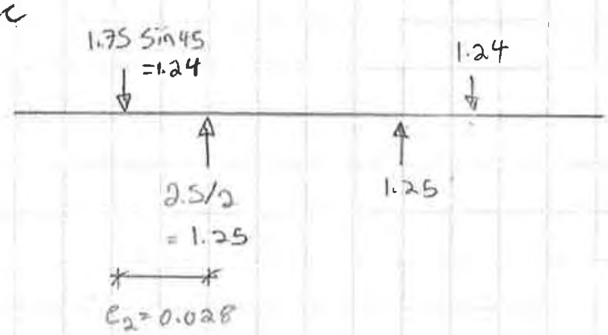




X-Plane



y-Plane



$V_f = 1.25$ kN

$M_{f_x} = 1.25 \times 0.0267 = 0.034$ kN-m

$M_{f_y} = 1.25 \times 0.028 = 0.035$ kN-m

$M_f = \sqrt{0.035^2 + 0.034^2} = 0.049$ kN-m

$V_r = 290 > 1.25$ ✓

$M_r = 3.63 > 0.049$ ✓

$$\frac{0.049}{3.63} + \left(\frac{1.25}{290}\right)^3 = 0.013 < 1 \checkmark$$

Appendix D

Renewal Options Analysis Memorandum

MEMO

TO: Kosta Karadakis, P. Eng., City of Ottawa, Assets Management Branch
FROM: Marc-Andre Chainey, P. Eng., Dillon Consulting Limited
cc: Nathan Bakker, P. Eng., Project Manager, Dillon Consulting Limited
DATE: May 14, 2019
SUBJECT: Decommissioning of Porters Island Bridge – Renewal Options Analysis
OUR FILE: 188142

The City of Ottawa (City) is investigating the possibility of decommissioning the Porters Island Pedestrian Bridge (SN013260). The bridge is two span (38.4 m – 38.4 m) pin-connected wrought iron Pratt through truss that spans the south branch of the Rideau River in Ottawa, between Porters Island and St. Patrick Street. The bridge was constructed in 1894 and is currently closed to all pedestrian traffic and is used solely to carry an Enbridge gas main onto Porters Island.

Dillon Consulting Limited (Dillon) completed an analysis of renewal options alternatives for Porters Island Pedestrian Bridge. The renewal options analysis presents and evaluates three different renewal options including construction cost estimates for current renewal need and life-cycle cost estimates. In addition, based on the known heritage value of the structure, we have incorporated comments into this analysis to identify how heritage value could be addressed. As outlined in the proposal for this assignment, the following renewal options were evaluated for this structure 1) structure decommissioning; 2) maintain current structure functionality; and 3) reinstate existing structure as a pedestrian crossing. The purpose of this study is to further develop the above-predefined renewal options and to provide the City with an understanding of the potential financial implications of each. Therefore, a recommended renewal option has not been selected. This memo summarizes the results of the renewal options analysis.

The renewal options developed and analysed in this memo are based on the findings of the Impact Assessment including the 2018 OSIM Inspection and the Structural Evaluation. The contents of the Impact Assessment Report, including appendices, is considered an integral part of this memo. While significant findings affecting renewal options are summarized herein, the reader is directed to the full report for the comprehensive background taken into consideration in the development of the renewal options presented below.

Development of Renewal Options

Structural Deficiencies and Concerns Identified

The following outlines the major deficiencies and concerns to be addressed by the different renewal options based on the findings of 2018 OSIM Inspection and the Structural Evaluation.

Defects and Deterioration

- The timber deck system (deck boards and stringers) is in poor to fair condition with severe weathering and rotting noted throughout. Full replacement of the timber deck system is recommended.
- Severe section loss of the bearings and bottom chord members was noted at the south abutment. The bearings and bottom chord members were not accessible for inspection at the north abutment, and similar deterioration to the section loss observed at the south abutment is assumed.
- Visual crack indications were noted at several truss members at the forged lap of loop-welded eyebars (verticals, diagonals and bottom chord).
- Severe corrosion and a cracked spacer was observed at the southeast bearing of the pier.

Structural Behavior

- The expansion bearings at both abutments are seized and are not permitting unrestricted thermal movement of the structure.
- Loading of truss members is not evenly distributed to individual eyebars based on field observations. Therefore the evaluation considers loading of a single eyebar (vs. sharing between two adjacent eyebars) which is in line with recommended practice for pin-connected eyebars.
- Several bottom chord members appear to be partially or fully disengaged resulting in an unusual and unpredictable structural behaviour.

Structurally Deficient Members

- The completed structural evaluation identified several structural deficient members based on the existing structure function and for reinstatement to a pedestrian crossing.
- If the structure is to remain in its current functional configuration, the potential structurally deficient members include the end posts, bottom chord and pin connections.
- If the structure is to be reinstated to a pedestrian crossing, the potential structurally deficient members include:
    - Floorbeams (deficient for maintenance vehicle loading);
    - Bottom Chords;
    - Diagonals and Verticals;
    - End Posts; and
    - Pin Connections.

Description and Scope of Work of Renewal Options

The description, anticipated scope of work, a listing of the assumptions and structural considerations for the different functional options are presented below. A Class C construction cost estimate for each option is based on the scope of work defined below and a detailed cost breakdown is provided in Appendix A.

Option 1: Decommissioning

The objective for this option is to remove the existing structure and relocate the existing Enbridge gas plant to another suitable location. The anticipated scope of work for decommissioning of this structure includes:

- Removal of deck system;

- Removal and salvaging of the steel superstructure;
- Relocation of gas main; and
- Modifications to approaches and embankments.

It is assumed that the substructure elements would remain in place, including the in-water pier. For the purpose of the decommissioning cost estimate it has been assumed that the structure would be removed and dismantled in such a way that the structural components with heritage value (as identified through completion of a Cultural Heritage Evaluation Report (CHER)) would be identified, and salvaged for potential future use. Considerations for the structural stability during removal and demolition of the structure is critical in the safe execution of a decommissioning.

Option 2: Maintain Current Functionality

The objective for this option is to maintain the current use of the existing structure in supporting the existing Enbridge gas main, while remaining closed to vehicular and pedestrian traffic. The rehabilitated structure should meet the requirements of applicable codes and standards for utility support structures and the required inspection activities. The results from the structural evaluation and OSIM inspection have confirmed that rehabilitation of the existing bridge is required to achieve this option objective. The approach for this option is to perform minimal rehabilitation to address current structural concerns and identified risks while lowering the operational and maintenance costs associated with the upkeep of the structure. This option has the potential to preserve many of the anticipated heritage attributes of the structure (as identified through the completion of a CHER) in-situ.

Based on the results of the structural evaluation several structural deficiencies have been identified. A potential approach to reduce the loading on the structure is to replace the deteriorated timber floor system with a narrow galvanized open steel grating inspection catwalk complete with railings. The reduced dead load and limited snow loading will limit the required structural interventions. An updated structural evaluation of the proposed inspection catwalk system would be required to establish the required structural rehabilitation of the existing truss. For the purposes of the options analysis, it is assumed that the structural deficient members will be limited to the end post and bottom chord bracing (i.e. pin replacement or retrofit will not be required).

The anticipated scope of work under this option includes:

- Removal of Timber deck system;
- Supply and installation of an inspection catwalk;
- Repair and strengthening of the bottom chord members with severe localized section loss (4 locations at abutments, and one pin location at the pier);
- Localized strengthening of the end post;
- Supply and installation of new abutment bearings (4 locations);
- Masonry Repairs;
- Localized coating touch-ups; and
- Repair and modifications at approaches and embankments.

Repair of Eyebar Members: The existing eyebars are assumed to be comprised of wrought iron as described in the Structural Evaluation memo. Wrought iron can be repaired through welding procedures and welded repair details have been previously tested and found to be satisfactory[1]. Steel composition testing would be required to confirm the material and develop the required welding procedures. For the purpose of this renewal options analysis, it has been assumed that the eyebar members can be repaired through welding following the removal of the existing deck.

Option 3: Reinstate Pedestrian Crossing

The objective for this option is to reinstate the functionality of the structure as a pedestrian crossing, which requires a major rehabilitation of the existing bridge. The rehabilitated structure should meet the requirements of the applicable codes and standards for a pedestrian crossing including maintenance vehicle loading. The approach for this option is to perform a comprehensive rehabilitation of the structure to the requirements of current codes and standards for an anticipated design life of 75 years with limited required interventions on the rehabilitated structure. This option also has the potential to preserve many of the anticipated heritage attributes of the structure (as identified through the completion of a CHER) in-situ.

Renewal of the existing structure for pedestrian use would require significant structural repairs/modifications and additional investigations, and may require consideration for sympathetic design elements if heritage attributes/features are impacted. Several truss members and connections have been identified as being structurally deficient under this option and extensive strengthening of structural members including replacement of members with severe section loss would be required.

A literature review has identified previous successful truss bridge rehabilitations of similar construction[2] including pin replacement and the complete reconstruction of the eye-bar members with crack indications at the forge-welded loop. An approach following the recommendations in the Virginia DOT Best Practices for the Rehabilitation and Moving of Historic Metal Truss Bridges[3] is assumed for this option. Given that a functional need for this crossing has not been identified, it is assumed that this renewal option would be based on the cultural and historical value of the structure and importance will be given to preserving the heritage fabric of this structure.

The anticipated scope of work under this option includes:

- Removal of Timber deck system;
- Temporary support or re-routing of gas main;
- Dismantling of truss members;
- Rehabilitation and/or reconstruction and/or strengthening of individual truss components;
- Supply and installation of new bearings (all locations);
- Reconstruction of truss superstructure;
- Recoating of entire truss;
- Repair and modifications at approaches and embankments.

Removal and reinstatement of truss superstructure: The feasibility of removal and reinstatement of the existing truss was reviewed on a cursory level. Use of a large capacity mobile crane would allow for the

[1] Sanders, W. W. (1975). *Ultimate Load Behavior of Full-Scale Highway Truss Bridges*, Iowa Department of Transportation
[2] Thiel, M. E. (2001). *Evaluation and Rehabilitation of Historic Metal Truss Bridges: Survey of Literature and Current Practices*, Texas Department of Transportation
[3] McKeel W. T. (2006). *Best Practices for the Rehabilitation and moving of historic Metal Truss Bridges*, Virginia Department of Transportation

lifting of the truss superstructure from an appropriate distance (no timber deck system in place). Temporary bracing and the use of a spreader beam would also be required. Transportation of the superstructure to and from a designated staging area may be accomplished through the use of barges on the Rideau River, wide-load flat-bed trucks on the road network, or a combination of both.

Life Cycle Interventions

The following life-cycle interventions have been included in the life-cycle cost model of each option.

The function of the existing masonry substructure is maintained or partially maintained in all evaluated renewal option. Repointing of masonry elements on a regular basis (assumed to be at 15-25 year intervals) is required to maintain the overall integrity of the masonry structure. Given that the last repointing was complete in 1998 on this structure, it is assumed that a masonry rehabilitation would be required by 2023. As a result of this lifecycle intervention timeline, the intervention has been included in the initial construction scope of work for all options.

Option 1: Decommissioning

Following the removal and decommissioning of the structure, the only foreseen life-cycle intervention is masonry rehabilitation as required to maintain the soil-retaining performance of the existing abutments, particularly the north abutment.

Option 2: Maintain Current Functionality

Required life cycle interventions for maintaining the existing functionality of the structure following the rehabilitation include masonry rehabilitation of the substructure, and future structural steel repairs and replacement of the inspection catwalk.

For the purposes of the life-cycle cost model, we have assumed that following the 75 year design life, the structure would be decommissioned.

Option 3: Reinstate Pedestrian Crossing

Required life-cycle interventions for maintaining the existing functionality of the structure following the rehabilitation include masonry rehabilitation of the substructure, future timber boardwalk and structural steel repairs and complete recoating along with replacement of the deck and railings.

For the purposes of the life-cycle cost model, we have assumed that following the 75 year design life, the structure would be decommissioned.

Operations and Maintenance Considerations (O&M)

Operations and maintenance (O&M) considerations are often left out of life-cycle cost models as a result of the comparable functionality and associated O&M costs of alternative options under consideration. However, due to the significant differences between the O&M costs of the evaluated functional alternatives, O&M considerations have been incorporated in the Life Cycle Cost model to provide a comprehensive financial comparison of the options evaluated.

The following considerations for O&M have been included in the life-cycle cost model of each option.

Option 1: Decommissioning

O&M considerations for a decommissioning option would be limited to any components chosen to remain in place. Such components may include the existing substructure elements such as the center in-water pier. Provided it is not required to preserve the condition of the in-water pier, no significant ongoing O&M activities are considered.

For the purpose of this options analysis, it has been assumed that the truss components would be salvaged and preserved to maintain the heritage integrity of the wrought iron truss. As such, O&M considerations also include storage and preservation of the truss members.

Option 2: Maintain Current Functionality

O&M considerations for structural renewal option to maintain the current function of supporting the gas main includes:

- Operational Costs:
  - Biennial Inspections of the structure.
- Maintenance Costs:
  - Graffiti removal on superstructure and substructure;
  - Cleaning and clearing of debris.

Should this option be pursued, the City should investigate offloading the burden of life-cycle interventions and O&M associated with maintaining the current function of supporting the gas main, including the necessary inspections, to Enbridge Gas to limit the cost and liability to the City.

Option 3: Reinstate Pedestrian Crossing

The O&M considerations are the most extensive for the complete renewal option given the renewed pedestrian crossing functionality and associated maintenance requirements. Anticipated O&M requirements include:

- Operational Costs:
  - Snow clearing and de-icing;
  - Biennial inspections of the structure.
- Maintenance Costs:
  - Timber boardwalk repairs;
  - Graffiti removal on superstructure and substructure;
  - Cleaning and clearing of debris.

To reduce operational costs, and minimize salt impacts to the Rideau River, the City may consider closing the structure to pedestrians during the winter months. This approach could also reduce the overall costs for rehabilitation if access to the structure is prevented by a ‘maintenance vehicle’.

Detailed Financial Analysis

A life cycle cost analysis was undertaken for each of the options in accordance with the Ministry of Transportation of Ontario Structural Financial Analysis Manual. The effective discount rate used for the analysis was 5.0% with a sensitivity of ±2%. The cost estimates were developed in accordance with the Infrastructure Services Department's guideline for Capital Cost Estimates. The financial analysis is included in Appendix A and the results are summarized in Table 1 and Table 2. Percentages in brackets represent the difference between a given option and the least expensive option.

Initial Construction Cost Estimates

TABLE 1: CONSTRUCTION COST OF EVALUATED OPTIONS (2018$)

Option	Description	Cost
1	Decommissioning	$ 271,000
2	Maintain Current Functionality	$ 676,000
3	Reinstate Pedestrian Crossing	$ 1,520,000

Life Cycle Cost Estimates

TABLE 2: LIFE CYCLE COST OF EVALUATED OPTIONS (2018$)

Option	Description	Discount Rate		
		3.0%	5.0%	7.0%
1	**2019**: Structure decommissioning **2044**: Masonry abutment preservation **2069**: Masonry abutment preservation **2094**: Masonry abutment preservation	$425,000 (-)	$354,400 (-)	$318,000 (-)
2	**2019:** Maintain Current Functionality with structural steel repairs, deck replacement/catwalk installation, coating repairs, masonry rehabilitation. **2044:** Substructure masonry repairs, Coating repairs **2069:** Substructure masonry repairs, truss repairs and catwalk replacement. **2094:** Structure decommissioning	$1,078,400 (154%)	$862,200 (143%)	$759,900 (139%)
3	**2019:** Reinstate pedestrian crossing **2034**: Boardwalk, railing and structure repairs **2044:** Substructure masonry repairs, truss recoating and boardwalk replacement. **2059:** Boardwalk, railing and structure repairs **2069:** Truss recoating and boardwalk replacement, substructure masonry repairs, and bearing replacement. **2084:** Boardwalk, railing and structure repairs **2094:** Structure decommissioning	$2,592,500 (510%)	$2,102,700 (493%)	$1,843,600 (480%)

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Associate, Structural Engineer

Appendix A

Financial Analysis

Summary of Alternatives

Initial Construction Cost

Renewal Option	Description	Cost (2018$)*	Rank	%
1	Decommissioning	$ 271,000.00	1	0%
2	Maintain Current Functionality	$ 676,000.00	2	149%
3	Reinstate Pedestrian Crossing	$ 1,520,000.00	3	461%

* Costs associated with the management of the existing Enbridge gas main such as relocation, temporary re-routing, temporary support or protection and reinstatement are not included.

Life Cycle Cost

Renewal Option	Discount Rate								
	3.0%			5.0%			7.0%		
	Cost (2018$)	Rank	%	Cost (2018$)	Rank	%	Cost (2018$)	Rank	%
1	$ 424,921.12	1	0%	$ 354,425.52	1	0%	$ 317,760.25	1	0%
2	$ 1,078,330.52	2	154%	$ 862,165.51	2	143%	$ 759,888.84	2	139%
3	$ 2,598,746.69	3	512%	$ 2,105,089.14	3	494%	$ 1,844,486.10	3	480%

Note: Costs for gas main temporary support, protection and relocation were developed by the City in consultation with Enbridge for the various alternatives, with summary provided as follows:

Renewal Option1: Decommissioning: Costs for temporary support, protection and relocation onto new modular bridge structure founded on the existing substructure - $650,000.

Renewal Option 2: Maintain Current Functionality - Costs for temporary support and protection during rehabilitation of the existing structure - $20,000.

Renewal Option 3: Reinstate Pedestrian Crossing - Costs for temporary support and protection during major reconstruction of the existing structure - $200,000.

The above costs have not been included in the lifecycle analysis.

Capital Cost Estimate

Option 1 - Decommissioning

Item	Description	Unit	Quantity	Unit Price	Total
GENERAL ITEMS					
1	Mobilisation and Demobilisation	LS	1	$ 10,000.00	$ 10,000.00
2	Traffic Control Plan	LS	1	$ 7,500.00	$ 7,500.00
3	Erosion and Sediment Control, Monitoring, and Measures	LS	1	$ 5,000.00	$ 5,000.00
4	Access Platform and Scaffolding	LS	1	$ 10,000.00	$ 10,000.00
		SUB-TOTAL		$	32,500.00
STRUCTURAL ITEMS					
5	Removal of Existing Deck	m2	280	$ 50.00	$ 14,000.00
6	Removal and Transportation of Existing Structure	ea	2	$ 25,000.00	$ 50,000.00
7	Dismantling and Salavging of Truss Components	ea	2	$ 15,000.00	$ 30,000.00
8	Removal of Bearings From Substructure	ea	8	$ 300.00	$ 2,400.00
9	Masonry Repairs (See interventions)	LS	1	$ 30,000.00	$ 30,000.00
		SUB-TOTAL		$	126,400.00
ROADWAY ITEMS					
10	Modification of fencing at approaches	LS	1	$ 5,000.00	$ 5,000.00
11	Reinstatement	LS	1	$ 2,500.00	$ 2,500.00
			SUB-TOTAL	$	7,500.00
OTHER/MISC. ITEMS					
12	Removal of Gas Main (cost by others)	LS	1		$ -
		SUB-TOTAL		$	-
	CONSTRUCTION COSTS			**$**	**166,400.00**
	ENGINEERING SERVICES		*15%*	$	24,960.00
	UTILITIES		*0%*	$	-
	CITY INTERNAL COSTS		*10%*	$	16,640.00
	MISCELLANEOUS		*5%*	$	8,320.00
	SUB-TOTAL			$	216,320.00
	CONTINGENCY		*25%*	$	54,080.00
	TOTAL			**$**	**270,400.00**
	ROUNDED			$	271,000.00

Life Cycle Cost

Option 1 - Decommissioning

Construction and Interventions

Year		Cost (2018 $)	Discounted Cost 3.0%	Discounted Cost 5.0%	Discounted Cost 7.0%	Cost Description
2019	1	$ 271,000.00	$ 263,106.80	$ 258,095.24	$ 253,271.03	Decommissioning
2043	24	$ 7,100.00	$ 3,492.73	$ 2,201.48	$ 1,399.74	Engineering Services
2044	25	$ 71,000.00	$ 33,910.00	$ 20,966.50	$ 13,081.69	Abutment Masonry Preservation
2068	49	$ 7,100.00	$ 1,668.15	$ 650.10	$ 257.90	Engineering Services
2069	50	$ 71,000.00	$ 16,195.60	$ 6,191.46	$ 2,410.29	Abutment Masonry Preservation
2093	74	$ 7,100.00	$ 796.72	$ 191.98	$ 47.52	Engineering Services
2094	75	$ 71,000.00	$ 7,735.11	$ 1,828.36	$ 444.09	Abutment Masonry Preservation
TOTAL		**$ 505,300.00**	**$ 326,905.10**	**$ 290,125.12**	**$ 270,912.26**	

Operations and Maintenance (O&M)

$$PV = A \times \frac{(1+i)^n - 1}{i(1+i)^n}$$

Annual Cost (2018 $)	Discounted Equivalent Present Cost 3.0%	Discounted Equivalent Present Cost 5.0%	Discounted Equivalent Present Cost 7.0%	Cost Description
$ 1,800.00	$ 53,463.29	$ 35,072.95	$ 25,553.45	Storage and Preservation of Truss Members
$ 1,500.00	$ 44,552.74	$ 29,227.45	$ 21,294.54	Grafitti Removal on Substructure
TOTAL $ 3,300.00	**$ 98,016.03**	**$ 64,300.40**	**$ 46,847.99**	

Residual Value

N/A

Total Life Cycle Cost

Cost Description	Discounted Cost 3.0%	Discounted Cost 5.0%	Discounted Cost 7.0%
Construction Cost	$ 326,905.10	$ 290,125.12	$ 270,912.26
O&M Cost	$ 98,016.03	$ 64,300.40	$ 46,847.99
Residual Value	$ -	$ -	$ -
Total Present Net Value	**$ 424,921.12**	**$ 354,425.52**	**$ 317,760.25**

Life Cycle Interventions

Option 1 - Decommissioning

MASONRY REHABILITATION

Last Intervention:	2019		
Intervention Cycle:	25 *years*		
Intervention Schedule:	2044	2069	2094

	Description	Unit	Quantity	Unit Price	Total
GENERAL	Mobilisation and Demobilisation	LS	1	$ 5,000.00	$ 5,000.00
	Traffic Control Plan	LS	1	$ 2,500.00	$ 2,500.00
	Erosion and Sediment Control, Monitoring, and Measures	LS	1	$ 5,000.00	$ 5,000.00
	Access Platform and Scaffolding	wk	4	$ 1,500.00	$ 6,000.00
			SUB-TOTAL	$	18,500.00
STRUCTURA	Repointing of Masonry Abutment	ea	2	$ 10,000.00	$ 20,000.00
	Stone Repair - Crack Injection	m	10	$ 500.00	$ 5,000.00
	Stone Repair - Dutchmen	ea	1	$ 5,000.00	$ 5,000.00
			SUB-TOTAL	$	30,000.00
MISC.	Reinstatement	LS	1	$ 2,500.00	$ 2,500.00
			SUB-TOTAL	$	2,500.00
		CONSTRUCTION TOTAL		$	51,000.00
		CITY INTERNAL COSTS	*10%*	$	5,100.00
		CONTINGENCY	*25%*	$	14,025.00
		TOTAL		**$**	**70,125.00**
		ROUNDED		$	71,000.00
		ENGINEERING SERVICES	*10%*	*$*	*7,100.00*

O&M Considerations

Option 1 - Decommissioning

OPERATIONAL COSTS		$ 1,800.00	/year
Storage and Preservation of Truss Members			
Estimated O&M Unit Cost:	$ 1,800.00		
Activity Cycle:	1 */year*		
Effective Yearly Cost:	$ 1,800.00 */year*		

MAINTENANCE COSTS		$ 1,500.00	/year
Grafitti Removal on Substructure			
Estimated O&M Unit Cost:	$ 7,500.00		
Activity Cycle:	5 *years/ea*		
Effective Yearly Cost:	$ 1,500.00 */year*		

TOTAL O&M ANNUAL COST	$ 3,300.00	/year

Capital Cost Estimate

Option 2 - Maintain Current Functionality

Item	Description	Unit	Quantity	Unit Price	Total
GENERAL ITEMS					
1	Mobilisation and Demobilisation	LS	1	$ 30,000.00	$ 30,000.00
2	Traffic Control Plan	LS	1	$ 7,500.00	$ 7,500.00
3	Erosion and Sediment Control, Monitoring, and Measures	LS	1	$ 10,000.00	$ 10,000.00
4	Access Platform and Scaffolding	LS	1	$ 20,000.00	$ 20,000.00
		SUB-TOTAL		$	67,500.00
STRUCTURAL ITEMS					
5	Removal of Existing Deck	m2	280	$ 50.00	$ 14,000.00
6	Installation of New Floorbeam/Diaphragm at Abutments	ea	2	$ 6,500.00	$ 13,000.00
7	Bearing Replacement at Abutments	ea	4	$ 5,000.00	$ 20,000.00
8	Strengthening of Bottom Chords at Abutments	ea	4	$ 7,500.00	$ 30,000.00
9	Pin Repairs	ea	2	$ 5,000.00	$ 10,000.00
10	Repair of eye-bar crack indications	ea	16	$ 5,000.00	$ 80,000.00
11	Provisional Steel Repairs	LS	1	$ 25,000.00	$ 25,000.00
12	Supply and Installation of new inspection catwalk	LS	1	$ 40,000.00	$ 40,000.00
13	Coating Touch-ups (including lead abatement)	LS	1	$ 25,000.00	$ 25,000.00
14	Masonry Repairs (See interventions)	LS	1	$ 83,500.00	$ 83,500.00
		SUB-TOTAL		$	340,500.00
ROADWAY ITEMS					
15	Modification of fencing at approaches	LS	1	$ 5,000.00	$ 5,000.00
16	Reinstatement	LS	1	$ 2,500.00	$ 2,500.00
		SUB-TOTAL		$	7,500.00
	CONSTRUCTION COSTS			**$**	**415,500.00**
	ENGINEERING SERVICES		*15%*	$	62,325.00
	UTILITIES*		*0%*	$	-
	CITY INTERNAL COSTS		*10%*	$	41,550.00
	MISCELLANEOUS		*5%*	$	20,775.00
	SUB-TOTAL			$	540,150.00
	CONTINGENCY		*25%*	$	135,037.50
	TOTAL			**$**	**675,187.50**
	ROUNDED			$	676,000.00

* Costs associated with the management of the existing Enbridge gas main such as temporary support or protection is not included.

Life Cycle Cost

Option 2 - Maintain Current Functionality

Construction and Interventions

Year		Cost (2018 $)	Discounted Cost 3.0%	Discounted Cost 5.0%	Discounted Cost 7.0%	Cost Description
2019	1	$ 676,000.00	$ 656,310.68	$ 643,809.52	$ 631,775.70	
2043	24	$ 22,900.00	$ 11,265.28	$ 7,100.56	$ 4,514.66	*Engineering Services*
2044	25	$ 167,000.00	$ 79,760.13	$ 49,315.56	$ 30,769.61	*Substructure Masonry Rehabilitation*
2044	25	$ 62,000.00	$ 29,611.55	$ 18,308.77	$ 11,423.45	*Coating Repairs*
2068	49	$ 87,300.00	$ 20,511.16	$ 7,993.53	$ 3,171.09	*Engineering Services*
2069	50	$ 582,000.00	$ 132,758.32	$ 50,752.57	$ 19,757.60	*Steel repairs and catwalk replacement*
2093	74	$ 34,950.00	$ 3,921.86	$ 945.02	$ 233.91	*Engineering Services*
2094	75	$ 233,000.00	$ 25,384.23	$ 6,000.10	$ 1,457.38	*Decommissioning of Structure*
	TOTAL	**$ 1,865,150.00**	**$ 959,523.22**	**$ 784,225.63**	**$ 703,103.40**	

Operations and Maintenance (O&M)

$$PV = A \times \frac{(1+i)^n - 1}{i(1+i)^n}$$

	Annual Cost (2018 $)	Discounted Equivalent Present Cost 3.0%	Discounted Equivalent Present Cost 5.0%	Discounted Equivalent Present Cost 7.0%	Cost Description
	$ 2,500.00	$ 74,254.57	$ 48,712.42	$ 35,490.90	Biennial Inspections
	$ 500.00	$ 14,850.91	$ 9,742.48	$ 7,098.18	Grafitti Removal on Superstructure
	$ 1,000.00	$ 29,701.83	$ 19,484.97	$ 14,196.36	Grafitti Removal on Substructure
TOTAL	**$ 4,000.00**	**$ 118,807.31**	**$ 77,939.88**	**$ 56,785.44**	

Residual Value

N/A

Total Life Cycle Cost

Cost Description	Discounted Cost 3.0%	Discounted Cost 5.0%	Discounted Cost 7.0%
Construction Cost	$ 959,523.22	$ 784,225.63	$ 703,103.40
O&M Cost	$ 118,807.31	$ 77,939.88	$ 56,785.44
Residual Value	$ -	$ -	$ -
Total Present Net Value	**$ 1,078,330.52**	**$ 862,165.51**	**$ 759,888.84**

Life Cycle Interventions

Option 2 - Maintain Current Functionality

MASONRY REHABILITATION

Last Intervention: 2019
Intervention Cycle: 25 *years*
Intervention Schedule: 2044 2069

	Description	Unit	Quantity	Unit Price	Total
GENERAL	Mobilisation and Demobilisation	LS	1	$ 5,000.00	$ 5,000.00
	Traffic Control Plan	LS	1	$ 2,500.00	$ 2,500.00
	Erosion and Sediment Control, Monitoring, and Measures	LS	1	$ 5,000.00	$ 5,000.00
	Environmental Protection (in-Water Work)	LS	1	$ 7,500.00	$ 7,500.00
	Access Platform and Scaffolding	wk	10	$ 1,500.00	$ 15,000.00
			SUB-TOTAL	$	35,000.00
STRUCTURAL	Repointing of Masonry Abutment and Wingwalls	ea	2	$ 10,000.00	$ 20,000.00
	Repointing of Masonry Pier	ea	1	$ 40,000.00	$ 40,000.00
	Stone Repair - Crack Injection	m	25	$ 500.00	$ 12,500.00
	Stone Repair - Surface Repair	ea	4	$ 1,500.00	$ 6,000.00
	Stone Repair - Dutchmen	ea	1	$ 5,000.00	$ 5,000.00
			SUB-TOTAL	$	83,500.00
MISC	Reinstatement	LS	1	$ 2,500.00	$ 2,500.00
			SUB-TOTAL	$	2,500.00
	CONSTRUCTION TOTAL			$	121,000.00
	CITY INTERNAL COSTS		*10%*	$	12,100.00
	CONTINGENCY		*25%*	$	33,275.00
	TOTAL			**$**	**166,375.00**
	ROUNDED			$	167,000.00
	ENGINEERING SERVICES		*10%*	*$*	*16,700.00*

COATING TOUCHUPS (Add-On)

	Description	Unit	Quantity	Unit Price	Total
	Localized Enclosure and Environmental Measures for Recoating of Structural Steel	LS	1	$ 7,500.00	$ 7,500.00
			SUB-TOTAL	$	7,500.00
	Coating Touch-Ups	LS	1	$ 25,000.00	$ 25,000.00
	Provisional Steel Repairs	LS	1	$ 5,000.00	$ 5,000.00
			SUB-TOTAL	$	30,000.00
	CONSTRUCTION TOTAL			$	37,500.00
	CITY INTERNAL COSTS		*10%*	$	12,100.00
	CONTINGENCY		*25%*	$	12,400.00
	TOTAL			**$**	**62,000.00**
	ROUNDED			$	62,000.00
	ENGINEERING SERVICES		*10%*	*$*	*6,200.00*

Life Cycle Interventions

Option 2 - Maintain Current Functionality

STRUCTURAL STEEL REPAIRS AND CATWALK REPLACEMENT

Last Intervention: N/A

Intervention Cycle: 50 *years*

Intervention Schedule: 2069

Capital Cost estimate for Renewal Option - Maintain Existing Functionality			
CONSTRUCTION TOTAL		$	415,500.00
UTILITIES	*0%*	$	-
CITY INTERNAL COSTS	*10%*	$	41,550.00
MISCALLANEOUS	*5%*	$	20,775.00
CONTINGENCY	*25%*	$	103,875.00
TOTAL		**$**	**581,700.00**
ROUNDED		$	582,000.00
ENGINEERING SERVICES	*15%*	*$*	*87,300.00*

Life Cycle Interventions

Option 2 - Maintain Current Functionality

DECOMMISSIONING OF STRUCTURE

Last Intervention: N/A
Intervention Cycle: N/A
Intervention Schedule: 2094

Capital Cost estimate for Renewal Option 1 - Decommissioning			
CONSTRUCTION TOTAL		$	166,400.00
UTILITIES	*0%*	$	-
CITY INTERNAL COSTS	*10%*	$	16,640.00
MISCELLANEOUS	*5%*	$	8,320.00
CONTINGENCY	*25%*	$	41,600.00
TOTAL		**$**	**232,960.00**
ROUNDED		$	233,000.00
ENGINEERING SERVICES	*15%*	*$*	*34,950.00*

O&M Considerations

Option 2 - Maintain Current Functionality

OPERATIONAL COSTS		**$ 2,500.00**	**/year**
Biennial Inspections			
Estimated O&M Unit Cost:	$ 5,000.00		
Activity Cycle:	2 *years/ea*		
Effective Yearly Cost:	$ 2,500.00 */year*		
MAINTENANCE COSTS		**$ 1,500.00**	**/year**
Grafitti Removal on Superstructure			
Estimated O&M Unit Cost:	$ 2,500.00		
Activity Cycle:	5 *years/ea*		
Effective Yearly Cost:	$ 500.00 */year*		
Grafitti Removal on Substructure			
Estimated O&M Unit Cost:	$ 5,000.00		
Activity Cycle:	5 *years/ea*		
Effective Yearly Cost:	$ 1,000.00 */year*		
TOTAL O&M ANNUAL COST		**$ 4,000.00**	**/year**

Capital Cost Estimate

Option 3 - Reinstate Pedestrian Crossing

Item	Description	Unit	Quantity	Unit Price	Total
GENERAL ITEMS					
1	Mobilisation and Demobilisation	LS	1	$ 50,000.00	$ 50,000.00
2	Traffic Control Plan	LS	1	$ 10,000.00	$ 10,000.00
3	Erosion and Sediment Control, Monitoring, and Measures	LS	1	$ 10,000.00	$ 10,000.00
4	Access Platform and Scaffolding	LS	1	$ 25,000.00	$ 25,000.00
		SUB-TOTAL		$	95,000.00
STRUCTURAL ITEMS					
5	Removal of Existing Deck	m2	280	$ 50.00	$ 14,000.00
6	Removal and Transportation of Existing Structure	ea	2	$ 25,000.00	$ 50,000.00
7	Dismantling and of Truss Components	ea	2	$ 10,000.00	$ 20,000.00
8	Restoration and Strengthening of Truss Members to be Re-used	LS	1	$ 45,000.00	$ 45,000.00
9	Supply of new Truss bottom chord members (as required)	LS	1	$ 25,000.00	$ 25,000.00
10	Supply of new floorbeams	LS	1	$ 10,000.00	$ 10,000.00
11	Supply of new Truss Components (pins, hangers, spacers, etc. as required)	LS	1	$ 25,000.00	$ 25,000.00
12	Shop Coating of All Structural Steel	LS	1	$ 75,000.00	$ 75,000.00
13	Assembly of Restored Trusses	ea	2	$ 20,000.00	$ 40,000.00
14	Modification of Bearing Plates and supply of new Elastomeric Bearings	ea	8	$ 1,250.00	$ 10,000.00
15	Transportation and Erection of Trusses	ea	2	$ 25,000.00	$ 50,000.00
16	Supply and installation of New Timber Deck	m2	280	$ 325.00	$ 91,000.00
17	Supply and installation of New Railings	m	156	$ 1,000.00	$ 156,000.00
18	Coating Touch-ups	LS	1	$ 15,000.00	$ 15,000.00
19	Provisional Steel Repairs	LS	1	$ 30,000.00	$ 30,000.00
20	Masonry Repairs (See interventions)	LS	1	$ 83,500.00	$ 83,500.00
		SUB-TOTAL		$	739,500.00
ROADWAY ITEMS					
21	Modification of fencing at approaches	LS	1	$ 15,000.00	$ 15,000.00
22	Modified Sidewalk Approaches	LS	1	$ 10,000.00	$ 10,000.00
		SUB-TOTAL		$	25,000.00
ELECTRICAL ITEMS					
23	New Electrical/Lighting System	LS	1	$ 75,000.00	$ 75,000.00
			SUB-TOTAL	$	75,000.00
OTHER/MISC. ITEMS					
24	Temporary Rerouting and reinstatement of Gas Main	LS	1	$ -	$ -
		SUB-TOTAL		$	-
	CONSTRUCTION COSTS			**$**	**934,500.00**
	ENGINEERING SERVICES		15%	$	140,175.00
	UTILITIES*		0%	$	-
	CITY INTERNAL COSTS		10%	$	93,450.00
	MISCELLANEOUS		5%	$	46,725.00
	SUB-TOTAL			$	1,214,850.00
	CONTINGENCY		25%	$	303,712.50
	TOTAL			**$**	**1,518,562.50**
	ROUNDED			$	1,520,000.00

* Costs associated with the management of the existing Enbridge gas main such as relocation, temporary re-routing, temporary support or protection and reinstatement is not included.

Life Cycle Cost

Option 3 - Reinstate Pedestrian Crossing

Construction and Interventions

Year		Cost (2018 $)	Discounted Cost 3.0%	Discounted Cost 5.0%	Discounted Cost 7.0%	Cost Description
2019	1	$1,520,000.00	$1,475,728.16	$1,447,619.05	$1,420,560.75	
2033	14	$ 6,200.00	$ 4,098.93	$ 3,131.42	$ 2,404.47	*Engineering Services*
2034	15	$ 62,000.00	$ 39,795.44	$ 29,823.06	$ 22,471.65	*Boardwalk, railing and structure repairs*
2043	24	$ 22,900.00	$ 11,265.28	$ 7,100.56	$ 4,514.66	*Engineering Services*
2044	25	$ 167,000.00	$ 79,760.13	$ 49,315.56	$ 30,769.61	*Substructure Masonry Rehabilitation*
2044	25	$ 62,000.00	$ 29,611.55	$ 18,308.77	$ 11,423.45	*Coating Repairs*
2043	24	$ 52,605.00	$ 25,878.17	$ 16,311.12	$ 10,370.90	*Engineering Services*
2044	25	$ 527,000.00	$ 251,698.14	$ 155,624.56	$ 97,099.32	*Recoating and boardwalk replacement*
2058	39	$ 6,200.00	$ 1,957.67	$ 924.72	$ 443.02	*Engineering Services*
2059	40	$ 62,000.00	$ 19,006.52	$ 8,806.83	$ 4,140.38	*Boardwalk, railing and structure repairs*
2068	49	$ 71,735.00	$ 16,854.16	$ 6,568.34	$ 2,605.71	*Engineering Services*
2069	50	$ 167,000.00	$ 38,093.88	$ 14,563.02	$ 5,669.28	*Substructure Masonry Rehabilitation*
2069	50	$ 25,000.00	$ 5,702.68	$ 2,180.09	$ 848.69	*Bearing Replacement*
2069	50	$ 527,000.00	$ 120,212.43	$ 45,956.36	$ 17,890.47	*Recoating and boardwalk replacement*
2083	64	$ 6,200.00	$ 935.00	$ 273.07	$ 81.63	*Engineering Services*
2084	65	$ 62,000.00	$ 9,077.62	$ 2,600.68	$ 762.86	*Boardwalk, railing and structure repairs*
2093	74	$ 23,300.00	$ 2,614.58	$ 630.01	$ 155.94	*Engineering Services*
2094	75	$ 233,000.00	$ 25,384.23	$ 6,000.10	$ 1,457.38	*Decommissioning of Structure*
	TOTAL	**$ 3,603,140.00**	**$ 2,157,674.57**	**$ 1,815,737.33**	**$ 1,633,670.16**	

Operations and Maintenance (O&M)

$$PV = A \times \frac{(1+i)^n - 1}{i(1+i)^n}$$

	Annual Cost (2018 $)	Discounted Equivalent Present Cost 3.0%	Discounted Equivalent Present Cost 5.0%	Discounted Equivalent Present Cost 7.0%	Cost Description
	$ 3,750.00	$ 111,381.85	$ 73,068.64	$ 53,236.35	*Biennial Inspections*
	$ 1,600.00	$ 47,522.92	$ 31,175.95	$ 22,714.17	*Snow Clearing & De-icing*
	$ 2,500.00	$ 74,254.57	$ 48,712.42	$ 35,490.90	*Grafitti Removal on Superstructure*
	$ 2,500.00	$ 74,254.57	$ 48,712.42	$ 35,490.90	*Grafitti Removal on Substructure*
	$ 2,000.00	$ 59,403.65	$ 38,969.94	$ 28,392.72	*Timber Repairs*
	$ 2,500.00	$ 74,254.57	$ 48,712.42	$ 35,490.90	*Lighting Maintenance and Repairs*
TOTAL	**$ 14,850.00**	**$ 441,072.12**	**$ 289,351.80**	**$ 210,815.94**	

Residual Value

N/A

Total Life Cycle Cost

Cost Description	Discounted Cost 3.0%	Discounted Cost 5.0%	Discounted Cost 7.0%
Construction Cost	$ 2,157,674.57	$ 1,815,737.33	$ 1,633,670.16
O&M Cost	$ 441,072.12	$ 289,351.80	$ 210,815.94
Residual Value	$ -	$ -	$ -
Total Present Net Value	**$ 2,598,746.69**	**$ 2,105,089.14**	**$ 1,844,486.10**

Life Cycle Interventions

Option 3 - Reinstate Pedestrian Crossing

BOARDWALK, RAILING AND STRUCTURE REPAIRS

Last Intervention: N/A
Intervention Cycle: 15 *years* *(After Replacement)*
Intervention Schedule: 2034 2059 2084

	Description	Unit	Quantity	Unit Price	Total
GENERAL	Mobilisation and Demobilisation	LS	1	$ 5,000.00	$ 5,000.00
	Traffic Control Plan	LS	1	$ 2,500.00	$ 2,500.00
	Erosion and Sediment Control, Monitoring, and Measures	LS	1	$ 2,500.00	$ 2,500.00
			SUB-TOTAL	$	10,000.00
STRUCTURAL	Board Removal and Disposal	ea	24	$ 100.00	$ 2,400.00
	Supply and Installation of New Boards	ea	24	$ 500.00	$ 12,000.00
	Railing Repairs	LS	1	$ 2,500.00	$ 2,500.00
	Coating Touch-ups	LS	1	$ 2,500.00	$ 2,500.00
	Provisional Steel Repairs	LS	1	$ 5,000.00	$ 5,000.00
			SUB-TOTAL	$	24,400.00
ROAD.	Fence and Guiderail Repairs	LS	1	$ 5,000.00	$ 5,000.00
			SUB-TOTAL	$	5,000.00
ELECT.	Lighting Fixture Upgrade or Repair	LS	1	$ 5,000.00	$ 5,000.00
			SUB-TOTAL	$	5,000.00
		CONSTRUCTION TOTAL		$	44,400.00
		CITY INTERNAL COSTS	*10%*	$	4,440.00
		CONTINGENCY	*25%*	$	12,210.00
		TOTAL		**$**	**61,050.00**
		ROUNDED		$	62,000.00
		ENGINEERING SERVICES	*10%*	*$*	*6,200.00*

MASONRY REHABILITATION

Last Intervention: 2019
Intervention Cycle: 25 *years*
Intervention Schedule: 2044 2069

See Masonry Rehabilitation in the Required Interventions of the Maintain Option.

CONSTRUCTION TOTAL		$	121,000.00
CITY INTERNAL COSTS	*10%*	$	12,100.00
CONTINGENCY	*25%*	$	33,275.00
TOTAL		**$**	**166,375.00**
ROUNDED		$	167,000.00
ENGINEERING SERVICES	*10%*	*$*	*16,700.00*

Life Cycle Interventions

Option 3 - Reinstate Pedestrian Crossing

STEEL RECOATING AND BOARDWALK TIMBER REPLACEMENT

Last Intervention: N/A

Intervention Cycle: 25 *years*

Intervention Schedule: 2044 2069

	Description	Unit	Quantity	Unit Price	Total
GENERAL	Mobilisation and Demobilisation	LS	1	$ 20,000.00	$ 20,000.00
	Traffic Control Plan	LS	1	$ 5,000.00	$ 5,000.00
	Erosion and Sediment Control, Monitoring, and Measures	LS	1	$ 5,000.00	$ 5,000.00
	Complete Enclosure and Environmental Measures for Recoating of Structural Steel	LS	1	$ 50,000.00	$ 50,000.00
	Access Platform and Scaffolding	LS	1	$ 20,000.00	$ 20,000.00
			SUB-TOTAL	$	100,000.00
STRUCTURAL	Board Removal and Disposal	m2	280	$ 35.00	$ 9,800.00
	Supply and Installation of New Boards	m2	280	$ 325.00	$ 91,000.00
	Railing Repairs and Reinstatement	m	156	$ 100.00	$ 15,600.00
	Complete Re-Coating	LS	1	$ 125,000.00	$ 125,000.00
	Provisional Steel Repairs	LS	1	$ 50,000.00	$ 50,000.00
			SUB-TOTAL	$	291,400.00
ELECT.	Lighting Fixture Upgrade or Repair	LS	1	$ 25,000.00	$ 25,000.00
			SUB-TOTAL	$	25,000.00
	CONSTRUCTION TOTAL			$	416,400.00
	CITY INTERNAL COSTS		*10%*	$	4,440.00
	CONTINGENCY		*25%*	$	105,210.00
	TOTAL			**$**	**526,050.00**
	ROUNDED			$	527,000.00
	ENGINEERING SERVICES		*10%*	*$*	*52,605.00*

BEARING REPLACEMENT (Add-On)

	Description	Unit	Quantity	Unit Price	Total
	Access for north abutment bearings	LS	1	$ 5,000.00	$ 5,000.00
			SUB-TOTAL	$	5,000.00
	Bearing Replacement	EA	8	$ 1,250.00	$ 10,000.00
			SUB-TOTAL	$	10,000.00
	CONSTRUCTION TOTAL			$	15,000.00
	CITY INTERNAL COSTS		*10%*	$	4,440.00
	CONTINGENCY		*25%*	$	4,860.00
	TOTAL			**$**	**24,300.00**
	ROUNDED			$	25,000.00
	ENGINEERING SERVICES		*10%*	*$*	*2,430.00*

Life Cycle Interventions

Option 3 - Reinstate Pedestrian Crossing

DECOMMISSIONING OF STRUCTURE

Last Intervention: N/A
Intervention Cycle: N/A
Intervention Schedule: 2094

Capital Cost estimate for Renewal Option 1 - Decommissioning			
CONSTRUCTION TOTAL		$	166,400.00
UTILITIES	*0%*	$	-
CITY INTERNAL COSTS	*10%*	$	16,640.00
MISCELLANEOUS	*5%*	$	8,320.00
CONTINGENCY	*25%*	$	41,600.00
TOTAL		**$**	**232,960.00**
ROUNDED		$	233,000.00
ENGINEERING SERVICES	*10%*	*$*	*23,300.00*

O&M Considerations

Option 3 - Reinstate Pedestrian Crossing

OPERATIONAL COSTS			**$ 5,350.00**	**/year**
Biennial Inspections				
Estimated O&M Unit Cost:	$ 7,500.00			
Activity Cycle:	2	*years/ea*		
Effective Yearly Cost:	$ 3,750.00	*/year*		
Snow Clearing & De-icing				
Estimated O&M Unit Cost:	$ 100.00			
Activity Cycle:	16	*ea/year*		
Effective Yearly Cost:	$ 1,600.00	*/year*		
MAINTENANCE COSTS			**$ 9,500.00**	**/year**
Grafitti Removal on Superstructure				
Estimated O&M Unit Cost:	$ 2,500.00			
Activity Cycle:	1	*ea/year*		
Effective Yearly Cost:	$ 2,500.00	*/year*		
Grafitti Removal on Substructure				
Estimated O&M Unit Cost:	$ 5,000.00			
Activity Cycle:	2	*years/ea*		
Effective Yearly Cost:	$ 2,500.00	*/year*		
Timber Repairs				
Estimated O&M Unit Cost:	$ 1,000.00			
Activity Cycle:	2	*ea/year*		
Effective Yearly Cost:	$ 2,000.00	*/year*		
Lighting Maintenance and Repairs				
Estimated O&M Unit Cost:	$ 5,000.00			
Activity Cycle:	2	*years/ea*		
Effective Yearly Cost:	$ 2,500.00	*/year*		
TOTAL O&M COST			**$ 14,850.00**	**/year**

Appendix E

Consultation Summary

Consultation Summary

Impact Assessment Study for the Decommissioning of Porters Island Pedestrian Bridge (SN013260)

Contact List

Stakeholders		Contact Information		
		Name	Job Title	Email
City of Ottawa	Ward 12 Rideau-Vanier	Mathieu Fleury	Councillor	mathieu.fleury@ottawa.ca
	Corporate Real Estate Office	Stephen O'Brien	Program Manager, Acquisitions	stephen.o'brien@ottawa.ca
	Corporate Real Estate Office	Tim Holland	Real Estate Advisor I	Tim.Holland@ottawa.ca
	Corporate Real Estate Office	Paul Kerluke	Real Estate Advisor II	Paul.Kerluke@ottawa.ca
	Corporate Real Estate Office	Kim Millar	Program Manager, Environmental Remediation and Leasing	kimberley.millar@ottawa.ca
	Right of Way Services	Linda Carkner	Program Manager, Right of Way	Linda.Carkner@ottawa.ca
	Traffic Services	Stephen Lyon	Senior Engineer, Traffic Management	Stephen.Lyon@ottawa.ca
	Legal Services	Taffy Nahas	Legal Counsel	taffy.nahas@ottawa.ca
	Roads Services - PWES (Core)	Bryden Denyes	Area Manger Roads Services	Bryden.Denyes@ottawa.ca
	Infrastructure Services - Roadway Rehab Network	Douglas Rathwell	Senior Engineer, Road Renewal	Douglas.Rathwell@ottawa.ca
	Transportation Planning Services	Kornel Mucsi	Program Manager, Transportation Policy & Networks	Kornel.Mucsi@ottawa.ca
	Heritage Services Unit**	Ashley Kotarba	Planner I	Ashley.Kotarba@ottawa.ca
	Economic Development Services, Planning	Jennifer Boyer	Planner II	Jennifer.Boyer@ottawa.ca
	Corporate Services - Environmental Remediations	Rich Barker		Richard.Barker@ottawa.ca
	Corporate Services - Real Estate Partnership &	Sue Petrovic		Sue.Petrovic@ottawa.ca
Provincial Agencies	Rideau Valley Conservation Authority	Eric Lalande	Planner	eric.lalande@rvca.ca
	Ministry of Tourism, Culture and Sport	Karla Barboza	Team Lead - Heritage (Acting)	karla.barboza@ontario.ca
		Robert von Bitter	Archaeolgical Data Co-Ordinator	robert.vonbitter@ontario.ca
	Ministry of Natural Resources and Forestry	Mary Dillon	District Planner, Kemptville District Office	mary.dillon@ontario.ca
Federal Agencies	Transport Canada	Ludovic D'Souza	Senior Analyst, Coordination and Policy Advice, Ontario Reg	ludovic.dsouza@tc.gc.ca
	Parks Canada	Craig Cunningham	Program/Policy Officer II	craig.cunningham@pc.gc.ca
	Fisheries and Oceans Canada	Abdelhafid Chalabi	Senior Policy Advisor, Policy and Regulatory Initiatives	fisheriesprotection@dfo-mpo.gc.ca
Utility Agencies	City of Ottawa Utility Coordination	Erin Purdy		erin.purdy@ottawa.ca
	Central Registry	cc Kosta Karadakis,		informationcentre@ottawa.ca
	Enbridge Gas	Mark Dinner	Planning and Design Analyst	mark.dinner@enbridge.com
	Enbridge Gas	James Arbuthnott		james.arbuthnott@enbridge.com
	Hydro One Transmission	Ryan Hass		Ryan.Hass@HydroOne.com
	Hydro Ottawa	Emmanuel Coffie		emmanuelcoffie@HydroOttawa.com
	Bell Access	Jennifer Sellars		Jennifer.Sellars@bell.ca
	Birch Hill Telecom	Robert Corney		robert.corney@bhtelecom.ca
	Fibrenoire	Alain Robidoux		arobidoux@fibrenoire.ca
	Group Telecom	Diego Tobias		Diego.Tobias@bell.ca
	Primus	Walter Barkovich		wbarkovich@primustel.ca
	Rogers	MaryLou Schilt		MaryLou.Schilt@rci.rogers.com
	Telus	Jovica Stojanovski		Jovica.Stojanovski@telus.com
	Videotron Télécom	Daniel Rajotte		daniel.rajotte@videotron.com utilitycirculations@videotron.com
	Zayo	John Steele		john.steele@zayo.com

* Local residents and communities including the Chartwell Rockcliffe Retirement Residence and the Garry J. Armstrong Home were intentionally removed from consultation list as discussed in proposal

** Sally Coutts (City of Ottawa, Coordinator, Heritage Services) asked to be removed from email chains relating this file on July 9, 2018

Did not include National Capital Commission as project is not anticipated to impact federal lands. Note that the shorelines of Rideau River and some adjacent lands are owned by NCC.

September 12, 2018

177 Colonnade Road
Suite 101
Ottawa, Ontario
Canada
K2E 7J4
Telephone
613.745.2213
Fax
613.745.3491

Company Name
Address Line
City, Province
Postal Code

Attention: Mr./Ms./Mrs. First and Last Name
Position/Title

City of Ottawa
Long-Term Strategy and Impact Assessment Study
Porter Island Bridge

Dear Mr./Ms./Mrs. Last Name:

The City of Ottawa (City) is undertaking an internal study to assess the long-term strategy for the future of the Porter Island Bridge (Structure Reference: SN013260). The bridge crosses the Rideau River between Porter Island and St. Patrick Street in downtown Ottawa (**Figure 1**). The City has retained Dillon Consulting Limited (Dillon) to develop feasible long-term strategy options for this structure, including, but not limited to, an impact assessment for options to retain and rehabilitate the structure for pedestrian use, as well as decommissioning the structure.

The existing two-span steel truss bridge, supported on a stone masonry pier and abutments, was constructed in 1894 and maintains its historical significance both locally and provincially. While the bridge was closed in 2009 due to its poor condition and remains fenced off from public use, it still carries an Enbridge gas main servicing Porter Island.

As part of this project, the City is seeking input from select internal staff, provincial ministries, agencies and utilities regarding potential risks and/or impacts associated with these potential long-term strategies.

To provide comments or for further information on this project, please contact the following prior to September 28, 2018.

Nathan Bakker, M. Eng., P.Eng.
Project Manager
Dillon Consulting Limited
177 Colonnade Road, Suite 101
Ottawa, Ontario, K2E 7J4
Tel: 613-745-2213 ext. 3009
Fax: 613-745-3491
Email: porterislandbridge@dillon.ca

Comments received will be considered and incorporated into the development of the long-term strategies where feasible. Please indicate your interest in being included in future correspondence regarding the selected long-term strategy for the bridge.

Sincerely,

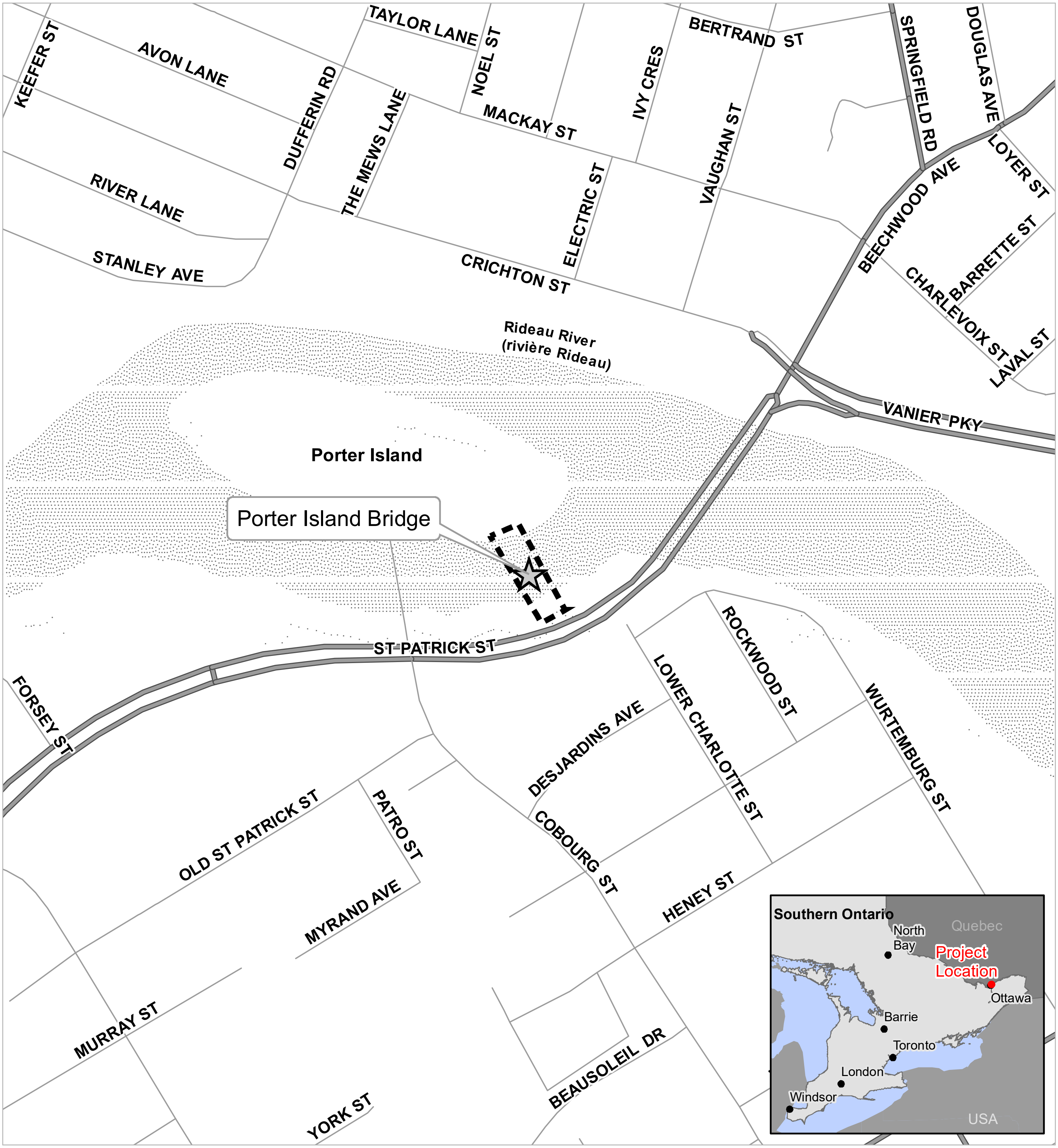
DILLON CONSULTING LIMITED

Adele Mochrie, B.Sc.
for Nathan Bakker, P.Eng.
Project Manager

ANM:rrk
Enclosure

cc: Mr. Kosta Karadakis

Our file: 18-8142



CITY OF OTTAWA
LONG-TERM STRATEGY AND
IMPACT ASSESSMENT STUDY

Bridge Location
Project Study Area
Road Class
Arterial
Local / Street
Waterbody

PORTER ISLAND BRIDGE
FIGURE 1 STUDY AREA

MAP DRAWING INFORMATION:
DATA PROVIDED BY MNRF

MAP CREATED BY: JH
MAP CHECKED BY: AM
MAP PROJECTION: NAD 1983 MTM 9

FILE LOCATION: \\DILLON.CA\DILLON_DFS\LONDON\
LONDON CAD\GIS\VISUAL COMMUNICATIONS DI\
MXD TEMPLATES\
GREY - 8.5X11 PORTRAIT - LEGEND BOTTOM.MXD

0 12.5 25 50 Meters

SCALE 1:4,400

PROJECT: 18-8142 STATUS: DRAFT DATE: 08/17/2018

Consultation Summary

Impact Assessment Study for the Decommissioning of Porters Island Pedestrian Bridge (SN013260)

Response Summary

Stakeholders		Contact Information - Name	Contact Information - Job Title	Response ID	Response
City of Ottawa	Ward 12 Rideau-Vanier	Mathieu Fleury	Councillor	1 & 2	Noted there's strong support within the community to get this bridge re-opened. Provided letter from the Lowertown Community Association requesting that "the historic Porter's Island bridge be restored and opened to pedestrian traffic and that it be designated under the Ontario Heritage Act. "
City of Ottawa	Corporate Real Estate Office	Stephen O'Brien	Program Manager, Acquisitions	3	Suggests we look into whether or not you need any permits from DFO, MNR, RVCA or any other authority in regards to in-water work. The City owns the land either side of the bridge, however the water and shoreline is within the ownership of the "Public authority Having Jurisdiction".
City of Ottawa	Corporate Real Estate Office	Tim Holland	Real Estate Advisor I	4	Noted the island is a former landfill
City of Ottawa	Heritage Services Unit**	Ashley Kotarba	Planner I	5 & 6	Inquired if public need to be consulted. Provided a detailed letter with some key history on the bridge and noted that the community has recently submitted a request to designate the bridge under Part IV of the Ontario Heritage Act to protect the bridge from demolition in perpetuity. "Heritage staff at the City are reviewing this submission and will wait for the outcome of this Impact Assessment Study prior to determining the urgency of the request. Heritage Staff are of the opinion that this bridge has an interesting history and that it is an important landmark within the community."
City of Ottawa	Corporate Services - Real Estate Partnership & Development Office	Sue Petrovic		7	Provided the results of an HLUI search within 100 M, and a former landfill search within 500 M, of the Porter Island Bridge and noted files are available if needed.
Provincial Agencies	Rideau Valley Conservation Authority	Eric Lalande	Planner	8	"The RVCA would like to be involved in any proposed concepts going forward. The Bridge is located within the RVCA's regulated area, and any works, would require a permit from the RVCA. Placement of fill and shore line restoration may be of concerns, as the RVCA would seek to ensure that any work would not create impacts on the existing floodplain. It is possible that in-water works are restricted based on the time of year, (for spawning). The RVCA would be interested in minimizing winter maintenance (salt) on the bridge, or improve water quality inputs to the River."
Provincial Agencies	Ministry of Tourism, Culture and Sport	Karla Barboza	Team Lead - Heritage (Acting)	9	Response letter from Jeff Elkow, Heritage Planner; follow EA process for Archaeology and Built Heritage processes (see full response letter for details)
Provincial Agencies	Ministry of Tourism, Culture and Sport	Robert von Bitter	Archaeolgical Data Co-Ordinator	10	Currently no reported sites are showing up in their mapping system at that location and tehrefore it is possible that archaeological assessments/surveys have never been conducted on Porter Island
	Ministry of Natural Resources and Forestry	Mary Dillon	District Planner, Kemptville District Office	11	MNRF required notification if any of the strategies are anticipated to impact natural heritage features or Species at Risk. They also note that some municipal projects may be subject to the provisions of the Public Lands Act or the Lakes And Rivers Improvement Act and may require an approval.
Federal Agencies	Parks Canada	Craig Cunningham	Program/Policy Officer II	12	Confirmed that the proposed bridge work is not within Parks Canada's jurisdiction.
Federal Agencies	Fisheries and Oceans Canada	Abdelhafid Chalabi	Senior Policy Advisor, Policy and Regulatory Initiatives	13	Email from Lucas Coletti recommending the team visits their *Projects Near Water* website at www.dfo-mpo.gc.ca/pnw-ppe/index-eng.html to determine whether the project requires a review by the Department using our self-assessment process.
Utilities	Central Registry			14	Provided a drawing showing utilities in the Study Area
Utilities	Enbridge Gas	James Arbuthnott		15	Requested to keep him informed of the development of this project and it's findings as Enbridge has assets on the bridge
Utilities	Hydro One Transmission	Ryan Hass		16	Confirmed Hydro One does not have a plant at this location
Utilities	Fibrenoire	Alain Robidoux		17	Confirmed Fibrenoire does not have any plant on the bridge and has no requirements to install new plant if the bridge is to be replaced.
Utilities	Videotron Télécom	Daniel Rajotte		18	Confirmed Videotron's record shows no existing and/or proposed underground plant in the proposed installation area.
Utilities	Zayo	John Steele		19	Confirmed Zayo does not have any plant along/on this bridge, but does have a structure and fiber located on the south side of St Patrick as well as the north side of the St Patrick bridge to Beechwood Ave. The indicated that as long as standard clearances are maintained and will not affect the structure identified above, they will not be impacted by the project.

Comment 1

DILLON CONSULTING

Mochrie, Adele <amochrie@dillon.ca>

Porter Island Bridge, Long-Term Strategy and Impact Assessment Study

---

Fleury, Mathieu <Mathieu.Fleury@ottawa.ca> Fri, Sep 28, 2018 at 2:46 PM
To: "Mochrie, Adele" <amochrie@dillon.ca>
Cc: Porter Island Pedestrian Bridge <porterislandbridge@dillon.ca>, "Bakker, Nathan" <nbakker@dillon.ca>, "Karadakis, Kosta" <kosta.karadakis@ottawa.ca>

Hi Adele,
Just wanted to mention that there's strong support within the community to get this bridge re-opened.
Here's their letter.
thanks,

Emily Jordan

Councillor's Assistant | Adjointe au conseiller

Office of Councillor | Bureau du conseiller Mathieu Fleury

Ward | Quartier 12 (Rideau-Vanier)

613 580-2424 ext | poste 25275

Rideau-Vanier.ca

[Quoted text hidden]
[Quoted text hidden]
This message is directed in confidence solely to the person(s) named above and may contain privileged, confidential or private information which is not to be disclosed. If you are not the addressee or an authorized representative thereof, please contact the undersigned and then destroy this message.

Ce message est destiné uniquement aux personnes indiquées dans l'entête et peut contenir une information privilégiée, confidentielle ou privée et ne pouvant être divulguée. Si vous n'êtes pas le destinataire de ce message ou une personne autorisée à le recevoir, veuillez communiquer avec le soussigné et ensuite détruire ce message.

<Figure 1 - Porter Island Study Area.pdf>

LCA Letter-Porter Bridge_2018-04-30.pdf
71K

Comment 2

LOWERTOWN BASSEVILLE
COMMUNITY ASSOCIATION COMMUNAUTAIRE

PO Box 53050 Rideau Centre PO
CP 53050 BP Centre Rideau
Ottawa ON K1N 1C5

info@lowertown-basseville.ca

4 May 2018

Councillor Fleury
110 Laurier Ave W,
Ottawa, ON
K1P 1J1

Reference: Reopening of the Porter Bridge

Dear Councillor Fleury,

The Lowertown Community Association on behalf of residents would like the City of Ottawa to open the heritage bridge connecting Porter's Island to St. Patrick Street for pedestrian traffic.

Providing a walkway here would provide a shorter route to the St. Patrick bridge but also a safe location for exercise, bird watching and observation of the Rideau River.

The bridge was built in 1894 to provide access to the first contagious diseases hospital opened on the island. It is owned by the City of Ottawa and has recently been added to the Heritage Register. It has been on the Ontario Heritage Bridge list for some time as a rare example of a pin-connected truss bridge with two spans. Its design and historical context make it eligible for designation under the Ontario Heritage Act.

It is our understanding that the management and residents of the Chartwell Rockcliffe Retirement Residence are supportive of this initiative. In addition, there are residents of the Gary J. Armstrong Home that could benefit from pedestrian access.

The Lowertown East Residents Committee has identified the lack of maintenance and oversight in the bridge vicinity as an environmental security problem. The area around the bridge and along the sidewalk is overgrown with tangled bushes and fallen trees and the bridge is currently used as a shelter for homeless individuals. It has experienced some damage due to fire and other vandalism.

The Lowertown Community Association requests that the historic Porter's Island bridge be restored and opened to pedestrian traffic and that it be designated under the Ontario Heritage Act.

Yours sincerely,

Liz Bernstein
President
Lowertown Community Association
Association communautaire de la Basse-Ville

Cc : David Jeanes, President of Heritage Ottawa

Comment

3

DILLON
CONSULTING

Mochrie, Adele <amochrie@dillon.ca>

Porter Island Bridge, Long-Term Strategy and Impact Assessment Study

O'Brien, Stephen <Stephen.O'Brien@ottawa.ca> Fri, Sep 28, 2018 at 11:58 AM
To: "Mochrie, Adele" <amochrie@dillon.ca>, Porter Island Pedestrian Bridge <porterislandbridge@dillon.ca>
Cc: "Bakker, Nathan" <nbakker@dillon.ca>, "Karadakis, Kosta" <kosta.karadakis@ottawa.ca>

Adele,

If you haven't done so already I would suggest you look into whether or not you need any permits from DFO, MNR, RVCA or any other authority in regards to waterways, shorelines and aquatic life. All these in regards to whether you are doing any work in the water? On the shore? Bridge abutments or footings within the water or shoreline? The City owns the land either side of the bridge, however the water and shoreline is within the ownership of the "Public authority Having Jurisdiction".

Regards,

Stephen O'Brien, AACI - *Program Manager of Acquisitions, Realty Services, Corporate Real Estate Office, City of Ottawa,* *613-580-2424 x22595, 110 Laurier Avenue West, 5th Floor, Ottawa, K1P 1J1*

From: Mochrie, Adele [mailto:amochrie@dillon.ca]
Sent: Thursday, September 27, 2018 4:42 PM
To: Porter Island Pedestrian Bridge <porterislandbridge@dillon.ca>
Cc: Bakker, Nathan <nbakker@dillon.ca>; Karadakis, Kosta <kosta.karadakis@ottawa.ca>
Subject: Porter Island Bridge, Long-Term Strategy and Impact Assessment Study

Good afternoon everyone,

Further to our September 12, 2018 email, we kindly request all comments on this project by September 28, 2018. Please let our team know if you have any questions or concerns.

Kind regards,

Adele

Adele Mochrie
Associate
Dillon Consulting Limited
130 Dufferin Avenue Suite 1400
London, Ontario, N6A 5R2

Comment 4

DILLON CONSULTING

Mochrie, Adele <amochrie@dillon.ca>

Porter Island Bridge, Long-Term Strategy and Impact Assessment Study

Bakker, Nathan <nbakker@dillon.ca> Thu, Sep 13, 2018 at 11:43 AM
To: Adele Mochrie <amochrie@dillon.ca>

FYI.

DILLON CONSULTING

Nathan Bakker, M. Eng., P. Eng.
Associate
Dillon Consulting Limited
177 Colonnade Rd South Suite 101
Ottawa, Ontario, K2E 7J4
T - 613.745.2213 ext. 3009
M - 613.203.2062
NBakker@dillon.ca
www.dillon.ca

Please consider the environment before printing this email

---------- Forwarded message ----------
From: **McCurdy, Matthew** <mmccurdy@dillon.ca>
Date: Thu, Sep 13, 2018 at 11:43 AM
Subject: Re: FW: Porter Island Bridge, Long-Term Strategy and Impact Assessment Study
To: Nathan Bakker <nbakker@dillon.ca>

As discussed, below is a link to the Projectwise - Submission Document Workspace. The various background reports are saved in the Received folder.

pw:\\pwintsrv.dillon.ca:Clients\Documents\Proposals\FY2019\1. Government\1. Managed\Ottawa, City of\Porter Island Sampling\Submission Document Workspace\

DILLON CONSULTING

Matthew McCurdy
Dillon Consulting Limited
177 Colonnade Rd South, Suite 101
Ottawa, Ontario, K2E 7J4
T - 613.745.6338 ext. 3022
F - 613.745.3491
M - 613.762.4211
MMcCurdy@dillon.ca
www.dillon.ca

Please consider the environment before printing this email

On Thu, Sep 13, 2018 at 11:38 AM, McCurdy, Matthew <mmccurdy@dillon.ca> wrote:

Hi Erin,
Thanks for passing this along. We had already discussed the relationship of the two projects with Nathan Baker here at Dillon, so he is aware of our work and the nature of the site. We'll make sure to keep them updated as our investigation work proceeds.

Matt

DILLON CONSULTING

Matthew McCurdy
Dillon Consulting Limited
177 Colonnade Rd South, Suite 101
Ottawa, Ontario, K2E 7J4
T - 613.745.6338 ext. 3022
F - 613.745.3491
M - 613.762.4211
MMcCurdy@dillon.ca
www.dillon.ca

Please consider the environment before printing this email

On Thu, Sep 13, 2018 at 8:59 AM, Tait, Erin <Erin.Tait@ottawa.ca> wrote:

Hi Brent & Matt –

I received this notice that Dillon is undertaking a feasibility study of the old bridge connected to Porter Island. You may want to pass along the info that the island was a former landfill and any excavation work to rehabilitate or stabilize the bridge on the island end may encounter waste and/or impacted fill which would need to be managed appropriately.

Thanks,

Erin

From: Millar, Kim
Sent: Wednesday, September 12, 2018 3:33 PM
To: Tait, Erin <Erin.Tait@ottawa.ca>
Subject: FW: Porter Island Bridge, Long-Term Strategy and Impact Assessment Study

FYI

From: Holland, Tim
Sent: Wednesday, September 12, 2018 2:31 PM
To: Millar, Kim <Kimberley.Millar@ottawa.ca>
Subject: FW: Porter Island Bridge, Long-Term Strategy and Impact Assessment Study

Hi Kim,

This was sent to me as a point of contact. I think we should have something to say on this subject. Would this be something that our Environmental Group would comment on given that the area is a former land fill area? Should this be sent to other groups within the City?

Tim

From: Kennedy, Tarah <tkennedy@dillon.ca>
Sent: Wednesday, September 12, 2018 1:39 PM
To: Holland, Tim <Tim.Holland@ottawa.ca>
Cc: Nathan Bakker <nbakker@dillon.ca>; Adele Mochrie <amochrie@dillon.ca>; 188142 <188142@dillon.ca>
Subject: Porter Island Bridge, Long-Term Strategy and Impact Assessment Study

Comment 5

From: **Kotarba, Ashley** <Ashley.Kotarba@ottawa.ca>
Date: Thu, Sep 13, 2018 at 8:47 AM
Subject: RE: Porter Island Bridge, Long-Term Strategy and Impact Assessment Study
To: Kennedy, Tarah <tkennedy@dillon.ca>

Hello Tarah,

Thank you sending this along to me. Is this something that the community should be commenting on at this point? I can pass along contact details if you like, or send it directly to them.

Please advise,

Thank you,

-Ashley

From: Kennedy, Tarah <tkennedy@dillon.ca>
Sent: Wednesday, September 12, 2018 1:48 PM
To: Kotarba, Ashley <Ashley.Kotarba@ottawa.ca>
Cc: Nathan Bakker <nbakker@dillon.ca>; Adele Mochrie <amochrie@dillon.ca>; 188142 <188142@dillon.ca>
Subject: Porter Island Bridge, Long-Term Strategy and Impact Assessment Study

Please find attached a Project Initiation letter related to the above-noted project.

If you have any questions please contact Nathan Bakker at nbakker@dillon.ca.

--

Tarah Kennedy
Dillon Consulting Limited
130 Dufferin Avenue Suite 1400
London, Ontario, N6A 5R2
T - 519.438.1288 ext. 1281
F - 519.672.8209
TKennedy@dillon.ca
www.dillon.ca

Please consider the environment before printing this email

Comment 6

September 28, 2018

Long-Term Strategy and Impact Assessment Study
Porter Island Bridge

Comments from the City of Ottawa, Heritage & Urban Design Branch

The Porter Island Bridge is an important heritage resource within the Lowertown community. The bridge has been identified on the Historic Bridge list, and also on the City of Ottawa's Heritage Register. Being listed on the Historic Bridge list does not provide any protection from demolition, and is simply a method of recognition. Resources listed on the Heritage Register are identified as having cultural heritage value, and requires notification to Heritage Staff with 60 day's notice of intent to demolish.

Porter Island Bridge was constructed in 1894 as an access point to connect Porter Island to the mainland. The bridge was built by the Dominion Bridge Company, a Montreal-based firm. The island would house a smallpox hospital, which was accessed via this metal and wood bridge. The buildings on the island were used throughout the 20th century as a hospital, military barracks, veteran housing, and today as long-term care facilities.

The bridge was constructed using a pin-connected Pratt truss method. During the late 19th century, wrought iron, pin-connected Pratt truss bridges were the most commonly constructed bridges across the country, and as such, are recognized as the most nationally significant bridge type of its era. The Porter Island Bridge is a rare surviving example of this type.

With urban renewal in Lowertown during the 1950s and 1960s, and the construction of a new, wider bridge, the original Porter Island bridge was not heavily used. By the 1990s, the City deemed the bridge unnecessary, closing it in the winter months, and later closing it permanently.

In response to increasing concern over the fate of the bridge, the community has recently submitted a request to designate the bridge under Part IV of the *Ontario Heritage Act*. This would protect the bridge from demolition in perpetuity. Heritage staff at the City are reviewing this submission and will wait for the outcome of this Impact Assessment Study prior to determining the urgency of the request. Heritage Staff are of the opinion that this bridge has an interesting history and that it is an important landmark within the community.

Please let me know if you have further questions.

Thank you,

Ashley Kotarba

Ashley Kotarba
Heritage Planner
City of Ottawa
Ashley.kotarba@ottawa.ca

Comment 7

DILLON CONSULTING

Mochrie, Adele <amochrie@dillon.ca>

Porter Island Bridge, Long-Term Strategy and Impact Assessment Study

Petrovic, Sue <Sue.Petrovic@ottawa.ca> Mon, Oct 1, 2018 at 10:43 AM
To: "Mochrie, Adele" <amochrie@dillon.ca>, Porter Island Pedestrian Bridge <porterislandbridge@dillon.ca>
Cc: "Bakker, Nathan" <nbakker@dillon.ca>, "Karadakis, Kosta" <kosta.karadakis@ottawa.ca>, "Tait, Erin" <Erin.Tait@ottawa.ca>

Good Morning Adele,

Attached are the results of an HLUI search within 100 M, and a former landfill search within 500 M, of the Porter Island Bridge.

The Environmental Remediation Unit (ERU) has historic data gap reports for the former landfills either owned or jointly owned by the City of Ottawa (green text in the attached Excel sheet) if you would like me to provide the reports to you, please let me know, we have electronic copies available.

For more information on the Porter Island former landfill (Ur-30) specifically, you may contact my colleague, Erin Tait (cc'd on this email);

Erin Tait, Specialist, Environmental Remediation

Environmental Remediation Unit

Office: 613-580-2424 ext. 12958|

Cell: 613-809-7679

erin.tait@ottawa.ca

Thank you.

Sue Petrovic

Real Estate Advisor | Conseiller en biens immobiliers

Environmental Remediation & Leasing | Assainissement environnement & location

City of Ottawa | Ville d'Ottawa

Corporate Real Estate Office | Bureau des biens immobiliers municipal

110 avenue Laurier Avenue West/Ouest | Ottawa ON K1P 1J1

613.580.2424 ext./poste 21517 | C: 613.797.8643

From: Mochrie, Adele <amochrie@dillon.ca>
Sent: Thursday, September 27, 2018 4:42 PM
To: Porter Island Pedestrian Bridge <porterislandbridge@dillon.ca>
Cc: Bakker, Nathan <nbakker@dillon.ca>; Karadakis, Kosta <kosta.karadakis@ottawa.ca>
Subject: Porter Island Bridge, Long-Term Strategy and Impact Assessment Study

Good afternoon everyone,

[Quoted text hidden]

From: Kennedy, Tarah <tkennedy@dillon.ca>
Sent: Friday, September 21, 2018 11:51 AM
To: Petrovic, Sue <Sue.Petrovic@ottawa.ca>
Cc: Adele Mochrie <amochrie@dillon.ca>; Nathan Bakker <nbakker@dillon.ca>; 188142 <188142@dillon.ca>
Subject: Porter Island Bridge, Long-Term Strategy and Impact Assessment Study

On behalf of the Project Team please find attached a Project Initiation letter related to the above-noted project.

If you have any questions please contact Nathan Bakker at nbakker@dillon.ca.

--

DILLON CONSULTING

Tarah Kennedy
Dillon Consulting Limited
130 Dufferin Avenue Suite 1400
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F - 519.672.8209
TKennedy@dillon.ca
www.dillon.ca

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4 attachments

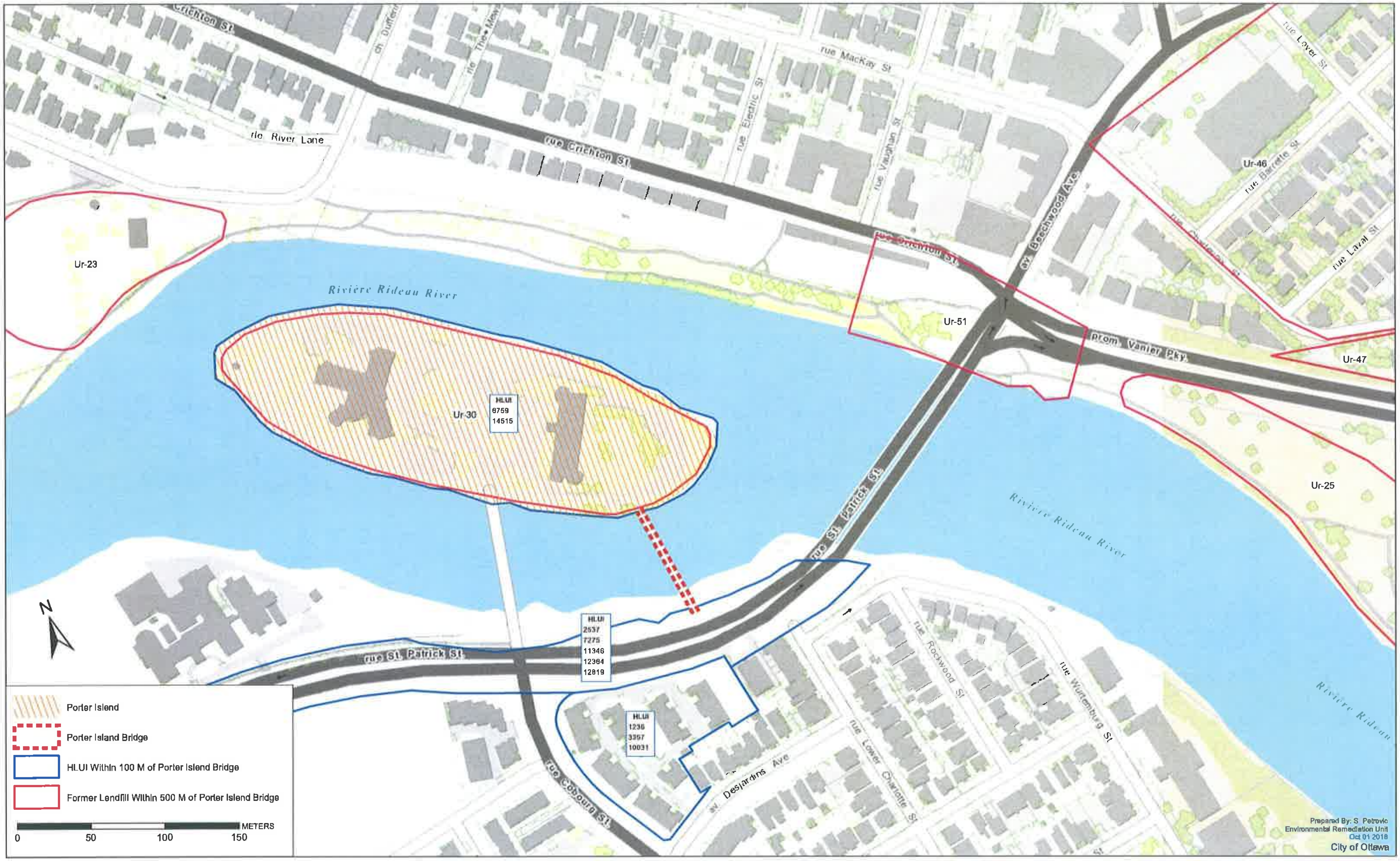
Figure 1 - Porter Island Study Area.pdf
369K

Petrovic_Porter Island Letter_092118.pdf
394K

Porter_Island_Bridge_HLUI.xlsx
287K

Porter_Island_Bridge_HLUI.pdf
5968K

Porter_Island_Bridge_HLUI



HLUI	Name	Street Number	Street Name	Comments 1	Comments 2	Waste Generator #	Type of Facility	Storage Tanks	References 1	References 2	Pin Certainty	PIN
1236	B. A. SERVICE STATION	612	ST. PATRICK				Gasoline Service Stations		M.1960, M.1970, M.1980		2	04236-0357
2537	C. RACICOT	292	GUIGUES	1920 - just painter listed 1930 - also listed as residence			Motor Vehicle Repair Shops		M.1900, M.1910, M.1920, M.1930, M.1940, M.1950, M.1956; M.1960, M.1970, M.1980; FIP1901-10-25,vol2; FIP1912-10-25,vol1; FIP1922-10-25,vol1; FIP1948-212-25; FIP1956-212-25		2	04218-0010
3357	COMMERCIAL PRINTERS	0	COBOURG	11 to 15			Commercial Printing Industries		S.1958, S.1961, S.1964-65, M.1958, M.1961, M.1964; FIP1901-6-8,vol1;FIP1901-6-8,vol 2 (1888), FIP1912-6-8,vol1; FIP1948-213-8; FIP1956-213-3-8; M.1957		2	04236-0357
6759	HOPEWELL HOSPITAL	0	ISLAND LODGE				Hospitals		M.1900, M.1910, M.1920, M.1930, M.1940, M.1950		1	04218-0178
7275	IMPERIAL GARAGE	0	ST. PATRICK	1920 - lists King Edward Garage @ 367 1940 - service station - Parfield Oils Ltd. 1950 - under construction	367 to 377		Motor Vehicle Repair Shops		M.1900, M.1910, M.1920, M.1930, M.1940, M.1950M.1922, M.1948, M.1956; FIP1901-10-33,vol2; FIP1912-10-33,vol1; FIP1922-10-33,vol1; FIP1948-212-33; FIP1956-212-1-33		2	04218-0010
11346	PUBLIC WORKS AND GOVERNMENT SERVICES CANADA	0	ST. ANDREW	SIR CHARLES TUPPER BUILDING		ON0144720	Other Storage and Warehousing Industries		M.1960, M.1970, M.1980	2003 PID	1	04213-0061
10031	OTTAWA DIAPER SERVICE	0	COBOURG	13 to 15			Laundries and Cleaners		M.1960, M.1970, M.1980		2	04236-0357
12364	SAMUEL LAMPERT AND CO. LIMITED	0	ROSE	30 to 50			Machine Shop Industry		M.1960, M.1970, M.1980, M.1922, M.1948, M.1956; FIP1901-10-33,vol2; FIP1912-10-33,vol1; FIP1922-10-33,vol1; FIP1948-212-33; FIP1956-212-1-33		2	04213-0001
12819	ST. JACQUES FRERES ROOFING AND SHEET METAL	23	MCGEE SIDE				Exterior Close In Work		M.1960, M.1970, M.1980		2	04218-0010
14515	UNNAMED WASTE DISPOSAL SITE			<u>Generic classification for former landfills located within the boundaries of the City of Ottawa</u>								

Former Landfills

HLUI	Name	Site ID	Operational Period
6191	East Bank of Rideau River (Keefer to Dufferin)	Ur-23	1928-1938, based on aerial photographs [GLL, 1984]; probably before 1925 [Dillon, 1984]
6131	East Bank of Rideau River (St. Patrick St Bridge to Cummings Bridge)	Ur-25	before 1928 (earliest aerial photograph available shows no landfilling activity) [GLL, 1984]; 1930-1945 or later [Heritage];
GAL 2	Beechwood Ave.	Ur-46	possibly 1906-1912 (Area 1) and 1912-1922 (Area 2)
GAL 12	Rideau View Estate	Ur-47	possibly 1912-1933
GAL 3	St. Patrick Bridge	Ur-51	possibly 1918-1932
6203	Porters Island	Ur-30	between 1909 and 1912 [Paterson, 1999]; before 1928 (earliest aerial photograph available show no landfilling activity) [GLL, 1984]; probably before 1925 [Dillon, 1984]

HLUI occurs (or occurred) on the subject property(ies)
Privately Owned Former Landfill - City has no information regarding current environmental conditions
City Owned and/or City/Jointly Owned Former Landfill - Environmental Reports on file at Environmental Remediation Unit (ERU) offices
<u>Underlined Text</u> Text has been added, not included in HLUI

Comment
8

DILLON
CONSULTING

Mochrie, Adele <amochrie@dillon.ca>

Porter Island Bridge - RVCA Comments

2 messages

Eric Lalande <eric.lalande@rvca.ca> Thu, Sep 13, 2018 at 11:25 AM
To: "porterislandbridge@dillon.ca" <porterislandbridge@dillon.ca>
Cc: "Kennedy, Tarah" <tkennedy@dillon.ca>

Hi Nathan,

Reading through the letter for preliminary comments if offer the following:

- The RVCA would like to be involved in any proposed concepts going forward.
- The Bridge is located within the RVCA's regulated area, and any works, would require a permit from the RVCA
- Placement of fill and shore line restoration may be of concerns, as the RVCA would seek to ensure that any work would not create impacts on the existing floodplain.
- It is possible that in-water works are restricted based on the time of year, (for spawning).
- The RVCA would be interested in minimizing winter maintenance (salt) on the bridge, or improve water quality inputs to the River

Let me know if you require anything else at this point, thank you for circulating us on this proposed project.

Thanks,

Eric Lalande, MCIP, RPP

Planner,

Rideau Valley Conservation Authority

613-692-3571 x1137

eric.lalande@rvca.ca

-

3889 Rideau Valley Drive, PO Box 599

Manotick, ON K4M 1A5

www.rvca.ca

Comment 9

Ministry of Tourism, Culture and Sport

Heritage Program Unit
Programs and Services Branch
401 Bay Street, Suite 1700
Toronto ON M7A 0A7
Tel: 416 314 7182

Ministère du Tourisme, de la Culture et du Sport

Unité des programmes patrimoine
Direction des programmes et des services
401, rue Bay, Bureau 1700
Toronto ON M7A 0A7
Tél: 416 314 7182

Ontario

September 28, 2018 (EMAIL ONLY)

Nathan Bakker, M. Eng., P. Eng.
Project Manager
Dillon Consulting Limited
E: porterislandbridge@dillon.ca

RE: MTCS file #: 0009662
Proponent: City of Ottawa
Subject: Project Initiation - Long Term Strategy and Impact Assessment Study Porter Island Bridge
Location: City of Ottawa, Ontario

Dear Nathan Bakker:

Thank you for providing the Ministry of Tourism, Culture and Sport (MTCS) with the Project Initiation Letter for your project. MTCS's interest in this EA project relates to its mandate of conserving Ontario's cultural heritage, which includes:

- Archaeological resources, including land-based and marine;
- Built heritage resources, including bridges and monuments; and,
- Cultural heritage landscapes.

Under the EA process, the proponent is required to determine a project's potential impact on cultural heritage resources.

Project Summary
The City of Ottawa is undertaking an internal study to assess the long-term strategy for the future of the Porter Island Bridge. The City seeks to develop feasible long-term strategy options for the structure, including, but not limited to, an impact assessment for options to retain and rehabilitate the structure for pedestrian use, as well as decommissioning the structure.

Archaeological Resources
Your EA project may impact archaeological resources and you should screen the project with the MTCS *Criteria for Evaluating Archaeological Potential* and the *Criteria for Evaluating Marine Archaeological Potential* to determine if an archaeological assessment is needed. MTCS archaeological sites data are available at *archaeologicalsites@ontario.ca*. If your EA project area exhibits archaeological potential, then an archaeological assessment (AA) should be undertaken by an archaeologist licenced under the *OHA*, who is responsible for submitting the report directly to MTCS for review.

Built Heritage and Cultural Heritage Landscapes
A Cultural Heritage Evaluation Report (CHER) and Conservation Plan should be undertaken and completed prior to issuance of the Notice of Completion for the project. A Cultural Heritage Evaluation Report (CHER) is used to determine the cultural heritage value or interest of a potential Provincial Heritage Property. A conservation plan details how a cultural heritage resource can be *conserved*. The recommendations of the plan should include descriptions of repairs, stabilization and preservation activities as well as long term conservation, monitoring and maintenance measures. Our Ministry's *Info Sheet #5: Heritage Impact Assessments and Conservation Plans* outlines the scope of Conservation Plans. Please send the CHER and Conservation Plan to MTCS and the local municipality for review, and make it available to local organizations or individuals who have expressed interest in heritage.

In addition, the MTCS *Criteria for Evaluating Potential for Built Heritage Resources and Cultural Heritage Landscapes* should be completed to help determine whether your EA project may impact any additional cultural heritage resources. The Clerk for the municipality can provide information on property registered or designated under the *Ontario Heritage Act*. Municipal Heritage Planners can also provide information that will assist you in completing the checklist.

Environmental Assessment Reporting
All technical heritage studies and their recommendations are to be addressed and incorporated into EA projects. Please advise MTCS whether any technical heritage studies will be completed for your EA project, and provide them to MTCS before issuing a Notice of Completion. If your screening has identified no known or potential cultural heritage resources, or no impacts to these resources, please include the completed checklists and supporting documentation in the EA report or file.

Thank-you for consulting MTCS on this project: please continue to do so through the EA process, and contact me for any questions or clarification.

Sincerely,

Jeff Elkow
Heritage Planner
Jeff.Elkow@Ontario.ca

Copied to: Adele Mochrie, Dillon Consulting
Kosta Karadakis, City of Ottawa

It is the sole responsibility of proponents to ensure that any information and documentation submitted as part of their EA report or file is accurate. MTCS makes no representation or warranty as to the completeness, accuracy or quality of the any checklists, reports or supporting documentation submitted as part of the EA process, and in no way shall MTCS be liable for any harm, damages, costs, expenses, losses, claims or actions that may result if any checklists, reports or supporting documents are discovered to be inaccurate, incomplete, misleading or fraudulent.

Please notify MTCS if archaeological resources are impacted by EA project work. All activities impacting archaeological resources must cease immediately, and a licensed archaeologist is required to carry out an archaeological assessment in accordance with the Ontario Heritage Act and the Standards and Guidelines for Consultant Archaeologists.

If human remains are encountered, all activities must cease immediately and the local police as well as the Cemeteries Regulation Unit of the Ministry of Government and Consumer Services must be contacted. In situations where human remains are associated with archaeological resources, MTCS should also be notified to ensure that the site is not subject to unlicensed alterations which would be a contravention of the Ontario Heritage Act.

Comment 10

Mochrie, Adele <amochrie@dillon.ca>

Porters Island, Ottawa

von Bitter, Robert (MTCS) <Robert.vonBitter@ontario.ca> Fri, Oct 12, 2018 at 10:59 AM
To: "amochrie@dillon.ca" <amochrie@dillon.ca>

Adele,

Currently no reported sites are showing up in our mapping system at that location.

As well, I looked for archaeological reports that have "Porter's" in the title and couldn't locate any.

It could be archaeological assessment/survey has never taken place there.

Hope this info helps,

Robert von Bitter

Robert von Bitter

Archaeological Data Co-Ordinator

Archaeology Program Unit|Programs and Services Branch

Ministry of Tourism, Culture and Sport

401 Bay Street Suite 1700

Toronto, Ontario M7A 0A7

416-314-7161

Robert.vonBitter@ontario.ca

From: Mochrie, Adele [mailto:amochrie@dillon.ca]
Sent: October 11, 2018 4:40 PM
To: Archaeology (MTCS)
Subject: Porters Island, Ottawa

Good afternoon,

I am inquiring whether there are any know archaeological reports completed for Porter Island in Ottawa. The island has a long history dating back to the late 1800's, when it was used to quarantine residents infected with smallpox, and houses several hospitals until the mid 1900's. It was also historically used as a landfill. More recently, it was reconstructed with two retirement/long term care residences.

Given it's extensive history and more recent development, I suspect that archaeological assessments may have been completed for most, if not all, of the island. I'm completing a screening for archaeological potential and it would be great to see what areas previous investigations covered, and where there may still be undisturbed areas, especially around the heritage bridge that remains.

I've attached a site map for reference.

Thanks,

Adele

Adele Mochrie
Associate
Dillon Consulting Limited
130 Dufferin Avenue Suite 1400
London, Ontario, N6A 5R2
T - 519.438.1288 ext. 1268
F - 519.672.8209
M - 226.751.2588
AMochrie@dillon.ca
www.dillon.ca

Comment 11

DILLON CONSULTING

Mochrie, Adele <amochrie@dillon.ca>

Porter Island Bridge, Long-Term Strategy and Impact Assessment Study

Kennedy, Tarah <tkennedy@dillon.ca> Wed, Oct 10, 2018 at 11:42 AM
To: Adele Mochrie <amochrie@dillon.ca>

See below.

---------- Forwarded message ---------
From: **Dillon, Mary (MNRF)** <Mary.Dillon@ontario.ca>
Date: Wed, Oct 10, 2018 at 9:26 AM
Subject: RE: Porter Island Bridge, Long-Term Strategy and Impact Assessment Study
To: Kennedy, Tarah <tkennedy@dillon.ca>

Hi Tarah,

I am sorry for the delay.

Thank you for the notice regarding the study. If any of the strategies are anticipated to impact natural heritage features or Species at Risk then please notify the Ministry and we can work with you to address them. Similarly, some municipal projects may be subject to the provisions of the Public Lands Act or the Lakes And Rivers Improvement Act and may require an approval. For more information on whether an approval may be required, please see the following web pages or contact this office.

https://www.ontario.ca/page/crown-land-work-permits

https://www.ontario.ca/page/lakes-and-rivers-improvement-act-administrative-guide

If there are any questions, please get in touch.

Sincerely,

Mary Dillon

District Planner – Kemptville District

Ministry of Natural Resources and Forestry

613-258-8470

From: Kennedy, Tarah [mailto:tkennedy@dillon.ca]
Sent: September-12-18 1:52 PM
To: Dillon, Mary (MNRF)
Cc: Nathan Bakker; Adele Mochrie; 188142
Subject: Porter Island Bridge, Long-Term Strategy and Impact Assessment Study

Comment 12

Mochrie, Adele <amochrie@dillon.ca>

Porter Island Bridge, Long-Term Strategy and Impact Assessment Study

craig.cunningham@pc.gc.ca <craig.cunningham@pc.gc.ca> Thu, Sep 13, 2018 at 1:23 PM
To: "Kennedy, Tarah" <tkennedy@dillon.ca>
Cc: 188142 <188142@dillon.ca>, Adele Mochrie <amochrie@dillon.ca>, Nathan Bakker <nbakker@dillon.ca>

Hi Tarah,

Thank you for circulating this information to us. From the description it appears that the bridge is crossing the natural branch of the Rideau River that flows through the City of Ottawa. Parks Canada's jurisdiction applies to the channelized part of the Rideau River, including the Canal proper, which is situated to the west of the subject location. The proposed bridge work is therefore not within Parks Canada's jurisdiction. The natural branch of the river would fall under the jurisdiction of both the provincial Ministry of Natural Resources and Forestry as well as Rideau Valley Conservation Authority.

Regards,

Craig

Craig Cunningham
Realty Permitting Officer

Rideau Canal National Historic Site
Parks Canada / Government of Canada
34 Beckwith Street South, Smiths Falls, ON K7A 2A8
Craig.Cunningham@pc.gc.ca / Tel: 613-283-7199 Ext. 284

Agent de délivrance des permis, Lieu historique national du Canal-Rideau
Parcs Canada, Gouvernement du Canada
34 Beckwith Street South, Smiths Falls, ON K7A 2A8
Craig.Cunningham@pc.gc.ca / Tel: 613-283-7199 Ext. 284

From: "Kennedy, Tarah" <tkennedy@dillon.ca>
To: craig.cunningham@pc.gc.ca
Cc: Nathan Bakker <nbakker@dillon.ca>, Adele Mochrie <amochrie@dillon.ca>, 188142 <188142@dillon.ca>
Date: 12/09/2018 01:53 PM
Subject: Porter Island Bridge, Long-Term Strategy and Impact Assessment Study

---

Please find attached a Project Initiation letter related to the above-noted project.

If you have any questions please contact Nathan Bakker at nbakker@dillon.ca.

--

Tarah Kennedy
Dillon Consulting Limited
130 Dufferin Avenue Suite 1400
London, Ontario, N6A 5R2
T - 519.438.1288 ext. 1281
F - 519.672.8209
TKennedy@dillon.ca
www.dillon.ca

Comment 13

DILLON CONSULTING

Mochrie, Adele <amochrie@dillon.ca>

Porter Island Bridge, Long-Term Strategy and Impact Assessment Study

FPP.CA / PPP.CA (DFO/MPO) <fisheriesprotection@dfo-mpo.gc.ca> Wed, Sep 12, 2018 at 2:36 PM
To: Nathan Bakker <nbakker@dillon.ca>
Cc: Adele Mochrie <amochrie@dillon.ca>, 188142 <188142@dillon.ca>, "Kennedy, Tarah" <tkennedy@dillon.ca>

Dear Mr. Baker:

Thank you for the notification of Porter Island Bridge Long-Term Strategy and Impact Assessment Study. Fisheries and Oceans Canada reviews projects (works, undertakings, or activities) being conducted in or near waterbodies that support fish that are part of, or that support a commercial, recreational or Aboriginal fishery. We also review project proposals for impacts to Species at Risk. We do not review notifications for administrative processes. Please visit our Projects Near Water website at www.dfo-mpo.gc.ca/pnw-ppe/index-eng.html to determine whether your project requires a review by the Department using our self-assessment process. If you determine that your project needs a review, please complete and submit a Request for Review Form to: FisheriesProtection@dfo-mpo.gc.ca. If you have any questions, contact us at: 1-855-852-8320.

Thank you,

Fisheries Protection Program| Programme de protection des pêches

Fisheries and Oceans Canada| Pêches et Océans Canada

867 Lakeshore Road, Burlington, ON, L7S 1A1 | 867, ch. Lakeshore, Burlington, ON, L7S 1A1

Email/Courriel: Lucas.Coletti@dfo-mpo.gc.ca

Fisheries and Oceans Canada has changed the way new project proposals (referrals), reports of potential Fisheries Act violations (occurrences) and information requests are managed in Central and Arctic Region (Alberta, Saskatchewan, Manitoba, Ontario, Nunavut and the Northwest Territories). Please be advised that general information regarding the management of impacts to fish and fish habitat and self-assessment tools (e.g. Measures to Avoid Harm) that enable you to determine Fisheries Act requirements are available at DFO's "Projects Near Water" website at www.dfo-mpo.gc.ca/pnw-ppe/index-eng.html. For all occurrence reports, or project proposals where you have determined, following self-assessment, that you cannot avoid impacts to fish and fish habitat, please submit to fisheriesprotection@dfo-mpo.gc.ca. For general inquiries, call 1-855-852-8320.

From: Kennedy, Tarah [mailto:tkennedy@dillon.ca]
Sent: 2018–September-12 1:55 PM
To: FPP.CA / PPP.CA (DFO/MPO)
Cc: Nathan Bakker; Adele Mochrie; 188142
Subject: Porter Island Bridge, Long-Term Strategy and Impact Assessment Study

Please find attached a Project Initiation letter related to the above-noted project.

If you have any questions please contact Nathan Bakker at nbakker@dillon.ca.

DILLON
CONSULTING

Mochrie, Adele <amochrie@dillon.ca>

18-1090 - Porter Island Bridge, Long-Term Strategy and Impact Assessment Study

ISD Information Centre / Centre Information <informationcentre@ottawa.ca> Wed, Oct 3, 2018 at 1:51 PM
To: "Mochrie, Adele" <amochrie@dillon.ca>
Cc: "Bakker, Nathan" <nbakker@dillon.ca>

Good afternoon ,

Attached are the plans for the location requested.

If you have any concerns regarding this information, please refer to the contact information below.

Thank you.

GIS & Data Management Branch - Information Centre;

By Phone: 613-580-2424 Ext 44455
By Fax: 613-580-2609
By Email: informationcentre@ottawa.ca

From: Mochrie, Adele <amochrie@dillon.ca>
Sent: Tuesday, October 02, 2018 1:27 PM
To: ISD Information Centre / Centre Information <informationcentre@ottawa.ca>
Subject: 18-1090 - Porter Island Bridge, Long-Term Strategy and Impact Assessment Study

If we could have in pdf, that would be great. I don't anticipate we need any CAD files at this time.

Thanks!
Adele

Adele Mochrie
Associate
Dillon Consulting Limited
130 Dufferin Avenue Suite 1400
London, Ontario, N6A 5R2
T - 519.438.1288 ext. 1268
F - 519.672.8209
M - 226.751.2588
AMochrie@dillon.ca
www.dillon.ca

On Tue, Oct 2, 2018 at 11:49 AM ISD Information Centre / Centre Information <informationcentre@ottawa.ca> wrote:

What format would you prefer for the utility data?

From: Mochrie, Adele <amochrie@dillon.ca>
Sent: Friday, September 21, 2018 2:11 PM
To: ISD Information Centre / Centre Information <informationcentre@ottawa.ca>
Cc: Tarah Kennedy <tkennedy@dillon.ca>; Bakker, Nathan <nbakker@dillon.ca>; 188142 <188142@dillon.ca>
Subject: 18-1090 - Porter Island Bridge, Long-Term Strategy and Impact Assessment Study

Good afternoon Shelley,

Do you happen to have any plans associated with the Porter Island Bridge, and in the close vicinity? We have reached out to the various utility companies, but it would be helpful to know the location of plants in the area.

Thanks very much,

Adele

Adele Mochrie
Associate
Dillon Consulting Limited
130 Dufferin Avenue Suite 1400
London, Ontario, N6A 5R2
T - 519.438.1288 *ext.* 1268
F - 519.672.8209
M - 226.751.2588
AMochrie@dillon.ca
www.dillon.ca

Please consider the environment before printing this email

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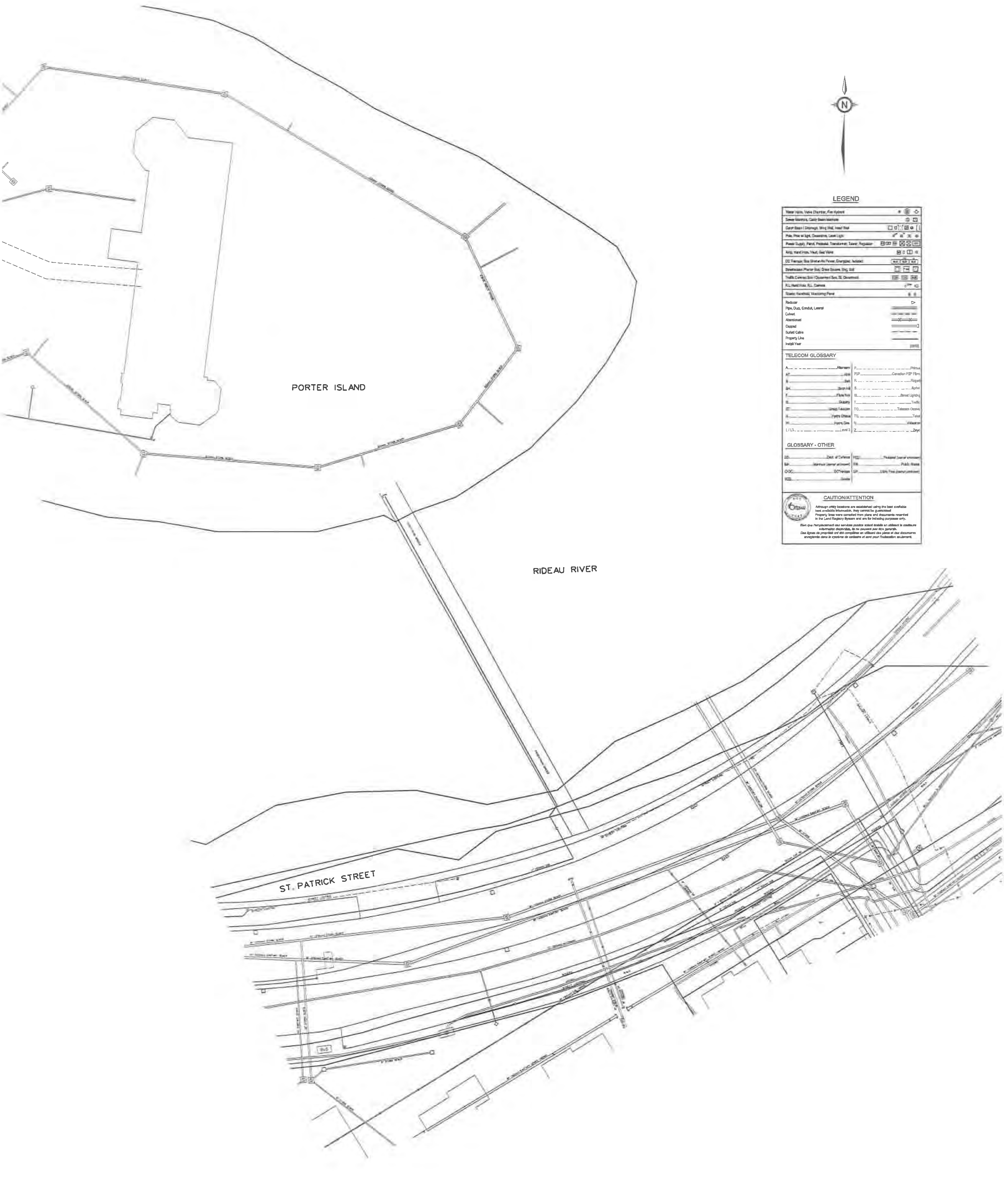
Tarah Kennedy
Dillon Consulting Limited
130 Dufferin Avenue Suite 1400
London, Ontario, N6A 5R2
T - 519.438.1288 ext. 1281
F - 519.672.8209
TKennedy@dillon.ca
www.dillon.ca

Please consider the environment before printing this email


PORTER ISLAND
RIDEAU RIVER
ST. PATRICK STREET
N
LEGEND
TELECOM GLOSSARY
GLOSSARY - OTHER
CAUTION/ATTENTION

Comment
15

Mochrie, Adele <amochrie@dillon.ca>

DILLON
CONSULTING

Porter Island Bridge, Long-Term Strategy and Impact Assessment Study

James Arbuthnott <James.Arbuthnott@enbridge.com> Wed, Oct 3, 2018 at 12:16 PM
To: "Kennedy, Tarah" <tkennedy@dillon.ca>
Cc: Adele Mochrie <amochrie@dillon.ca>, Nathan Bakker <nbakker@dillon.ca>, 188142 <188142@dillon.ca>

Hi,

Please keep me informed of the development of this project and it's findings. Enbridge has assets on bridge in question.

James Arbuthnott, PMP

Sr Advisor, Planning

Eastern Region

—

ENBRIDGE GAS DISTRIBUTION
TEL: 613-748-6840
400 Coventry Rd, Ottawa, K1K 2C7

enbridgegas.com
Integrity. Safety. Respect.

From: Kennedy, Tarah [mailto:tkennedy@dillon.ca]
Sent: Friday, September 21, 2018 11:53 AM
To: James Arbuthnott
Cc: Adele Mochrie; Nathan Bakker; 188142
Subject: [External] Porter Island Bridge, Long-Term Strategy and Impact Assessment Study

On behalf of the Project Team please find attached a Project Initiation letter related to the above-noted project.

If you have any questions please contact Nathan Bakker at nbakker@dillon.ca.

--

Tarah Kennedy
Dillon Consulting Limited
130 Dufferin Avenue Suite 1400
London, Ontario, N6A 5R2
T - 519.438.1288 ext. 1281
F - 519.672.8209
TKennedy@dillon.ca
www.dillon.ca

Comment 16

DILLON CONSULTING

Mochrie, Adele <amochrie@dillon.ca>

Porter Island Bridge, Long-Term Strategy and Impact Assessment Study

Ryan.Hass@hydroone.com <Ryan.Hass@hydroone.com> Mon, Sep 24, 2018 at 8:19 AM
To: tkennedy@dillon.ca
Cc: amochrie@dillon.ca, nbakker@dillon.ca, 188142@dillon.ca

Hydro One Transmission has no plant at this location

From: Kennedy, Tarah [mailto:tkennedy@dillon.ca]
Sent: Friday, September 21, 2018 11:54 AM
To: HASS Ryan
Cc: Adele Mochrie; Nathan Bakker; 188142
Subject: Porter Island Bridge, Long-Term Strategy and Impact Assessment Study

*** Exercise caution. This is an EXTERNAL email. DO NOT open attachments or click links from unknown senders or unexpected email. ***

On behalf of the Project Team please find attached a Project Initiation letter related to the above-noted project.

If you have any questions please contact Nathan Bakker at nbakker@dillon.ca.

--

Tarah Kennedy
Dillon Consulting Limited
130 Dufferin Avenue Suite 1400
London, Ontario, N6A 5R2
T - 519.438.1288 ext. 1281
F - 519.672.8209
TKennedy@dillon.ca
www.dillon.ca

Please consider the environment before printing this email

Comment 17

DILLON CONSULTING

Mochrie, Adele <amochrie@dillon.ca>

Porter Island Bridge, Long-Term Strategy and Impact Assessment Study

Alain Robidoux <arobidoux@fibrenoire.ca> Fri, Sep 21, 2018 at 1:11 PM
To: tkennedy@dillon.ca
Cc: amochrie@dillon.ca, nbakker@dillon.ca, 188142@dillon.ca

Good afternoon All

Fibrenoire does not have any plant on the bridge shown.

As well, Fibrenoire has no requirements to install new plant if the bridge is to be replaced.

We will not be required to attend meetings

thank you

Alain Robidoux
Network Planner / Concepteur Réseau
Fibrenoire - www.fibrenoire.ca
A: 1400 St-Laurent Blvd, Suite 102, Ottawa, Ontario K1K 4H4
T. 613 454-3002, x168
C. 613-799-8397
arobidoux@fibrenoire.ca
Twitter: @fibrenoire

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[Quoted text hidden]

Comment
18

DILLON
CONSULTING

Mochrie, Adele <amochrie@dillon.ca>

Porter Island Bridge, Long-Term Strategy and Impact Assessment Study

UtilityCirculations@videotron.com <UtilityCirculations@videotron.com> Tue, Oct 2, 2018 at 9:07 AM
To: amochrie@dillon.ca

Good morning

Videotron's record shows no existing and/or proposed underground plant in the proposed installation area. No Conflict!

Thanks, have a nice day!

De : "Mochrie, Adele" <amochrie@dillon.ca>
A : UtilityCirculations@videotron.com,
Cc : Porter Island Pedestrian Bridge <porterislandbridge@dillon.ca>
Date : 2018-09-26 12:17
Objet : Fwd: Porter Island Bridge, Long-Term Strategy and Impact Assessment Study

---

Good afternoon,

Thank you for your response regarding Videotron's plants in the GTA. However, the project site is located on Porter Island, in the Rideau River in Ottawa. We would appreciate knowing of any plants within this area. For ease of review, I've attached a map showing the project location at the Porter Island Bridge.

Kind regards,
Adele

Comment
19

Mochrie, Adele <amochrie@dillon.ca>

DILLON
CONSULTING

Porter Island Bridge, Long-Term Strategy and Impact Assessment Study

John Steele <john.steele@zayo.com> Fri, Sep 21, 2018 at 12:10 PM
To: Nathan Bakker <nbakker@dillon.ca>
Cc: Adele Mochrie <amochrie@dillon.ca>, "Kennedy, Tarah" <tkennedy@dillon.ca>

Good Afternoon,

Zayo does not have any plant along/on this bridge.

We have structure and fiber located on the south side of St Patrick as well as the north side of the St Patrick bridge to Beechwood Ave.

As long as standard clearances are maintained and will not affect the structure identified above, we will not be impacted by the project.

Cheers,

John R. Steele

Outside Plant Project Manager | Zayo Group
Desk: 613.688.8706 | Cell: 819.923.2189 | john.steele@zayo.com

From: Kennedy, Tarah [mailto:tkennedy@dillon.ca]
Sent: September-21-18 12:04 PM
To: john.steele@zayo.com
Cc: Adele Mochrie <amochrie@dillon.ca>; Nathan Bakker <nbakker@dillon.ca>; 188142 <188142@dillon.ca>
Subject: Porter Island Bridge, Long-Term Strategy and Impact Assessment Study

On behalf of the Project Team please find attached a Project Initiation letter related to the above-noted project.

If you have any questions please contact Nathan Bakker at nbakker@dillon.ca.

--

Tarah Kennedy
Dillon Consulting Limited
130 Dufferin Avenue Suite 1400
London, Ontario, N6A 5R2
T - 519.438.1288 ext. 1281
F - 519.672.8209

Appendix F

Information on Gas Main

7 December 1982

File RS 325-1

Ottawa Gas
400 Coventry Road
Ottawa, Ontario
K1K 2C7

Attention: Mr. Neil Harte
Manager, Planning and
Technical Services

Dear Sir:

Re: Proposed Installation of the NPS 4 ST
Gas Main at Porter's Island Pedestrian
Bridge over the Rideau River, City of Ottawa

This is to advise that the Department has no objection to the proposed installation of a NPS 4 ST gas main at Porter's Island pedestrian structure, subject to the following requirements:

a. That the installation be carried out as detailed in Consumer's Gas Drawing Nos 83-P1-4159-C and D.

b. That the gas main be inspected by Ottawa Gas at regular intervals not exceeding one year, or when damaged. Ottawa Gas is to assume responsibility for any maintenance, repairs or replacement of the gas main, when necessary, at its own expense.

c. Ottawa Gas is to assume liability for any damages sustained to the bridge or to any individual as a result of the construction and operation of the gas main on the structure.

d. When required for bridge maintenance or repair work, Ottawa Gas, shall its own expense, deactivate, cut off, cleanse and reactive the gas main. An advance notice of one week is to be provided to Ottawa Gas for this purpose, except in case of emergencies.

e. Vehicles in excess of 2500 lb (1150 kg) gross weight are not to be permitted on the pedestrian structure.

An advance notice of three working days minimum is requested before commencing the field operations. Please co-ordinate with Mr. Jack Armstrong of the Homes of the Aged, Island Lodge (telephone 237-5100, ext 45).

It is requested that one copy of the certified 'As Constructed' drawings be forwarded to this office for our records after completion of the installation of the gas main.

One set of your drawings is being returned herewith.

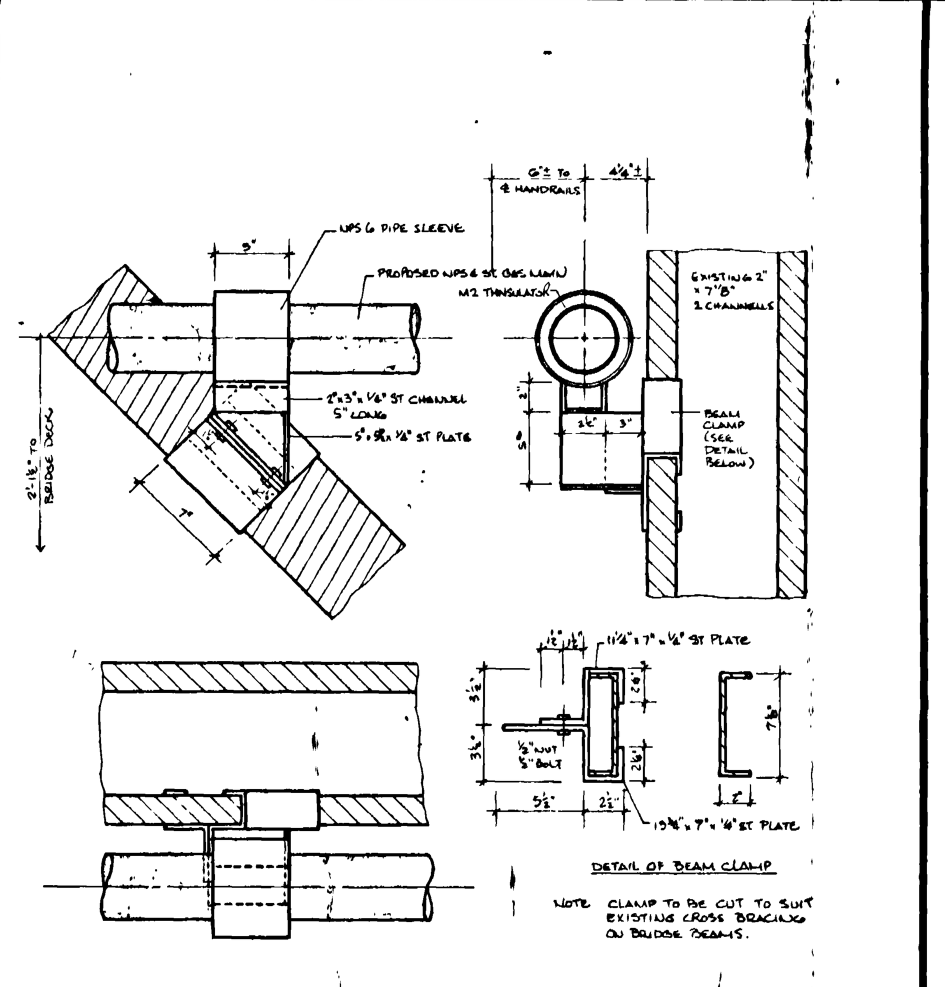
Yours truly

V. K. Sahni, P Eng
Structural Maintenance Engineer
Design and Construction
Division

VKS/ng

cc: Mr. G. Armstrong
Director, Homes of the Aged

Mr. J. Robertson
Island Lodge



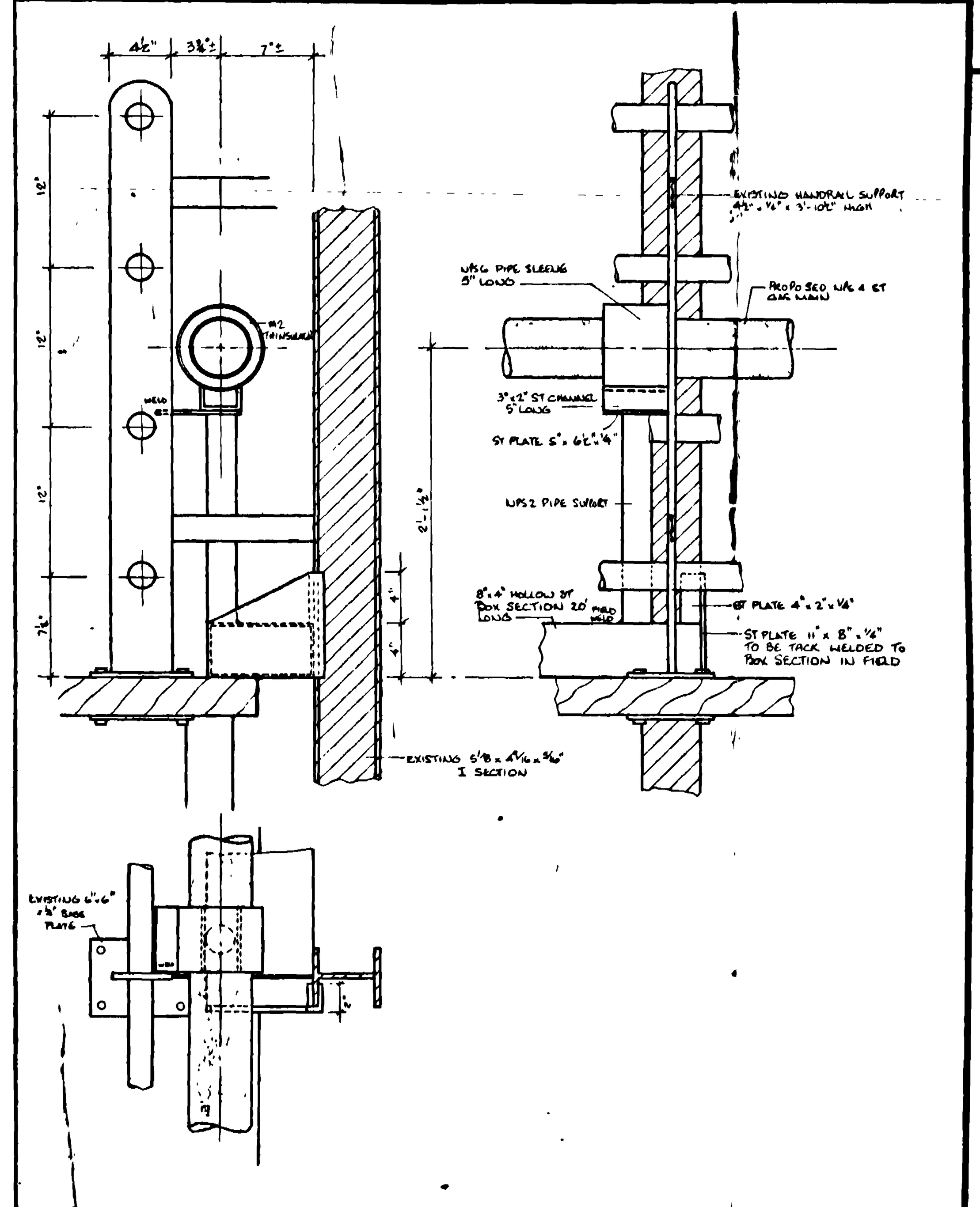
PIPE ALIGNMENT GUIDE ON CHANNEL SECTION (G)

ONE REQUIRED

SCALE 1½" = 1'-0"

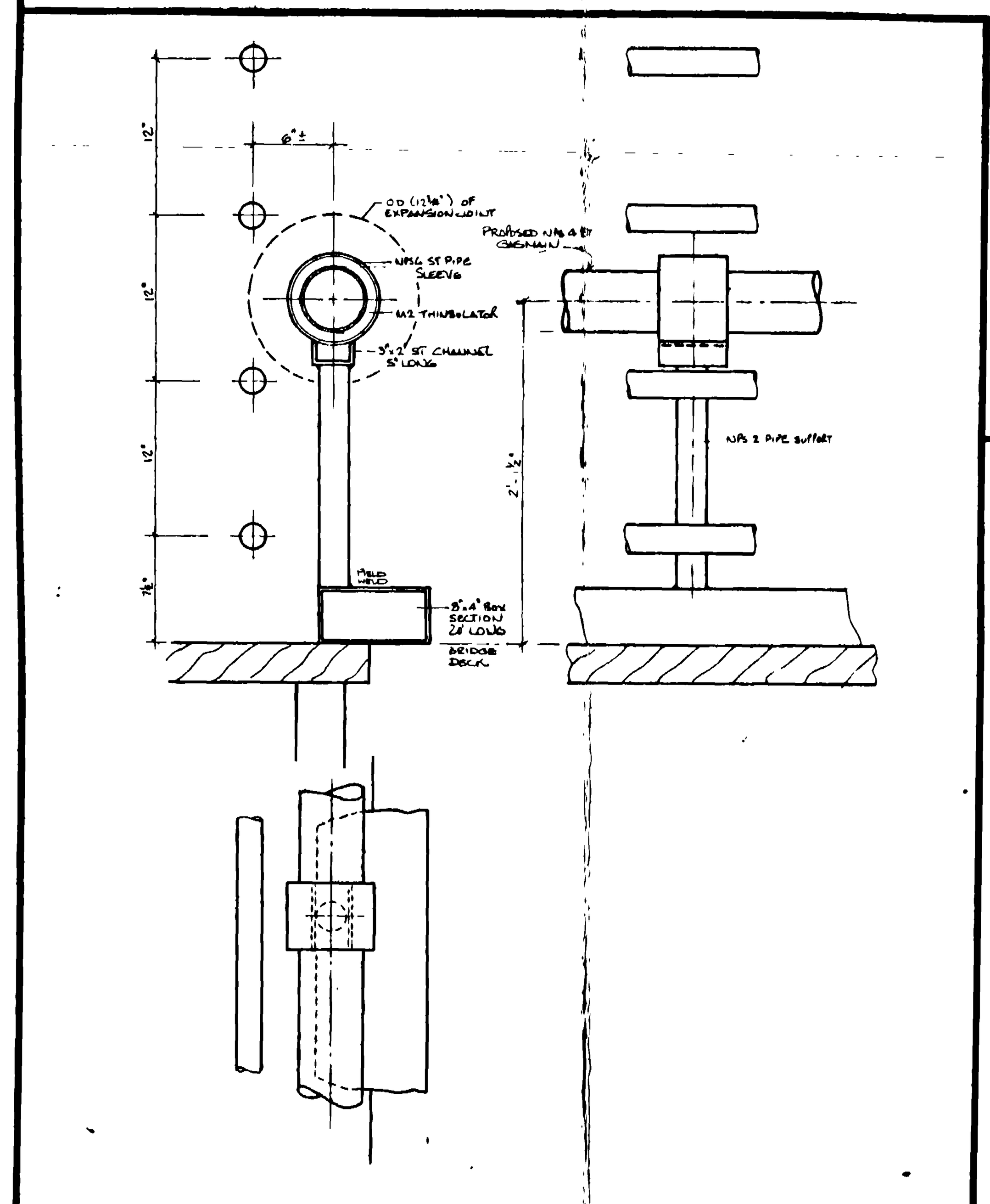
WEST ELEVATION

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



PIPE ALIGNMENT GUIDE ON H SECTION (E)1

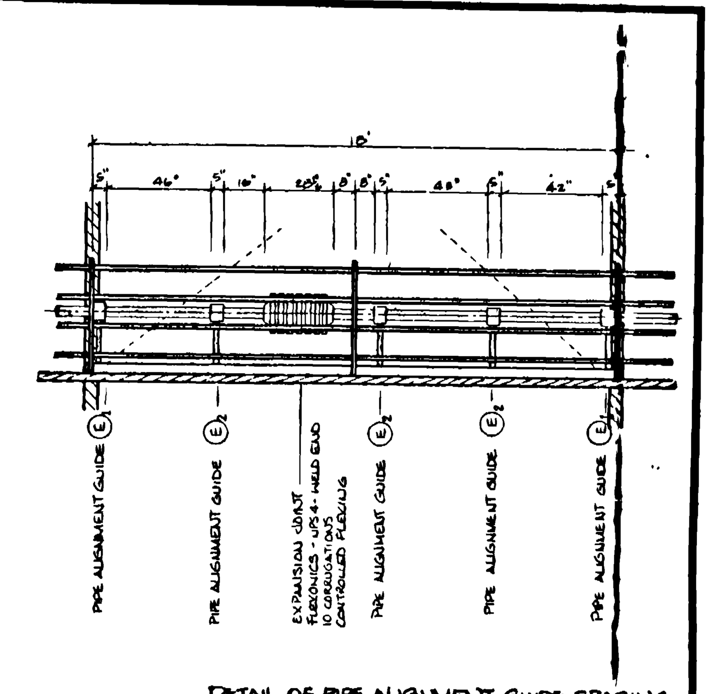
SCALE 1½" = 1'-0"



NOTE: FIELD CUTS TO BE MADE IN 8"×4" HOLLOW BOX SECTION TO ACCOMMODATE BRIDGE RODS

PIPE ALIGNMENT GUIDE BETWEEN H SECTIONS (E)2

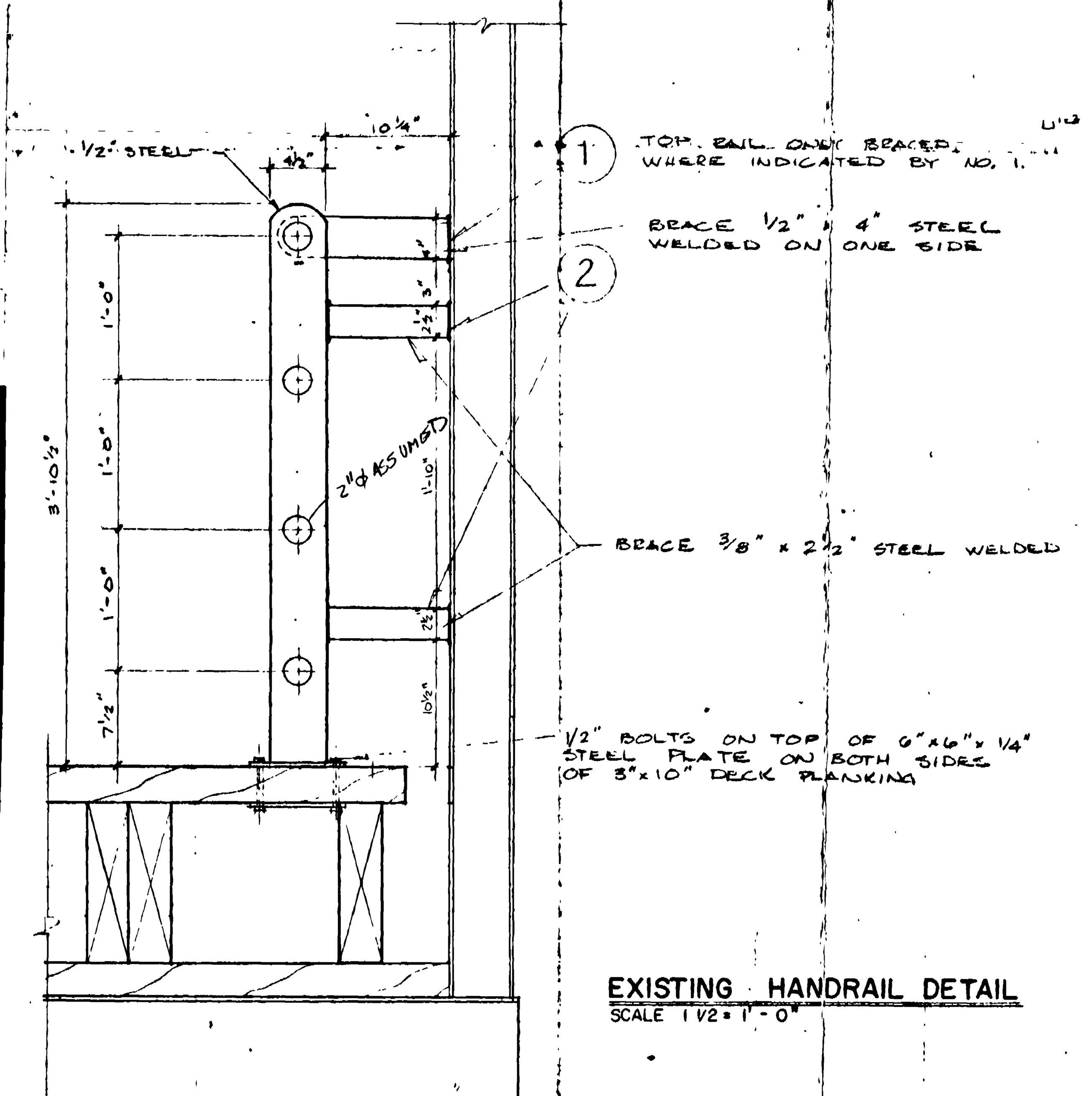
SCALE 1½" = 1'-0"



DETAIL OF PIPE ALIGNMENT GUIDE SPACING

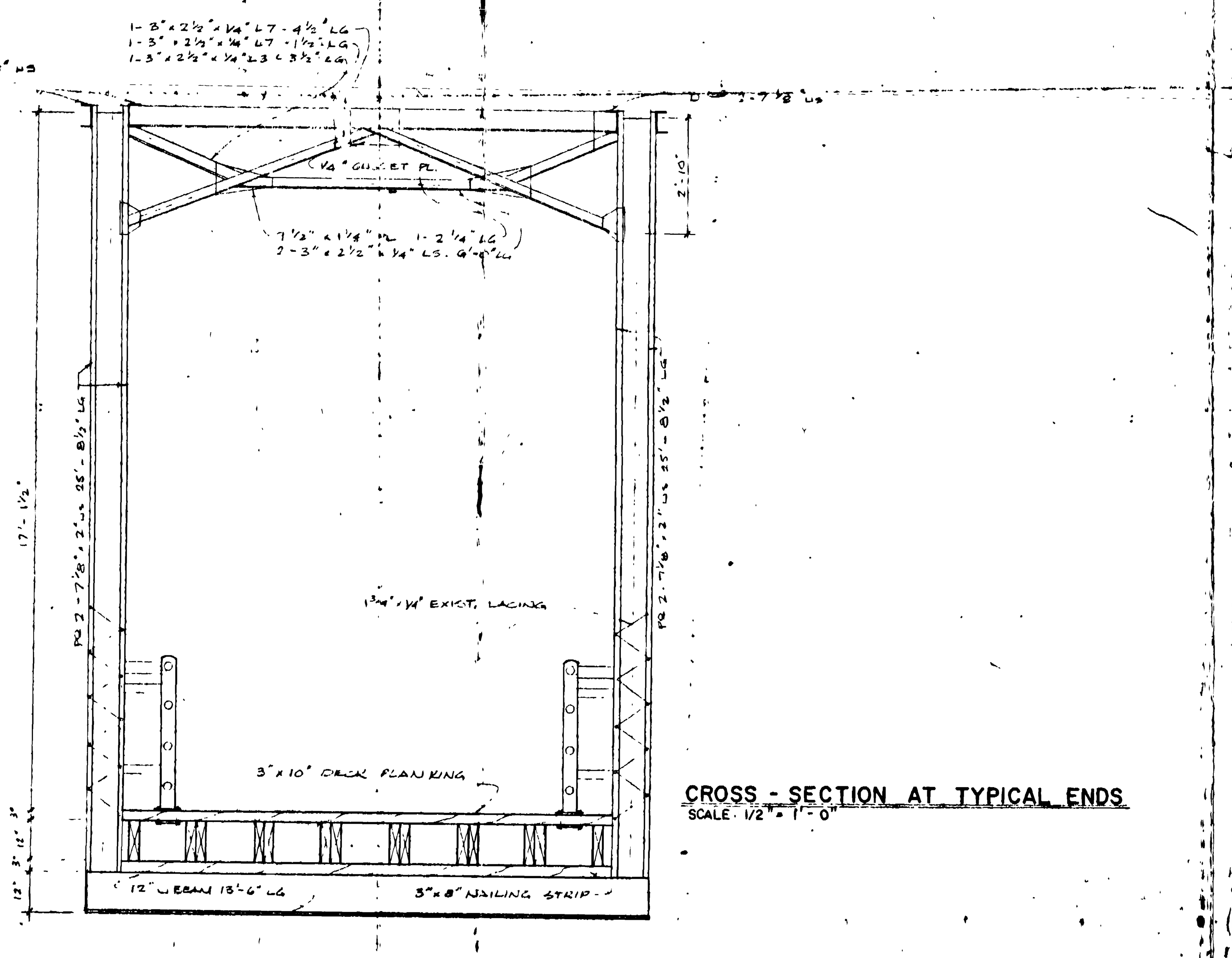
SEE (E)1 FOR DETAIL OF CUTS IN 8"×4" BOX SECTION TO ACCOMMODATE BRIDGE RODS

NO.	REVISIONS	BY	DATE



EXISTING HANDRAIL DETAIL

SCALE 1½" = 1'-0"



CROSS - SECTION AT TYPICAL ENDS

SCALE: 1/2" = 1'-0"

BILL OF MATERIALS

LOCATION: OLD PORTERS ISLAND BRIDGE OTTAWA

ORDER NO. 60-3173-83 DWG. NO. 83-B1-4159-D DATE Nov 30-82

CONST. BY FS. CHECKED [signature] APPROVED [signature]

MARK	REQ'D.	SIZE	DESCRIPTION.	PART NO.
PIPE ALIGNMENT GUIDE ON CHANNEL SECTION (G) ONE ASSEMBLY REQUIRED				
	1	¼"	ST. PLATE 11¼" × 7" × ¼" } FOR FABRICATING CLAMP	
	1	¼"	" " 13¾" × 7" × ¼"	
	2	½" × 2'	MACHINE BOLTS }	3003143
	2	½"	HEX NUTS	3030044
	2	½"	LOCK WASHERS	
	1	¼"	ST. PLATE 5" × 5½" × ¼"	
	1	2" × 3' × ¼"	ST. Ц CHANNELL - 5" LONG	
	1	NPS 6	ST PIPE SLEEVE, 5" LONG CSA Z245.3 CAT I GR 290 4.78 mm wt	
	1	NPS 4	T.D. WmSON PLASTIC M-2- THINSULATOR	
PIPE ALIGNMENT GUIDES BETWEEN H SECTIONS (E)1 AND (E)2 5 ASSEMBLIES REQUIRED				
	1	8" × 4"	HOLLOW ST BOX SECTION - 20' LONG	
	2	¼"	ST PLATE 11" × 8" × ¼"	
	5	NPS 2	ST PIPE, CSA 245.3 CAT I Gr172, 3.91 mm wt 1'-5" LONG	
	2	¼"	ST PLATE 5" × 6½" × ¼"	
	5	3" × 2" × ¼"	ST Ц CHANNEL 5" LONG	
	5	NPS 6	ST PIPE SLEEVE, 5" LONG CSA Z245.3 CAT I. GR 210 4.78 mm wt	
	5	NPS 4	T.D. WmSON PLASTIC M2 THINSULATOR	
	2	¼"	ST PLATE 4' × 2" × ¼"	
fw4	4	NPS 4	FLANGE WN, RF, ANSI B16.5 ASTM A105, CL 300	1120678
i4	2	NPS 4	INSULATING SET, PLAMET TYPE F, CL 300	2216220
n	16	¾"	NUTS } ANSI B1.1 ASTM A307 GR B	3030066
b	16	¾" × 4"	MACHINE BOLTS	3005229
E490	2	NPS 4	ELBOW 90°, WELDED, LR, ANSI B16.9 ASTM A234 GR B. 241 MPa 4.78mm	1110232
E445	3	NPS 4	" " " " "	1114223
P4	300'	NPS 4	ST. PIPE, CSA Z245.3 CAT I GR 290 4.78mm	
EJ	1	NPS 4	FLEXONICS EXPANSION JOINT, WELD END	
			10 CORRUGATIONS, 4⅜" MAX AXIAL TRAVERSE	
			12¾" MAX. O.D., 28¹¹⁄₁₆" TOTAL OVERALL LENGTH	
			CONTROLLED FLEXING	

Consumers' Gas

PLANNING AND TECHNICAL SERVICES

PROPOSED NPS 4 ST. GAS MAIN CROSSING

OLD PORTERS ISLAND BRIDGE OTTAWA

THE REGIONAL MUNICIPALITY OF OTTAWA-CARLETON
TRANSPORTATION DEPARTMENT
DESIGN & CONSTRUCTION DIVISION
STRUCTURES BRANCH

DRAWING REVIEW

THE REVIEW OF THIS DRAWING DOES NOT IN ANY WAY RELIEVE THE DESIGNER OF RESPONSIBILITY FOR THE DESIGN OR ACCURACY OF DIMENSIONS

	NO COMMENT	SUBMISSION No 1
✓	SEE COMMENTS	CONTRACT No. —
		STRUCTURE No. 325
	AMEND & RESUBMIT	DATE 7 Dec 82
		BY [signature]

MAIN EXTENSION RECORDS PROGRESS

WORK	BY	DATE	WORK		BY	DATE	WORK		BY	DATE
ATLAS PLATE REVISION			AS LAID DRAWING MADE				PIPELINE DATA RECORDED			
PUCC SHEET REVISION			VALVES	NO ON PLATES			REG STATION & NUMBER RECORDED			
REGIONAL PLAN REVISION				NO IN FIELD NOTES			CORROSION	AREA ASSIGNED		
METRO GRID MAP REVISION				CARDS ORIGINATED				CARDS COMPLETE		
CONST DWG CHECKED AGAINST FIELD NOTES			DRIP CARD MADE				BELT LINE MAP REVISION			

MAIN APPROPRIATION INFORMATION

CLASSIFICATION L M I H LOCATION CLASS ______ MATERIAL ______

TEST PRESSURE ______ kPa HUMIDIFIED YES ______ NO ______

UTILITY	LEGEND
ABAND GAS MAIN	
PROP GAS MAIN	
EXIST GAS MAIN	
WATER MAIN	
BELL U/G CABLE	
SEWER MAIN	
HYDRO U/G	

AREA

REFERENCE

DRN. FS.	CONST DWG	CHK.
DATE Nov 30 82	DATE	DATE
PERM. DWG.	CORROSION	APPROVED [signature]
DATE	DATE	DATE [illegible] 02

DRAWING & MATERIAL APPROVED

S. J. A. STILAND

I CERTIFY THAT CONST. WAS IN ACCORDANCE WITH THIS DWG.

INSPECTOR

CERTIFICATE NO. ______

TIE-IN FOREMAN.

CERTIFICATE NO. ______

ORD. NO. 60-3173-83

SCALE AS NOTED

DWG. NO. 83-B1-4159-D

B-32604-1

ABANDONED GAS MAIN.

PROPOSED NPS 4 GAS MAIN

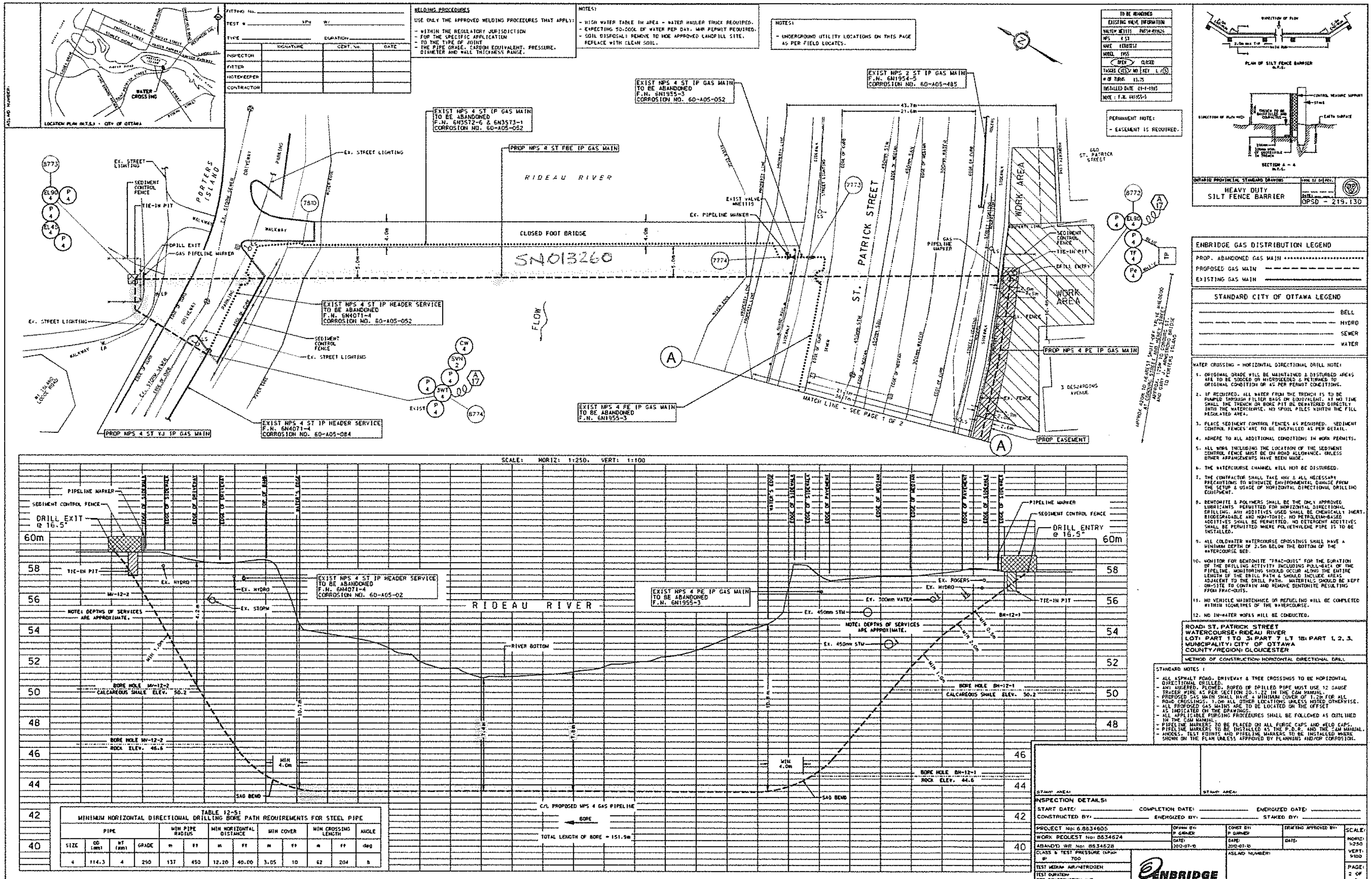
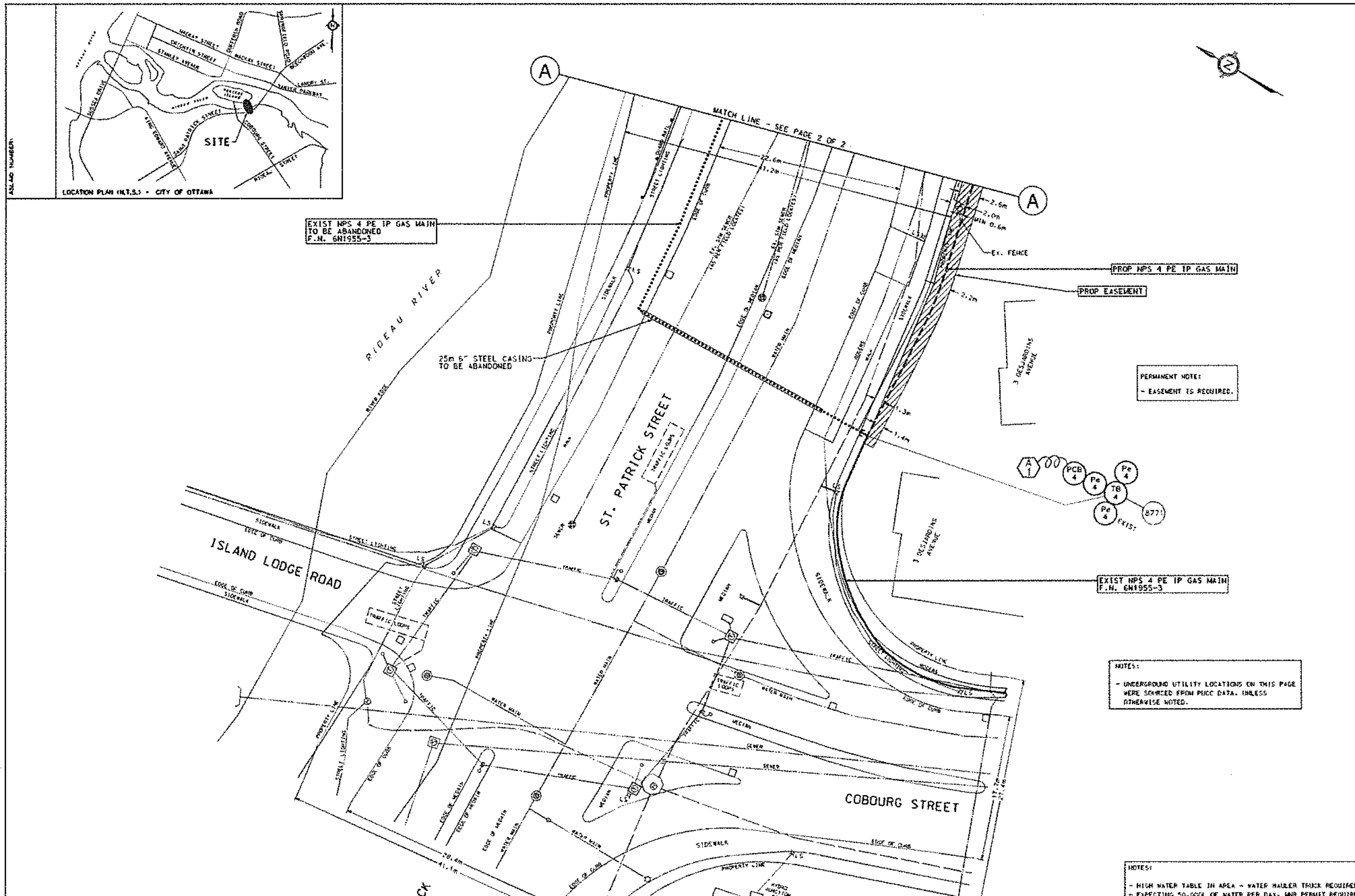


TABLE 12-5:
MINIMUM HORIZONTAL DIRECTIONAL DRILLING BORE PATH REQUIREMENTS FOR STEEL PIPE

PIPE				MIN PIPE RADIUS		MIN HORIZONTAL DISTANCE		MIN COVER		MIN CROSSING LENGTH		ANGLE
SIZE	OD (mm)	WT (mm)	GRADE	m	ft	m	ft	m	ft	m	ft	deg
4	114.3	4	290	137	450	12.20	40.00	3.05	10	62	204	8



NOTES:

- HIGH WATER TABLE IN AREA - WATER HAULER TRUCK REQUIRED.
- EXPECTING 50,000L OF WATER PER DAY. MNR PERMIT REQUIRED.
- SOIL DISPOSAL: REMOVE TO MOE APPROVED LANDFILL SITE. REPLACE WITH CLEAN SOIL.

FITTING No.			
TEST @ ____ kPa W/			
TYPE ____ DURATION			
	SIGNATURE	CERT. No.	DATE
INSPECTOR			
FITTER			
NOTEKEEPER			
CONTRACTOR			

ENBRIDGE GAS DISTRIBUTION LEGEND

PROP. ABANDONED GAS MAIN	••••••••
PROPOSED GAS MAIN	— — — —
EXISTING GAS MAIN	———

STANDARD CITY OF OTTAWA LEGEND

———	BELL
— — —	HYDRO
———	SEWER
———	WATER

STANDARD NOTES :

- ALL ASPHALT ROAD, DRIVEWAY & TREE CROSSINGS TO BE HORIZONTAL DIRECTIONAL DRILLED.
- ANY AUGERED, PLOWED, BORED OR DRILLED PIPE MUST USE 12 GAUGE TRACER WIRE AS PER SECTION 20.1.22 IN THE C&M MANUAL.
- PROPOSED GAS MAIN SHALL HAVE A MINIMUM COVER OF 1.2m FOR ALL ROAD CROSSINGS, 1.0m ALL OTHER LOCATIONS UNLESS NOTED OTHERWISE.
- ALL PROPOSED GAS MAINS ARE TO BE LOCATED ON THE OFFSET AS INDICATED ON THE DRAWINGS.
- ALL APPLICABLE PURGING PROCEDURES SHALL BE FOLLOWED AS OUTLINED IN THE C&M MANUAL.
- PIPELINE MARKERS TO BE PLACED ON ALL PURGE CAPS AND WELD CAPS.
- PIPELINE MARKERS TO BE INSTALLED AS THE P.D.F. AND THE C&M MANUAL.
- ANODES, TEST POINTS AND PIPELINE MARKERS TO BE INSTALLED WHERE SHOWN ON THE PLAN UNLESS APPROVED BY PLANNING AND/OR CORROSION.

TEST INFORMATION:
TESTED @ ____ kPa DURATION: ____ h / min
WITH: AIR / NITROGEN / WATER TEST TYPE: SPRING GAUGE / TEST CHART / DRAGNET / OTHER
INSPECTOR: ____ CERT No: ____ DATE: ____
FITTER: ____ CERT No: ____ DATE: ____
NOTEKEEPER: ____ CERT No: ____ DATE: ____
CONTRACTOR: ____ CREW I.D. ____ DATE: ____

INSPECTION DETAILS:
START DATE: ____ COMPLETION DATE: ____ ENERGIZED DATE: ____
CONSTRUCTED BY: ____ ENERGIZED BY: ____ STAKED BY: ____

TEST INFORMATION:
TESTED @ ____ kPa DURATION: ____ h / min
WITH: AIR / NITROGEN / WATER TEST TYPE: SPRING GAUGE / TEST CHART / DRAGNET / OTHER
INSPECTOR: ____ CERT No: ____ DATE: ____
FITTER: ____ CERT No: ____ DATE: ____
NOTEKEEPER: ____ CERT No: ____ DATE: ____
CONTRACTOR: ____ CREW I.D. ____ DATE: ____

INSPECTION DETAILS:
START DATE: ____ COMPLETION DATE: ____ ENERGIZED DATE: ____
CONSTRUCTED BY: ____ ENERGIZED BY: ____ STAKED BY: ____

PROPOSED ENBRIDGE BILL OF MATERIALS

CREATED BY: P GARNIER
CHECKED BY: ____
APPROVED BY: ____

ST. PATRICK STREET RELOCATION
CITY OF OTTAWA

DATE: 2012-07-24
PROJECT No: 6.8634605
W.R. No: 8634624

MARK	SIZE	STOCK No	REQ'D	DESCRIPTION	Crew
PE	4	0801105	60m	PIPE PE 10.58mm W.T. CSA B137.4 SDR 11 OR	
PE	4	0801190	60m	COILED PIPE PE 10.58mm W.T. CSA B137.4 SDR 11(AS REQUIRED)	
P	4	0933086	5m	PIPE STEEL GRADE 290 W.T. 4.0 mm CSA Z245.1 CAT.I COATING TO CSA Z245.21 Y.A	
P	4	0975300	142m	PIPE STEEL GRADE 290 W.T. 4.0 mm CSA Z245.1 CAT.I COATING TO CSA Z245.21 COATING SYSTEM 2A DOUBLE	
				FUSION BONDED EPOXY WITH ADDITIONAL 35MLS OF SPC-2888 LIQUID APPLIED EPOXY	
CW	4	1102472	1	CAP WELDED GRADE WPB 240 MPa SMYS ANSIB16.9 ASTM A234 6.0mm W.T. TAPER BORED TO 4.8mm W.T.	
EL90	4	1102232	2	ELBOW 90 WELDED L.R. GRADE WPB 240 MPa SMYS ANSIB16.9 ASTM A234 6.0mm W.T. TAPER BORED TO	
				4.8mm W.T.	
EL45	4	1104273	1	ELBOW 45 WELDED GRADE WPB 240 MPa SMYS ANSIB16.9 ASTM A234 6.0mm W.T. TAPER BORED TO 4.8mm	
				W.T.	
3WT	4	1175220	1	THREE WAY TEE STRAIGHT WASON SHORTSTOPP ANSISCHES 150 ANSIB16.25 6.0mm W.T. TAPER BORED TO	
				4.8mm W.T. (REFER TO WASON FITTING NOTE)	
S-N	2	1422341	1	SAVE A VALVE NIPPLE MUELLER H17491 WITH STEEL CAP	
PCB	4	1806399	1	PURGE CAP PE BUTT FUSED CSA B137.4	
CS	½	1805794	2	CAP PE SOCKET FUSED CSA B137.4	
TB	4	1810235	1	TEE PE BUTT FUSED CSA B137.4	
TF	4	1812340	1	TRANSITION FITTING PE CSA B137.4 C/W PROTECTIVE SLEEVE	
ECE	4	1815162	AS REQ'D	INNOGAZ COUPLING EXTERNAL PE ELECTROFUSED CSA B137.4.1	
TW		3036644	AS REQ'D	TRACER WIRE 14 AWG SOLID TW75 WHITE	
TW		3036689	AS REQ'D	TRACER WIRE 12 AWG SOLID TW75 GREEN (TO BE USED IN HORIZONTAL DRILLING APPLICATIONS)	
A	1 LB	2207016	1	MAGNESIUM ANODE 1LB	
A	17 LB	2213174	1	MAGNESIUM ANODE 17-51 ANODE	
TP		2221127	1	TEST POINT PLASTIC FOUR WIRE (NORTH - BLACK SOUTH - RED EAST - BLUE WEST - WHITE)	
PMT		2115517	AS REQ'D	PIPELINE MARKER 1.8m POLY-FLEX POST (TEMPORARY)	
PMP		2116000	AS REQ'D	PERMANENT PIPELINE MARKER POST	
PMP		2116500	AS REQ'D	PERMANENT PIPELINE MARKER SIGN	

PROJECT SUMMARY DETAIL FOR PROPOSED

ON	NETWORK NUMBER	LOW NODE	HIGH NODE	NPS	PROPOSED LENGTH	PMTS ID NUMBER	ACTUAL LENGTH INSTALLED CREW 1	CREW 2	ENERGIZE DATE
ST. PATRICK STREET	6544	8771	8772	4 PE	60 m	3629940			
PORTER'S ISLAND	6544	8772	8773	4 ST	142 m	3629942			
RIDEAU RIVER CROSSING	6544	8773	8774	4 ST	10 m	3629943			

PROPOSED ABANDONED ENBRIDGE BILL OF MATERIALS

CREATED BY: P GARNIER
CHECKED BY: ____
APPROVED BY: ____

ST. PATRICK STREET RELOCATION
CITY OF OTTAWA

DATE: 2012-07-24
PROJECT No: 6.8634605
W.R. No: 8634628

MARK	SIZE	STOCK No	REQ'D	DESCRIPTION	Crew

PROJECT SUMMARY DETAIL FOR PROPOSED ABANDONED

ON	NETWORK NUMBER	LOW NODE	HIGH NODE	NPS	PROPOSED LENGTH	PMTS ID NUMBER	ACTUAL LENGTH INSTALLED CREW 1	CREW 2	ENERGIZE DATE
ST. PATRICK STREET	6544	7773	8771	4 PE	83.0 m	3629643			
ST. PATRICK STREET	6544	7773	7774	4 ST	4.9 m	79505			
ST. PATRICK STREET	6544	7774	7810	4 ST	78.8 m	377223			
ST. PATRICK STREET	6544	7810	8774	4 ST	20.1 m	N/A			

STAMP AREA:

STAMP AREA:

No	REVISION FOR COMPLETE PROJECT	SIGNATURE	DATE
1	REVISED BORE PROFILE DETAILS - SHEET TWO	P GARNIER	2012-09-27
2	REVISED PER LAND DEPARTMENT	P GARNIER	2012-10-23
3	REVISED WATER CROSSING NOTE - SHEET TWO	P GARNIER	2012-12-17
4	UPDATES AS PER LAND DEPT	F YANG	2013-01-15

INSPECTION DETAILS:
START DATE: ____ COMPLETION DATE: ____ ENERGIZED DATE: ____
CONSTRUCTED BY: ____ ENERGIZED BY: ____ STAKED BY: ____

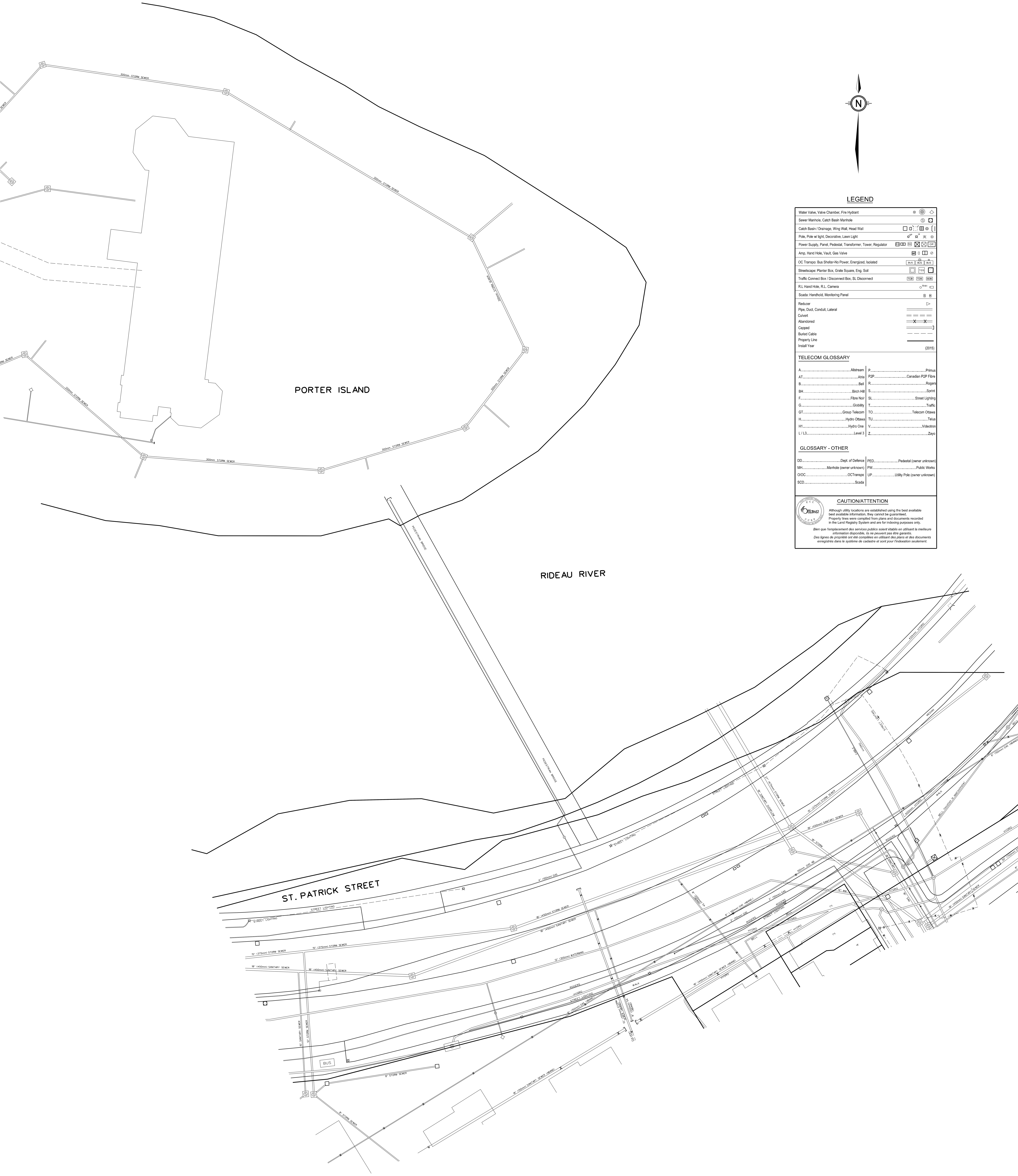
CONSULTANT: N/A

PROJECT: ST.PATRICK STREET

MATERIAL: PE ✓ ST ✓	LOCATION CLASS: 1 2 3 4	MUNICIPALITY: CITY OF OTTAWA		
ENGINEERING APPROVAL:	CLASS & TEST PRESSURE (kPa): IP 700	PROJECT No: 6.8634605		PAGE: 1 OF 2
	TEST MEDIUM: AIR/NITROGEN	WORK REQUEST No: 8634624		
	TEST DURATION:	ABAND'D WR No: 8634628		
	PER CONSTRUCTION AND MAINTENANCE MANUAL TABLE 25-3	DRAWN BY: P GARNIER	CONST BY: P GARNIER	SCALE: HORIZ: 1:250 VERT: 1:100
	PLATE No: NE-125	DATE: 2012-07-10	DATE: 2012-07-10	
	GRID No: 60-L-55	PLANNER APPROVED BY:	DRAFTING APPROVED BY:	
	NETWORK No: 6544			
	CORROSION No: 60-A05-052 60-A05-054	DATE:	DATE:	
	CORROSION APPROVAL/DATE: PENDING			

ENBRIDGE

ASLAID NUMBER:


PORTER ISLAND
RIDEAU RIVER
ST. PATRICK STREET
300mm STORM SEWER
STREET LIGHTING
BUS
N
LEGEND
Water Valve, Valve Chamber, Fire Hydrant
Sewer Manhole, Catch Basin Manhole
Catch Basin / Drainage, Wing Wall, Head Wall
Pole, Pole w/ light, Decorative, Lawn Light
Power Supply, Panel, Pedestal, Transformer, Tower, Regulator
Amp, Hand Hole, Vault, Gas Valve
OC Transpo: Bus Shelter-No Power, Energized, Isolated
Streetscape: Planter Box, Grate Square, Eng. Soil
Traffic Connect Box / Disconnect Box, SL Disconnect
R.L Hand Hole, R.L. Camera
Scada: Handhold, Monitoring Panel
Reducer
Pipe, Duct, Conduit, Lateral
Culvert
Abandoned
Capped
Buried Cable
Property Line
Install Year
(2015)
TELECOM GLOSSARY
A....Allstream
AT....Atria
B....Bell
BH....Birch Hill
F....Fibre Noir
G....Globility
GT....Group Telecom
H....Hydro Ottawa
H1....Hydro One
L / L3....Level 3
P....Primus
P2P....Canadian P2P Fibre
R....Rogers
S....Sprint
SL....Street Lighting
T....Traffic
TO....Telecom Ottawa
TU....Telus
V....Videotron
Z....Zayo
GLOSSARY - OTHER
DD....Dept. of Defence
MH....Manhole (owner unknown)
O/OC....OCTranspo
SCD....Scada
PED....Pedestal (owner unknown)
PW....Public Works
UP....Utility Pole (owner unknown)
UCC
Ottawa
CCSP
CAUTION/ATTENTION
Although utility locations are established using the best available best available information, they cannot be guaranteed.
Property lines were compiled from plans and documents recorded in the Land Registry System and are for indexing purposes only.
Bien que l'emplacement des services publics soient établis en utilisant la meilleure information disponible, ils ne peuvent pas être garantis.
Des lignes de propriété ont été compilées en utilisant des plans et des documents enregistrés dans le système de cadastre et sont pour l'indexation seulement.

[Quoted text hidden]

Note: Email correspondence identifying costs for modular bridge installation to act as utility structure.

---------- Forwarded message ----------
From: Fergus Mcilraith <fmcilraith@algonquinbridge.com>
To: "Karadakis, Kosta" <kosta.karadakis@ottawa.ca>
Cc:
Bcc:
Date: Mon, 8 Apr 2019 18:01:17 +0000
Subject: RE: Notice: A new Lead has been created for you in SFDC

CAUTION: This email originated from an External Sender. Please do not click links or open attachments unless you recognize the source.

ATTENTION : Ce courriel provient d'un expéditeur externe. Ne cliquez sur aucun lien et n'ouvrez pas de pièce jointe, excepté si vous connaissez l'expéditeur.

Hi Kosta,

As discussed, a budgetary price is $175,000 per 38.4m span.

This assumes galvanized steel, with timber deck, 2m wide.

Design, fabrication and delivery included.

Installation, & abutment design not included.

Let me know if you have questions.

Regards,

Fergus McIlraith, B.Eng., E.I.T.

Technical Sales Representative

Algonquin Bridge

C: 1-705-718-5657

www.algonquinbridge.com

From: Karadakis, Kosta <kosta.karadakis@ottawa.ca>
Sent: April-02-19 10:55 AM
To: Fergus Mcilraith <fmcilraith@algonquinbridge.com>
Subject: RE: Notice: A new Lead has been created for you in SFDC

Hi Fergus,

This is in the budgetary stage. We are looking at renewal alternatives for the pedestrian bridge, one of which is to replace with a utility bridge. Attached are drawings of the existing pedestrian bridge for your reference.

Thanks,

Kosta Karadakis, **M.A.Sc., P.Eng.**

Infrastructure Assessment Engineer - Structures

Asset Management Branch | Planning, Infrastructure and Economic Development Department

City of Ottawa | 100 Constellation Drive | 6th Floor E

Ottawa ON K2G 6J8 | MC 26-61

Tel: (613) 580-2424 ext. 23556 | Fax (613) 560-6068

kosta.karadakis@ottawa.ca

From: Fergus Mcilraith <fmcilraith@algonquinbridge.com>
Sent: Monday, April 01, 2019 9:02 AM
To: Karadakis, Kosta <kosta.karadakis@ottawa.ca>
Subject: FW: Notice: A new Lead has been created for you in SFDC

Hi Kosta,

We received your inquiry for the utility bridge in Ottawa below.

Do you have any drawings, or more details you could send?

Is this at a budgetary stage?

Regards,

Fergus McIlraith, B.Eng., E.I.T.

Technical Sales Representative

Algonquin Bridge

C: 1-705-718-5657

www.algonquinbridge.com

From: Riley Wilson
Sent: March-28-19 9:02 PM
To: Fergus Mcilraith <fmcilraith@algonquinbridge.com>
Subject: Fwd: Notice: A new Lead has been created for you in SFDC

Hi Fergus, lead below!

Riley.

Get Outlook for iOS

From: noreply@salesforce.com on behalf of System Admin <administration@ail.ca>
Sent: Thursday, March 28, 2019 10:13 AM
To: Riley Wilson
Subject: Notice: A new Lead has been created for you in SFDC

This is a notice for internal use that a new lead has been created for you Riley Wilson.

This lead has been automatically entered in SFDC as a new lead under your name.

Please update the lead source of this new lead to "AIL Website"

Riley Wilson, a new lead has been created, details are as follows...

Name: Kosta Karadakis
Company: City of Ottawa

Address Info:
ON
CA

Phone:
Fax:
E-mail:kosta.karadakis@ottawa.ca

Description:
Looking for a quote for a prefabricated utility bridge to be installed in the City of Ottawa spanning over Rideau River. The new superstructure is to be two-span (38.4 m - 38.4 m) and carry a single 4 inch gas main (NPS 4 steel gas main) and inspection catwalk

Detail Link:
https://na32.salesforce.com/00Q3800001UPupM

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2 attachments

noname.eml
41K

Third Party Requirements in the Vicinity of Natural Gas Facilities 2018.pdf
1368K

STANDARD

Third Party Requirements in the Vicinity of Natural Gas Facilities

Enbridge Gas Distribution

V3.1 2018

Revision History

Version	Date	Approval	Revisions
3.1	2018-Jul-25	Gonzalo Juarez Manager, Pipeline Engineering	Added new Section 6.0 Hydro-Excavation
3.0	2018-Apr-25	Gonzalo Juarez Manager, Pipeline Engineering	2.1 Work in the Vicinity of Pipelines • Updated contact numbers. 2.2 NEB-regulated Pipelines & Vital Mains • Added clarity. Table 2-2: Pipeline Location Verification Requirements for NEB-regulated pipelines and Vital Mains • Clarified requirements. Organized requirements by location of work. Table 2-3: Pipeline Location Verification Requirements for All Other Pipelines • Clarified requirements. Organized requirements by location of work. 2.4 Safe Excavation • Emphasized requirement that within 1 m (3.3 ft) of the NEB regulated or Vital Main only Hand Digging or hydro-excavation is allowed.

Version	Date	Approval	Revisions
			2.5 Points of Thrust • Clarified when EGD may require additional time to review the proposed work area. 2.6 Minimum Clearance from Other Structures • Updated captions for Table 2-5, 2-6, and 2-7. Added instruction to consider effects of stray current. Changed requirements for drilling perpendicular to a pipeline that is smaller than NPS 12. 2.10 Tree Planting • Added clarity to installation requirements for root deflectors. Removed inactive link to EGD information on tree planting. 4.1 General • Added clarity to approval requirements for exposed pipelines.

Version	Date	Approval	Revisions
			5.3 Drilling Across Pipelines • Changed requirements for drilling perpendicular to a pipeline that is smaller than NPS 12. 7.1 General • Added clarity. 7.2 Notification Requirements • Added clarity. • Updated insurance requirements. 7.3 Guidelines for Blasting • Added clarity. 8.3 Guidelines • Added clarity. 9.0 Appendix • Updated contact information. Added URL for Click Before You Dig.

Version	Date	Approval	Revisions
2.1	2015-Sep-30	Gonzalo Juarez Senior Engineering Construction & Maintenance	2.2 NEB Pipelines & Vital Mains • Added requirement for new NPS 42 Vital Main for GTA project, EGD's approval is required for all work within 30 m of the pipeline. 2.3 Pipeline Location Verification • Table 2-2, 2-3, 2-4 and 2-5. Added specific pipeline verification requirement for horizontal directional drilling. 5.1 General • Added additional daylight hole requirement for horizontal directional drilling. 5.2 Drilling Parallel to Pipelines • For drilling parallel to the pipeline, changed distance requirement to be measured from the side of the pipeline instead of locate marks. 5.3 Drilling Across Pipelines • Added additional daylight hole requirement and diagram, for horizontal directional drilling.

Version	Date	Approval	Revisions
2.0	2018-Apr-10	Nick Thalassinos Chief Engineer	2.0 General Requirements • Added requirements for clearance for Vital Mains and NEB regulated pipelines. • Added daylight hole requirements • Updated clearance requirements. 3.0 Operation of Heavy Equipment • Added Section 3.4 Damage to Enbridge Gas Distribution's Facilities. 5.0 Horizontal Directional Drilling • New section. 6.0 Backfilling • New section. Appendix • Updated contact numbers.
1.0	2007-Oct-01	Rob Fox Chief Engineer	Initial release.

Table of Contents

Introduction

This document is intended for anyone involved in planning or carrying out work in the vicinity of Enbridge Gas Distribution's (EGD) network. It summarizes the requirements to be followed and specifies the technical requirements aimed at protecting EGD's Facilities, and by extension, ensuring public and worker safety.

These Requirements supersede the prior version of EGD's *Third Party Requirements in the Vicinity of Natural Gas Facilities*, version 2.1 (2015). Version 3.0 (2018) is effective on June 6, 2018. Within this document, "Third Party" refers to an individual or organization that is not employed by or performing work under contract to EGD. These Requirements are applicable to work done by individuals such as homeowners, other utility companies, Excavators, Constructors, and Contractors.

Third Parties must follow the regulations and legislation applicable to their work in addition to these Requirements. It is understood that all legal provisions applicable to work carried out around natural gas Facilities take precedence over this document.

The terms "gas lines", "gas pipelines", and "mains" used throughout this document apply equally to natural gas mains and service lines, as well as any other component of the EGD's natural gas distribution system found on public or private land.

Note: The latest revision of this manual is available for download at https://www.enbridgegas.com/~/media/Extranet-Pages/Safety/Before-you-dig/Third-Party-Requirements-in-the-Vicinity-of-Natural-Gas-Facilities.

1.0 Definitions

Terms used in the following document are defined as follows:

Applicant: The owner of the proposed work.

Blaster: The person or persons responsible for setting the charges and performing the blast.

Blasting, Surface: An operation involving the excavation of rock foundations for various types of structures, grade construction for highways or railroads, or canals (trenches) for water supply or collection purposes.

Blasting, Tunnel: Operations involving the piercing of below ground (generally horizontal) opening in rock.

Compaction: Any vibration generating operation which will result in a potential increase of the density of soils or controlled backfill materials. The means to increase the density may be static or dynamic.

Constructor: A person who undertakes a project for an owner and includes an owner who undertakes all or part of a project by himself or by more than one employer (as defined by Occupational Health & Safety Act).

Contractor or Excavator: Any individual, partnership, corporation, public agency, or other entity that intends to dig, bore, trench, grade, excavate, hammer into, or break ground with mechanical equipment or explosives in the vicinity of a gas pipeline or related Facility.

Enbridge Gas Distribution (EGD): EGD refers to Enbridge Gas Distribution Inc., Enbridge Gas New Brunswick LP, Gazifère Inc., St. Lawrence Gas Company Inc., Niagara Gas Transmissions Limited, 2193914 Canada Limited.

Facility: Any Enbridge Gas Distribution main, service, regulator station or storage Facility and its related components.

Ground Disturbance: Activities associated with mechanical excavation, hydro-excavation, directional drilling, blasting, piling, Compaction, boring, ploughing, grading, backfilling and Hand Digging.

Hand Dig: To excavate using either a shovel with a wooden or fiberglass handle, or using hydro vacuum excavation equipment. The use of picks, bars, stakes or other earth piercing devices are not considered Hand Digging.

Independent Engineering Consultant: A Professional Engineer who is registered with the provincial or state Professional Engineering association and a holder of a Certificate of Authorization (C of A).

Locate Service Provider: Any entity that performs locates under the terms of a Locate Service Agreement.

Mark-ups: The formal review process used by infrastructure owners to evaluate and comment on proposed designs.

Pile: Any vertical or slightly slanted structural member introduced or constructed in the soil in order to transmit loads and forces from the superstructure to the subsoil; the structural member can also be used as a component of a retaining wall system.

Pile Driving: The placement of piles carried out by gravity hammer, vibratory hammer, auger, pressing, screwing or any combinations of the above methods.

Professional Engineer: An engineer registered and licensed with the provincial or state Professional Engineering Association in the jurisdiction in which the engineer is practicing.

Temporary Support: The support of gas pipelines before or during an excavation to protect the pipeline from its own weight; minimize deflection stresses.

Third Party: An individual or organization that is not employed by or performing work under contract to EGD (e.g. homeowners, other utility companies, Contractor, Excavators, Constructor etc.).

Vital Main: A subset of mains consisting of NEB-regulated (National Energy Board) pipelines, and select distribution pipelines.

2.0 General Requirements

2.1 Work in the Vicinity of Pipelines and Related Infrastructure

All work in the vicinity of gas Facilities must adhere to the requirements set forth in this document. Work includes, but is not limited to, any Ground Disturbance in the vicinity of Facilities or equipment crossing. Ground disturbance includes, but is not limited to, activities associated with mechanical excavation, hydro-excavation, directional drilling, blasting, piling, Compaction, boring, ploughing, grading, backfilling and Hand Digging. Locates are required before Ground Disturbance takes place.

A locate of the Facilities must be requested at least five (5) business days prior to beginning any work.

Table 2-1 Locate Contact Information

Area	Utility	Locates
Ontario	Enbridge Gas Distribution Inc.	Ontario One Call: www.on1call.com
Quebec	Gazifère	Info Excavation: www.info-ex.com
New Brunswick	Enbridge Gas New Brunswick	EGNB: 1-800-994-2762
New York	St. Lawrence Gas	Dig Safely New York: Dial 811

2.2 NEB-regulated Pipelines & Vital Mains

The NEB regulates natural gas, oil and commodity pipelines that extend beyond provincial, territorial or national boundaries. All work in the prescribed area (within 30 m (100 ft) from each side of the right of way of a NEB-regulated pipeline) must be reviewed by the applicable NEB-regulated operating company prior to commencing. This review is a regulatory requirement of the NEB.

Mains are designated as Vital Mains by EGD. The designation of pipelines as Vital Main may change at the discretion of EGD.

For the Enbridge Gas Distribution Inc. NPS 42 Vital Main, all work within 30 m (100 ft) from either side of the Vital Main must be approved by EGD prior to commencing. For all other Vital Mains, all Ground Disturbance work within 3 m (10 ft) from either side of the Vital Main, must be approved by EGD prior to commencing. Approval by EGD may include specific conditions that Third Parties must follow. EGD may require representation on site for any Ground Disturbance work within the vicinity of Vital Main and NEB-regulated pipelines.

NEB Vital Main	NEB-regulated pipelines and Vital Mains will be identified through locates and the Mark-Ups process. In these Requirements, special considerations for NEB-regulated pipelines and Vital Mains will be highlighted.

2.3 Pipeline Location Verification

Table 2-2 Pipeline Location Verification Requirements for NEB-regulated Pipelines and Vital Mains and Table 2-3 Pipeline Location Verification Requirements for All Other Pipelines indicates EGD's minimum requirements for the verification of the pipeline location based on the nature of work. The frequency and location of test holes may change at the discretion of EGD. Additional test holes may be required to sufficiently confirm the location of the pipeline.

When using hydro-excavation as an alternative to Hand Digging, refer to Section 6.0: Hydro-Excavation for safe operating practices.

Note: For all pipelines (including NEB-regulated pipelines and Vital Mains), when drilling parallel to the pipeline, a minimum horizontal clearance of 1 m (3.3 ft) is required.

When crossing perpendicular to a pipeline that is smaller than NPS 12 (excluding NEB-regulated pipelines or Vital Mains), the vertical clearance outlined in Table 2-5 Minimum Clearance Between Gas Pipelines (Less than NPS 12) and Other Underground Structures may be used as long as all daylighting requirements are also followed.

When crossing perpendicular to a pipeline that is NPS 12 or larger, or crossing any NEB-regulated pipelines or Vital Mains, a minimum vertical clearance of 1 m (3.3 ft) is required. See Section 5.0: Horizontal Directional Drilling.

Table 2-2 Pipeline Location Verification Requirements for NEB-regulated Pipelines and Vital Mains

Location of Work Relative to Pipeline	Required Verification of Pipe Location by Hand Digging or Hydro-Excavation
Work within 3 m (10 ft) but not crossing main	Top and sides of pipeline
Work parallel to pipe, within 1 m (3.3 ft) of edge of pipe	Spacing of test holes must not exceed 4.5 m (15 ft)
Work parallel to pipe, 1 m - 3 m (3.3 ft - 10 ft) from edge of pipe	Spacing of test holes must not exceed 10 m (33 ft)
Crossing below pipeline (open excavation)	Top and sides of pipeline, and 0.6 m (2 ft) below the pipeline
Crossing above pipeline (open excavation)	Top and sides of pipeline, or 0.6 m (2 ft) below the proposed installation

Table 2-3 Pipeline Location Verification Requirements for All Other Pipelines

Location of Work Relative to Pipeline	Required Verification of Pipe Location by Hand Digging or Hydro-Excavation
Work within 3 m (10 ft) but not crossing pipeline	Top and sides of pipeline
Work parallel to pipe, within 1 m (3.3 ft)	Spacing of test holes must not exceed 4.5 m (15 ft)
Work parallel to pipe, 1 m - 3 m (3.3 ft - 10 ft) from edge of pipe	Spacing of test holes must not exceed 10 m (33 ft)
Crossing below pipeline (open excavation)	For less than NPS 12: all sides of the pipeline including 0.3 m (1 ft) below the pipeline
	For NPS 12 and larger: all sides of the pipeline including 0.6 m (2 ft) below the pipeline

Table 2-3 Pipeline Location Verification Requirements for All Other Pipelines

Location of Work Relative to Pipeline	**Required Verification of Pipe Location by Hand Digging or Hydro-Excavation**
Crossing above pipeline (open excavation)	For less than NPS 12: Top of pipeline and all sides of the pipeline, or 0.3 m (1 ft) below the proposed installation
	For NPS 12 and larger: Top of pipeline and all sides of the pipeline, or 0.6 m (2 ft) below the proposed installation

Table 2-4 Pipeline Location Verification and Clearance Requirements for HDD for all Pipelines (including NEB and Vital Mains)

Location of Work Relative to Pipeline[a]	**Required Verification of Pipe Location by Hand Digging or Hydro-Excavation**
Crossing below pipeline (HDD)	All sides of pipeline (including below pipeline) exposed to 1.0 m (3.3 ft) from the pipeline's sidewalls. Additional daylight hole at 2.0 m to 4.0 m (6.6 ft to 13.1 ft) prior to the daylight hole at the crossing, to verify depth and trajectory of drill head and backreamer.
Crossing above pipeline (HDD)	Top of pipeline and all sides exposed to 1.0 m (3.3 ft) or 1.0 m (3.3 ft) below the proposed installation. Additional daylight hole at 2.0 m to 4.0 m (6.6 ft to 13.1 ft) prior to the daylight hole at the crossing, to verify depth and trajectory of drill head and backreamer.

a. See Figure 5-2 Pipeline Location Verification and Clearance Requirements for HDD for crossing all pipelines (including NEB-regulated pipelines and Vital Mains).

2.4 Safe Excavation

NEB Vital Main	Mechanical excavation is not permitted within 3 m (10 ft) of NEB-regulated pipelines or Vital Mains, unless verified visually. After the exact location of the main is verified visually, mechanical excavation is allowed up to 1 m (3.3 ft) from the pipeline. Within 1 m (3.3 ft) of the NEB-regulated or Vital Main, only Hand Digging or hydro-excavation is allowed.

For all other pipelines (excluding NEB-regulated and Vital Mains), mechanical excavation is not allowed within 1 m (3.3 ft) of the locate marks of the pipeline, until the exact location of the pipeline has been visually verified. The Excavator must expose the pipeline by Hand Digging or hydro-excavation. Once the pipeline is exposed, mechanical excavation is then permitted up to 0.3 m (1 ft) from the pipeline. Within 0.3 m (1 ft) of any pipeline, only Hand Digging or hydro-excavation is permitted.

Only hand held Compaction equipment may be used within 1 m (3.3 ft) of the sides or top of all gas pipelines.

Spoil from excavation must not be piled on the pipeline or its easement.

2.5 Points of Thrust

Additional precautions may need to be taken when working in the vicinity of points of thrust. Points of thrust occur at pipeline fittings such as elbows (45° or 90°), end caps, weld tees, reducers, closed valves, and reduced port valves. If a point of thrust is identified through the locate process, EGD may require additional time to review the proposed work area. In the event that the excavation involves exposing a point of thrust or exposing an area near a point of thrust, EGD may provide written specific instructions that are to be followed. Failure to follow these instructions can result in significant harm to persons, property and the environment.

2.6 Minimum Clearance from Other Structures

The following clearances must be maintained between the circumference of the gas pipeline and other underground structures:

Table 2-5 Minimum Clearance Between Gas Pipelines (Less than NPS 12) and Other Underground Structures

Direction	**Minimum Clearance m (ft)**
Horizontal	0.6 m (2 ft)
Vertical	0.3 m (1 ft)

Table 2-6 Minimum Clearance Between Gas Pipelines (NPS 12 and larger) and Other Underground Structures

Direction	**Minimum Clearance m (ft)**
Horizontal	0.6 m (2 ft)
Vertical	0.6 m (2 ft)

Table 2-7 Minimum Clearance Between NEB-regulated pipelines and Vital Mains and Other Underground Structures

Direction	**Minimum Clearance m (ft)**
Horizontal	1 m (3.3 ft)
Vertical	0.6 m (2 ft)

When crossing EGD's pipelines, all proposed installations must be installed as close to a 90° angle as possible.

Additional clearance or mitigation may be required for installations (such as transit systems or power transformers) that will introduce DC stray current interference or AC fault hazards.

Note: For all pipelines (including NEB-regulated pipelines and Vital Mains), when drilling parallel to the pipeline, a minimum horizontal clearance measured from the edge of the pipeline to the edge of the final bore hole of 1 m (3.3 ft) is required.

When drilling across pipelines that are smaller than NPS 12 (excluding NEB-regulated pipelines and Vital Mains), the vertical clearance, measured from the edge of the pipeline and the edge of the final bore hole, may follow the vertical clearance outlined in Table 2-5 Minimum Clearance Between Gas Pipelines (Less than NPS 12) and Other Underground

Structures as long as all daylighting requirements are also followed.

When drilling across pipelines that are NPS 12 or larger, or crossing any NEB-regulated pipelines or Vital Mains, a minimum vertical clearance, measured from the edge of the pipeline to the edge of the final bore hole, of 1 m (3.3 ft) is required. See Section 5.0: Horizontal Directional Drilling.

Table 2-8 Minimum Cover Requirements

	Location	Min. Cover m (ft)
Mains	Under traveled surfaces (roads), Road Crossings	1.2 m (4 ft)
	Right-of-way	1 m (3.3 ft)
	Highways	1.5 m (5 ft)
	Railways – Cased	1.7 m (5.5 ft)
	Railways – Uncased	3.1 m (10 ft)
	Below drainage and irrigation ditch	1 m (3.3 ft)
Services	Private property	0.5 m (1.6 ft)
	Streets and Roads	0.9 m (2.9 ft)

2.7 Blasting, Pile Installation, and Compaction

Blasting, Pile installation or Compaction activities in the vicinity of EGD's Facilities require the prior approval of EGD.

Written notification from the owner of the proposed work must be submitted to EGD at the contact information listed in the Appendix. The request must be submitted a minimum of four (4) weeks prior to beginning work to allow sufficient time for review. See Section 8.0: Blasting Requirements, and Section 9.0: Pile Installation Or Compaction Requirements, for specific responsibilities.

NEB Vital Main	Piles within 3.0 m (10 ft) of NEB-regulated pipelines and Vital Main must be installed using an auger, unless otherwise approved by EGD. Vibration and displacement monitoring must be conducted, and communicated to EGD daily. Work must stop if the peak particle velocity exceeds 50 mm/sec (2 in./s) or displacement exceeds 50 mm (2 in.). The use of an auger will not be permitted within 1 m (3.3 ft) of a NEB-regulated pipeline or Vital Main, unless approved by EGD.

2.8 Repair of Damaged Pipe and Pipe Coating

In all cases where the pipeline or the pipeline coating is damaged by construction activities, contact EGD immediately and leave the excavation open until EGD personnel have made the necessary repairs.

2.9 Encroachment

Permanent awnings and roof structures are prohibited above EGD's Facilities within the public right-of-way, or EGD's right-of-way. EGD will not accept responsibility for any damages resulting from maintenance or operation of its Facilities to encroaching structures within the public or EGD right-of-ways. Example of encroaching structure may include: bus shelters, street benches or garbage bins.

EGD requires that all permanent structures be built a minimum of 7 m (22.9 ft) away from EGD's Vital and NEB-regulated pipelines and Vital Mains, unless otherwise approved by EGD. This requirement is in place as to allow EGD sufficient access and working space should an inspection or repair be needed.

2.10 Tree Planting

When planting trees, the gas pipeline in and near the area of excavation must be located to ensure sufficient clearance is maintained between the pipeline and the tree.

NEB Vital Main	For pipelines regulated by the NEB-regulated pipelines and Vital Mains, trees or large shrubs must have a minimum horizontal clearance between the edge of the root ball or open bottom container and adjacent edge of the existing pipeline of not less than 2.5 m (8 ft).

For all other pipelines (excluding NEB-regulated pipelines and Vital Mains), a minimum horizontal clearance of 1.2 m (4 ft) is recommended between the edge of the root ball or open bottom container and adjacent edge of the existing gas pipeline.

In cases where the recommended clearance cannot be achieved, EGD may specify the installation of a root deflector.

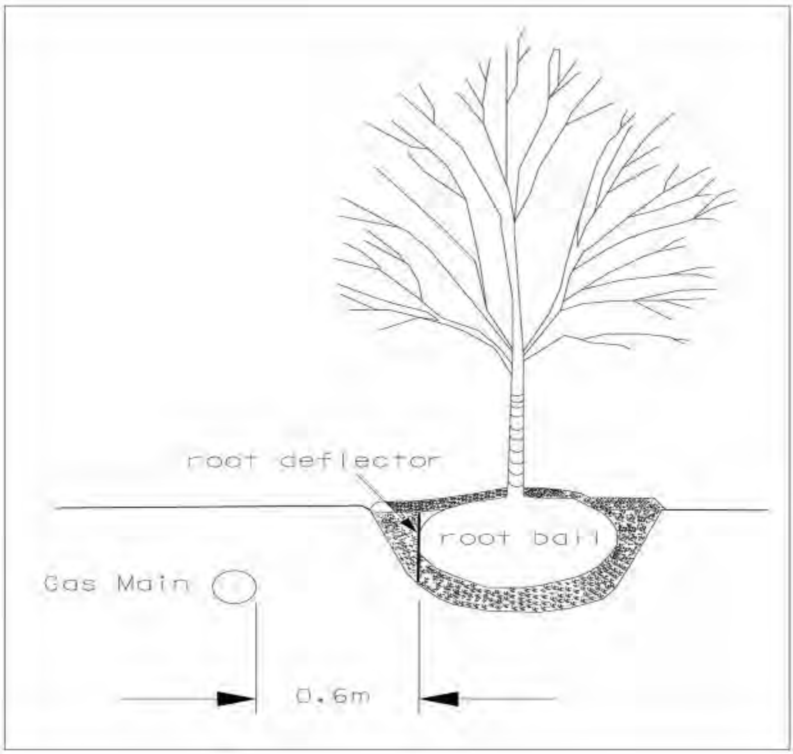
Root Deflectors

A root deflector is a physical barrier placed between tree roots and pipelines to prevent damage to the pipelines. A root deflector can be made from ¼ in. thick rigid plastic, fiberglass or other non-degradable material. The root deflector is intended to prevent the root tips from attaching to the gas main.

Typically, root deflectors are straight barriers or encircle the tree. If installed as a straight barrier, the root deflector should be installed 0.6 m (2 ft) from the pipeline on the tree-side of the pipeline. Also, it should extend parallel to the pipeline in both directions for 1.2 m (4 ft) measured from the center of the tree trunk.

Root deflectors usually have a collar to keep the top of the deflector at ground level, and extend down to the bottom of the root-ball as shown in Figure 2-1 Example of a Root Deflector.

Figure 2-1 Example of a Root Deflector



3.0 Operation of Heavy Equipment

3.1 General

Additional precautions are necessary when equipment in excess of the weights listed in Table 3-1 Vehicle Load Restrictions is operated in the vicinity of buried Facilities where no pavement exists or where grading operations are taking place.

Table 3-1 Vehicle Load Restrictions

Pipe Material	Weight/Axle Maximum Allowable Load kg (lb)
Plastic	7,000 kg (15,400 lb)
Steel	10,000 kg (22,046 lb)

Prior to any crossing, the location of the gas main must first be staked out by an EGD representative.

The Excavator is responsible for confirming the location and depth of the main. Test hole spacing must not exceed 50 m (160 ft).

3.2 Equipment Moving Across the Pipeline

Crossing locations for heavy equipment must be kept to a minimum.

The crossing locations must be determined by EGD after reviewing:

- The nature of the construction operation
- The types and number of equipment involved
- The line and depth of the existing gas main

The use of equipment is contingent upon the review by EGD.

Once the crossing locations have been established, heavy equipment is restricted to crossing at these locations only. It is the responsibility of the Third Party to inform their personnel of the crossing location restrictions.

Pipelines may require additional protection at crossing locations by constructing berms and/or installing steel plates over the pipeline.

Equipment must be operated at “dead-slow” speed when crossing pipelines in order to minimize loading impact. The pipeline must also be crossed at a 90° angle.

3.3 Equipment Moving Along the Pipeline

Heavy equipment can be operated parallel to existing pipelines provided that a minimum offset of 1 m (3.3 ft) is maintained on pipeline sizes less than NPS 12 and 2 m (6.6 ft) on pipeline sizes NPS 12 and larger, unless otherwise directed by EGD.

Only lightweight, rubber-tired equipment may be operated directly over the existing gas pipelines, unless a minimum pipe cover of twice the pipe diameter or 1 m (3.3 ft) (whichever is greater) can be verified. The use of all other equipment is contingent upon review and approval by EGD.

3.4 Damage to Enbridge Gas Distribution's Facilities

If damage to EGD's Facilities occurs, all work must stop and the damage must be reported immediately by calling the Emergency Contact numbers listed in the Section 10.0: Appendix.

4.0 Support of Gas Pipelines

4.1 General

The support requirements specified in this section are the minimum requirements. EGD must be notified regarding the support of any gas main. EGD has complete discretion in the approval of any support system. Additionally, if a pipeline is to be exposed for longer than one month, approval must be sought from EGD and work must follow the requirements outlined in Section 2.0: General Requirements.

Third Parties must not depart from these support requirements unless a Professional Engineer working for or on behalf of the Third Party has designed an alternative method. Any alternative method must be comparable to these specifications and be, in the opinion of the Professional Engineer, consistent with good engineering practices. The alternative specification must be documented, approved by a Professional Engineer and provided to EGD for review prior to the commencement of work.

The Third Party is responsible for the adequate support of the buried gas pipelines exposed during excavation according to this section.

4.2 Support of Gas Pipelines Perpendicular to Excavation

Temporary Support must remain in place until the backfill material underneath the pipeline is compacted adequately to restore support of the pipeline.

Before trenching beneath a main or service, Temporary Support must be erected for pipelines if the unsupported span of pipe in the trench exceeds the length indicated in Table 4-1 Maximum Span without Support Beam.

Note: For pipelines larger than NPS 8, contact EGD. Contact information can be found in the Section 10.0: Appendix.

When Temporary Support is required, Table 4-2 Support Beam Sizes and Maximum Span Between Beam Supports indicates the required beam for a given span. The beam must be a continuous length grade No. 1 Spruce-Pine-Fir (S-P-F) or equivalent. For spans exceeding 4.5 m (15 ft), a continuous length timber beam may not be available. In that case, steel I-beams (or equivalents) can be used as the support beam. Steel beam selection must be certified by a Professional Engineer.

Table 4-1 Maximum Span without Support Beam

Pipe Size (NPS)	Steel m (ft)	PE (polyethylene) m (ft)
½	2 m (6.6 ft)	1 m (3.3 ft)
¾ to 1¼	2.5 m (8.2 ft)	1.25 m (4.1 ft)
2	3 m (10 ft)	1.5 m (5 ft)
3 to 4	4.5 m (15 ft)	1.75 m (6 ft)
6	6 m (20 ft)	2 m (7 ft)
8	7 m (23 ft)	2 m (7 ft)

Table 4-2 Support Beam Sizes and Maximum Span Between Beam Supports

Pipe Size (NPS)	Steel		PE	
	2 m (6.6 ft)	4.5 m (14.7 ft)	2 m (6.6 ft)	4.5 m (14.7 ft)
½ to 2	Nil	4 × 6	4 × 4	4 × 6
3 to 6	Nil	Nil	4 × 4	6 × 6

The beam must be placed above the pipe with the ends of the beam resting on firm undisturbed soil. The beam must not bear directly on the gas line. The pipe must be supported from the beam with rope, canvas sling, or equivalent in a manner that will prevent damage to the pipe and coating, and eliminate sag. The spacing between the ropes must not exceed 1 m (3.3 ft) (see Figure 4-1 Support of Gas Pipelines Crossing Excavations).

Backfill material underneath the exposed pipeline must be compacted to a minimum of 95% standard Proctor density. Sand padding must be placed to a level 150 mm (6 in.) below and above the main. See Section 7.0: Backfilling for additional details.

Perform Compaction with the loose lift height not exceeding 200 mm (8 in.) or one-quarter of the trench width, whichever is less. Injecting water into the backfill beneath the pipe is not an acceptable method of Compaction.

All Temporary Support on pipelines must be removed before backfilling. Adequate support must remain in place until the backfill material has restored support.

4.3 Support of Pipelines Parallel to Excavation

Trench wall support may not be required for excavations less than 1.2 m (4 ft) deep. In this case, support is not required if the pipeline is at least 0.6 m (2 ft) from the edge of the excavation or outside the 45° line projected upward from the trench bottom (see Figure 4-2 Influence Lines for Gas Pipelines Adjacent to Excavations). If the pipe does not meet these requirements and the soil is soft clay or sand (soil types 3 and 4), the excavation must be suitably shored to prevent movement of the pipe. The shoring must remain in place until the backfill material has restored support.

Trench wall support is required for excavations with the following conditions: depth is equal or greater than 1.2 m (4 ft), the pipeline is closer to the edge of the excavation than the minimum allowed distance indicated in Table 4-3 Minimum Allowed Distance from Main to Excavation, or the soil is unstable.

Minimum distances from the edge of the trench to the pipeline in which the excavation influences pipelines are shown in Table 4-3 Minimum Allowed Distance from Main to Excavation. The pipeline must be supported if these minimum distances cannot be met.

Table 4-3 Minimum Allowed Distance from Main to Excavation

Minimum Allowed Distance from Main to Excavation		
Trench Depth (m)	**Soils[a] Type 1 & 2**	**Soils[a] Type 3 & 4**
1.2 m (3.9 ft)	0.9 m (3 ft)	0.9 m (3 ft)
1.5 m (4.9 ft)	0.9 m (3 ft)	0.9 m (3 ft)
1.8 m (5.9 ft)	0.9 m (3 ft)	0.9 m (3 ft)
2.1 m (6.9 ft)	0.9 m (3 ft)	0.9 m (3 ft)

Table 4-3 Minimum Allowed Distance from Main to Excavation

Minimum Allowed Distance from Main to Excavation		
Trench Depth (m)	**Soils[a] Type 1 & 2**	**Soils[a] Type 3 & 4**
2.4 m (7.9 ft)	0.9 m (3 ft)	0.9 m (3 ft)
2.7 m (8.9 ft)	0.9 m (3 ft)	1 m (3.3 ft)
3 m (9.8 ft)	0.9 m (3 ft)	1.5 m (4.9 ft)
3.3 m (10.8 ft)	0.9 m (3 ft)	1.8 m (5.9 ft)
3.6 m (11.8 ft)	0.9 m (3 ft)	2.2 m (7.2 ft)
3.9 m (12.8 ft)	0.9 m (3 ft)	2.5 m (8.2 ft)
4.2 m (13.8 ft)	0.9 m (3 ft)	3 m (9.8 ft)
4.5 m (14.8 ft)	1 m (3.3 ft)	3.4 m (11.2 ft)
4.8 m (15.7 ft)	1.5 m (4.9 ft)	3.8 m (12.5 ft)
5.1 m (16.7 ft)	2 m (6.6 ft)	4.1 m (13.5 ft)
5.4 m (17.7 ft)	2.5 m (8.2 ft)	4.6 m (15.1 ft)
5.7 m (18.7 ft)	3 m (9.8 ft)	5 m (16.4 ft)
6 m (19.7 ft)	3.4 m (11.2 ft)	5.5 m (18 ft)

a. As defined in the Occupational Health and Safety Act.

For pipelines where the trench bottom is below the water table, the trench must be suitably shored as required in Section 4.3: Support of Pipelines Parallel to Excavation.

For pipelines within the minimum distances given in Table 4-3 Minimum Allowed Distance from Main to Excavation, shoring must remain in place until backfill material restores support.

Any pipeline that is exposed for a length greater than indicated in Table 4-1 Maximum Span without Support Beam requires a field assessment.

Figure 4-1 Support of Gas Pipelines Crossing Excavations

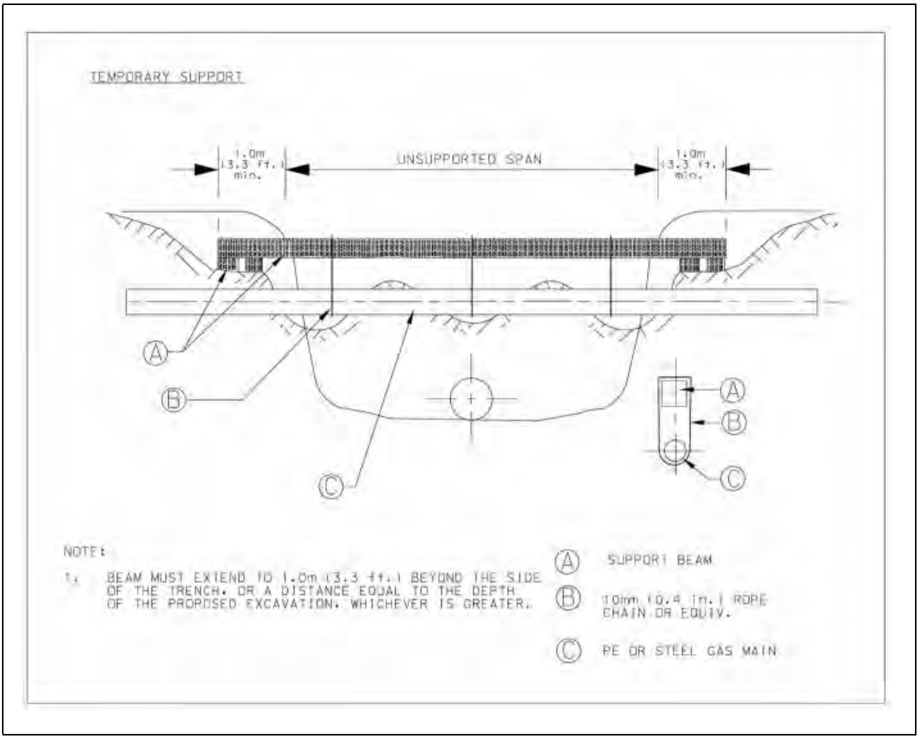
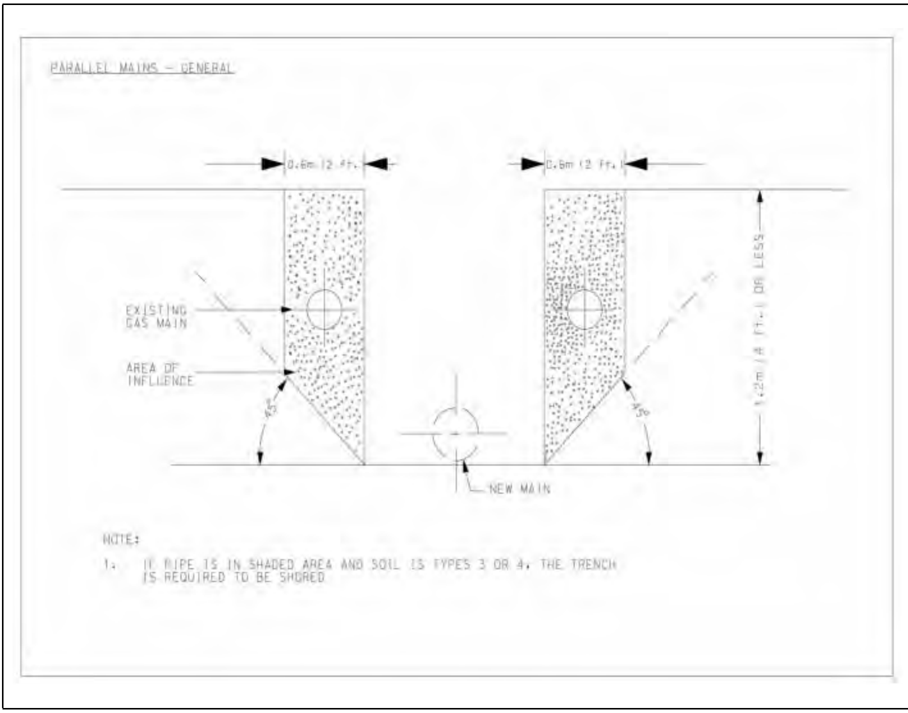


Figure 4-2 Influence Lines for Gas Pipelines Adjacent to Excavations



5.0 Horizontal Directional Drilling

5.1 General

Horizontal Directional Drilling (HDD) or Directional Boring is a steerable trenchless method of installing underground Facilities.

For installations using any other type of drilling or augering equipment in the vicinity of gas Facilities, contact EGD.

In all cases, daylight holes are required to visually verify the drill head's location (including depth) relative to the measurement of the tracking equipment. For daylight hole requirements, see Figure 5-2 Pipeline Location Verification and Clearance Requirements for HDD for crossing all pipelines (including NEB-regulated pipelines and Vital Mains).

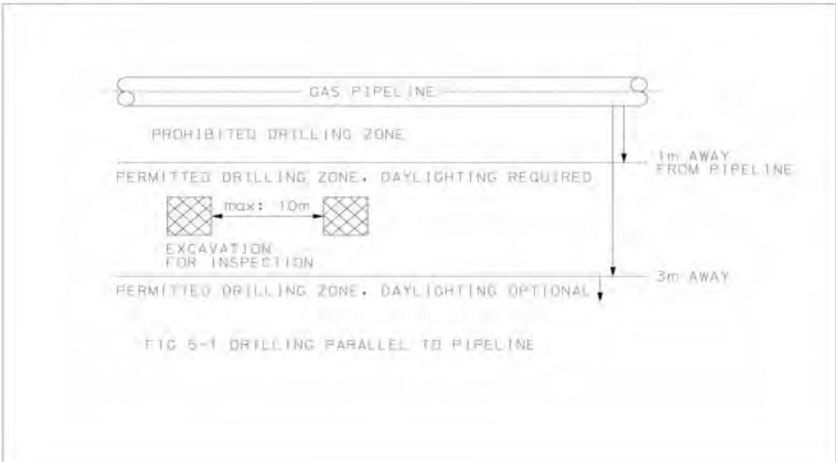
5.2 Drilling Parallel to Pipelines

When the proposed route is parallel to a natural gas pipeline at a perpendicular distance of 3 m (10 ft) or less, daylighting must be performed at intervals of no more than 10 m (33 ft) along the drilling path so that the precise location of the drilling head and backreamers (if any) can be verified visually. These excavations must be sufficiently wide to see the entire width of the drilling head, backreamers and structures from entry point to exit point.

The location of the pipeline must be visually confirmed as per the requirements set out in Table 2-2 Pipeline Location Verification Requirements for NEB-regulated Pipelines and Vital Mains and Table 2-3 Pipeline Location Verification Requirements for All Other Pipelines.

No drilling installation is to be performed within a distance of 1 m (3.3 ft) or less from either side of the pipeline. This prohibited zone may be widened in some cases.

Figure 5-1 Drilling Parallel to Pipelines



5.3 Drilling Across Pipelines

When the proposed drill path crosses an EGD pipeline, the pipeline must be exposed to the desired depth of the crossing to ensure that the natural gas pipeline is not affected and that the required clearance is maintained during all drilling operations. All minimum clearances must be measured from the outer edge of the drill, including backreamers (if any), to the outer circumference of the pipeline.

To assure that the directional drilling operation will not result in damage to the pipeline, the following daylight hole requirements must be followed:

- A pipeline daylight hole must be created that is sufficiently wide enough to see the drill head and backreamer entering the excavation at a minimum of 1 m (3.3 ft) before crossing the pipeline. See Figure 5-2 Pipeline Location Verification and Clearance Requirements for HDD for crossing all pipelines (including NEB-regulated pipelines and Vital Mains) Daylight Hole 1.
- A second daylight hole must be created prior to reaching the pipeline such that the precise location of the drill head and backreamer (if any) can be verified visually. The daylight hole

must be sufficiently wide to measure the depth and trajectory of the drill head and backreamer. See Figure 5-2 Pipeline Location Verification and Clearance Requirements for HDD for crossing all pipelines (including NEB-regulated pipelines and Vital Mains) Daylight Hole 2.

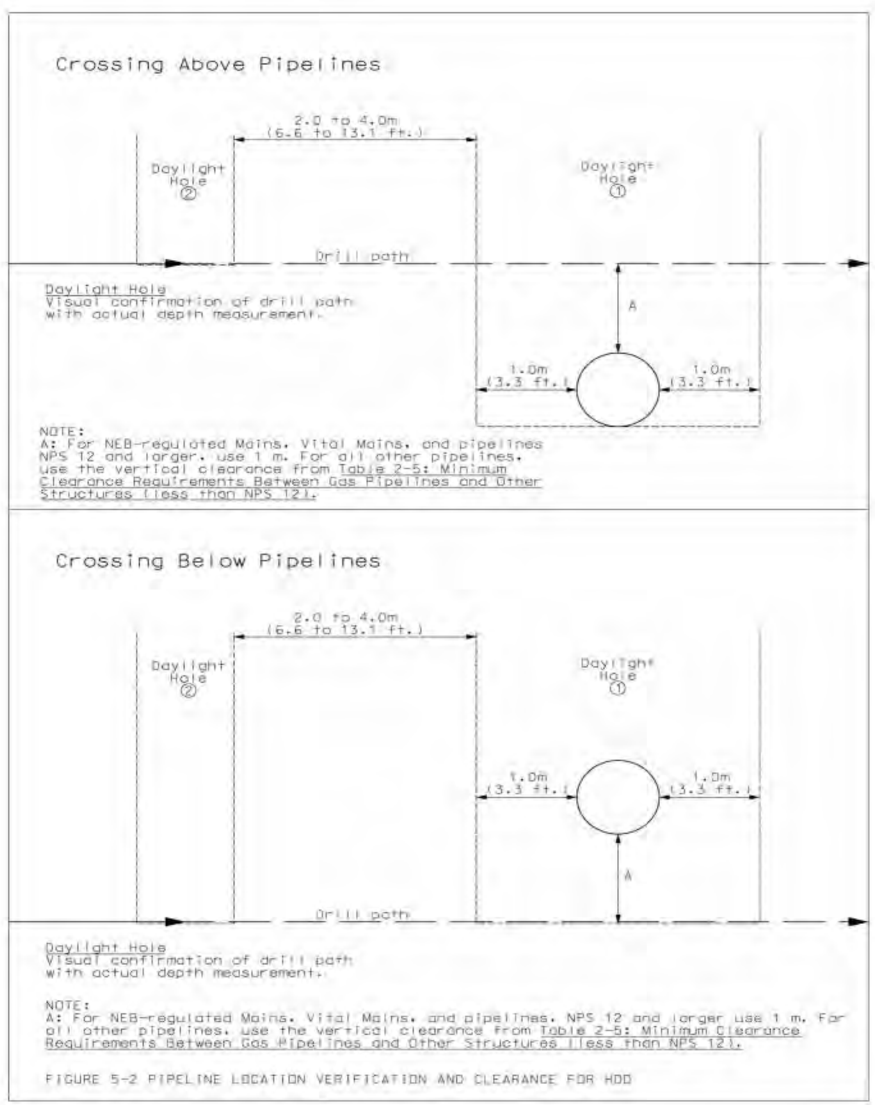
See Figure 5-2 Pipeline Location Verification and Clearance Requirements for HDD for crossing all pipelines (including NEB-regulated pipelines and Vital Mains).

When drilling across pipelines that are smaller than NPS 12 (excluding NEB-regulated pipelines and Vital Mains), the vertical clearance, measured from the edge of the pipeline and the edge of the final bore hole, may follow the vertical clearance outlined in Table 2-5 Minimum Clearance Between Gas Pipelines (Less than NPS 12) and Other Underground Structures as long as all daylighting requirements are also followed.

When drilling across pipelines that are NPS 12 or larger, or crossing any NEB-regulated pipelines or Vital Mains, a minimum vertical clearance, measured from the edge of the pipeline to the edge of the final bore hole, of 1 m (3.3 ft.) is required. See Section 5.0: Horizontal Directional Drilling.

The location of the pipeline must be visually confirmed as per the requirements set out in Table 2-2 Pipeline Location Verification Requirements for NEB-regulated Pipelines and Vital Mains and Table 2-3 Pipeline Location Verification Requirements for All Other Pipelines. See Section 2.6: Minimum Clearance from Other Structures for specified minimum clearances.

Figure 5-2 Pipeline Location Verification and Clearance Requirements for HDD for crossing all pipelines (including NEB-regulated pipelines and Vital Mains)



6.0 Hydro-Excavation

6.1 General

Hydro-excavation, also known as hydrovac, is the non-destructive process in which pressurized water is utilized as a method of excavation through loosening and suction of the soil, rocks, and other earth materials. Hydro-excavation machines are an alternative to hand digging to locate and expose pipelines.

6.2 Hydro-Excavation Procedures

The following procedures shall be followed at all times when excavating with hydro-excavation technology:

1. Prior to starting work, obtain the required locates. Operation of hydro-excavation equipment should only be performed by competent and qualified workers.
2. Spinning tip nozzles must be used for hydrovac excavations with water pressures that must not exceed the maximum water pressure of 20684 kPa (3000 psi) during excavation. Pressure measures shall be permanently monitored using a calibrated device mounted on either the hydro-excavation machine (truck, pump), or the wand when using a spinning tip nozzle.
3. Ensure that the wand shall never remain motionless during excavation. Avoid aiming directly at the plant at all times.
4. Maintain a distance of 20 cm (8 in.) between the end of the pressure wand nozzle and the plant and/or subsoil. Never insert the nozzle into the subsoil while excavating above the plant.
5. Hydro-excavation equipment and nozzles used must have been specifically designed for use above buried gas lines or other reasonably expected underground gas plant.
6. Install a device capable of stopping the excavation on demand, such as a dead man trigger or valve on the wand.
7. If heated water is used during excavation, the temperature and pressure of the water must not exceed 115°F (45°C) and 17250 kPa (2500 psi), respectively.

8. The excavator must contact the gas utility if any damage to gas plant occurs while using hydro-excavation technology or any other method of excavation.

7.0 Backfilling

7.1 General

The gas pipeline must be inspected by EGD for damages before backfilling the excavation. It is the Third Party's responsibility to ensure that the gas pipeline is not undermined or endangered in any way. If any damage occurs, contact EGD immediately at the Emergency phone numbers listed in Section 10.0: Appendix.

Backfilling must be done in such a manner as to prevent any rocks from being placed at or near the surface of the pipe. Native excavated material must be used as backfill unless otherwise directed by EGD. Where native material is unsuitable, 150 mm (6 in.) of approved earth or sand padding must be placed over the pipe for protection. Topsoil must not be used for backfilling.

Aggregate backfill must be replaced in 300 mm (12 in.) layers. Each layer must be thoroughly compacted by pneumatic tampers or an equivalent method acceptable to EGD to ensure no settlement.

The final layer must be smoothed down with a grader (or a rake for small scale projects) and must be tamped flush or slightly higher than the surrounding ground surface in order to prevent ponding of water and accommodate any future soil subsidence over the trench line.

Backfilling a flooded trench will not be allowed. The Third Party is responsible for the removal of water from the trench, before backfilling. If backfilling on a slope, the backfill must first be placed from the bottom of the slope, then the filling should continue by building upwards. This will prevent large voids in the backfill which can occur when the backfill is dumped from the top of a slope.

Backfill and Compaction within road allowances must be completed in accordance with the local governing authority. Any excess spoil must be removed as specified by EGD.

Unshrinkable fill or other engineered backfill material must be installed only when requested by the municipalities, local governing authority or as directed by EGD. The pipe and valve assemblies must be sand padded before placement of unshrinkable fill. The Third Party must ensure that placement of the unshrinkable fill does not displace sand padding or directly contact the pipeline.

The final covering of gas pipelines must adhere to municipal requirements.

8.0 Blasting Requirements

8.1 General

Before any blasting operation in the vicinity of a gas pipeline can occur, the hazards to EGD's plant must be evaluated. Responsibility for the design of the blast and any resultant damage is borne entirely by the Party using the explosives.

A recognized independent blasting consultant must be retained at the Applicant's expense to perform an evaluation of the blast design. The independent blasting consultant must be an Independent Engineering Consultant specialized in blasting. The copy of the stamped consultant's validation report of the blast must be submitted to EGD for review if the blasting will occur within 30 m (100 ft) of EGD's Facilities.

If in the opinion of EGD or an independent blasting consultant, blasting cannot be carried out without affecting the Facility's integrity, alternatives must be considered, including the replacement or relocation of the affected Facility at the Applicant's expense. In these situations, additional time must be allowed to obtain the necessary permits and to complete the necessary construction work.

In the event a third party is affected as a result of the blasting operations, all expenses associated therewith incurred by EGD must also be at the Applicant's expense.

Ontario: The Third Party must comply with the Ontario Provincial Standard Specification (OPSS 120 – General Specification for the Use of Explosives) in addition to EGD's blasting requirements.

New Brunswick: The Third Party must comply with the New Brunswick Provincial Standard Specification (NB Reg 89-108) in addition to EGD's blasting requirements.

Quebec: The Third Party must comply with Quebec's Acts regarding explosives (CQLR c E-22 and CQLR c E-22, r 1) and Safety Code (CQLR c S-2.1, r 4), in addition to EGD's blasting requirements.

8.2 Notification Requirements

Surface Blasting Applications

For Surface Blasting, a letter must be obtained from the Applicant, which includes:

- Name of the owner of the project, general Contractor and design engineer.
- Name of the blasting Contractor and person in charge of the blast.
- Proof of liability insurance in the minimum amount of $5 million per occurrence. Additional insurance requirements may be necessary. The certificate provided should indicate Enbridge Gas Distribution Inc. or the specific affiliate name as additional insured.
- Date for the blasting operation.
- A copy of a construction drawing drawn to scale indicating:
  - Map/sketch/detail of blasting zone showing the location of the gas Facilities and other public utilities (i.e. Bell, hydro, water).
  - Details of the proposed drilling and loading pattern for explosives.
  - Diameters of drilled holes, relative to EGD's Facilities.
- Predicted vibration levels anticipated at any affected Facilities.
- Number and timing of delays.
- Total explosive weight to be detonated per delay.
- Specifications for the type of explosives to be used.
- Controls to be used to confirm vibration levels (i.e. seismographs).
- Potential stabilization of rock face and type of potential stabilization techniques (i.e. rock anchors, shot crete, ribs, etc.).
- Geological parameters (borehole logs or geological reports) which indicate the design of the blast are acceptable.

- Written confirmation that the blasting operation will be carried out by qualified workers with appropriate engineering supervision.

Tunnel Blasting Applications

For Tunnel Blasting, the Applicant's letter must contain all information required in the Surface Blasting application as set out above. In addition, the required independent blasting consultant's report must include:

- Location plan and profile views with construction drawing or sketch drawn to scale.
- Evaluation of geotechnical data.
- Exact stand-off distances, horizontal and direct (radial).
- Type of advancement proposed and type of tunnel method; full face, top-heading and bench, pilot tunnel.
- Type of tunnel lining proposed.
- Other pertinent information specific to tunneling techniques.
- The use of preventative blasting techniques such as line drilling, cushion blasting, etc.

To assist with the preparation of the written request, locates to determine the location of the Facilities should be requested. Lists of regional addresses and phone numbers are outlined in Section 10.0: Appendix.

8.3 Guidelines for Blasting

The information provided in this section is not to be construed as an exhaustive list of performance specifications, but rather a guide for conducting blasting in the vicinity of EGD's Facilities. The Third Party is responsible for ensuring that all blasting work is performed in a good and workmanlike manner in accordance with all applicable laws, codes, by-laws, and regulations.

The Third Party will be held liable for and indemnify EGD in relation to any and all damage directly or indirectly caused or arising as a result of blasting operations carried out by the Applicant, its employees, Contractors or those for whom the Applicant is responsible at law.

Prior to blasting operations, a site meeting must be arranged with an authorized representative of the Applicant and an EGD representative to confirm the location of EGD’s Facilities and details of the proposed blast.

EGD’s pipelines must not be excavated prior to blasting. If excavation is unavoidable, then the pipeline must be properly supported according to EGD’s requirements as stated in Section 4.0: Support of Gas Pipelines. The Third Party must take suitable precautions to protect the exposed pipeline from fly-rock. Blasting mats must be used to minimize the risk of fly-rock.

Explosives must be of a type which must not propagate between holes or be desensitized due to compression pressures. Explosives must not be left in the drill hole overnight.

If a Surface Blast is:

- Located less than 10 m (33 ft) from pipeline, and
- Creates its first blast hole at a depth equal to the top of the pipeline, and
- The depth of subsequent blast holes exceeds one half of the horizontal distance to the closest portion of the pipeline,

then, the required independent blasting consultant's report must specifically address the impact of these conditions. This is not applicable for Tunnel Blasting operations. Monitoring of blasting vibrations with a portable seismograph capable of transmitting data instantaneously (e.g., via email or cellular) to the required reviewer in the vicinity of EGD's Facilities is mandatory to confirm that predicted vibration levels are respected. On a daily basis, a copy of the seismographic report must be provided to EGD.

Peak Particle Velocity (PPV) must be limited to **50 mm/sec (2 in./s)** and maximum amplitude must be limited to 0.15 mm (0.006 in.).

8.4 Post Blasting Operation

A leak survey will be completed at the end of each day of blasting. Upon completion of daily blasting operations and within 30 days after the final blasting, EGD will conduct a leak survey of the pipeline at the Third Party’s expense. Leak survey will also be completed at the end of each day of blasting. Damage that has resulted from the blasting will be repaired at the Third Party's expense. A summary of all blasting operations including blasting logs, vibration control, seismograph reports and other pertinent information must be provided to EGD by the Third Party daily and at the completion of blasting operations.

9.0 Pile Installation Or Compaction Requirements

9.1 General

Pile installation or Compaction activities in the vicinity of EGD's Facilities must be evaluated by EGD prior to beginning. Any resultant damage as a result of these activities will be borne entirely by the Third Party undertaking the proposed work.

If in the opinion of EGD, the particular Pile installation or Compaction operation cannot be carried out without affecting the pipeline or Facility integrity, the following must be considered:

- Risk analysis and/or mitigation program for the proposed operation.
- Alternate construction methods.
- Relocation or replacement of the Facility.

All costs incurred will be covered by the Third Party undertaking the proposed work and final approval for the work will be granted by EGD.

Piles installed using an auger must satisfy the locating and clearance requirements listed in Section 2.3: Pipeline Location Verification and Section 2.6: Minimum Clearance from Other Structures, respectively. EGD must provide approval for the installation of Piles within 3 m (10 ft) of a NEB-regulated pipeline or Vital Main.

The Third Party will be responsible for all costs related to customer interruption as well as costs incurred because of work delays. In the event a Third Party is affected as a result of the Pile installation and/or Compaction operations, all expenses associated therewith incurred by EGD will be passed to the Third Party.

9.2 Pile Installation or Compaction Application

The application to Pile Drive or do Compaction work must be sent to EGD. Contact information can be found in Section 10.0: Appendix. The application must include the following:

- Name of project owner, general Contractor and applicable sub-Contractors.

- A copy of the permits, certificates or other forms that are municipal bylaw requirements.
- Name of design engineer and a copy of the construction plans with drawings. These must detail the Facilities that can be affected.
- The type of piles and equipment to be used, and the control methods to prevent pile deviation.
- Geo-technical reports and other applicable information.
- A copy of the location of other public utilities: telephone, cable TV, sewer and water mains, electrical services, etc.
- A technical report with appropriate analysis and prediction of the vibration levels according to the opinion of an Independent Engineering Consultant specialized in vibration control and analysis.

This work must be completed under the supervisor of qualified personnel. Vibration results must be provided to EGD on a daily basis.

9.3 Guidelines for Pile Installation and Compaction Work

The information provided in this section is not to be construed as an exhaustive list of performance specifications, but rather a guide for conducting Pile installation and Compaction work in the vicinity of EGD's Facilities. The Third Party is responsible for ensuring that all Pile installation and Compaction work is performed in accordance with all applicable laws, codes, by-laws and regulations.

No operations must be permitted within a standoff distance of 1.5 m (5 ft) from the pipeline or other natural gas Facility, unless approved by EGD.

Prior to Pile installation and/or Compaction work, a site meeting must be arranged with an authorized representative of the Third Party and an EGD representative to confirm the location of EGD's Facilities and the details of the proposed work.

The pipeline should not be excavated prior to the Piling or Compaction operation. If excavation of the pipeline is necessary, then it must be properly supported in accordance with Section 4.0: Support of Gas Pipelines.

The following situations will require the opinion of an Independent Professional Engineer:

1. Compaction of soils or backfill rated at 10,000 ft-lbs (13,600 Nm) or higher at a stand-off distance of 6 m (20 ft) or less from the pipeline.
2. Pile Driving at a stand-off distance of 10 m (33 ft) or less from the pipeline Facility.
3. High-energy dynamic Compaction for the rehabilitation of soils at a stand-off distance of 30 m (100 ft) or less from the pipeline.
4. Type 4 soil as defined in Article 226 of the Occupational Health and Safety Act and Regulations for Construction Projects (See Section 9.5: Soil Types).

For these situations, the appropriate number of seismographs to monitor vibrations is mandatory. The seismographs must be the portable type with the capability of transmitting data instantaneously (e.g., via email or cellular). This control will confirm the intensity of the vibrations generated by the Pile installation or Compaction work as projected. Furthermore, reports of recorded intensities must be provided on a regular basis or at the request of EGD.

The **Peak Particle Velocity (PPV)** measured on the pipeline, or at the closest point of the related structure with respect to the work, must not exceed **50 mm/sec (2 in./s)**. Furthermore, the maximum displacement for the vertical and/or horizontal component corresponding to the above stated vibration intensity must not exceed 50 mm (2 in.) at any given length of the pipeline in question.

If the PPV or displacement limit is surpassed, all operations must stop notwithstanding any delays or costs incurred by the Third Party or owner of the proposed work. EGD will require that the cause of these higher vibrations or displacements be investigated. EGD may arrange for a leak survey to be conducted. EGD's Engineering Department must approve resumption of operations.

Should a situation with low energy Compaction operations with a soil cover of less than 1.5 m (5 ft) above the pipeline at a stand-off distance of 3 m (10 ft) or less from a pipeline be encountered, EGD may require the opinion of an Independent Engineering Consultant.

In addition, if a Type 3 soil (see Section 9.5: Soil Types) is present on site, EGD may require the opinion of an Independent Engineering Consultant.

The use of an auger may be required in order to avoid the use of piles.

All operations must comply with the Provincial Occupational Health and Safety Act and Regulations for Construction Projects, other applicable laws and regulations, as well as all applicable EGD specifications, standards and guidelines.

9.4 Post Piling or Compaction Operations

The Third Party must send EGD the items that follow within five (5) business days of the completion of the pile installation via Pile Driving or Compaction operations:

- A summary of all operations.
- Pile Driving and Compaction logs.
- Vibration control records.
- Seismograph records.

On completion of each day's work, and approximately 30 days after all work is completed, EGD will arrange to conduct a leak survey of the Facility. If damage to EGD's Facilities is found, it will be repaired by the Third Party. An invoice will be sent to the Third Party responsible for the work.

Table 8-1 Maximum Vibration Intensities Expected from Pile Driving

√(E/D)	Particle Velocity (in./s)				√(E/D)	Particle Velocity (mm/s)		
	Dry Sand	**Wet Sand**	**Clay**			**Dry Sand**	**Wet Sand**	**Clay**
0.10	0.020	0.030			0.10	0.43	0.74	
0.22	0.040	0.060	0.010		0.22	0.97	1.50	0.25
0.30	0.050	0.080	0.020		0.30	1.27	1.27	0.43
0.40	0.070	0.110	0.040		0.40	1.75	2.80	0.66
0.50	0.080	0.130	0.040		0.50	0.06	3.30	1.02
0.60	0.100	0.180	0.050		0.60	2.54	4.57	1.27
0.70	0.110	0.200	0.060		0.70	2.80	5.08	1.52
0.80	0.130	0.230	0.080		0.80	3.30	5.84	1.96
0.90	0.160	0.270	0.090		0.90	4.06	6.86	2.29
1	0.180	0.290	0.100		1	4.57	7.37	2.54
2	0.330	0.590	0.300		2	8.38	14.99	7.62
3	0.560	0.880	0.580		3	14.22	22.35	14.73
4	0.700	1.100	0.890		4	17.78	27.94	22.61
5	0.880	1.400	1.100		5	22.35	35.56	27.94
6	1.050	1.850	1.800		6	26.67	46.99	45.72
7	1.100	2.010	2.010		7	27.94	50.80	50.80
8	1.400	2.300	2.400		8	35.56	58.42	60.96
9	1.750	2.800	3.100		9	44.45	71.12	78.74
10	1.850	2.900	3.400		10	46.99	73.66	86.36

E is defined as rated energy of the pile hammer in ft-lbs.

D is defined as distance in inches.

Values highlighted in red indicate unacceptable vibration levels.

9.5 Soil Types

(Occupational Health and Safety Act and Regulations for Construction Projects)

Soil must be classified as Type 1, 2, 3, or 4 in accordance with the descriptions set out in this section.

Type 1 soil:

- is hard, very dense and only able to be penetrated with difficulty by a small sharp object;
- has a low natural moisture content and a high degree of internal strength;
- has no signs of water seepage; and
- can be excavated only by mechanical equipment.

Type 2 soil:

- is very stiff, dense and can be penetrated with moderate difficulty by a small sharp object;
- has a low to medium natural moisture content and a medium degree of internal strength; and
- has a damp appearance after it is excavated.

Type 3 soil:

- is stiff to firm and compact to loose in consistency or is previously- excavated soil;
- exhibits signs of surface cracking;
- exhibits signs of water seepage;
- if it is dry, may run easily into a well-defined conical pile; and
- has a low degree of internal strength.

Type 4 soil:

- is soft to very soft and very loose in consistency, very sensitive and upon disturbance is significantly reduced in natural strength;
- runs easily or flows, unless it is completely supported before excavating procedures;
- has almost no internal strength;

- is wet or muddy, and
- exerts substantial fluid pressure on its supporting system.

10.0 Appendix

Contact Information

Enbridge Gas Distribution 500 Consumers Road North York, ON M2J 1P8	Markups: Mark-Ups@enbridge.com Mail to: Distribution Asset Management Ontario One Call Locates: 1 (800) 400-2255 Damage Prevention: 1 (866) 922-3622 **Emergency: 1 (866) 763-5427**
Enbridge Gas Storage 3501 Tecumseh Road Mooretown, ON N0N 1M0	Ontario One Call Locates: 1 (800) 400-2255 Engineering Dept.: 1 (519) 862-6027 Operations Dept.: 1 (519) 862-6017 **Emergency: 1 (866) 763-5427**
Gazifère 706 Boulevard Greber Gatineau, QC J8V 3P8	Locates: 1 (800) 663-9228 Planning Dept.: 1 (819) 776-8804 **Emergency: 1 (819) 771-8321, press 1**
St. Lawrence Gas Company Inc. 33 Stearns Street P.O. Box 270 Massena, NY 13662	Dig Safely New York Locates: 811 or 1 (800) 962-7962 Damage Prevention: 1 (315) 842-3621 **Emergency: 1 (800) 673-3301**
Enbridge Gas New Brunswick Inc 440 Wilsey Road Fredericton, NB E3B 7G5	Locates: 1 (866) 344-5463 Planning and Technical Services: 1 (888) 642-2020 **Emergency: 1 (800) 994-2762**

The website www.clickbeforeyoudig.com gives access to the damage prevention centres in Canada and in the United States of America, and allows locate requests to be made for each province/state.

Appendix G

Lead Content Test Results

PARACEL LABORATORIES LTD. | TRUSTED. RESPONSIVE. RELIABLE.

300 - 2319 St. Laurent Blvd
Ottawa, ON, K1G 4J8
1-800-749-1947
www.paracellabs.com

Certificate of Analysis

Dillon Consulting Ltd. (Ottawa)

177 Colonnade Road, Suite 101
Ottawa, ON K2E 7J4
Attn: Nathan Bakker

Client PO:
Project: Report Date: 4-Oct-2018
Custody: Order Date: 1-Oct-2018

Order #: 1840089

This Certificate of Analysis contains analytical data applicable to the following samples as submitted:

Paracel ID	Client ID
1840089-01	Porters Island Bridge

Approved By:

Dale Robertson, BSc
Laboratory Director

Analysis Summary Table

Analysis	Method Reference/Description	Extraction Date	Analysis Date
Metals, ICP-OES	based on MOE E3470, ICP-OES	3-Oct-18	3-Oct-18

Sample Data Revisions

None

Work Order Revisions/Comments:

None

Other Report Notes:

n/a: not applicable
ND: Not Detected
MDL: Method Detection Limit
Source Result: Data used as source for matrix and duplicate samples
%REC: Percent recovery.
RPD: Relative percent difference.

Certificate of Analysis
Client: Dillon Consulting Ltd. (Ottawa)
Client PO:

Report Date: 04-Oct-2018
Order Date: 1-Oct-2018
Project Description:

Sample Results

Lead				Matrix: Paint Sample Date: 06-Sep-18
Paracel ID	**Client ID**	**Units**	**MDL**	**Result**
1840089-01	Porters Island Bridge	ug/g	20	508

Laboratory Internal QA/QC

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Matrix Blank									
Lead	**ND**	**20**	**ug/g**						
Matrix Duplicate									
Lead	**56.2**	**20**	**ug/g**	**47.9**			**16.0**	**30**	
Matrix Spike									
Lead	254		ug/L	23.9	92.0	70-130			

300 - 2319 St. Laurent Blvd
Ottawa, ON, K1G 4J8
1-800-749-1947
www.paracellabs.com

Certificate of Analysis

Dillon Consulting Ltd. (Ottawa)

177 Colonnade Road, Suite 101
Ottawa, ON K2E 7J4
Attn: Mazen Chaaraoui

Client PO:
Project: Porters Island
Custody:

Report Date: 17-Oct-2018
Order Date: 11-Oct-2018

Order #: 1841420

This Certificate of Analysis contains analytical data applicable to the following samples as submitted:

Paracel ID	Client ID
1841420-01	Sample 2
1841420-02	Sample 3
1841420-03	Sample 4
1841420-04	Sample 5

Approved By:

Dale Robertson, BSc
Laboratory Director

Certificate of Analysis
Client: Dillon Consulting Ltd. (Ottawa)
Client PO:

Report Date: 17-Oct-2018
Order Date: 11-Oct-2018
Project Description: Porters Island

Analysis Summary Table

Analysis	Method Reference/Description	Extraction Date	Analysis Date
Metals, ICP-OES	based on MOE E3470, ICP-OES	15-Oct-18	15-Oct-18

Sample Data Revisions

None

Work Order Revisions/Comments:

None

Other Report Notes:

n/a: not applicable
ND: Not Detected
MDL: Method Detection Limit
Source Result: Data used as source for matrix and duplicate samples
%REC: Percent recovery.
RPD: Relative percent difference.

PARACEL LABORATORIES LTD.

Order #: 1841420

Certificate of Analysis

Client: Dillon Consulting Ltd. (Ottawa)

Client PO:

Report Date: 17-Oct-2018

Order Date: 11-Oct-2018

Project Description: Porters Island

Sample Results

Lead — **Matrix: Paint** — **Sample Date: 10-Oct-18**

Paracel ID	Client ID	Units	MDL	Result
1841420-01	Sample 2	ug/g	20	538
1841420-02	Sample 3	ug/g	20	317
1841420-03	Sample 4	ug/g	20	431
1841420-04	Sample 5	ug/g	20	423

Laboratory Internal QA/QC

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Matrix Blank									
Lead	**ND**	**20**	**ug/g**						
Matrix Duplicate									
Lead	**4400**	**20**	**ug/g**	**3930**			**11.5**	**30**	
Matrix Spike									
Lead	2200		ug/L	1960	93.2	70-130			

PARACEL LABORATORIES LTD.

Paracel ID: 1841420

Head Office
300-2319 St. Laurent Blvd.
Ottawa, Ontario K1G 4J8
1-800-749-1947
paracel@paracellabs.com

Chain of Custody
(Lab Use Only)

Page ___ of ___

Client Name: Dillon Consulting	Project Reference: Porters Island
Contact Name: Mazen Chaaraoui	Quote #
Address: 177 Colonnade Road, Suite 101, Ottawa, Ontario K2E7J4	PO #
	Email Address: mchaaraoui@Dillon.ca
Telephone: 613-745-2213	

Turnaround Time:
☐ 1 Day ☐ 3 Day
☐ 2 Day ☑ Regular
Date Required: ____________

Criteria: ☐ O. Reg. 153/04 (As Amended) Table __ ☐ RSC Filing ☐ O. Reg. 558/00 ☐ PWQO ☐ CCME ☐ SUB (Storm) ☐ SUB (Sanitary) Municipality: ________ ☐ Other: ________

Matrix Type: S (Soil/Sed.) **GW** (Ground Water) **SW** (Surface Water) **SS** (Storm/Sanitary Sewer) **P** (Paint) **A** (Air) **O** (Other)

Paracel Order Number: 1841420

Required Analyses

	Sample ID/Location Name	Matrix	Air Volume	# of Containers	Sample Taken Date	Sample Taken Time	Lead										
1	Sample 2	P			10/10/2018	11:30	☑	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
2	Sample 3	P			10/10/2018	11:30	☑	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
3	Sample 4	P			10/10/2018	11:30	☑	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
4	Sample 5	P			10/10/2018	11:30	☑	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
5							☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
6							☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
7							☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
8							☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
9							☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
10							☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐

Comments:

Method of Delivery: Paracel

Relinquished By (Sign): [signature]	Received by Driver/Depot: Jeause	Received at Lab: Sumtporn Dumai	Verified By: [signature]
Relinquished By (Print): Mazen Chaaraoui	Date/Time: 11/10/18 12:20 PM	Date/Time: OCT 11, 2018 01.38	Date/Time: Oct 11/18 [illegible]
Date/Time: Oct 11 2018	Temperature: ____ °C	Temperature: ____ °C	pH Verified [ ] By:

Chain of Custody (Blank) - Rev 0.4 Feb 2016

Appendix H

Extract of Published Content on Heritage Value of Structure

Porter Island Bridge

Primary Photographer(s): Nathan Holth and Rick McOmber

Bridge Documented: April 13, 2011

0

View Photos and Videos

View Maps and Links

Key Facts

Facility Carried / Feature Intersected
Island Lodge Road (Abandoned Alignment) Over Rideau River

Location
Ottawa: Ottawa City, Ontario: Canada

Structure Type
Metal 7 Panel Pin-Connected Pratt Through Truss, Fixed

Construction Date and Builder / Engineer
1894 By Builder/Contractor: Dominion Bridge Company of Montréal, Québec

Technical Facts

Rehabilitation Date
Not Available or Not Applicable

Main Span Length
Not Available

Structure Length
Not Available

Roadway Width
Not Available

Spans
2 Main Span(s)

NBI Number
Not Applicable

Bridge Documentation

1905 Advertisement

This bridge is an extremely rare example not only of a pin-connected truss bridge in Ontario, but as a multi-span example. It is also noted for its excellent historic integrity with the only noteworthy alteration observed being the replacement of the original lattice railings with pipe railing on the bridge span. Single panels of original lattice railing remains attached to the endposts. The bridge has been bypassed by a modern bridge, but fortunately was not demolished and has been left standing. The bridge has been fenced off to all traffic including pedestrians. The bridge appears to be in decent overall condition, and the only apparent reason for fencing it off appears to be deteriorating wooden deck planks. It would be nice to see this bridge repaired and opened to pedestrian traffic. Ottawa has a number of significant heritage bridges but despite this fact, the bridge is one of the rarest and most significant in the city.

The bridge has marks on some of the metal identifying a mill that would have produced the material, but between the fencing and the fact it was placed on the inside of the built-up beams it is difficult to read. Interestingly however a date that appears to be 1891 appears after the mill name. This may or may not be the same as the construction date of the bridge. An online source lists an 1894 construction date for this bridge. This is plausible, since bridges like this were built from parts that a large bridge company like Dominion would have had stockpiles of, and may have been purchased in advance of actually constructing a particular bridge.

Photo Galleries and Videos: Porter Island Bridge


Bridge Photo-Documentation
Original / Full Size Photos

A collection of overview and detail photos. This gallery offers photos in the highest available resolution and file size in a touch-friendly popup viewer. Alternatively, **Browse Without Using Viewer**

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Islands of Ottawa: The once-dismal isolation of Porter's Island

BRUCE DEACHMAN (HTTPS://OTTAWACITIZEN.COM/AUTHOR/BRUCEDEACHMAN) Updated: July 20, 2015

Smallpox tents on Porter's Island, circa 1895-1911. *WILLIAM JAMES TOPLEY*

Bell Island. Ile Young. Clifford Allen Island. Kedey's. Bate. Upper and Lower Duck. Dinelle Twins Island. The Ottawa area might not boast an archipelago as studded as the St. Lawrence's Thousand Islands (actually one thousand, eight hundred and sixty four, but that makes for an unwieldy bumper sticker), but with the Rideau, Ottawa, Mississippi and Gatineau rivers all wending through the capital region, we have our share.

In the first in an occasional series exploring these water-locked isles, we visit Porter's Island, where a century ago very few Ottawans were keen to visit.

PORTER'S ISLAND

Porter's Island is named after John Porter, who served as Bytown's city engineer. Porter settled in the area in 1844 and lived here until his death in 1888.

And although it had to be abandoned each spring due to flooding, the island, on the Rideau River just south of Edinburgh Park, was used to keep typhoid and smallpox patients isolated from the rest of the city.

Outbreaks in 1871, 1874 and 1885 underlined the need for some kind of quarantine station, a role Porter's Island served from the mid-1890s. A small "hospital" existed at least as far back as 1902, but its shortcomings were well known. In 1911, as the city suffered outbreaks of smallpox, typhoid and tuberculosis, Chief Officer of Health John W. S. McCullough wrote:

"On Porter's Island about 300 yds. long and 50 to 100 yards wide lying in the Rideau River just below the St. Patrick's St. bridge, and used as a dumping ground for city refuse (dry) was situated the Smallpox Hospital, a miserable old clapboard shack 20 x 24 ft. and 1½ stories high, with stove pipe running up the stairway so that one had to go on hands and knees to get underneath it to go upstairs."

There, he noted, 17 patients slept three to a bed. Two nurses had a bed in a small storage room, a space where patients were also bathed. Outside, 10 patients shared a tent.

(https://postmediaottawacitizen2.files.wordpress.com/2015/07/smallpox-tents-on-porters-island-according-to-the-incriptio.jpg?quality=55&strip=all)

Smallpox tents on Porter's Island. According to the inscription on the negative, it appears the photo was taken in 1876.

The conditions at the hospital, McCullough wrote, were "disgraceful," and not surprisingly it was an experience few patients were eager to undergo. A newspaper account from January 1912 tells of one resident, Mrs. Couvilion, who refused to allow two public health officers into her Langevin Avenue home, just a half dozen blocks away, only acquiescing once they returned with a police officer. But when they returned again with an ambulance to take her to Porter's Island, she had barricaded her door. The matter was settled when she was "taken by force" by the police.

(https://postmediaottawacitizen2.files.wordpress.com/2015/07/the-womens-ward-at-the-newly-completed-hopewell-isolation-ho.jpg?quality=55&strip=all)

The women's ward at the newly completed Hopewell Isolation Hospital on Porter's Island, 1912.

McCullough's report helped pave the way for the Hopewell Isolation Hospital, with construction starting in December of that year. Not only was the facility separated from the rest of Ottawa by water, but a stone wall segregated the hospital from the rest of the island. It was designed by architect Frank C. Sullivan, at a cost of $28,000. Named for then-mayor Charles Hopewell, it opened in February 1913, and by October housed 82 smallpox patients, as well as a handful suffering other diseases.

The hospital remained in use until 1945.

In 1960, the city recommended that a seniors' home be built on the island. The 250-bed facility, called Island Lodge, opened in May 1964.

(https://postmediaottawacitizen2.files.wordpress.com/2015/07/porters-island-viewed-from-under-the-st-patrick-street-bri.jpg?quality=55&strip=all)

Porter's Island, viewed from under the St. Patrick Street bridge over the Rideau River. In the foreground on the island is the Rockcliffe Retirement Residence, while behind it and to the right is the Garry J. Armstrong long-term care facility. The steel truss bridge from the island to St. Patrick Street, built in 1894, is no longer in use. A century ago, the island housed the Hopewell Isolation Hospital.

Today, Porter's Island is home to two facilities: the Rockcliffe Retirement Residence and the Garry J. Armstrong Home, a 180-bed long-term care facility.

The island is accessible today by a bridge from St. Patrick Street, replacing the metal truss bridge constructed in 1894 by the Dominion Bridge Company. The original bridge remains, although it is now blocked off at either end and unused, even by pedestrian traffic.

bdeachman@ottawacitizen.com (mailto:bdeachman@ottawacitizen.com)

CONTAGIOUS AND INFECTIOUS DISEASES (HTTPS://OTTAWACITIZEN.COM/TAG/CONTAGIOUS-AND-INFECTIOUS-DISEASES)

RIDEAU RIVER (HTTPS://OTTAWACITIZEN.COM/TAG/RIDEAU-RIVER) regional sales manager for Ritchie Brothers, noting the auction house and the sellers...

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History of Ottawa's Porter Island - Dave Brown

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Published on Nov 26, 2015

Our Nation's Capital is known for its rich political past and distinctive beauty, but like all large cities if you look beyond its obvious history you're bound to find some interesting unknown, should I say, salty facts.

It turns out a century ago Ottawans were not keen to visit Porter's Island in the heart of the city on the Rideau River. Why? Because it was used as a location to keep typhoid and smallpox patients isolated from the rest of the town in not the best conditions.

But, that was a century ago – and our very own, and very keen Presenter Dave Brown just had to visit Porter Island today to get all of the historic details.

Category Nonprofits & Activism

SHOW LESS

remembers the invention of the w...el

Home

APR 19

Dark Moments in Ottawa History- Porter Island

Posted on April 19, 2018 by lindaseccaspina

Public Archives- MIKAN 3318778 —***Smallpox tents on Porter Island, circa 1895-1911. William James Topley Small Pox Shack served as the hospital***

There was a time was when the Ottawa's facilities for cases of smallpox were poorly inadequate, and when the only 'pest house" was a decrepit, rat-ridden shack unfit for human habitation. The outbreak of smallpox was a very real menace and those inflicted slept three to a bed inside, and outside, 10 patients shared one tent on Porter Island.

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Wisteria (62 Bridge St. - Carleton Place)
Carleton Place and Beckwith Museum

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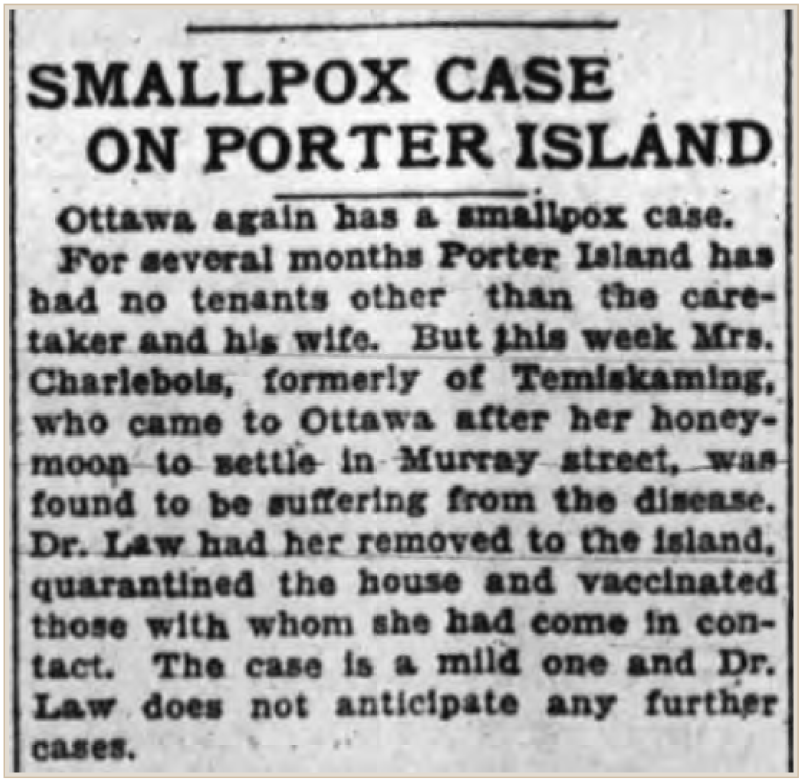
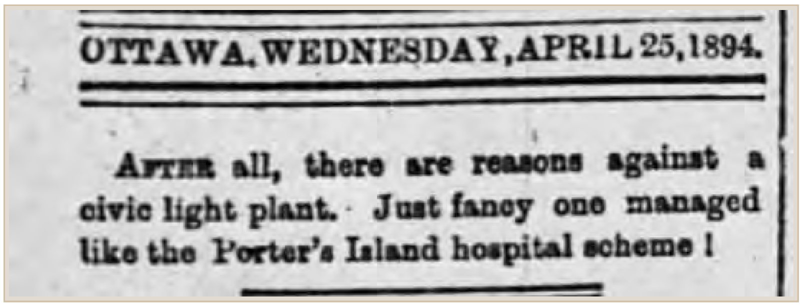


SMALLPOX CASE ON PORTER ISLAND

Ottawa again has a smallpox case.

For several months Porter Island has had no tenants other than the caretaker and his wife. But this week Mrs. Charlebois, formerly of Temiskaming, who came to Ottawa after her honeymoon to settle in Murray street, was found to be suffering from the disease. Dr. Law had her removed to the island, quarantined the house and vaccinated those with whom she had come in contact. The case is a mild one and Dr. Law does not anticipate any further cases.

May 26, 1904.



OTTAWA, WEDNESDAY, APRIL 25, 1894.

AFTER all, there are reasons against a civic light plant. Just fancy one managed like the Porter's Island hospital scheme!

April 25, 1894

In February of 1911 a Water Street mother spoke to the Ottawa media and said she was not going to send any child of hers *"to that Isolation Hospital"* which was situated on Porter's Island on the Rideau River just south of Edinburgh Park. The distraught woman said she had read in the newspapers about the inhabitable conditions, and even if some city councillors defended it, no child of hers was going there.

Carleton Place – Meet Me On The Mississippi

Archives Lanark

FLY NUISANCE; PORTER'S ISLAND

Dr. Hewitt, Dominion entomologist, has written a lengthy letter to Dr. Shirreff, M. H. O., in which he does not seem to approve of the Porter's Island site for a smallpox hospital.

He contends infectious matter can be carried by flies, and goes on to deal with the fly nuisance. He shows that it is quite possible for flies that have been in Porter's Island hospital tents to find their way to other parts of the city, carrying the dreaded disease.

Dr. Shirreff has been pressing strongly for the immediate construction of the hospital, and has told both the controllers and the members of the Board of Health this. They knew months ago that this question had to be settled, and it is still unsettled.

Part of the interesting statement given by Dr. Hewitt proves conclusively that flies could get away from the island; for after telling of preparation for tests, and how flies were marked and liberated on the island and then caught on "tanglefoot" paper on either side of the river, he adds:

"Between 29th August and 6th September about 14,000 marked flies were liberated on Porter's Island; 172 of these were recaptured in houses on both sides of the river in the surrounding district. The significance of this number is much greater when it is remembered that the number of marked flies represented an infinitesimal proportion of the flies present in the district."

Nov. 9 1911

Charles Honeywell changed all that when he became Mayor of Ottawa, and smallpox was said to be no longer a danger because of the new Isolation Hospital. The city was now prepared for a smallpox outbreak he said. Hopewell Hospital officially opened its doors in February, 1913 to help stop epidemic disease, and public health policies were now changing in Canada.

2 nurses standing with the Isolation Hospital ambulance, with driver in front seat.
[ca. 1926] Ottawa City Archives

In 1927 Mayor John Paul Balharrie (1925–1927) for whatever reasons attached an addition to the Isolation Hospital for diphtheria, scarlet fever, and measles. It was reported by media that "cheapness" was the chief reason. Time was when the Isolation Hospital was run in a rather scandalous manner; but even with the changes local parents still hid their contagious children in their homes rather than be forced to send their children to the dreaded Porter Island.

Clarke's private chapel, 551 Somerset St., on Sunday, at 4 p.m., to Central Depot, for interment at Cornwall, Ont.

LAUGHTON—On Friday, April 24, 1914 at her late residence, 48 Lisgar Street, Ottawa, Euphemia Yorston, in her 75th year.
Funeral was held today at 2.30 p.m.

CUTHBERT—At the Isolation Hospital, Ottawa, On Sunday morning, April 26, 1914, of diphtheria, Anne, daughter of Thomas Cuthbert, 492 Rideau St., aged 11 years and 7 months.
Funeral Monday, April 27, at 10 a.m., from 492 Rideau St., to Beechwood cemetery. Service conducted by Rev. J. E. Mavety, D.D.

IN MEMORIAM.

In loving memory of Edna Letham Turnbull, who entered into rest April 25, 1911.
"I know that my Redeemer liveth."
—J. H. F.

IN MEMORIAM.

April 27, 1914

Today, Porter's Island is home to the Rockcliffe Retirement Residence and the Garry J. Armstrong Home. The island is accessible today only by a bridge from St. Patrick Street, that replaced the metal truss bridge constructed in 1894 by the Dominion Bridge Company. The original bridge is now blocked off at either end and unused, even by pedestrian traffic, and is the only remains of what once was Ottawa's darker moments.

Photo-Historic Bridges

Public Archives MIKAN 331876

ORPHAN'S HOME UNDER SMALLPOX QUARANTINE

SENSATION CAUSED WHEN TWO CASES WERE FOUND THERE.

Discovery Was Made on Saturday Afternoon—Thought to Have Developed From Chickenpox—Children Removed to Porter's Island.

The fifty-three little orphans, a number of aged inmates in what is known as the annex, and the superintendent and officials of the Protestant Orphans' Home on Elgin street, are under quarantine and will be for several days on account of two cases of smallpox that developed there on Saturday afternoon.

Amey Salway, aged ten, and Stanley Church, aged 5 years, both belonging to Ottawa, were moved to the smallpox hospital at Porter's Island after a consultation of Medical Health Officer R. Law and two other doctors. The usual precautions in the way of fumigation of the big building were taken, and it was put under quarantine. A special constable was placed on duty at once, and the big crowds that chose Elgin street for their Sunday afternoon promenade wondered why the "blue coat" stuck to the one block in his walks.

WANTS THE JOURNAL.

"We always used to send one of the Home boys out for 'The Journal,' said an official at the Orphans' Home on Saturday, "but now that we cannot get out of here, we want you to send us The Journal every night. You could have a boy put it at the front door, or send it by mail. Try and arrange it, as we want to get it every night while the quarantine is on."

March 27, 1911.

Dr. R. H. Parent, chairman of the Board of Health, in his capacity as family physician, had talked to the woman at her home that morning. He had informed her that the child, who was inflicted with small pox, should be placed immediately in the Isolation Hospital despite her concerns. City officials when questioned by the local newspapers insisted that conditions were good, and none that would warrant calling any special meetings. The child was later taken by force out of her mother's arms to Porter Island by the police.

CITY OF OTTAWA
PROPERTY DEPARTMENT

TENDERS

FOR THE DEMOLITION OF FORMER ISOLATION HOSPITAL PORTER'S ISLAND, OTTAWA

Sealed Tenders, addressed to the Chairman and Members of the Board of Control, will be received by the Secretary of the Board of Control, Second Floor, City Hall, 111 Sussex Drive, Ottawa, Ontario, up to 11.00 a.m., Eastern Daylight Saving Time

TUESDAY, 13th JUNE, 1967

for the Demolition of the Former Isolation Hospital, Porter's Island, Ottawa, Ontario.

Plans, specifications, information and Forms of Tender may be obtained from the office of:—

The Director of Property,
Room 506,
City Hall,
111 Sussex Drive,
Ottawa, Ontario.

The Corporation does not bind itself to accept the lowest or any Tender and, in particular, if only one Tender is received, the Corporation reserves the right to reject it.

A. T. Hastey,
City Clerk

OTTAWA,
May 26, 1967

May 31, 1967

Little Boys Break Through Thin Ice—Third Brother Rescued By Passerby.

Roger Digonney, aged 5, and his brother, Gill Digonney, 7, were drowned in eight feet of water near Porter's Island shortly after 9.30 o'clock this morning. Their brother, Andre Digonney, 7, was saved by Joe Paquette, a passerby along nearby St. Patrick streeet bridge.

Sons of Mr. and Mrs. Charles Digonney, 3 Rheaume street, they had been playing on the thin ice in the Rideau River some 50 feet from the shore.

Heroic Rescue.

It was a heroic rescue. Mr. Paquette, who was crossing St. Patrick street bridge from New Edinburgh, heard frantic yells coming from the direction of Porter's Island bridge.

At first unable to see from where the disturbance arose, he rushed westward along the bridge until he could see the gaping hole in the ice under the other structure.

Taking a rowboat from the shore, he pushed it out to where he could see only the eldest boy's head above the surface, his arms threshing wildly about. Thinking nothing about the danger to himself, **Mr. Paquette jumped into the icy water, seized the boy and got him into the rowboat.**

Chilled to the bone, and sobbing wildly for his tiny brothers, the lad was rushed to his home.

Recover One Body.

Already a squad of Ottawa police constables had arrived on the scene, and within an hour the first body was recovered, believed to be that of Gill, elder of the two. He was rushed to Ottawa General Hospital, where efforts to revive him were in vain. Chief Coroner Dr. W. T. Shirreff was summoned.

Meanwhile, as hundreds of people lined the bridge to Porter's Island and the shore of the Rideau River, dragging operations continued from three boats. A city diver was rushed to the scene.

Sees Boys Struggling.

Another witness of the fatality was Mrs. Evangeline Pelletier, of 62 Beechwood avenue, who saw the three boys struggling in the icy water as she was crossing Porter's Island bridge. When she rushed closer, the two younger lads had disappeared beneath the surface. Their older brother, during his frantic efforts to keep above the water, kept shouting

"My brothers are in there!"

Joe Paquette lives at 4 Rheaume street, across from the home of Mr. and Mrs. Charles Digonney, parents of the two children. Besides Roger and Gill, and their brother Andre, who was rescued, two other small boys survive, Oscar, six, and George, aged three. The father is unemployed, and the family belongs to Ste. Anne's parish. Both Andre and Gill attended Ste. Anne's School.

Shivering and thinly clad after his icy plunge, Joe Paquette told The Journal the story of the rescue.

"I was crossing the St. Patrick bridge," he said, "when the sound of yelling reached me. I saw a group of boys on the ice beneath the bridge I was on, but there seemed nothing unusual there.

"When I reached the western end of the bridge, I could make out the yells came from near Porter's Island. I ran the distance, seized the first rowboat I saw, and jumped into the water when I got close enough."

Police received a call for help a few minutes before 10 o'clock. Constables A. J. Rondeau, Leo Brosseau, Lester Routliffe, Bert Wadsworth and Emile Rosa went immediately to the scene of the accident.

The body of the boy recovered was brought to the surface with grappling irons by Constable Brosseau and was rushed to hospital in Gauthier's ambulance.

November 21, 1936

Thanks to Tammy Marion for colouring this..

Come and visit the Lanark County Genealogical Society Facebook page– what's there? Cool old photos–and lots of things interesting to read. Also check out The Tales of Carleton Place.

Information where you can buy all Linda Seccaspina's books-You can also read Linda in The Townships Sun andScreamin' Mamas (USA)

Think the Smallpox issue on Outlander was far fetched?

Smallpox in Carleton Place — Did You Know?

The Great White Plague

Appendix I

City of Ottawa Risk Management Tables

	RISK IMPACT MEASUREMENT				
Impact	**Minimal - 1 -**	**Minor - 2 -**	**Moderate - 3 -**	**Major - 4 -**	**Extreme- 5 -**
Financial					
• % of City's operating Budget	<0.1%	0.1 - 0.5%	0.5 - 1.0%	1.0 - 2.0%	> 2.0%
•Legal damage awards/fines	insignificant	small	moderate	large	significant
•Outside funding increased/decreased	insignificant	small	moderate	large	significant
•Change in City's credit rating	insignificant	small	moderate	large	significant
•Capital reserve fund	insignificant	small	moderate	seriously eroded	depleted
Operational					
•Key physical assets -including data-measured by loss or gain	very limited	limited	loss of large but replaceable physical assets	loss of significant asset(s)	loss of key asset
•Essential service delivery: disruption or improvement	none or very minor	minor	moderate impact	significant impact	unable to deliver for an extended period
•Legislative or statutory compliance	n/a	n/a	n/a	some noncompliance	total noncompliance
•Environmental damage	very minor, non-permanent damage requiring no clean up measures	minor, non-permanent damage	moderate damage with moderate clean-up effort needed	major damage with extended clean up required; some permanent damage	irreparable significant damage
•Confidential/political information exposed or released	n/a	limited amount	moderate amount	significant amount	• critical or sensitive • politically sensitive material
Public					
•Safety & Security, Life Quality; public or employees	no injuries	minor injuries	serious injuries	serious injuries resulting in permanent disability	death(s) or significant permanent disability
•Public Confidence & Ratings; favourable or unfavourable	routine comments	some observations by review agencies	Praise or criticism by review agencies	Strong praise or criticism by review agencies	Very positive/negative public rating
•Media: favourable or unfavourable	very minor attention	some attention	moderate attention	strong comments	extreme comments
•City image affected positively or negatively	very minor impact on client trust	minor gain/setback in building client trust	• some gain/loss of client trust • criminal charges	• significant change in quality of life indicators • criminal charges to key personnel	total loss of client trust
•Ethical/Legal Considerations (City staff)	routine claims and litigation	• threat of a law suit • potential breach of Code of Conduct by individuals(s)	• contentious litigation • serious breach of Code of Conduct by individual	• public trial • serious breach of Code of Conduct by multiple individuals	• public inquiry/inquest • unethical behaviour
•Audits: positive or negative recommendations by internal or external auditors	routine comments	minor recommendations	moderate recommendations	strong praise or criticism	extreme praise or criticism remarks

Future Event Likelihood Rating

LIKELIHOOD		DESCRIPTION
5	Almost certain	Is **expected** to occur within the next year unless circumstances change. Frequent occurrence.
4	Likely or very possible	Will **probably** occur in most circumstances. More than a 50/50 chance. Has occurred within the past 3 years or is more than 50% likely to occur within the next 3 years.
3	Possible- occasionally (somewhat likely)	**Might** occur under current circumstances. Less than a 50/50 chance.
2	Unlikely	**Could** occur if circumstances change. Small likelihood, but could happen.
1	Rare – almost impossible	**May** occur only in exceptional circumstances. **Possible**, but would be very surprising. Has not occurred in the past 3 years and is not likely to occur in the next 3 years.

Likelihood is defined as the probability or chance that an event will occur within a specified time frame.

Assessment is based on trends and experience, past patterns and corporate memory. Risk assessments are firmly rooted in an understanding of the business, customer's and management's objectives.

Risk Score Chart

(Likelihood) x (Impact) = Risk Score

(1-5 scale) x (1-5 scale) = max of 25

Risk	Likelihood *1-5 Scale*	Impact *1-5 Scale*	Risk Score	Rank
Activity A	2	3	6	2
Activity B	3	1	3	3
Activity C	4	2	8	1

Risk Score	Level of Risk	
20- 25	Very High	Unacceptable
15- 19	High	Unacceptable
10-14	Medium-High	Marginally Acceptable
5-9	Medium	Marginally Acceptable
1 – 4	Low	Negligible