Appendix ‘B’ – Cultural Heritage Evaluation Report

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REVISED DRAFT REPORT

Cultural Heritage Evaluation Report

Three Grand River Crossings Schedule B Municipal Class Environmental Assessment, City of Brantford, Ontario

Submitted to:

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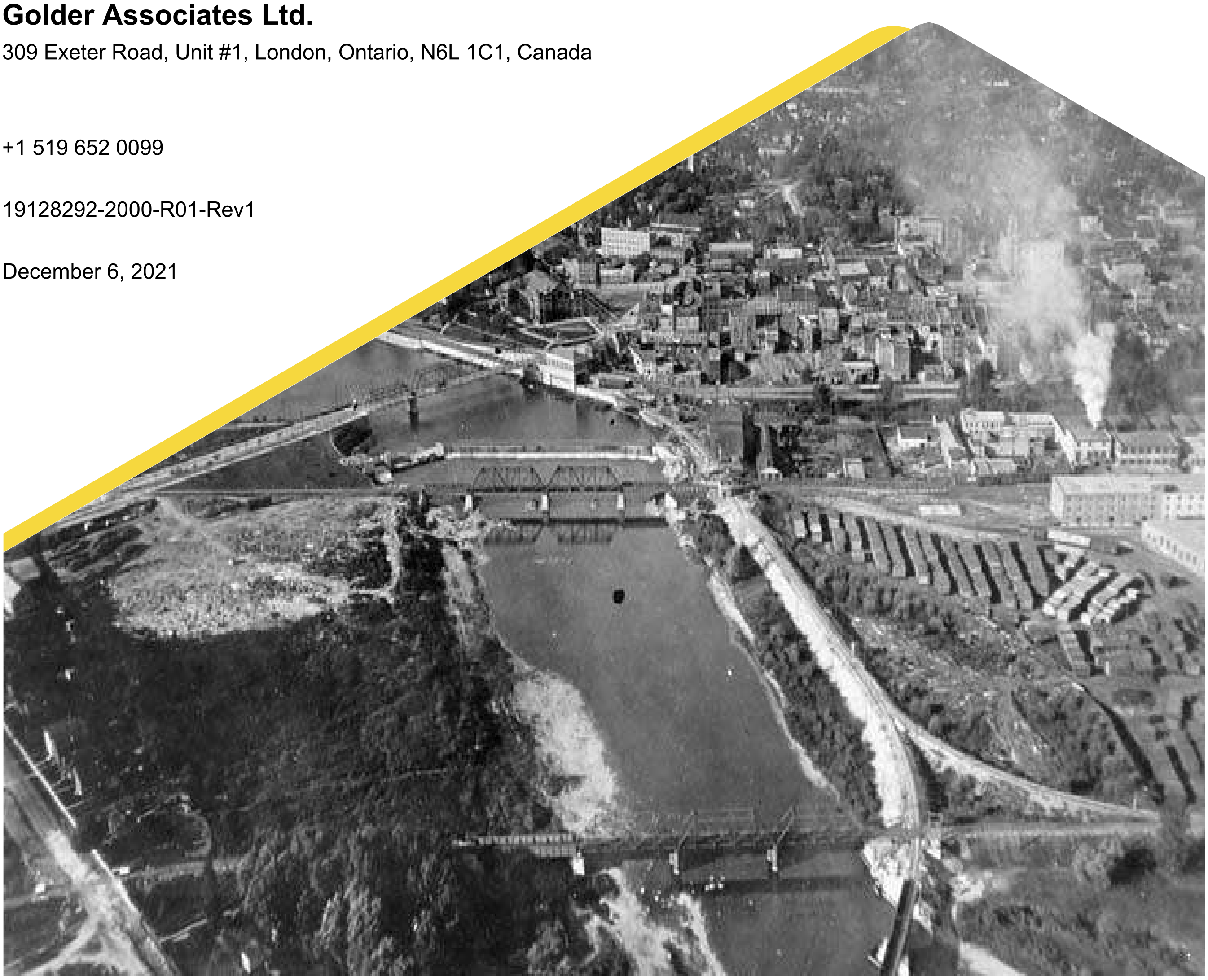
December 6, 2021



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Acknowledgements

Golder extends its thanks to the individuals (in alphabetical order by organization) below for their time and the wide range of information each contributed for this report:

Brant Museum & Archives	Nathan Etherington, Program & Community Coordinator
Brant Railway Heritage Society	Ken Chrysler, President
Canadian Industrial Heritage Centre	William Darfler, CIHC director and local historian
City of Brantford	Patrick Vusir CPT, Planner, Long Range Planning
Golder Associates Ltd.	Anuj Modi (MSc., P.Eng., PMP), Senior Structural Engineer/ Project Manager
Local historians	Jack Jackowetz, artist and local historian Ruth Lefler, local historian
TH&B Historical Society	Lance Brown, Archivist

Executive Summary

The Executive Summary highlights key points from the report only; for complete information and findings, as well as the limitations, the reader should examine the complete report.

In February 2020, GM BluePlan Engineering Limited (GM BluePlan) retained Golder Associates Ltd. (Golder) on behalf of the City of Brantford (the City) to conduct a Cultural Heritage Evaluation Report (CHER) to support the two-phase Three Grand River Crossings Schedule B Municipal Class Environmental Assessment (EA). The study area for the Class EA includes an approximately 800 m long by 150 to 300 m wide portion of the watercourse and banks of the Grand River in downtown Brantford, as well as the three crossings of the “Lorne Bridge”, “Brant’s Crossing Bridge”, and “Toronto, Hamilton and Buffalo (TH&B) Crossing Bridge”. The concrete Lorne Bridge was built for road traffic in 1923, while the metal and concrete Brant’s Crossing and TH&B Crossing Bridge rail crossings were erected in 1912-13 and 1893, respectively. The study area is also associated with the historic crossing of the Grand River by Indigenous leader Thayendanegea (Joseph Brant) in 1784, and includes remnants of crossings, rail lines, dams and recreational and institutional land-use dating from the late 19th century to 20th century. The CHER was initiated to identify whether each bridge and the study area as a whole met the *Ontario Regulation 9/06 Criteria for Determining the Cultural Heritage Value or Interest* and if a subsequent Heritage Impact Assessment (HIA) was required to inform the short and long-term management options for each bridge and wider study area.

Following guidance developed by the Ministry of Heritage, Sport, Tourism and Culture Industries (MHSTCI) and other sources, this CHER outlines the purpose and requirements of cultural heritage evaluation and the methods used to investigate and evaluate built heritage resources and cultural heritage landscapes, describes the study area’s geographic and historical context, inventories the built and landscape elements in the study area and at each bridge site, and for each discusses the structural history, architectural and engineering influences, integrity, and the physical conditions. It then evaluates the study area and each bridge using the criteria prescribed in *Ontario Regulation 9/06* and provides a Statement of Cultural Heritage Value or Interest (SCHVI) with Heritage Attributes for the study area and each bridge. Finally, it recommends future action. From the results of research, field investigations, analysis, and evaluation conducted for this CHER, Golder concludes that:

- **the “Brantford Crossings” corresponding to the study area should be considered a potential cultural heritage landscape as it meets six of nine criteria of *O. Reg. 9/06***
- **the Lorne Bridge is a built heritage resource since it meets eight of nine criteria of *O. Reg. 9/06***
- **the Brant’s Crossing Bridge is a built heritage resource since it meets seven of nine criteria of *O. Reg. 9/06*, and,**
- **the TH&B Crossing Bridge is a built heritage resource since it meets seven of nine criteria of *O. Reg. 9/06***

Based on these findings, Golder recommends to:

- **Conduct a Heritage Impact Assessment to identify the direct and indirect impacts of the preferred alternatives on the cultural heritage value or interest and heritage attributes of the Brantford Crossings cultural heritage landscape, the Lorne Bridge, the Brant’s Crossing Bridge, and the TH&B Crossing Bridge and, if necessary, recommend conservation measures to avoid or reduce any identified adverse effects.**

Study Limitations

Golder has prepared this report in a manner consistent with the guidelines developed by the Ministry of Heritage, Sport, Tourism and Culture Industries (MHSTCI) subject to the time limits and physical constraints applicable to this report. No other warranty, expressed or implied, is made.

This report has been prepared for the specific site, design objective, developments and purpose described to Golder Associates Ltd., by GM BluePlan Engineering Limited (the Client). The factual data, interpretations and recommendations pertain to a specific project as described in this report and are not applicable to any other project or site location.

The information, recommendations and opinions expressed in this report are for the sole benefit of the Client. No other party may use or rely on this report or any portion thereof without Golder Associates Ltd.'s express written consent. If the report was prepared to be included for a specific permit application process, then upon the reasonable request of the Client, Golder Associates Ltd. may authorize in writing the use of this report by the regulatory agency as an Approved User for the specific and identified purpose of the applicable permit review process. Any other use of this report by others is prohibited and is without responsibility to Golder Associates Ltd. The report, all plans, data, drawings and other documents as well as electronic media prepared by Golder Associates Ltd. are considered its professional work product and shall remain the copyright property of Golder Associates Ltd., who authorizes only the Client and Approved Users to make copies of the report, but only in such quantities as are reasonably necessary for the use of the report by those parties. The Client and Approved Users may not give, lend, sell, or otherwise make available the report or any portion thereof to any other party without the express written permission of Golder Associates Ltd. The Client acknowledges the electronic media is susceptible to unauthorized modification, deterioration and incompatibility and therefore the Client cannot rely upon the electronic media versions of Golder Associates Ltd.'s report or other work products.

Unless otherwise stated, the suggestions, recommendations and opinions given in this report are intended only for the guidance of the Client in the design of the specific project.

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1.0 INTRODUCTION

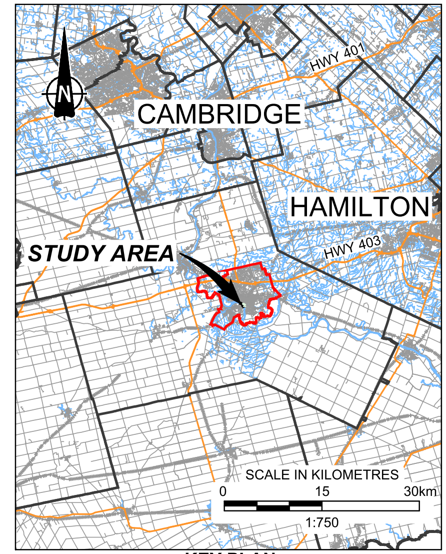
In February 2020, GM BluePlan Engineering Limited (GM BluePlan) retained Golder Associates Ltd. (Golder) on behalf of the City of Brantford (the City) to conduct a Cultural Heritage Evaluation Report (CHER) to support the two-phase Three Grand River Crossings Schedule B Municipal Class Environmental Assessment (EA). The study area for the Class EA includes an approximately 800 m long by 150 to 300 m wide portion of the watercourse and banks of the Grand River in downtown Brantford, as well as the three crossings of the “Lorne Bridge”, “Brant’s Crossing Bridge”, and “Toronto, Hamilton and Buffalo (TH&B) Crossing Bridge” (Figure 1). The concrete Lorne Bridge was built for road traffic in 1923, while the metal and concrete Brant’s Crossing and TH&B Crossing Bridge rail crossings were erected in 1912-13 and 1893, respectively. The study area is also associated with the historic crossing of the Grand River by Indigenous leader Thayendanegea (Joseph Brant) in 1784, and includes remnants of crossings, rail lines, dams and recreational and institutional land-use dating from the late 19th century to 20th century.

The CHER was initiated to identify whether each bridge and the study area as a whole met the *Ontario Regulation 9/06 Criteria for Determining the Cultural Heritage Value or Interest* and if a subsequent Heritage Impact Assessment (HIA) was required to inform the short and long-term management options for each bridge and wider study area.

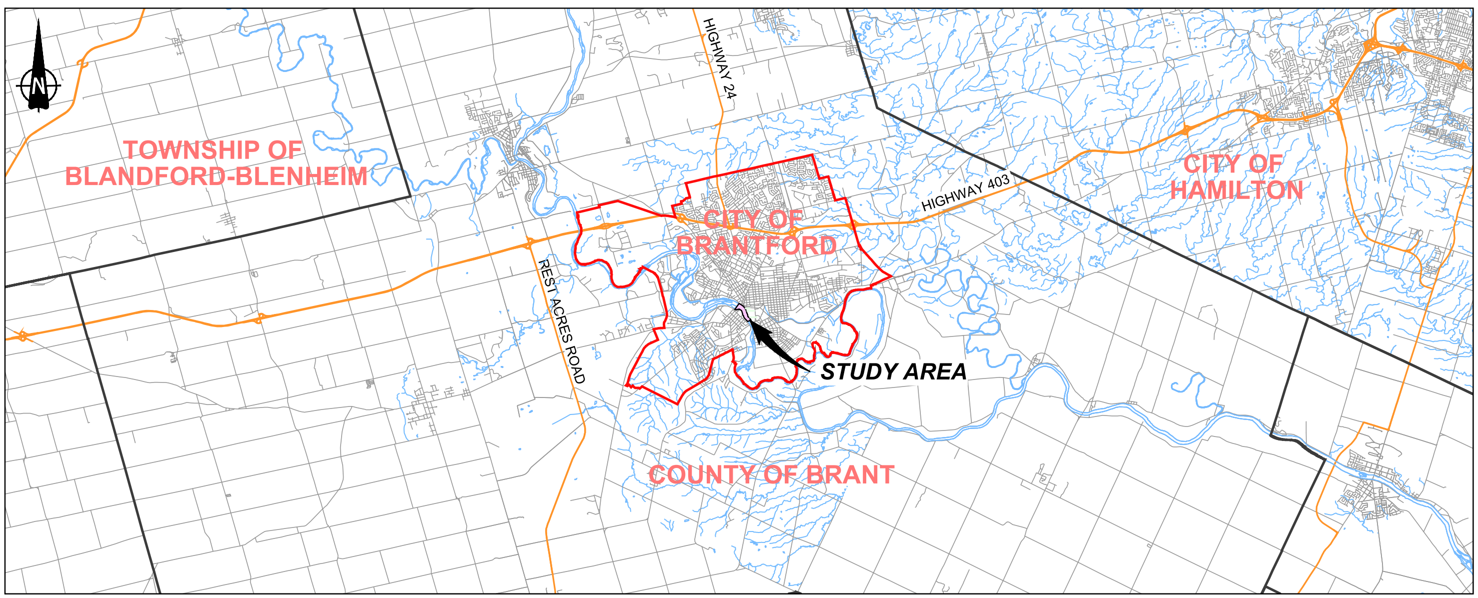
Following guidance developed by the Ministry of Heritage, Sport, Tourism and Culture Industries (MHSTCI) and other sources, this CHER:

- outlines the purpose and requirements of a cultural heritage evaluation report and the methods used to investigate and evaluate built heritage resources and cultural heritage landscapes;
- describes the study area’s geographic and historical context;
- inventories the built and landscape elements in the study area and at each bridge site, and for each discusses the structural history, architectural and engineering influences, integrity, and the physical conditions;
- evaluates the study area and each bridge using the criteria for cultural heritage value or interest prescribed in *Ontario Regulation 9/06* (*O. Reg 9/06*) under the *Ontario Heritage Act;*
- provides a Statement of Cultural Heritage Value or Interest (SCHVI) with Heritage Attributes for the study area and each bridge; and
- recommends future action.

AERIAL IMAGERY and OBM MAPPING



KEY PLAN



REGIONAL MAP

LEGEND

- APPROXIMATE STUDY AREA
- CITY OF BRANTFORD BOUNDARY
- TOWNSHIP/MUNICIPALITY BOUNDARY
- BRANTFORD — TOWNSHIP/MUNICIPALITY

REFERENCE

DRAWING BASED ON MNR LIO, OBTAINED 2019, PRODUCED BY GOLDER ASSOCIATES LTD UNDER LICENCE FROM ONTARIO MINISTRY OF NATURAL RESOURCES, © QUEENS PRINTER 2019;
THE GRAND RIVER CONSERVATION AUTHORITY 2006 ORTHOGRAPHIC IMAGERY;
CANMAP STREETFILES V2008.4.

NOTES

THIS DRAWING IS SCHEMATIC ONLY AND IS TO BE READ IN CONJUNCTION WITH ACCOMPANYING TEXT.

ALL LOCATIONS ARE APPROXIMATE.

PROJECT
CULTURAL HERITAGE EVALUATION REPORT
BRANT'S CROSSING BRIDGE
CITY OF BRANTFORD, ONTARIO

TITLE
LOCATION MAP

GOLDER

PROJECT No.	19128292	FILE No. 19128292–2000–R01001	
CADD	ZJB/DCH	Jan 27/21	SCALE AS SHOWN REV.
CHECK			**FIGURE 1**

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2.0 STUDY AREA, OBJECTIVE, SCOPE, & METHODS

2.1 Study Area

The study area defined for this study includes the area proposed in the March 2020 Notice of Commencement. It extends approximately 180 m north of the Lorne Bridge and 195 m south of the TH&B Crossing Bridge for an overall approximate length of 800 m northwest-southeast. At its narrowest point in the south it is approximately 150 m wide, averages 175 m wide in its mid section and expands to approximately 300 m wide on its north boundary.

2.2 Objective, Scope & Methods

The objectives of this study were to determine if:

- Each bridge and the study area meet the criteria for cultural heritage value or interest as prescribed in *O. Reg. 9/06* and could be considered for designation under Part IV of the *Ontario Heritage Act*.

To meet the study's objectives, Golder followed the typical process to investigate a study area or property and evaluate its cultural heritage significance (Figure 2). Understanding the significance and heritage attributes of a built heritage resource or cultural heritage landscape is a critical first step before the impacts of a proposed change can be assessed, and strategies developed to avoid or mitigate any adverse effects. Following this process, Golder:

- consulted City heritage staff and other knowledgeable individuals in the community (Section 2.3)
- reviewed applicable provincial and municipal heritage policies (Section 3.0)
- conducted field investigations to document existing conditions in the study area and at each bridge site (Sections 5.2, 6.1, 7.1, 8.1)
- researched archival and published sources to chart the history of the study area and each bridge (Sections 4.0, 0, 6.2, 7.2, and 8.2).
- analysed the heritage integrity and described the overall physical condition of each bridge (Sections 6.3,7.3, and 8.3)
- evaluated the study area and each bridge using the criteria prescribed in *O. Reg. 9/06*, in combination with provincial and municipal guidance (Sections 6.4,7.4, and 8.4). This included review of previous bridge evaluations in:
  - *Grand Old Bridges: The Grand River Watershed Bridge Inventory* (Robinson Heritage Consulting 2004)
  - "Lorne Bridge", "Brantford Railway Truss Bridge", and "Brantford Railway Girder Bridge" (HistoricBridges.org, 2012)
  - *Arch, Truss & Beam: The Grand River Watershed Heritage Bridge Inventory* (Heritage Resources Centre 2013)
- developed recommendations for future action based on provincial, and municipal conservation guidance (Section 9.0).

For this study Golder compiled archival and published sources, including maps and aerial imagery, from Golder's technical library, the City, knowledgeable individuals, and online sources. The research did not directly access local archives and information repositories since at the time of writing these remained closed due to the COVID-19 pandemic.

Cultural Heritage Specialist Shannon Neill-Sword conducted field investigations on April 22, 2020. This included taking written notes and photographing the bridges and the surrounding landscape with a Google Pixel 3a digital camera. Golder also consulted several widely recognized manuals related to evaluating cultural heritage significance, including:

- *The Ontario Heritage Tool Kit* (5 volumes, MHSTCI 2006)
- *Standards and Guidelines for the Conservation of Provincial Heritage Properties – Heritage Identification & Evaluation Process* (MHSTCI 2014)
- *Ontario Heritage Bridge Guidelines for Provincially Owned Bridges* (MTO 2008)
- *Guidelines on the Man-Made Heritage Component of Environmental Assessments* (MHSTCI 1980)
- *The Evaluation of Historic Buildings* and *Heritage Planning: Principles and Practice* (Kalman 1979 and 2014)
- *Informed Conservation: Understanding Historic Buildings and their Landscapes for Conservation (Clark 2001).*

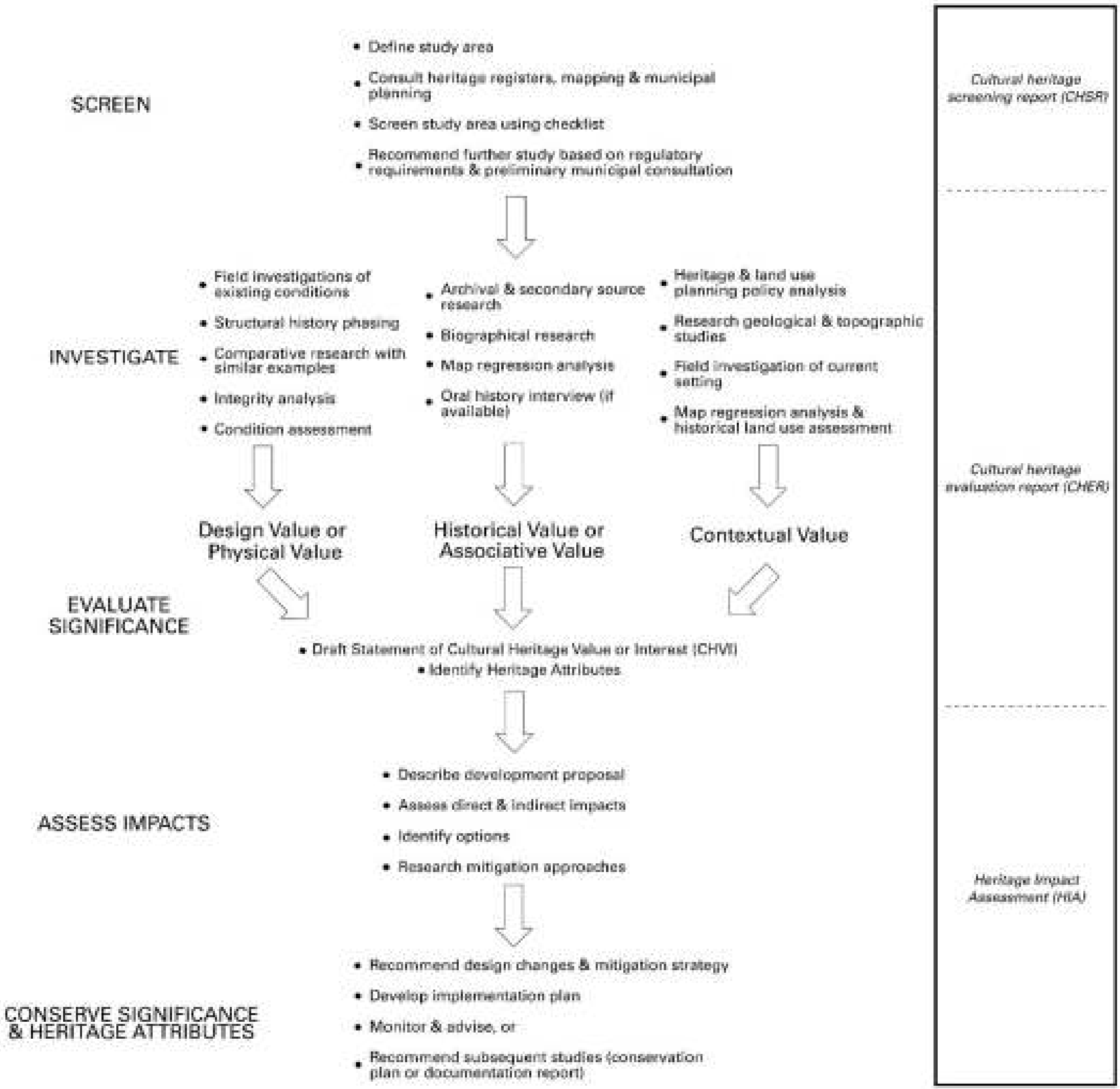

Figure 2: Typical process to investigate a property, evaluate its significance, assess impacts to the property's CHVI and heritage attributes, and mitigate any adverse effects.

2.3 Stakeholder Engagement

Table 1 lists the results of stakeholder engagement conducted for this CHER.

Table 1: Results of stakeholder engagement

Contact	Request	Response
Patrick Vusir CPT Planner, Long Range Planning City of Brantford	May 15, 2020 – Meeting request via email and to confirm all available information sources identified by the City were provided to GM BluePlan. June 10 – Inquired via email if the City had a copy of the Heritage Resources Centre (University of Waterloo) *Lorne Bridge Designation Report* 2009	May 21 – Remote meeting. Discussed sources provided to GM BluePlan, other possible sources and suggested to contact Lance Brown at TH&B Historical Society May 25 – provided relevant historical and secondary sources including the 2016 *Cultural Heritage Landscape Feasibility Study for the Mohawk Canal and Alfred Watts Hydrogenerating Station Ruins*. Patrick also noted that there was no additional material on file regarding Indigenous land use in the study area during the historical period, nor information on City engineer Frank P. Adams. June 9 – provided the 1923 and 1979 drawings for the Lorne Bridge. June 10 – responded that there were no electronic copies of the *Lorne Bridge Designation Report* on file at the City
Canadian Industrial Heritage Centre (CIHC), Brantford	May 15 – general request via email for information on the three bridges in the study area	May 26 – email response from Jean Farquharson with advice to contact Bill Darfler (CIHC director and local historian)
Lance Brown, Archivist, TH&B Historical Society	May 25 – request for general information on the TH&B Crossing Bridge June 2 – July 2 – follow-up correspondence re: information provided May 28	May 28 – Provided summaries of the Grand River Bridge and Locks Bridge and CN Rail elevation and section drawings of both structures. June 2, June 2 – responses to follow up questions
William Darfler CIHC director and local historian	May 26 – request for meeting	May 26 – Remote meeting. Discussed Brant's Ford and importance of local physiography to understand crossings. Suggested contacting Jack Jackowetz and Ruth Lefler.

Contact	Request	Response
Jack Jackowetz, Artist and local historian	May 26 – request for general information on study area May 27-July 17 – follow-up email correspondence re: information provided	May 27 – Provided via email historical summaries of the Brantford, Norfolk & Port Burwell Railway, Toronto, Hamilton & Buffalo Railway, and Lorne Bridge. May 29 – provided historical photograph of the Lake Erie and Northern (LE&N)/ Canadian National Railway (CNR) Crossing sent by Ken Chrysler (Brant Railway Heritage Society) June 29 – provided 1919 aerial image of the study area June 17 – relayed permission from Ken Chrysler to use selected images posted on the Brant Railway Heritage Society
Ruth Lefler Local historian	May 26 – request for general information on study area	May 30 – response that only information in collection about the three bridges is limited to what is found in local books June 1 – upon request provided text of "Walking Tour Around the Armoury and Jubilee Terrace Park" published in the *Brantford Expositor.*
Nathan Etherington Program & Community Coordinator Brant Museum & Archives 57 Charlotte Street Brantford	June 4 – request via email for sources and citations for information presented in the "Three Bridges" powerpoint presentation provided to GM BluePlan.	June 4 – remote meeting to discuss information request. June 11 – follow up email with further sources
Dr. Michael Drescher, Associate Professor School of Planning, Academic Officer Undergraduate; School of Planning Director; Heritage Resources Centre, Faculty of Environment, University of Waterloo	June 5, 2020 – request via email for a copy of the *Lorne Bridge Designation Report*, 2009	June 16 – Responded that the report was authored by individuals who no longer with the HRC and that a physical copy is not accessible at the University of Waterloo due to the pandemic.

3.0 PLANNING, LEGAL AND REGULATORY CONTEXT

Cultural heritage resources are recognized, protected, and managed through several provincial and municipal planning and policy regimes. These policies have varying levels of authority, though generally all inform decision-making on identification and evaluation of cultural heritage resources in the built environment.

3.1 Federal and International Heritage Policies

3.1.1 General

Many provincial and municipal policies align in approach to the Canada's Historic Places *Standards and Guidelines for the Conservation of Historic Places in Canada* (Canada's Historic Places 2010), which was drafted in response to international and national agreements such as the 1964 *International Charter for the Conservation and Restoration of Monuments and Sites* (*Venice Charter*), 1983 Canadian *Appleton Charter for the Protection and Enhancement of the Built Environment*, and *Australia ICOMOS Charter for Places of Cultural Significance* (*Burra Charter*, updated 2013*)*. The latter is important for pioneering "values based" evaluation and management, an approach central to Canadian federal, and provincial and territorial legislation and policies for identifying and conserving cultural heritage.

3.1.2 Canadian Heritage River System

As the study area is within the Grand River Canadian Heritage River Watershed, the policies of the Canadian Heritage Rivers System apply. The Canadian Heritage Rivers System (CHRS) is a conservation program intended to give national recognition to Canada's outstanding rivers and encourages their long-term management to conserve their natural, cultural, and recreational values. The program is a federal-provincial-territorial government partnership that works with local community-level river stewardship.

A Cultural Framework for Canadian Heritage Rivers, 2nd Ed. (CHRS 2000) provides a standardized basis for understanding the connections between human activities and Canadian heritage rivers. The framework provides five main themes of connection: resource harvesting, water transport, riparian settlement, culture and recreation, and jurisdictional use. Each of the five theme has three sub-themes, with numerous elements to each. In the heritage planning context, these themes, sub-themes, and elements are useful for identifying, categorizing, and evaluating the importance of heritage resources within a heritage river watershed.

3.1.2.1 The Grand River Heritage Watershed

Given the size of the Grand River Watershed and its central place in numerous communities, its importance is difficult to summarize, but the CHRS offers the following description:

> Because of its cultural history and outstanding recreational opportunities, the 290 km-long Grand River and its major tributaries, the Nith, Conestogo, Speed and Eramosa, were together designated as a Canadian Heritage River in 1994. The Grand meanders past towns where 19th century mills, foundries and factories still stand, and winds through wetlands and forests composed of rare Carolinian species (CHRS 2020).

To support the Grand River Watershed's designation in 1994, *The Grand Strategy for Managing the Grand River as a Canadian Heritage River* (*The Grand Strategy*) (GRCA 1994) identified five key themes representing human heritage resources:

- the watershed's cultural mosaic since the mid-nineteenth century
- the strong association of Native [Indigenous] Peoples with the watershed for thousands of years
- the Grand River's industrial heritage

- human adaptation to fluctuating river flows
- the many famous persons associated with the Grand River Watershed

The Grand Strategy also offers guidance on the opportunities, challenges, objectives, and potential action associated with its two central goals:

- To strengthen, through shared responsibility, the knowledge, stewardship and enjoyment of the heritage and recreational resources of the Grand River Watershed; and,
- To improve the well-being of all life in the Grand River Watershed.

3.2 Provincial Legislation, Policies & Guidance

3.2.1 Environmental Assessment Act & Municipal Class Environmental Assessments

The *Environmental Assessment Act* (EAA) was legislated to ensure that Ontario's environment is protected, conserved, and wisely managed. Under the EAA, "environment" includes not only natural elements such as air, land, water and plant and animal life, but also the "social, economic and cultural conditions that influence the life of humans or a community", and "any building, structure, machine or other device or thing made by humans". To determine the potential environmental effects of new development, the Environmental Assessment (EA) process was created to standardize decision-making. For the municipal road, water, and wastewater projects this decision-making is streamlined in the Class EA process, which divides routine activities with predictable environmental effects into four "schedules" (Government of Ontario 2014; MEA 2015). This EA falls under the Schedule B process since it includes "improvements and minor expansions to existing facilities" with "potential for some adverse environmental effects".

The phases (up to five) and associated actions required for each of these schedules are outlined in the Ontario Municipal Engineers Association (MEA) Manual. A step within Phase 2 of a Class EA is to prepare a description and inventory of the "natural, social and economic environments", which includes built heritage resources and cultural heritage landscapes. This inventory is compiled through searching federal, provincial, and municipal registers or databases of previously identified built heritage resources and cultural heritage landscapes, but also through evaluation using criteria for significance established by the Province (see Section 3.2.3).

To assist in identifying cultural heritage constraints and whether further study is required for bridge projects, the MEA developed the *Municipal Heritage Bridges Cultural, Heritage and Archaeological Resources Assessment Checklist* (Revised, 2014). This checklist first confirms the correct Class EA schedule before asking a series of questions about a bridge's date of construction, its type, its heritage planning context, and whether it is adjacent to known built heritage resources or cultural heritage landscapes. The next steps are recommended depending on a "yes" or "no" response for each question. This checklist is currently under review and intended primarily to determine if a Schedule A project will require a CHER or HIA; if not, the checklist provides documentation of due diligence in the project filing. The checklist is similar in scope to the Ministry of Heritage, Sport, Tourism and Culture Industries (MHTSCI) *Criteria for Evaluating Potential for Built Heritage Resources and Cultural Heritage Landscapes: A Checklist for the Non-Specialist* (2016) (see below), which is applied for Schedule A+, B and C projects. A copy of the completed Municipal Class EA's associated checklist for municipal bridges (Municipal Heritage Bridges Cultural, Heritage and Archaeological Resources Assessment Checklist Revised April 11, 2014) can be found in 0.

Avoidance of cultural heritage resources is the primary mitigation suggested in the manual, although other options suggested including: “employing necessary steps to decrease harmful environmental impacts such as vibration, alterations of water table, etc.” and “record or salvage of information on features to be lost” (Appendix 2 of MEA 2015). In all cases, the “effects should be minimized where possible, and every effort made to mitigate adverse impacts, in accordance with provincial and municipal policies and procedures.” Importantly, the Class EA provides the opportunity to integrate the requirements of the *EAA* with the *Ontario Planning Act* (see below), both of which must be met (MCEA 2015).

3.2.2 The *Planning Act* & Provincial Policy Statement

The Ontario *Planning Act* (1990) and associated *Provincial Policy Statement* 2020 (PPS 2020) mandate heritage conservation in land use planning. Under the *Planning Act*, conservation of “features of significant architectural, cultural, historical, archaeological or scientific interest” are a “matter of provincial interest” and integrates this at the provincial and municipal levels through the PPS 2020. Issued under Section 3 of the *Planning Act*, PPS 2020 recognizes that cultural heritage and archaeological resources “provide important environmental, economic, and social benefits”, and that “encouraging a sense of place, by promoting well-designed built form and cultural planning, and by conserving features that help define character, including *built heritage resources* and *cultural heritage landscapes*” supports long-term economic prosperity (PPS 2020:6,22).

The importance of identifying and evaluating built heritage and cultural heritage landscapes is recognized in two policies of PPS 2020:

- Section 2.6.1 – *Significant built heritage resources* and *significant heritage landscapes* shall be conserved
- Section 2.6.3 – Planning authorities shall not permit *development* and *site alteration* on *adjacent lands* to *protected heritage property* except where the proposed *development* and *site alteration* has been evaluated and it has been demonstrated that the *heritage attributes* of the *protected heritage property* will be conserved

Each of the italicised terms is defined in Section 6.0 of PPS 2020, with those relevant to this report provided below:

- ***Adjacent lands***: for the purposes of policy 2.6.3, those lands contiguous to a *protected heritage property* or as otherwise defined in the municipal official plan.
- ***Built heritage resource:*** means a building, structure, monument, installation or any manufactured or constructed part or remnant that contributes to a property’s cultural heritage value or interest as identified by a community, including an Indigenous community. *Built heritage resources* are located on property that may be designated under Parts IV or V of the *Ontario Heritage Act*, or that may be included on local, provincial, federal and/or international registers.
- ***Conserved***: means the identification, protection, management and use of built heritage resources, cultural heritage landscapes and archaeological resources in a manner that ensures their cultural heritage value or interest is retained. This may be achieved by the implementation of recommendations set out in a conservation plan, archaeological assessment, and/or heritage impact assessment that has been approved, accepted or adopted by the relevant planning authority and/or decision-maker. Mitigative measures and/or alternative development approaches can be included in these plans and assessments.

- ***Cultural heritage landscape:*** means a defined geographical area that may have been modified by human activity and is identified as having cultural heritage value or interest by a community, including an Indigenous community. The area may include features such as buildings, structures, spaces, views, archaeological sites or natural elements that are valued together for their interrelationship, meaning or association. Cultural heritage landscapes may be properties that have been determined to have cultural heritage value or interest under the *Ontario Heritage Act*; or have been included in on federal and/or international registers, and/or protected through official plan, zoning by-law, or other land use planning mechanisms.
- ***Development*:** means the creation of a new lot, a change in land use, or the construction of buildings and structures requiring approval under the Planning Act.
- ***Heritage attributes:*** the principal features or elements that contribute to a protected heritage property's cultural heritage value or interest, and may include the property's built, constructed, or manufactured elements, as well as natural landforms, vegetation, water features, and its visual setting (e.g., significant views or vistas to or from a protected heritage property).
- ***Protected heritage property:*** property designated under Parts IV, V or VI of the *Ontario Heritage Act*; property subject to a heritage conservation easement under Parts II or IV of the *Ontario Heritage Act*; property identified by the Province and prescribed public bodies as provincial heritage property under the Standards and Guidelines for Conservation of Provincial Heritage Properties; property protected under federal legislation, and UNESCO World Heritage Sites.
- ***Significant*:** means, in regard to cultural heritage and archaeology, resources that have been determined to have cultural heritage value or interest. Processes and criteria for determining cultural heritage value or interest are established by the Province under the authority of the *Ontario Heritage Act*.

The definition for *significant* includes a caveat that "while some significant resources may already be identified and inventoried by official sources, the significance of others can only be determined after evaluation." The criteria for significance established by the Province as well as the need for evaluation is outlined in the following section.

3.2.3 *Ontario Heritage Act* and *Ontario Regulation 9/06*

The *Ontario Heritage Act (OHA)* enables the Province and municipalities to conserve significant individual properties and areas. For Provincially owned and administered heritage properties, compliance with the *Standards and Guidelines for the Conservation of Provincial Heritage Properties* is mandatory under Part III of the *OHA* and holds the same authority for ministries and prescribed public bodies as a Management Board or Cabinet directive. For municipalities, Part IV and Part V of the *OHA* enables council to "designate" individual properties (Part IV), or properties within a heritage conservation district (HCD) (Part V), as being of "cultural heritage value or interest" (CHVI). Evaluation for CHVI under the *OHA* (or *significance* under PPS 2020) is guided by *Ontario Regulation 9/06* (*O. Reg. 9/06*), which prescribes the *criteria for determining cultural heritage value or interest*. *O. Reg. 9/06* has three categories of absolute or non-ranked criteria, each with three sub-criteria:

1) The property has ***design value or physical value*** because it:

- i) Is a rare, unique, representative or early example of a style, type, expression, material or construction method;
- ii) Displays a high degree of craftsmanship or artistic merit; or
- iii) Demonstrates a high degree of technical or scientific achievement.

2) The property has ***historic value or associative value*** because it:

- i) Has direct associations with a theme, event, belief, person, activity, organization, or institution that is significant to a community;
- ii) Yields, or has the potential to yield information that contributes to an understanding of a community or culture; or
- iii) Demonstrates or reflects the work or ideas of an architect, artist, builder, designer, or theorist who is significant to a community.

3) The property has ***contextual value*** because it:

- i) Is important in defining, maintaining or supporting the character of an area;
- ii) Is physically, functionally, visually or historically linked to its surroundings; or
- iii) Is a landmark.

A property needs to meet only one criterion of *O. Reg. 9/06* to be considered for designation under Part IV of the *OHA*. If found to meet one or more criterion, the property's CHVI is then described with a Statement of Cultural Heritage Value or Interest (SCHVI) that includes a brief property description, a succinct statement of the property's cultural heritage significance, and a list of its heritage attributes. In the *OHA* heritage attributes are defined slightly differently to the PPS 2020 and directly linked to real property[1]; therefore, in most cases a property's CHVI applies to the entire land parcel, not just individual buildings or structures.

Once a municipal council decides to designate a property, it is recognized through by-law and added to a "Register" maintained by the municipal clerk. A municipality may also "list" a property on the Register to indicate it as having potential cultural heritage value or interest.

3.2.4 Provincial Heritage Guidance

3.2.4.1 Ministry of Heritage, Sport, Tourism and Culture Industries

For provincial properties, heritage planning must comply with the MHSTCI *Standards and Guidelines for the Conservation of Provincial Heritage Properties* (MHSTCI *Standards and Guidelines*). Though not applicable to private or municipal projects, the MHSTCI *Standards and Guidelines* provides "best practice" approaches for evaluating cultural heritage resources not under provincial jurisdiction. For example, the *Standards and Guidelines for the Conservation of Provincial Heritage Properties – Heritage Identification & Evaluation Process* (MHSTCI 2014) provides detailed explanations of the *O. Reg. 9/06* criteria and their application.

To advise municipalities, organizations, and individuals on heritage protection and conservation, the Province, through the MHSTCI, has developed a series of guidance products. One used primarily for EAs is the MHSTCI *Criteria for Evaluating Potential for Built Heritage Resources and Cultural Heritage Landscapes: A Checklist for the Non-Specialist* (2016). This checklist provides a screening tool for a study area to identify all the known or recognized cultural heritage resources, commemorative plaques, cemeteries, Canadian Heritage River watersheds, properties with structures 40 or more years old, or potential cultural heritage landscapes. If known or potential cultural heritage resources are identified, the MHSTCI *Checklist* then advises whether further investigation as part of a Cultural Heritage Evaluation Report (CHER) or Heritage Impact Assessment (HIA) is necessary.

[1] The OHA definition "heritage attributes means, in relation to real property, and to the buildings and structures on the real property, the attributes of the property, buildings and structures that contribute to their cultural heritage value or interest."

Further guidance on identifying, evaluating, and assessing impact to built heritage resources and cultural heritage landscapes is provided in the *Ontario Heritage Tool Kit* series. Of these, *Heritage Property Evaluation* (MHSTCI 2006a) describes in detail the *O.Reg. 9/06* criteria and methods for researching and evaluating potential cultural resources. For heritage evaluations, the *Ontario Heritage Tool Kit* partially, but not entirely, supersedes earlier MHSTCI advice. Criteria to identify cultural landscapes is provided in greater detail in the *Guidelines on the Man-Made Heritage Component of Environmental Assessments* (1980:7), while recording and documentation procedures are outlined in the *Guideline for Preparing the Cultural Heritage Resource Component of Environmental Assessments* (1992:3-7).

3.2.4.2 Ministry of Transportation (MTO)

Although a prescribed public body required to follow the MHSTCI *Standards and Guidelines* the MTO has also developed guidance to manage the large number of heritage properties it administers, as well as the impacts of road construction on cultural heritage resources. Major rehabilitation or new construction is guided by the *Environmental Standards and Practices User Guide, Section 10: Built Heritage and Cultural Heritage Landscapes* (2006), the *Environmental Guide for Built Heritage and Cultural Heritage Landscapes* (2007), and Section 3.7 of the *Environmental Reference for Highway Design, Cultural Heritage – Built Heritage and Cultural Heritage Landscapes* (2013).

For bridges, the MTO worked with the University of Waterloo to produce *Heritage Bridges: Identification and Assessment Guide, Ontario 1945-1965* (2005) and created the Ontario Heritage Bridge List for structures evaluated to have provincial significance. The process and requirements to identify heritage bridges and potentially add them to the Ontario Heritage Bridge List is provided in the interim *Ontario Heritage Bridge Guidelines for Provincially Owned Bridges* (OHBG)(2008). This document also introduces evaluation criteria that is derived from *O. Reg. 9/06*, yet specifically addresses the sometimes-complex architectural features and context of bridge structures. Finally, the OHBG outlines conservation options for provincially significant heritage bridges.

Municipalities can reference the OHBG for guidance but must use *O. Reg. 9/06* when evaluating a bridge as a cultural heritage resource.

3.3 Municipal Heritage Policies

3.3.1 City of Brantford Official Plan

The City's *Official Plan* (last consolidated in 2015) informs decisions on issues such as future land use, physical development, growth, and change within the City limits. In Section 6.2.10, the *Official Plan* lists its goal and objective for cultural heritage and archaeology; respectively, these are to "sustain, conserve and enhance significant built environments", and "identify, inventory and conserve lands, cultural heritage landscapes, buildings, structures and sites of historic, architectural and archaeological values."

Section 9.0 in the *Official Plan* outlines the City's policies for cultural heritage and archaeology, and includes general policies as well as those for: Heritage Conservation Districts (Section 9.2); Designation of Cultural Heritage Resources (9.3); Inventory of Heritage Resources (9.4); Heritage Incentives (9.5); The Grand River as a Canadian Heritage River (9.8); and Archaeological Resources (9.9).[2]

[2] Section 9.6 and 9.7 have been deleted.

Under Section 9.3.2 the *Official Plan* references *O. Reg. 9/06* before listing seven criteria to determine cultural heritage significance. In some cases, these match *O. Reg. 9/06* criteria (Sections 9.3.2.2, 9.3.2.3, 9.3.2.4, and 9.3.2.5) while three introduce new criteria:

- Section 9.3.2.1 - the resource and associated features date from an important period in Brantford's historical development;
- Section 9.3.2.6 - it is a good, representative example of outstanding interior design;
- Section 9.3.2.7 - it makes an important contribution to the urban composition or streetscape which it forms a part.

3.3.2 Waterfront Master Plan

The City of Brantford Waterfront Master Plan (WMP, 2010) provides policy guidance for areas falling within the substantial waterfront areas of the City, including the Three Grand River Crossings and adjacent park land. Part 4 of the WMP addresses cultural heritage within the waterfront areas, setting out three key principles to be considered within the planning area:

- Protect and interpret the pre-contact history and role of the Grand River corridor.
- Enhance connections between the Grand River and areas of cultural heritage significance in Brantford.
- Conserve and interpret areas of cultural heritage significance.

Specific policies relating to the Three Grand River Crossings or water crossings generally are not set out in the WMP.

4.0 GEOGRAPHICAL AND HISTORICAL CONTEXT

4.1 General Geographic Context

The study area is in southwestern Ontario, approximately 35 km west of the west shore of Lake Ontario and 40 km north of the north shore of Lake Erie. It is within the Norfolk Sand Plain physiographic region, which extends from Elgin County through large portions of Norfolk, Haldimand, and Brant Counties. This physiographic region consists of fine textured sands and silts deposited as a delta in glacial Lakes Whittlesey and Warren (Chapman and Putnam 1984:154), though within the river is exposed dolostone bedrock (Janzen 2018). Brantford is on the boundary of the Huron Grey-Brown Podzolic (GBP) soils to the west and Burford GBP to the east, with the former being rolling terrain with slightly stony clay loam, and the latter being undulating terrain and loam with few stones (Department of Agriculture 1960). Both are well drained.

The study area also includes a section of the Grand River or *O:se Kenhionhata:tie*, which winds through the communities of Grand Valley, Fergus, Elora, Waterloo, Kitchener, Cambridge, Paris, Brantford, Caledonia, and Cayuga from its headwaters Wareham, approximately 120 km north of Brantford. The river empties into Lake Erie approximately 65 km southeast of the study area. Ecologically, the study area is in the Mixedwoods Plains Ecozone and the Lake Erie-Lake Ontario Ecoregion, which is one of the mildest climates in Canada and ideal for growing crops. Here there are remnants of the Carolinian forests and a diverse range of flora and fauna (Crins *et al* 2009:45-52).

In reference to cultural boundaries, the study area is centrally located within the single-tier municipality of the City of Brantford. Brantford is approximately 7 km north of the Six Nations of the Grand River, 32.5 km west of the City of Hamilton and 82 km east of the City of London, and 27 km south of the City of Cambridge.

4.2 Historical Context

4.2.1 Indigenous Regional History

Indigenous people entered southern Ontario after the glaciers retreated between 10,000 and 12,000 years ago. These first arrivals, known as Paleo People, travelled across large areas in search of caribou and smaller game as well as wild, edible plants. In the subsequent Archaic Period (8,000 to 1,000 Before Common Era [BCE]) the environment slowly transitioned from sub-arctic to conditions like those today. Indigenous groups continued to travel to access seasonal game and plant resources, but with increasingly diverse toolkits as extensive trade networks developed. As population sizes increased, group territories became smaller.

The introduction of ceramic manufacture is used by archaeologists to mark the beginning of the Woodland Period (1,000 BCE to 1650 Common Era [CE]). Artifacts found on settlement and burial sites from this period begin to show distinctive regional styles and suggest that societies who made them were developing complex social structures. Near the end of the Woodland Period (c. 850 CE) people had added cultivation of domesticated plants and horticulture to their way of life. They also began establishing villages that would be continually occupied over decades.

The Indigenous peoples who occupied the Grand River Valley in the first half of the 17th century had descended from villagers who had grown maize in the flood plains along the river as early as circa 500 CE. When French traders and missionaries arrived, they named these people the Neutrals for the role they played in the war between the Haudenosaunee (Iroquois) and the Huron. Ultimately, they and the Huron were assimilated into the Haudenosaunee, a 16th century alliance of the Cayuga, Mohawk, Oneida, Onondaga and Seneca nations. After the Tuscarora joined in 1715, the alliance became known as the Confederacy of Six Nations (Groarke 2009: 22).

At the outbreak of the American Revolutionary War (1775-1783), the Grand Council of Six Nations expressed neutrality, although Mohawk leader Thayendanegea (Joseph Brant) (Figure 3) promoted the British cause and formed the Brant's Volunteers to fight the Americans. After the British forces lost the war, Thayendanegea left New York State and petitioned the British for land along the Grand River Valley for himself and Six Nations in compensation for his services (Groarke, 2009: 22). Initially Governor of Quebec, Sir Frederick Haldimand granted Thayendanegea and Six Nations land in the Bay of Quinte, which a group of Mohawks led by John Deseronto accepted as it was believed to be the birthplace of Tekanawita, the Peacemaker who united the original Five Nations of the Iroquois Confederacy. Today the Tyendinaga (variant of Brant's name Thayendanegea) Mohawk Territory in the Bay of Quinte encompasses one-third of the original treaty land granted (Mohawks of the Bay of Quinte 2020).

In 1784 Thayendanegea successfully secured the Haldimand Tract, a corridor that measured "six miles deep from each side of the river" (Six Nations Council 2008; Morris 1943:19-21). Although this area along the Grand was already the hunting and camping grounds of the Mississaugas, the Crown paid £1,100 to relinquish their access (Groarke 2009: 24). The Six Nations members who had not travelled to Quinte with Deseronto then followed Thayendanegea to the Grand River as they —especially the Seneca— felt it was important to live closer to their traditional territory in New York State should future wars affect their kin across the border (Reville 1920: 34).

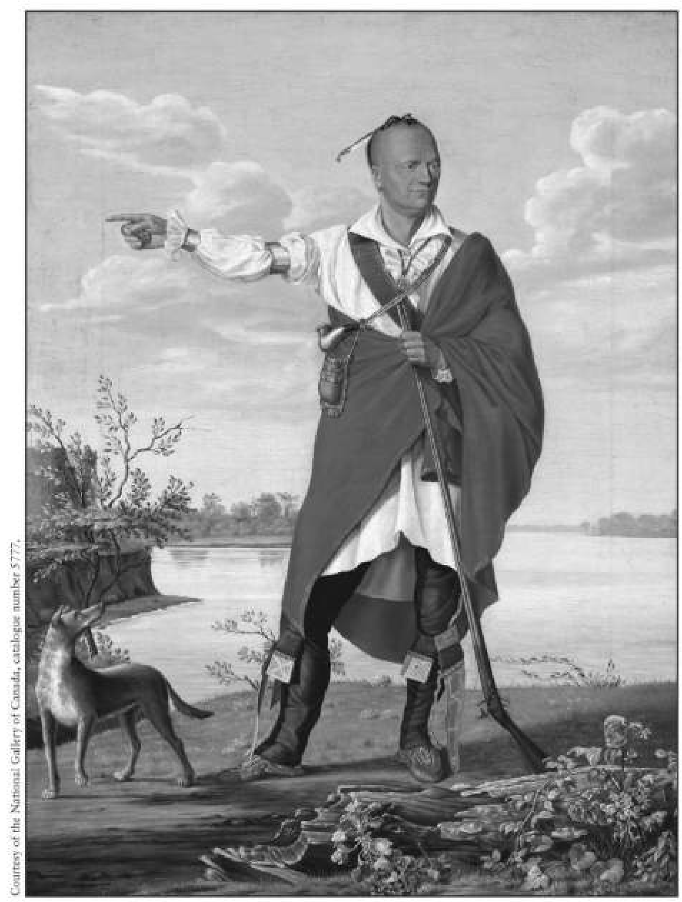

Figure 3: 1807 portrait of Thayendanegea or Joseph Brant by William Berczy. Brant is portrayed pointing to the newly acquired land on the bank of the Grand River (Groarke, 2009: 23).

As it had been before the arrival of Europeans, the Grand River Valley was also desirable for the Six Nations because of its relatively flat terrain, accessible source of fresh water from the river, and well-drained and periodically flooded fertile soils. These conditions were ideal for hunting game and cultivation of a wide range of produce such as maize, beans, squashes, sunflowers, gourds, and tobacco (Reville, 1920: 344).

The benefits that drew the Six Nations to the Haldimand Tract also attracted Europeans. Prior to his death in 1830, Thayendanegea promoted the lease and sale of property within the land grant to European settlers in the hope this would become a source of income for Six Nations. These sales were controversial as it was unclear whether Thayendanegea was legally authorized to parcel out and sell the land or if that land was to be held, in trust, by the Crown for Six Nations (Six Nations Council 2008; Groarke, 2009: 24). Over time, the Six Nations of the Grand River lost ownership of much of the territory in the Haldimand Tract and the legitimacy of the land sales continues to be disputed. Today, the Six Nations' reserve at the Grand River totals 48,000 acres (194.25 square km), approximately 5% of the original 950,000-acre grant. As compensation for the 1784 land cessation, 4,800 acres (19.42 square km) of the reserve are allocated to the Mississaugas of the Credit First Nation (Six Nations Council 2008).

4.2.2 Brantford Township, County of Brant

While the British were negotiating with Indigenous and settler interests on a local level, concurrently they were reorganizing how they governed the colony. Following the Toronto Purchase of 1787, today's southern Ontario was located within the old Province of Quebec and divided into four political districts: Lunenburg, Mechlenburg, Nassau, and Hesse. These became part of the Province of Upper Canada in 1791, and were renamed the Eastern, Midland, Home, and Western Districts, respectively. The study area is within the former Western District, which originally included all lands between an arbitrary line running north from Long Point (on Lake Erie) to Georgian Bay, and the Canada/US border along the Detroit and St. Clair rivers. Each district was further subdivided into counties and townships; the study area was originally in Wentworth County (later forming part of Brant County) and Brantford Township.

Although the township lands were formally owned by Six Nations until the 1830s, United Empire Loyalist families had moved into the area by 1788 (Page & Smith 1875; Reville 1920). These homesteaders initially settled along the fertile banks of Fairchild's Creek running through the eastern half of the township, and along the eastern banks of the Grand River to the west. In 1810, just three families were known to be residing in the township, but thirty years later the population had grown to 5,199, six saw mills and six grist mills were in operation, and the land was regarded as well cultivated and fully settled (Smith 1846).

Development intensified in the following years. In 1846 there were 6,000 people living in the township and construction of the Great Western Railway in 1854 and the Grand Trunk Railway in 1856 brought further growth. In the 1860s the population had peaked at nearly 7,000 (Smith 1846; Sutherland 1869). However, by 1875 the rural population had fallen to 4,000 (Page & Smith 1875), corresponding with a general shift away from agricultural work as the sole source of employment.

4.2.3 Industrial Growth of Brantford: Town to City

Several communities developed in Brantford Township throughout the 19th century including the villages of Burtch, Cainsville, Mount Vernon, Newport, and Rosebank, but it was the Town of Brantford that emerged as the prosperous centre. First officially surveyed by Lewis Burwell in 1830, the town had previously been known as Grand River Ferry, a small village that in 1818 had a population of 12 (Groarke 2009: 24). In 1825, the names Biggar's Town and Lewisville were rejected in favour of "Brant's Ford", to honour where Joseph Brant was believed to have forded the river (Figure 25) (Rayburn 1997:42).

By 1846, Brantford boasted a population of roughly 2,000 with eight churches, a weekly newspaper, a post office, as well as numerous factories, stores, and schools (Smith 1846). In 1847, a farmer's market was established and in addition to the sale of local produce and goods, and this became the hub for the mercantile trade (Groarke 2009: 25).

Three decades later the town numbered nearly 10,000 inhabitants and was incorporated as the City of Brantford in 1876 (Page & Smith 1875). Rich fertile soil had led to success in Brantford's agricultural industry and from that solid economic base grew large-scale manufacturing. By the turn of the century, Brantford was an international production centre for industrial and domestic goods, earning it the rank of third most important export city in Canada (*The Industrial Recorder of Canada* 1901). The manufacturing sector continued to expand rapidly in the 20th century and gained fame for its production of windmills, sawmill equipment, bicycles, stoves, paint, and varnish. In addition to these items, it was the production of agricultural machinery that gave Brantford global recognition as a leading supplier (Groarke, 2009: 25).

The notable agricultural manufacturers driving the City's industrial success were the Cockshutt Plow Company, Goold, Shapley and Muir, J.O. Wisner, Son & Co., Verity Plow, the Waterous Engine Works and, most of all, A. Harris & Son which later became Massey-Harris and finally Massey Ferguson after consolidating Wisner and Verity Plow. Massey Ferguson would surpass its closest competitor, the Ford Motor Company, and eventually become the world's largest supplier of farming machinery (Figure 4). Brantford would enjoy its industrial successes until the 1980s when due to compounding economic factors, such as low commodity prices and high debt charges, it became difficult for farmers to purchase high quality agricultural equipment, causing a steep decline in manufacturing and Brantford's prosperity (Groarke, 2009: 26). By then, however, the City had annexed substantial portions of the surrounding area and between 1980 and 1990 subsumed the remaining lands within Brantford Township to form a single-tier municipality independent from the surrounding County of Brant. In 2016, the population of the City of Brantford numbered 97,496 (Statistics Canada 2016).

Figure 4: The global success of Massey-Harris' farming machinery is evident in this Russian advertisement dating to the late 19th century (Groarke, 2009: 27).

4.2.4 A Brief Transportation History of Brantford

Prior to the introduction of rail, communication and transportation of goods and people in Ontario was by either via limited waterway routes or by carriage or stage on poorly maintained roads. However, Brantford had long been connected to its surrounding area by Indigenous trails and was planned as a stop on the trunk route that Lieutenant Governor John Graves Simcoe had proposed in 1793 (Gentilcore & Wood 1975:33-37). Despite this, surveys were not completed until after the War of 1812 and it was not until 1823 that Brantford's Colborne Street became a link on the road connecting Hamilton and London (ASI 2016:7).

At the same time, "canal fever" in Ontario had turned attention to the potential of the Grand River to provide access to the Great Lakes. The Grand River Navigation Company (GRNC), incorporated in 1832, offered area producers access to domestic and American markets by offering 48-hour round trips to Buffalo and beyond via the Welland Canal, and sought to extend navigation into downtown Brantford through the Grand River Canal, also called the Brantford Cut or Mohawk Canal. When the canal opened in 1848 it boasted a system of eight locks and dams, and in just two years an estimated 100 steam ships were using the waterway, stimulating growth for Brantford area mills and manufacturers (ASI 2016:9). Despite this success, the GRNC struggled to be profitable due to the high overhead of maintaining the locks and channels as well as strong competition with the railroads. It failed in 1859, disproportionately impacting the Six Nations who by then were majority stakeholders, and the town acquired the GRNC's assets in 1861 (ASI 2016:9; Beers, 1883).

Early development of the railroad in Ontario, and southwestern Ontario especially, was driven by the realization that trade with American states could be expedited by establishing a relatively flat, direct route across the province. As a result, American investment in Ontario railroads became common in the latter half of the 19th century. In 1851, Brantford missed a major opportunity to capitalize on the growth of rail, refusing to offer a bonus to the Great Western Railway (GWR) to run its Niagara Falls-Detroit River line through Brantford. Instead the GWR ran its line eight miles to the north.

To correct this misstep, in 1854 leading citizens funded their own railway, the Brantford, Buffalo and Goderich, that providing a direct route to Buffalo via Fort Erie and connected to the GWR and Grand Trunk Railroad (GTR) lines at Paris. In addition to the Buffalo line east, the proponents planned to expand the Paris line west to Goderich, providing connected towns with access to Lake Huron (Smith 2020). This objective was achieved in 1858 with the help of British investors and under the new name Buffalo & Lake Huron (B&LH) (Cooper 2020). In 1870, the GTR leased the B&LH in perpetuity, causing concerns among Brantford's citizens and industry about a GTR monopoly increasing shipping rates (Smith 2020). Additionally, Brantford had no direct route to Hamilton and Toronto, having to first make the connection to the GTR and GWR lines at Paris. As a partial solution, in 1871, the Town paid GWR $76,000 to construct an eight-mile branch line to its station at Harrisburg, which opened in November of that year (Wilkes 1927).

Brantford's leading citizens continued to pursue additional rail connections to improve access and reduce rates. In 1874, a dormant company was renewed and renamed the Brantford, Norfolk and Port Burwell (BN&PB) under the leadership of Brantford resident George H. Wilkes. Its aim was to establish a connection to Lake Erie and Pennsylvania coal, vital to Brantford's factories. Although the company struggled, it did finish the track to Tillsonburg, which opened in April 1876. The GWR became concerned when the Canada Southern Railway (CSR) initially leased the line, and persuaded the BN&PB to break its lease by agreeing to improve the bridge across the Grand River, connecting the BN&PB to GWR's Colborne street station (Smith 2020). The GWR leased the line in perpetuity in 1877 and operated the Tillsonburg road, but the line was never extended south to Port Burwell.

With the GWR amalgamation with the GTR in 1882, concerns re-emerged about monopoly, poor service, and high rates (Smith 2020). Once again, George Wilkes and Brantford's citizens incorporated a new railroad to correct the perceived issues. The Brantford, Waterloo and Lake Erie (BW&LE) was incorporated in 1885 with the aim of connecting to the CSR at Waterford, giving access to the Michigan Central Railroad (MCR) lines, and bringing rail competition back to the town. Despite financial challenges, the determined citizens funded the line, and the connection to Waterford was completed in February 1890. However, further financing problems and neighbourhood routing issues meant that the line had to terminate at a station at the curve of Colborne Street in west Brantford. The local directors sold the line to a Chicago investor, J.N. Young, on conditions that, for a bonus of $75,000 he would bridge the Grand River and carry the line on to Hamilton (Reville 1920: 187).

Like Brantford, Hamilton residents sought to break the GTR monopoly with an independent connection to Buffalo and to the MCR. Leading citizens incorporated the Toronto, Hamilton and Buffalo (TH&B) Railway to achieve this aim. They were soon forced to revise their expectations, and instead of connecting to Buffalo settled to link with the MCR at Waterford via Brantford. In 1892 the BW&LE amalgamated with the TH&B under the TH&B name. Young appears to have continued his work with the BW&LE until the end of 1893, when the whole of the TH&B was acquired by a group of New York investors (Maus 1941) The TH&B completed the line from Hamilton to Brantford, with service commencing in May 1895. This connection gave Hamilton access to the MCR at Waterford and Brantford direct access to Toronto over the Canadian Pacific Railway (CPR) lines from Hamilton to Toronto (IR 1901). Though it remained independently operated, the TH&B came under the control of the New York Central and CPR in the mid-1890s (Maus 1941).

At the start of the 20th century Brantford was served by rail facilities surpassing those of most similar-sized towns (Figure 5) (IR 1901). Despite efforts to minimize its control, the GTR transported two-thirds of the freight traffic in Brantford, with a freight value third among all Canadian cities served by the company (IR 1901). In 1902, an opportunity arose for Brantford to correct its 1851 error of forcing the GWR to bypass the community. With the GTR upgrading and updating all its routes, Brantford secured a revision to the mainline route with a bonus of $57,000 to bring the line south of the existing route and through the Town (Smith 2020). The GTR accepted, and the renewed mainline opened to passenger service in September 1905. This mainline continued in operation after Canadian National Railway (CNR) succeeded as owner in 1923, and under Via Rail from 1986 to the present.

Traffic on the smaller BN&PB (GTR, and later CNR) and TH&B (later Canadian Pacific Railway) lines declined significantly beginning in the 1920s, which led to reductions in passenger service on the lines. The CNR terminated passenger service on its Tillsonburg line (former BN&PB) in 1948 and the TH&B ended its Waterford service in 1954, with the last train called at the Brantford station in the fall of the same year. Freight service continued on these lines in a limited capacity to Hamilton (c. 1986) Tillsonburg (c. 1987), and Burford (c. 2001).

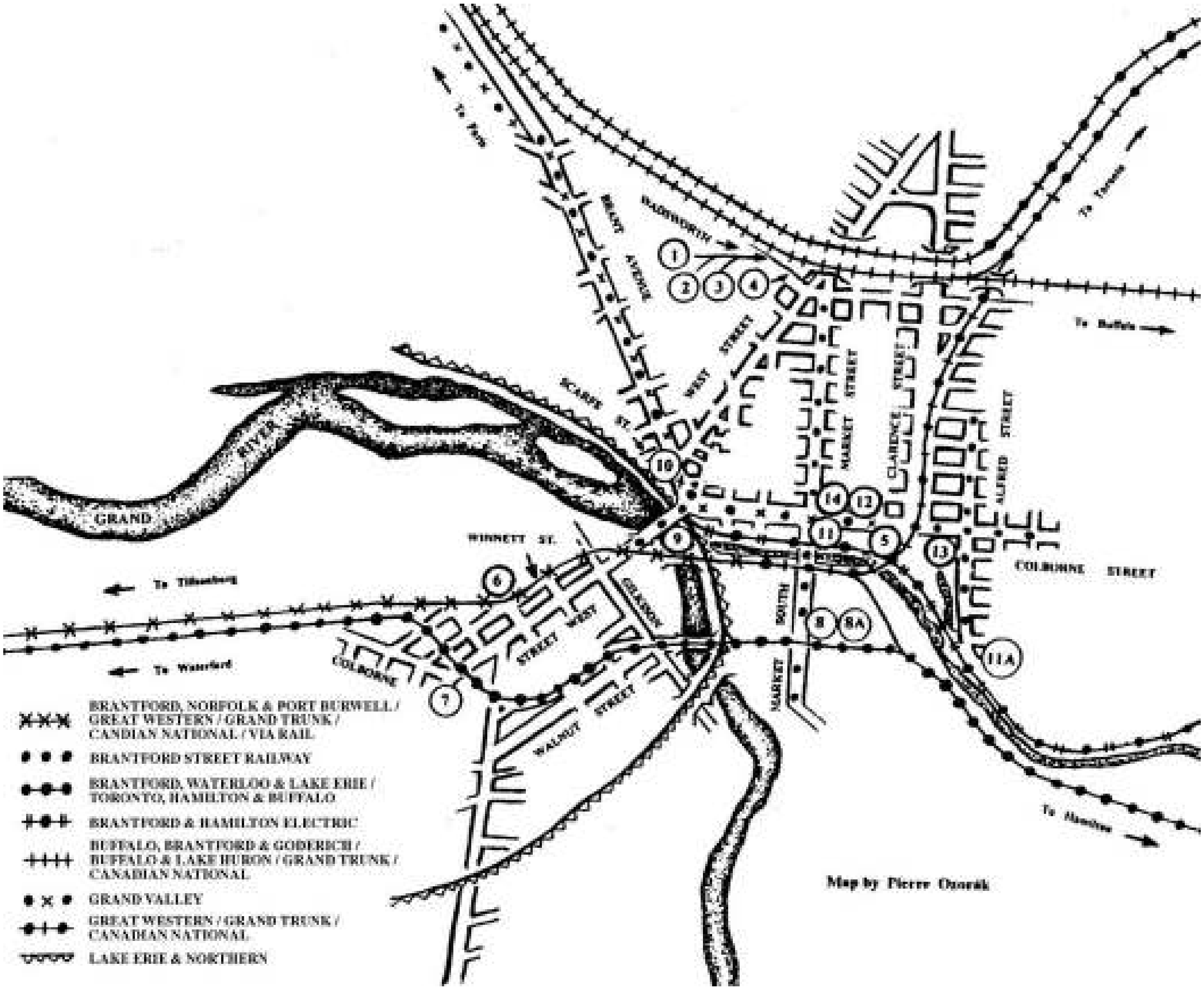

Figure 5: Map of the historic steam and electric railways serving Brantford, Ontario (Ozorak n.d.).

4.2.5 A Brief Overview of Bridge Construction in Ontario

The history of bridges in Ontario mirrors the developments in materials and bridge building technology seen across North America. From the early to middle 19th century, the favoured material for bridges was wood, although building spans entirely in stone was occasionally attempted. Apart from military projects, the earliest Ontario bridges were often built in vernacular forms, but between 1841 and 1849 the Province of Canada Department of Public Works assumed construction of bridges and roads and drew on the expertise of professional bridge engineers (Cuming 1984:36), and this professionalization was further entrenched with enactment of the *Municipal Act* in 1849 that moved responsibility for roads and bridges to local government. In the 1850s as railways began to develop in the Province, qualified designers were in high demand and by the end of the 19th century bridges were the domain of trained civil engineers and specialized bridge building companies, just as is required today.

Developments in the railway technology in the 1850s were quickly transferred to road bridge construction. By 1850 wrought iron was increasingly available and had largely replaced wood for bridge construction by the 1870s (Cuming 1984:38). Iron was applied in a diverse range of designs, including trussed frame, tied and hinged arch, girder and beam, and movable and suspension bridges. The tied-arch or bowstring truss was one of the early preferred designs for metal bridges in Ontario although into the 1880s, pin-connected truss bridges were common. Trussed frame bridges were adopted for their efficiency of materials and ability to distribute loads via a network of beams arranged in triangle patterns. Originally developed for wood structures, many truss designs were found to suit the new iron material. Truss bridges were often selected from a catalogue; a community or railroad company picked a basic design and a bridge company would then design the specific bridge, fabricate the pieces, and ship the pieces to the location for assembly (Cuming 1984:38).

By the 1880s, steel replaced wrought iron as the material of choice although in its application, such as trussed framing, it continued iron construction (Cumming 1984:41). Riveting technology had developed in the 19th century though it was not until a portable riveting machine was developed in the 1880s and 1890s that the technology was practical for bridge building (Parsons Brinkerhoff and Engineering and Industrial Heritage 2005:2-16). Riveted connections were faster, cheaper and the bridge remained more stable over time than bolt or pin connected bridges (Parsons Brinkerhoff and Engineering and Industrial Heritage 2005:2-17). Field riveting was common around the turn of the 20th century.

Beam and girder bridges had been built in iron since the mid-nineteenth century, but iron mills were limited in their capabilities so iron beams tended to replace wood beams and the bridges were small. In the 1890s steel mills began to develop the capacity to produce large beams and to build girders for large bridges. Built up girder or plate girder bridges were introduced in the late nineteenth century but were more expensive than rolled beam bridges, however girder bridges could be built to span longer distances and handle curves better than beam bridges. Girders were built by riveting flange angles to plates and adding cover plates to the top and bottom. Eventually welding replaced riveting to connect the parts of the girder (Parsons Brinkerhoff and Engineering and Industrial Heritage 2005: 3-110).

Elsewhere in North America, concrete was applied to bridge engineering in last quarter of the 19th century, while in Ontario the first bridge to be built from reinforced concrete was in 1906 (Cuming 1983:44). Reinforced concrete had developed at the end of the 19th century to improve the tensile strength of concrete and simple cast-in-place flat-slab bridges and reinforced concrete beam bridges were first used in North America in the first decade of the 20th century. Both types were popular choices for short spans from the 1910s to 1960s, with a large number built in the 1920s and 1930s (Parsons Brinckerhoff and Engineering and Industrial Heritage 2005:3-83,3-88).

Bridge construction in Ontario from the mid-20th Century onward involved rapid technological developments in concrete and steel construction. Many factors, including a population boom and increasing economic prosperity, led to significant road and bridge construction projects, with the Department of Highways leading the way (HRC n.d.:9). Although steel shortages immediately after the Second World War limited construction, by the middle of the 1950s this had passed, and many highway improvement and bridge projects planned years earlier were completed (HRC n.d.: 9). However, it was simultaneously realized that steel reinforcing was susceptible to deterioration during harsh winters in turn causing failures in the concrete such as spalling and cracking. (Brinckerhoff and Engineering and Industrial Heritage 2005:2-17). This led to the widespread adoption of pre-stressed concrete for bridge construction, where robust concrete I-beams are prestressed in a factory setting before being transported to the bridge site (Ressler 2015:300-301). Today pre-stressed concrete is the preferred technology for small to medium-scale bridges on Ontario’s roads.

5.0 THREE BRIDGES STUDY AREA

5.1 The Study Area as Potential Cultural Heritage Landscape

During research, field investigation, and evaluation of the three bridges it became apparent that the study area as a whole had the potential to meet the PPS 2020 definition for cultural heritage landscape (CHL), which is “a defined geographical area that may have been modified by human activity and…may include features such as buildings, structures, spaces, views, archaeological sites or natural elements that are valued together for their interrelationship, meaning or association.” It also appeared to meet several criteria for CHLs provided in the 1980 MHSTCI *Guidelines on the Man-Made Heritage Component of Environmental Assessments* (MHSTCI 1980:7), which are primarily based on visual character:

- It is the only one of its kind or one of the remaining few
- It is the most outstanding example of its kind
- It is perceived by the moving eye as a built-up area with a particularly interesting and attention catching series of visions
- It provides the observer with a strong and definite sense of position or place
- It has a unique or typical material content well executed in terms of colour, texture, style, and scale
- It is exemplary of distinctive cultural processes in the historic development and use of land
- It is part of a complex of outstanding scenic/ historic areas or is perceived as an ensemble of different landscape categories such as townscape, agricultural landscape, natural landscape, or waterscape, or
- It is part of landscape categories as mentioned above, and presents to the moving eye opportunities for special sequential experiences or series of visions of distinctive scenic views.

Based on the UNESCO 1992 *Operational Guidelines* for cultural landscapes adopted by the MHSTCI (*InfoSheet #2,* 2006:1-2), the property can be further defined as an evolved landscape (“those which have evolved through the use by people and whose activities have directly shaped the landscape or area”) and a “relict” landscape (“where even though an evolutionary process may have come to an end, the landscape remains historically significant”). It can also be defined as an industrial landscape primarily related to transportation (Palmer and Neaverson 1994:17), and as a “historic vernacular landscape”, defined in Page *et al.* (1998:12):

> A landscape whose use, construction, or physical layout reflects endemic traditions, customs, beliefs, or values; expresses cultural values, social behavior, and individual actions over time; is manifested in physical features and materials and their interrelationships, including patterns of spatial organization, land use, circulation, vegetation, structures, and objects. It is a landscape whose physical, biological, and cultural features reflect the customs and everyday lives of people.

Based on these definitions, and the analysis and evaluation presented in subsequent sub-sections, this CHER therefore proposes that:

- ***the “Brantford Crossings” area corresponding to the study area be considered as potential cultural heritage landscape.***

The proposed boundaries of the potential CHL for the most part follow those of the study area except in the north and south, where there are visual relationships with adjacent cultural heritage features (Figure 6). In the north, the boundaries of the CHL include the full extent of Lorne Park and views upriver, as well as Jubilee Terrace Park, the Sergeant William Merrifield VC Armoury (hereafter Brantford Armoury), and the Brant County War

Memorial. The visual and civic or recreational land use connections between these places and the first and second Lorne bridges is illustrated in numerous historical photographs, while there are visual connections between all three bridges and the Brantford Armoury and War Memorial.

In the south, the boundaries of the CHL include the east and west abutments of the Lake Erie and Northern Railway Bridge (LE&N) Bridge. Although the 1972 Brantford Southern Access Road (BSAR) Bridge that carries the Veteran's Memorial Parkway continues the historical pattern of building permanent crossings over the Grand River in this corridor, and is visually connected to the other three earlier bridges, it is currently excluded from the CHL since a thorough cultural heritage evaluation of the bridge was beyond the scope of this study.

5.2 Existing Conditions

The subject CHL is not currently recognized as having CHVI and is not included on the City of Brantford Heritage Register. The existing conditions described below follow a modified approach to identify "landscape characteristics" as outlined in the US National Park *Guide to Cultural Landscape Reports* (1998). As defined in the *Guide*, landscape characteristics "include tangible and intangible aspects of a landscape from the historic period(s); these aspects individually and collectively give a landscape its historic character and aid in the understanding of its cultural importance" (Page *et al.* 1998:53). Discussion and photographs of the specific setting and built features at each bridge site are described in Sections 6.0, 7.0, and 8.0.

General character: The general character of the study area is urban and commercial and industrial, yet unlike many communities on the Grand River, the character is also natural riverine within the riverbanks. It is only between Brant's Crossing and Lorne Bridge that the banks are lined with artificial features such as terraced bedrock and the concrete walling beneath the girder span of the Lorne Bridge.

Topography: Overall the topography is flat, with steep but relatively low banks on either side of the Grand River. On the east the terrain rises gradually to the northeast from approximately 650 m above sea level (masl) to 680 masl —steepest near the east approach to the Lorne Bridge— as well as southeast, while on the west the ground rises even more gradually toward the highpoint of Mount Pleasant at 780 masl to the southwest.

Vegetation: Low to medium height vegetation lines the riverbanks and is thickest in the north part of the study area at Lorne Park and in views north of Grand Island. Tall grasses are present on the islands and flood prone areas within the channel. On the upper terrace either side of the river the vegetation is primarily maintained grass or small shrubs, as well as the occasional tall tree.

Water features: The Grand River is the dominant water feature and though shallow at the time of the field investigations maintained a strong flow. It is widest (approximately 100 m) in the northern portion of the study area, then begins to narrow south of Brant's Crossing to 70 m wide at the south portion of the study area.

The river experiences significant seasonal changes in water level resulting in steep banks within the riparian zone on each side of the river. These changes are further evidenced by the mudflats that lie under and to the south of the bridge on the west bank of the river.

Components & small-scale features: For a relatively small area, the study area has a high number of components and small-scale features (Figure 6). The three bridges are the most prominent of these, and each border associated features such as the road works or paths, embankments, ballast used for the approaches, or numerous small-scale features.

North of the west approach to Lorne Bridge within Lorne Park are the monuments and plaque to Brant's Crossing (Figure 7 and Figure 8), while approximately 95 m north of the Lorne Bridge on the east side of the river is the location of the clubhouse for the former Brantford Canoe Club (today Aka:we Canoe Club) begun in

1877 (Figure 9 and Figure 10). Adjacent to the study area at the east approach of the Lorne Bridge is the Brantford Armoury (1893) and Boer War Monument (1903) at Jubilee Terrace Park, while further east but still visually prominent is the Brant County War Memorial (1933) (Figure 11). Both Jubilee Terrace Park and the Brant County War Memorial are protected heritage properties designated under Part IV of the *Ontario Heritage Act* (City Bylaw 187-96 and Bylaw 202-96, respectively).

At the east abutment and pier of the Lorne Bridge and running both north and south are the concrete retaining walls and trackways of the LE&N Railway, and the wall on the south side of the Lorne Bridge abutment was originally in the footprint of the B&H and LE&N Station (1914-1958) (Figure 12 and Figure 13). Immediately south of this was the entrance to the Brantford Canal (1848) (the path of which is still evident in the topography), that was originally spanned by a pony plate girder bridge (Figure 14 and Figure 15). South of the west approach in Fordview Park are the concrete remains of the dam spillway (1923), now used as a lookout (Figure 16 and Figure 17).

At the east approach to Brant's Crossing is a preserved section of LE&N Railway tracks as well as concrete piers for hydro pylons that ran parallel with the rail line on the river's east bank (Figure 18 to Figure 20). This portion of the river has also been identified as the historic location of Brant's Ford (Figure 21). Immediately south of the east approach to the TH&B Crossing Bridge is the concrete east abutment of the LE&N Bridge (1919-1973), and from here the west abutment is visible approximately 120 m downriver (Figure 22 and Figure 23).

Spatial organization & cluster arrangement: The principle spatial organization in the study area is the relationship between the bridges and the river. All three bridges span the river perpendicular to the shore, which although typical of bridge construction was not universal in the study area, the most striking example being the now demolished LE&N Bridge that entered the river at approximately 35-degree (east) and 50-degree (west) angles. All the surviving bridges also have a relatively low profile, with only the Lorne Bridge rising gradually to a high point in the middle. The three bridges that stand today are distributed relatively equidistant from one another across the study area but, as alluded to above, the small-scale features are clustered at the bridge approaches and primarily on the east bank of the Grand.

Land use & boundary demarcations: Apart from the busy transportation corridor of the Lorne Bridge, land use within the study area has transitioned completely from the industrial use that typified its history for much of 19th to 20th centuries to recreational use. This includes within the Grand River, which powered at least one tannery within the study area during the 19th century, although there is also long history of its recreational use since at least 1877 with the Brantford Canoe Club.

Boundaries within the study area are primarily marked by vegetation and the former rail lines. While the boundaries of the river change with the season based on water level, vegetation along the riverbanks is relatively consistent throughout the year. Vegetation also marks the edges of Lorne Park, although hard boundaries here and on the opposite side of the river at Jubilee Terrace Park are marked by the road and bridge balustrade. On the terraces either side of the river, the visual and study area boundaries are demarcated by the Fordview Trail (west), Dike Trail (southeast), and SC Johnson Trail (northeast).

Circulation: Circulation within the study area is linear and north and south along the riverbanks via the rail routes now converted to pedestrian recreational trails. All east-west circulation is channelled to the three crossings, and only the Lorne Bridge allows vehicle access.

Views & Vistas: As the river travels through the City, it meanders through a series of long bends, resulting in relatively short sightlines up and down-river. Static views predominate within the study area and are channelled north and south when standing on the bridges by the vegetation that lines the riverbanks. However, all views from each bridge provide wide vistas of the full span —abutment to abutment— of the other bridges. Despite the height of vegetation along the banks, the Brantford Armoury, Boer War Monument and War Memorial are prominent in all views to the north or northeast from each bridge. Views to the north from the Lorne Bridge are the most expansive, and take in the Brantford Armoury, the course of the river, and Grand Island. In all views within the study area, the number, as well as the rusted metal and weathered concrete fabric, of the bridges conveys a historical industrial character.

Serial views to the east occur when travelling along the SC Johnson Trail between Brant’s Crossing and the Lorne Bridge, and serial views west and east are possible when travelling by vehicle or on foot across the Lorne Bridge. Serial views when crossing the Brant’s Crossing and TH&B Crossing Bridge are more limited and tend to be channelled either east or west along the former rail lines.

Due to the vegetation along the riverbanks, views into the study area are channelled to the crossings, with the only expansive views possible when facing south from a viewpoints north of the study area on the east bank, and facing north from the BSAR Bridge.

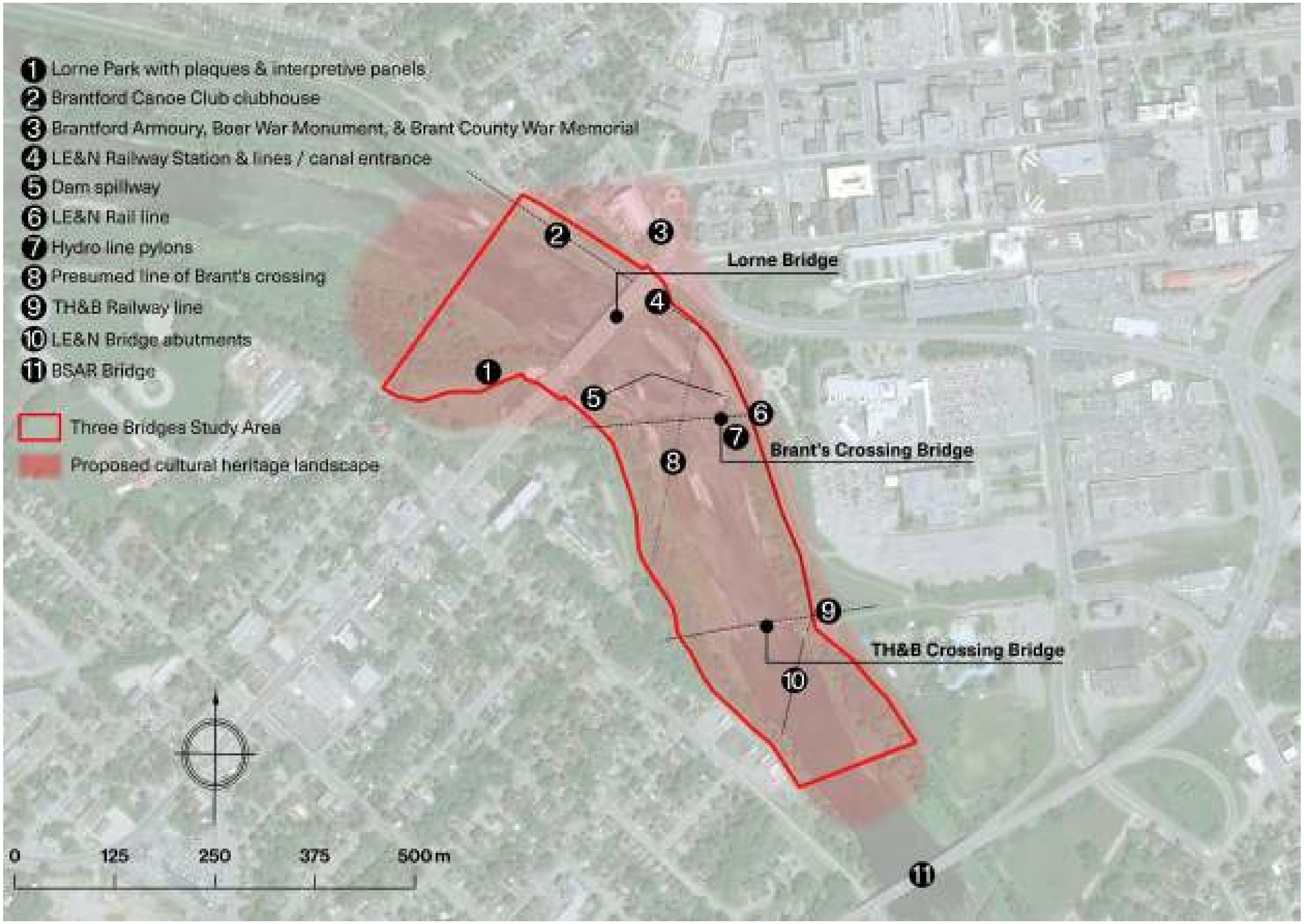

Figure 6: Three Bridges Study area, proposed Brantford Crossings cultural heritage landscape, and landscape features (Bing aerial imagery)

Figure 7: View facing southwest of the southeast portion of Lorne Park

Figure 8: “Brant’s Ford” monuments in Lorne Park

Figure 9: Circa 1900 photograph of Jubilee Terrace Park showing the Brantford Canoe Club clubhouse (far left nearest the skating area) (*Brantford Expositor*, City of Brantford)

Figure 10: View facing east from the Lorne Bridge of the same area shown in Figure 9

Figure 11: View facing north of the Boer War Monument (left), Brantford Armoury (centre), and Brant County War Memorial (far right)

Figure 12: View facing northwest of the Lorne Bridge (left and centre) and the B&H and LE&N Station (far right), July 1953 (City of Brantford)

Figure 13: View facing northeast of the same area shown in Figure 11

Figure 14: View of the B&H and LE&N Station and canal pony girder bridge circa 1900 (Collection of Brant Railway Heritage Society)

Figure 15: View facing southeast from the Lorne Bridge of the same area shown in Figure 14

Figure 16: View facing north of the dam spillway, June 1954 (City of Brantford)

Figure 17: View facing north of the same area shown in Figure 16

Figure 18: Post 1924 view facing north of the LE&N Line (centre) and hydro pylon (far left) (Collection of Brant Railway Heritage Society)

Figure 19: Preserved section of the LE&N Line at the east approach to Brant's Crossing Bridge

Figure 20: Concrete hydro pylon bases south of the east approach to the Brant's Crossing Bridge

Figure 21: Brant's Ford interpretive plaque in Lorne Park

Figure 22: View facing southwest of the LE&N Railway Bridge abutments

Figure 23: The LE&N Bridge in 1952 (Toronto Public Library – Toronto Star Archive)

5.3 Overview Landscape History

The geology and glacial history of the Brantford area has made it an ideal crossing point, and it is possible that Indigenous people forded the Grand River in the general location of Brantford continually since the end of the glacial period. As the meltwaters receded, Brantford's location on the shoreline of glacial Lake Warren would have made it an attractive site for fishing and to intercept game, and its high ground provided a means to traverse the land east and west. These landscape qualities continued to be value at the time of contact with Europeans during the 17th century, although crossing locations would have changed from year-to-year, based on the river's erosion and deposition of sediment from year-to-year (Darfler 2020: pers. comm.).

With the arrival of Thayendanega (Joseph Brant) in 1784, the crossing became formalized in Euro-Canadian descriptions, although the name Brantford was not officially adopted until 1825 (Rayburn 1997:42). The precise location of the crossing became the subject of heated debate during the 1920s, with locations suggested both north of the Lorne Bridge, at the Lorne Bridge site, and at the TH&B Crossing Bridge. The debate included oral testimony such contributed by Annie Thompson, who when interviewed in 1919 at the age of 96 related the ford to be near the TH&B Crossing Bridge (Reville 1920: 137) (Figure 25). Eventually it was decided that the ford entered the river south of the Bridge on the west bank and north of the Bridge on the east bank, and it was here that the Brant Historical Society and Imperial Order Daughters of the Empire placed a boulder and plaque and a sundial. These were later moved to Lorne Park in the 1950s.

Crossings by early European settlers likely moved yearly after 1784 as well, and permanent links may have been explored as early as 1812 (see Section 6.2.1). These links are described in further detail for each bridge site, but in general, map regression analysis of the large number of historical maps available clearly shows that this relatively small section of the Grand River became the focus for five periods of bridge building for nearly two centuries (Figure 24). Bridges by the late 19th century were serving a vital function in the community's development, for both movement of people and heavy goods, and "bird's eye depictions" and maps often foregrounded these structures (Figure 26 and Figure 27).

Into the second decade of the 20th century there were a multitude of permanent iron and steel crossings serving road and rail transport (Figure 28). As Stilgoe (1983:89) writes, "iron and steel bridges…entered the national imagination first as engineering marvels, then as constituents of the new industrial zone aesthetic" and part of this was because "industrial zone bridges attracted attention because of their nearness to each other" and "having many bridges often meant more to a city than having a single marvel". In Pittsburgh, for example, "citizens gloried in their multiplicity of bridges because the array of spans announced the intense prosperity of their city" (Stilgoe 1983:89). This was likely the same in Brantford, even if on a smaller scale.

Bridges continued to play a significant role in Brantford through the late 20th century, despite the decline in the City's economic fortunes (Figure 29 and Figure 30). Though only the Lorne Bridge is still in use for its original purpose, the earlier bridges and several associated features are still prominent features on the landscape.

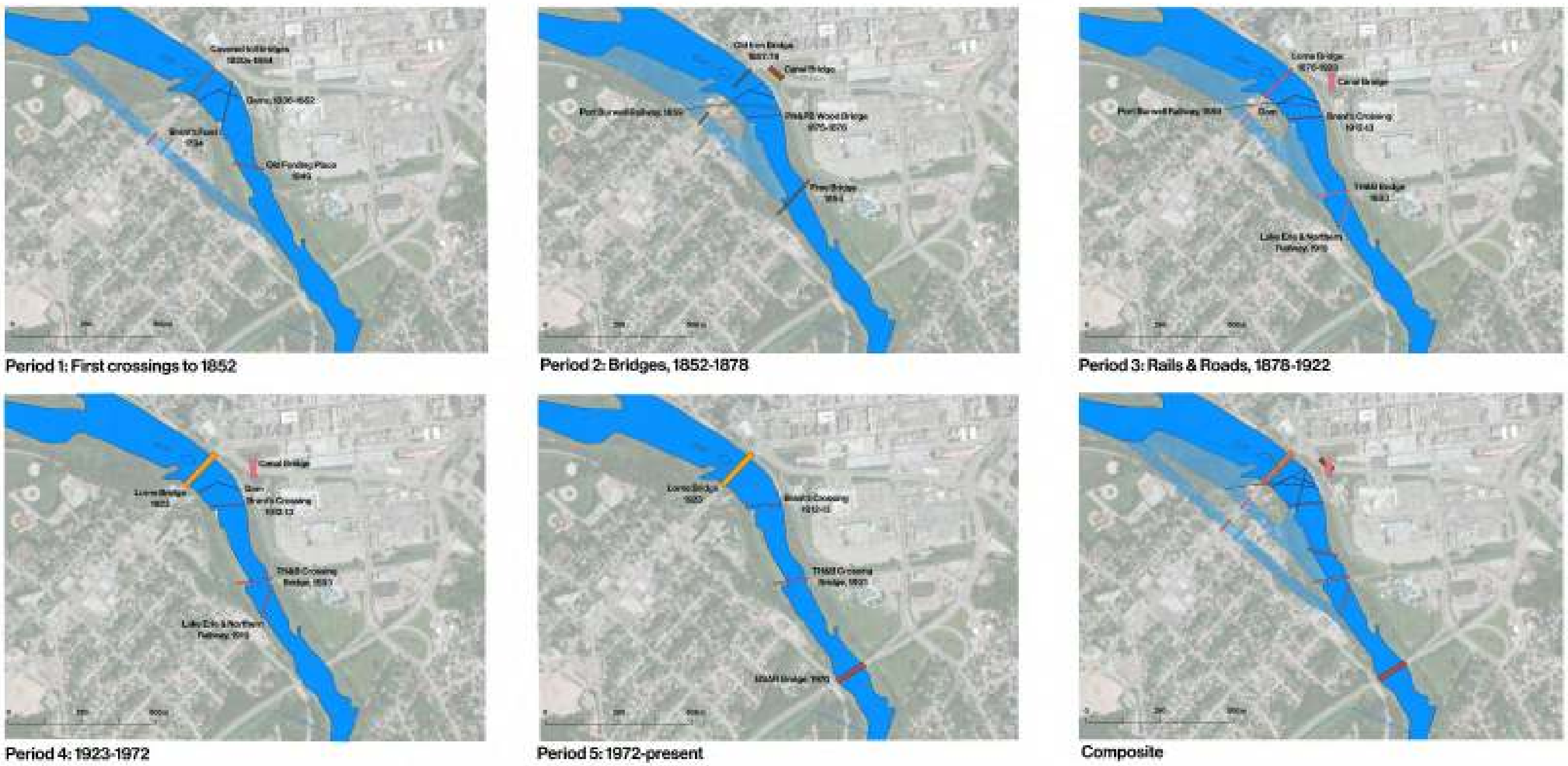

Figure 24: Map regression analysis of Grand River crossings in Brantford, 1784 to present (Bing aerial imagery)

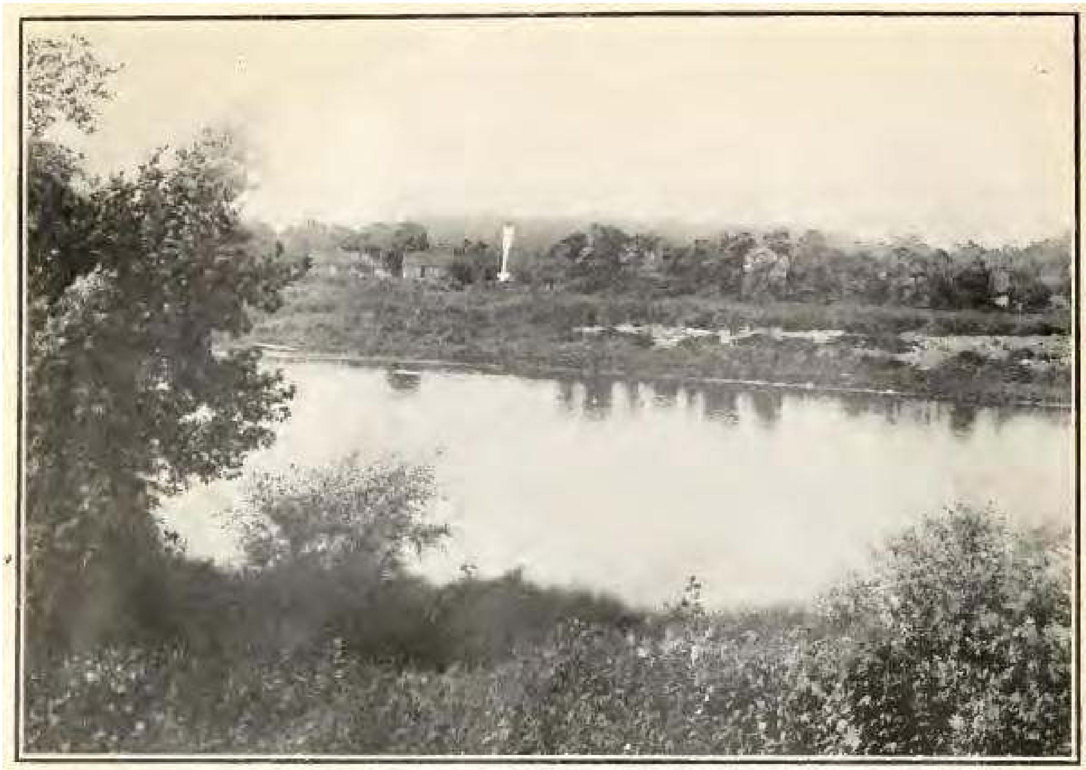

Figure 25: Frontispiece in Reville's *History of the County of Brant* showing the "Brant's Ford" as it was then understood. The arrow "indicates the point of emergence on the west side...between the Daniels and Jones properties on Gilkison Street" and "nearer the T.H.& B. Bridge" (Reville 1920).

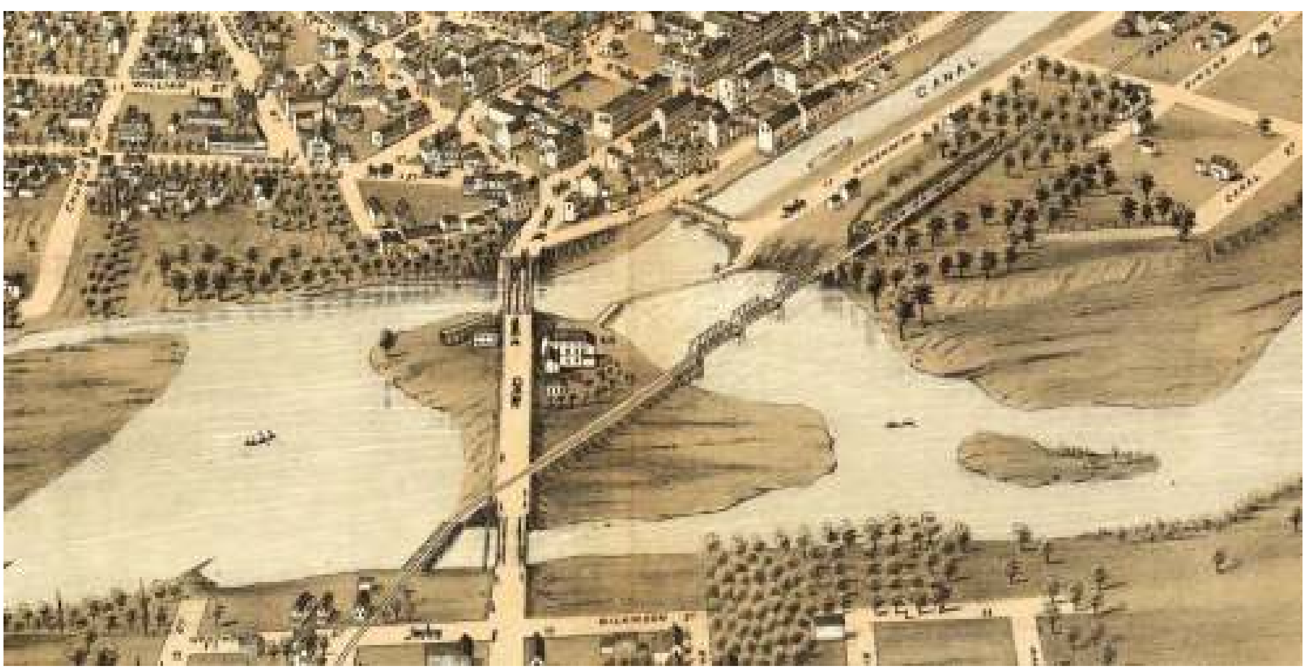

Figure 26: The study area as depicted on the 1875 *Bird's Eye View of Brantford*

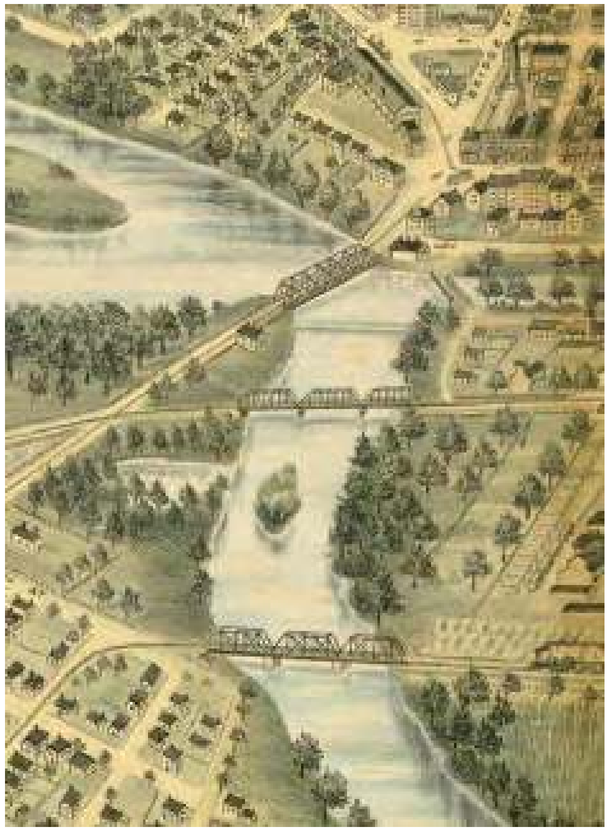

Figure 27: The study area as shown on the 1892 *Bird's Eye View of Brantford*

Figure 28: 1919 aerial photograph of the study area, showing from far to near, the Lorne Bridge, Brant's Crossing, TH&B Crossing Bridge, and LE&N crossing, facing north.

Figure 29: Aerial photograph of the study area facing west, June 1963

Figure 30: Aerial photograph of the study area facing north, circa 1976

5.4 Evaluation of Cultural Heritage Value or Interest

As outlined in Section 3.2.3, one approach to determine if a built heritage resource or cultural heritage landscape should be considered for designation as a protected heritage property under the *OHA* is to evaluate it using the criteria prescribed in *O. Reg. 9/06*. These criteria address potential design or physical values, historical or associative values, and contextual values.

From the results of the historical research and comparative analysis, the landscape as defined above was evaluated to determine if it met the criteria for cultural heritage value or interest as prescribed in *O. Reg. 9/06*. The results of this evaluation are provided in the following subsections.

5.4.1 Design Value or Physical Value

Criteria	Meets criterion (Yes/No)
(i) Is a rare, unique, representative or early example of a style, type, expression, material or construction method.	**Yes**
Rationale: The Brantford Crossings landscape is a rare and representative example of an industrial transportation landscape. Unlike communities with multiple 19th and early 20th century rail and road crossings that have been entirely demolished or replaced, or communities with a limited number of bridges, the Brantford Crossings landscape retains three intact bridges dating from 1893 to 1924 as well as the remains of the LE&N Bridge abutments, the B&H and LE&N station, and the dam spillway. With its combination of road and rail bridges of varying forms and materials, the Brantford Crossings is also representative of industrial landscapes across northeastern North America (such as Pittsburgh PA) with an "industrial zone aesthetic" typified by a "multiplicity of bridges" in iron, steel, and concrete all constructed near each other.	

Criteria	Meets criterion (Yes/No)
(ii) Displays a high degree of craftsmanship or artistic merit.	No
Rationale: As an evolved and industrial landscape, the Brantford Crossings does not display a high degree of craftsmanship or artistic merit, although views incorporating the Lorne Bridge, dam, and Brant's Crossing have been the subject of photographs throughout the second half of the 20th century and into the 21st century.	

Criteria	Meets criterion (Yes/No)
(iii) Demonstrates a high degree of technical or scientific achievement.	No
Rationale: A high degree of technical or scientific achievement is not evident in the Brantford Crossings, which is an evolved and industrial landscape.	

5.4.2 Historical Value or Associative Value

Criteria	Meets criterion (Yes/No)
(i) Has direct associations with a theme, event, belief, person, activity, organization or institution that is significant to a community.	**Yes**
Rationale: The Brantford Crossings has direct associations with the theme of Brantford's development and identity as an industrial centre and the development of rail and road transportation in the community. This is reflected in interpretive signage in Lorne Park. It is also directly related to the theme of bridge building in the community, which was celebrated historically (through such events as the official openings of the Lorne Bridge) and recently, such as the Bridges in the County of Brant and Brantford collaborative project and studies commissioned on the bridges of the Grand River. Importantly, it is also directly associated with the theme of Grand River crossings at this location, not only as Brant's Ford and crossings in the last two centuries but potentially stretching back many centuries in Indigenous history.	

Criteria	Meets criterion (Yes/No)
(ii) Yields or has the potential to yield information that contributes to an understanding of a community or culture.	**Yes**
Rationale Research for this study was relatively limited in scope and constrained by limited access to archives by the current COVID-19 pandemic; it is therefore probable that further historical and field study of the Brantford Crossings will yield information that contributes to a better understanding of Brantford's social and industrial development.	

Criteria	Meets criterion (Yes/No)
(iii) Demonstrates or reflects the work or ideas of an architect, artist, builder, designer or theorist who is significant to a community.	No
Rationale: As an evolved landscape, the Brantford Crossings does not reflect the ideas of any one architect, artist, builder, designer, or theorist.	

5.4.3 Contextual Value

Criteria	Meets criterion (Yes/No)
(i) Is important in defining, maintaining or supporting the character of an area.	**Yes**
Rationale: Centrally located in the community with a high degree of heritage integrity and an associated riverine environment, the Brantford Crossings is important for in defining, maintaining, and supporting the character of the downtown area of Brantford. It is also central to the community's identify as a crossing, as reflected in its original name "Brant's Ford".	

Criteria	Meets criterion (Yes/No)
(ii) Is physically, functionally, visually or historically linked to its surroundings.	**Yes**
Rationale: The Brantford Crossings is physically, functionally, visually, and historically linked to human use of the Grand River Canadian Heritage River and its immediate surroundings, including the downtown core of Brantford, industrial centre of Eagle's Nest, and former estates, residential areas, small scale features such as monuments and relict rail lines, and recreational grounds such as Lorne Park and Jubilee Terrace Park.	

Criteria	Meets criterion (Yes/No)
(iii) Is a landmark.	**Yes**
Rationale: The Brantford Crossings is a landmark recognized since at least the early 20th century as Brantford's historic core and is today recognized through interpretive signage, historical monuments, and multiple pedestrian walking trails but also for its combination of inter-visible prominent landmarks of the three bridges, Brantford Armoury, Boer War Monument, and the Brant County War Memorial.	

5.4.4 Evaluation Results

The preceding evaluation has determined that the Brantford Crossings study area:

- **Meets six of nine criteria of *O. Reg. 9/06* and therefore has cultural heritage value or interest as a cultural heritage landscape**

Based on this evaluation, a Statement of CHVI is proposed below.

5.4.5 Statement of Cultural Heritage Value or Interest

Description – Brantford Crossings Cultural Heritage Landscape

The Brantford Crossings cultural heritage landscape is centrally located in the City of Brantford and is an approximately 1 km section of the Grand River that extends from immediately north of the Veterans Memorial Parkway (formerly Brantford Southern Access Road [BSAR]) Bridge in the south to north of the Lorne Bridge in the north. It is widest in the north (approximately 400 m) where it includes Lorne Park and the Brantford Armoury on the west and east sides of the river, respectively, and narrows to 160 m wide on the south and bound by Fordview Trail on the west and the Dike Trail on the east.

Statement of Cultural Heritage Value or Interest

The Brantford Crossings is an evolved cultural heritage landscape with design or physical value, historical or associative value, and contextual value. With its surviving four-span girder Toronto, Hamilton and Buffalo (TH&B) Crossing Bridge, four-span girder and Pratt through truss Brant's Crossing Bridge, concrete open spandrel Lorne Bridge, and small scale concrete features such as the remains of a dam spillway and abutments of the Lake Erie and Northern Railway Bridge (LE&N) Bridge, the cultural heritage landscape is a rare and representative example of a late 19th century to early 20th century industrial urban landscape, one that often featured multiple rail and road crossings built in different forms and primarily constructed in metal and concrete.

In addition to its association with Brantford's development as an industrial centre in southern Ontario, and its role in permanently linking the east and west sides of Brantford since at least the 1840s, the Brantford Crossings area has direct associations with the ford that Joseph Brant used to cross the Grand River in 1784 to establish the Six Nations of the Grand River settlement, and for which the community was named in 1825, and as a crossing for Indigenous people stretching back many centuries.

Its contextual value lies in its central location in the City of Brantford, and role in defining the character, maintaining and supporting the character of this Grand River community. Visually, physically, functionally, and historically it reflects the long human use of the Grand River at this location as a crossing point, transportation corridor, and recreational area, and one connecting the industrial, commercial, and residential core of Brantford with surrounding communities and areas. With its surviving bridges and associated rail, road, and pedestrian transportation features, its recreational areas such as Lorne Park and Jubilee Terrace Park, and prominent historical sites such as the Brantford Armoury and Brant County War Memorial, the Brantford Crossings is a community landmark.

Heritage Attributes

Major built features and properties including the:

- Lorne Bridge
- Brant's Crossing Bridge
- Toronto, Hamilton and Buffalo (TH&B) Crossing Bridge
- Brantford Armoury and Jubilee Terrace Park
- Brant County War Memorial

Small scale features including the:

- Boer War Monument
- Concrete retaining walls and former rail lines of the B&H Electric Railway station and lines, and LE&N rail line
- Concrete dam spillway, hydro pylons, and Lake Erie and Northern Railway (LE&N) Bridge abutments
- Former locations of the Mohawk Canal and Brantford Canoe Club clubhouse
- Lorne Park with historical monuments
- Pedestrian trails either side of the river, most of which correspond to former rail lines

Natural features including:

- The width, flow, and seasonally changing water level of the Grand River Canadian Heritage River
- Trees, brush, and tall grasses lining the riverbanks
- Topography of low riverbanks rising to flat terraces either side of the river

Views including:

- Inter-visible views of the three bridges, dam spillway, Brantford and Hamilton (B&H) Electric Railway and LE&N station retaining walls, LE&N Bridge abutments, and river corridor
- Vistas from the north incorporating the Brantford Armoury, river course, and three bridges, and Lorne Park
- Vistas from the south incorporating the Brant County War Memorial, Brantford Armoury, three bridges and river corridor

6.0 LORNE BRIDGE

6.1 Existing Conditions

6.1.1 Setting

The general character around Lorne Bridge is urban, with primarily mid-rise institutional and commercial land use on the east side and urban park and low to mid-rise residential and commercial on the west side (Figure 31 and Figure 32). The topography is flat at both approaches, with steep but low banks at the river's edge. On the east, south of the bridge, is exposed and terraced rock, while on the west the bank slope is covered in trees.

Vegetation is thicker and taller on the west and extends a distance to the north and south, while the east side is predominately grassed with widely spaced trees and low trees along the bank. Within the channel are long islands, that have some vegetation growth that shift and change seasonally.

The Bridge, which is oriented northeast southwest, is the most northerly of crossings in the study area and is approximately 100 m north from the Brant's Crossing Bridge on the west, and approximately 180 m north on the east. It is also approximately 400 m upriver from the TH&B Crossing Bridge.

Immediately east of the bridge is the four-way junction of Colborne Street West, Colborne Street, Icomm Drive and Brant Avenue (Figure 33 and Figure 34). The east terminus also borders Jubilee Terrace Park and the Brantford Armoury property. Crossing under the east span is the former LE&N/CNR Line, now converted to the SC Johnson and Dike Trail pedestrian routes. Passing through the pedestrian underpass on the west approach is Fordview Trail, which connects Fordview Park southwest of the bridge with Lorne Park northwest of the bridge. The nearest intersection on the west is at Colborne Street West and Gilkison Street, approximately 240 m west of the bridge (Figure 35 and Figure 36). Colborne Street West as it is carried over the bridge is two lanes westbound, and three lanes eastbound with an additional lane turning south onto Icomm Drive.

Views to the north are expansive and dominated by the river and tree covered flood plain and extends nearly a kilometer northwest before the river is divided in two channels by Kerby Island and turns to the northwest (Figure 37). The path of the former LE&N line can be traced for a distance north before it also turns northeast to follow the path of the river, and to the northeast there are clear views of the Brantford Armoury and Boer War monument. Views to the south are equally as expansive and offer clear views of the Brant's Crossing bridge in the foreground, and the TH&B Crossing Bridge and BSAR Bridge in the middle views (Figure 38). The mid-rise residential (west) and Civic Centre (east) are also clearly visible.

Figure 31: View of the Lorne Bridge facing north from the east bank

Figure 32: View of the Lorne Bridge facing south from the east bank.

Figure 33: View facing west of the east approach

Figure 34: View east from the Lorne Bridge

Figure 35: View facing east of the west approach

Figure 36: View west from the Lorne Bridge

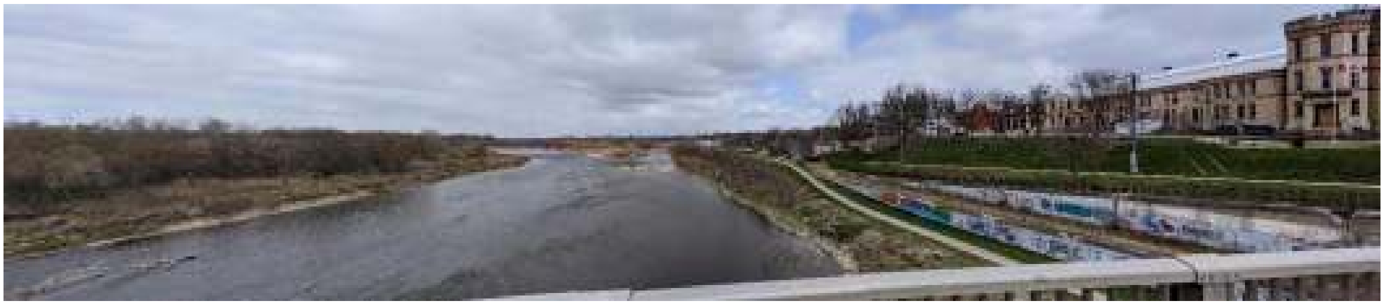

Figure 37: Vista facing north from the Lorne Bridge, with the Brantford Armoury at far right

Figure 38: Vista facing south from the Lorne Bridge

6.1.2 Lorne Bridge

The structure that carries Colborne Street West over the Grand River can be characterized as a fixed, rigid frame reinforced concrete, three-span open-spandrel arched deck bridge (the Lorne Bridge) combined with a fixed, rigid frame reinforced concrete single-span and simply supported flat beam box or girder deck rail overbridge (the Lorne Bridge Girder Span) (Figure 39 and Figure 40). The subject bridge is not included on the City of Brantford Heritage Register. The latter span, and the west approach span with pedestrian underpass, has created issues when determining the overall length of the Lorne Bridge. As recorded in the 2017 OSIM report, the arched bridge is 130.5 m (428 feet) long and 22.9 m (75 feet) wide, with a roadway width of 17.4 m (57 feet), and its outer span lengths are 41.7 m (136 feet 10 inches) with the centre span measuring 46.9 m (153 feet 10 inches). The girder overbridge is recorded separately as 19.8 m (64 feet 11 ½ inches), for an overall combined length of 150.3 m (493 feet 1 inch).

However, the 1923 plans record the total length as 500 feet (152.4 m), the width as 58 feet (17.7 m), the outer spans as 130 feet (39.6 m) and centre span as 140 feet (42.7 m). A 1969 report provides the same widths for the spans, but the width (pavement and sidewalks) as 59 feet (18 m) and the length as 400 feet (121.9 m) (J.D. Lee Engineering Ltd. 1969:1). This is further confused by a 1992 report, which lists the bridge as 124.4 m long (McCormick Rankin 1992:1).

The reasons for these dimension discrepancies are unknown but probably a result of the Bridge being measured from different structural landmarks at each point in time as well as advances in technology such as laser distance measurement. This has had little effect on its management although it is interesting that such a major and prominent public work should have no consistent documentation.

Figure 39: North elevation of the Lorne Bridge

Figure 40: South elevation of the Lorne Bridge

6.1.2.1 Substructure

Supporting the Lorne Bridge Girder Span on the east approach is a simple front wall and conventional closed cast-in-place concrete abutment with vertical wing walls that extend to the north and south and retain a wide approach embankment (Figure 41). The longer south wing wall angles slightly to the east before terminating while the north wall is short, and its coping descends to ground level. The bearing shelf and ballast wall is set back a distance from the front wall and cannot be seen from ground level. The bearings are elastomeric pads, one for each of the seven girders.

The Lorne Bridge Girder Span's west abutment also forms the east abutment for the arch span of the Lorne Bridge. It is also conventional closed and cast-in-place concrete and there are two low wing walls running north and south from the east face that retain the former rail line. On this face is a narrow bearing shelf crenulated to match the girders, and the ballast wall is set back only a short distance from the face (Figure 42). There are no bearings. On the west face the abutment supports the thrust of the wide arch rib or bottom chord of the Lorne Bridge directly, without an impost (Figure 43).

At their base, or outside walls, Pier No.1 (west) and Pier No. 2 (east) of the Lorne Bridge are approximately 8.4 m wide, 19.5 m long, and stand 12.5 m high (Figure 44 and Figure 45). The upper portions of the piers, or inside walls, extend between each arch span to the superstructure and are narrower in both dimensions, measuring 3.65 m wide by 16.6 m long (north-south). Portions of the inside walls extend past the arches, forming an engaged column or pilaster. All construction is solid shaft, cast-in-place concrete and the outer walls have symmetrical curved ends on the upstream and downstream sides with minimal batter. On their sides the outer walls of the piers also have an impost at the spring of the arch (Figure 46).

The three arch spans of the Lorne Bridge each have wide arch ribs or bottom chords over which are 16 spandrel columns per arch. There are no spandrel arches to form an arcade.

Running through the west approach embankment is a concrete pedestrian underpass with asphalt surface, flat arch headwall and short concrete wing walls extending at an acute angle from the entrances (Figure 47 and Figure 48).

Figure 41: The Lorne Bridge Girder Span that forms the east approach of the Lorne Bridge

Figure 42: Narrow crenulated bearing shelf on the east side of Lorne Bridge east abutment, where it supports the girder of the Lorne Bridge Girder Span

Figure 43: North side of the east abutment of the Lorne Bridge

Figure 44: View west of the downriver sides of Pier No. 1 and Pier No. 2

Figure 45: View west of the upriver sides of Pier No. 1 and Pier No. 2

Figure 46: Spring of the arch at Pier No. 1

Figure 47: South headwall and wing walls of the concrete pedestrian underpass

Figure 48: North headwall and wing walls of the concrete pedestrian underpass

6.1.2.2 Superstructure

The superstructure over the arched spans of the Lorne Bridge and the Lorne Bridge Girder Span is a solid and thin concrete slab deck with a chamfered soffit and a slight rise in the centre that cambers to the east and west (Figure 49). Either side of the asphalt wearing surface are low cast-in-place concrete parapet walls with single railings, which are either aluminium post and panel or hot dip galvanized. Another aluminium post and panel railings runs along the outside edges of the deck, and there is a cast-in-place concrete sidewalk between the railing and parapet wall on both the north and south (Figure 50). Expansion joints are at either end of the girder span, and over the east and west abutments.

There are two plaques on the east approach. The one mounted on the concrete terminus of the north railing commemorates the original construction in 1924, while the other on the concrete terminus of the south railing was installed for the 1980 reconstruction (Figure 51).

Pedestrian access to the deck on the north side of the west approach adjacent to Lorne Park is via a bifurcated concrete stairs with low chamfered and moulded handrail, stylized “Renaissance” balusters and tall and chamfered outer strings (Figure 52). The outer face of the landing has a denticulated cornice, and the thick square newels have a chamfered and moulded cap, chamfered corners, and a thick pedestal (Figure 53). From the main landing, straight stairs parallel to the road ascend to a half-pace landing that opens onto the sidewalk on the deck (Figure 54).

Access from the south side of the west approach is via a set of concrete straight stairs with half-pace landing, while access on the east is only on the north side and via a set of straight stairs.

Figure 49: View west from the east abutment of the solid and thin concrete slab deck with chamfered soffit

Figure 50: View east from near the centre of the bridge of the deck camber from the east and west, low cast-in-place concrete parapet walls with single railings either side of the asphalt wearing surface, and cast-in-place concrete sidewalk with aluminium post and panel railings

Figure 51: Plaques commemorating the Lorne Bridge construction and reconstruction (left from Francis Porter Adams, Great War Centenary Association)

Figure 52: Bifurcated concrete stairs on the north side of the west approach, facing south from Lorne Park

Figure 53: Outer face of the landing with denticulated cornice, thick square newels, and low chamfered and moulded handrail with "Renaissance" balusters

Figure 54: Half-pace landing at the west approach deck with thick square newels with chamfered and moulded caps, chamfered corners, and thick pedestals

6.2 Structural History

Of the five historical phases representing crossings at this specific bridge site, the last three are evident in the bridge construction that survives today. Each phase is described in the following subsections.

6.2.1 Phase 1: Earliest Crossings, 1812 to 1878

According to Reville's *History of the County of Brant* "there is a legend [emphasis added] that the first bridge to be thrown across the river was in 1812 at a point below the existing structure [at that time the first Lorne Bridge]" (Reville 1920:137). Given Reville's doubts about this initial structure, little can be speculated about its construction except that if a bridge was built in 1812 it was likely wood and in two sections, as the river at that time and into the late 19th century was divided into two channels (Reville 1920:136).

The first confirmed permanent crossing at the Lorne Bridge site had been built, according to Reville, "sometime previous to 1841" and may have been erected by Captain Marshall Lewis as early as the 1820s (Reville 1920:137, 73). According to the oral history of a early Brantford resident George H. Wilkes, this crossing was a wood covered structure and that Herbert Biggar, son of early settler Robert Biggar drove the "first team that ever crossed a bridge over the Grand River at Brantford" (Reville 1920:101, 370). Correlating with the early 19th century date and possible covered type is the structure depicted in the *Plan of the Village of Brantford* drawn by surveyor Lewis Burwell in 1834 (Figure 55), which shows a low-arched span supported by a braced pier bent in the centre and braces at the abutments, and a superstructure with cross-hatched shading either to indicate framing or a covered way. This initial crossing was also a toll bridge and though described in 1850 as “substantial”, it collapsed on July 1, 1854 (Reville 1920:118,137). Its replacement wood span may also have been a covered type, which was referred to as the “new bridge” when Henry Crawley was collecting tolls on it in 1854 (Reville 1920:117).

The replacement bridge was itself replaced by the “Old Iron Bridge” in 1857, constructed by contractors Jordan & Acret. Its depiction on the 1875 *Bird’s Eye View* and an early photograph shows the Iron Bridge was a two-span, bowspring arch (Whipple) pony truss bridge with both side and central tied arches resting on an ashlar masonry pier and abutments (Figure 56 and Figure 57). Confusingly, Reville states that this bridge “only lasted a few months” but then writes that it was a flood twenty one years later, on September 14, 1878, that swept away the Iron Bridge, taking with it the life of a “retired merchant, named Tyrell” (Reville 1920:138). Wilkes remembered the flood as washing away a pier, causing the bridge to collapse (Reville 1920: 101). The Old Iron Bridge was replaced within 8 days by a temporary “pile-driven” bridge, that served until the first Lorne Bridge was constructed in 1879 (Reville 1920: 138).

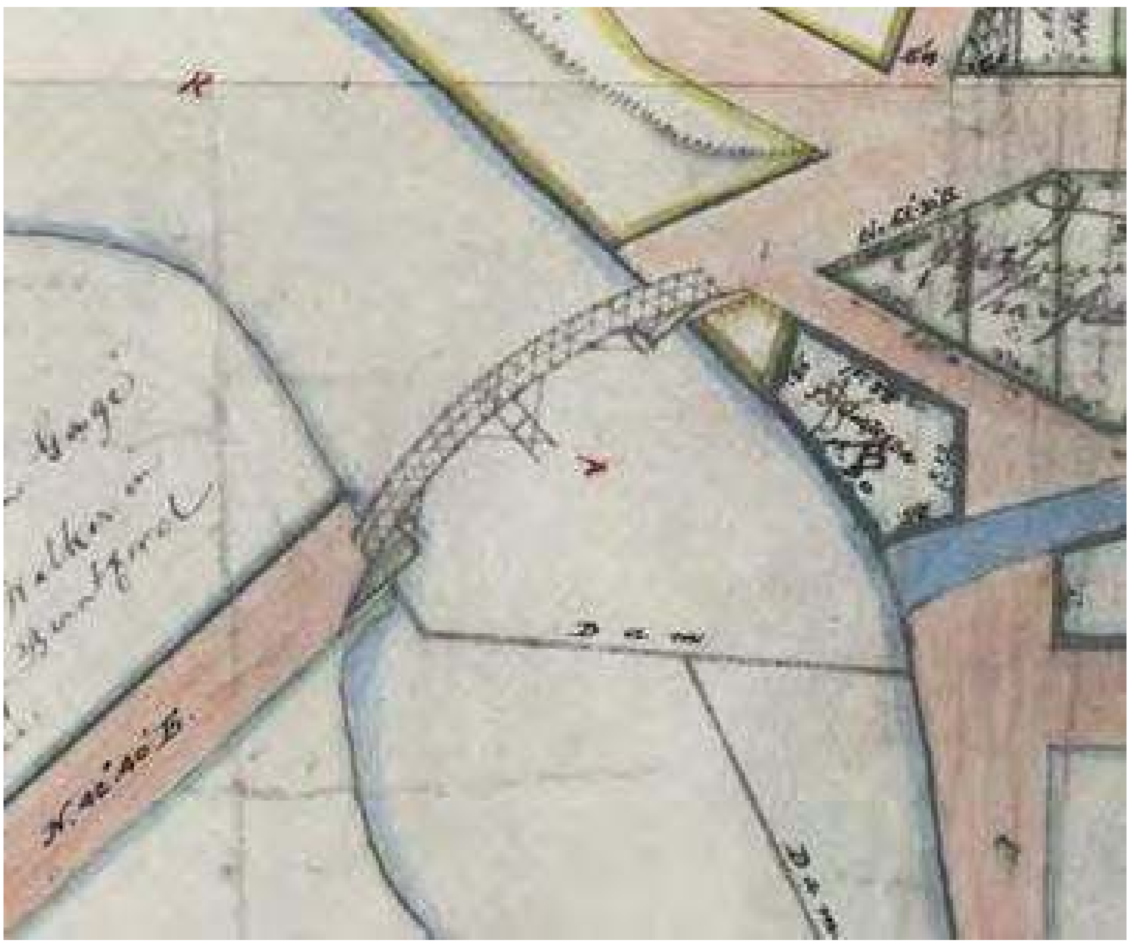

Figure 55: Detail from Lewis Burwell’s 1834 *Plan of the Village of Brantford* showing what appears to be a covered bridge at the east side of the Lorne Bridge site

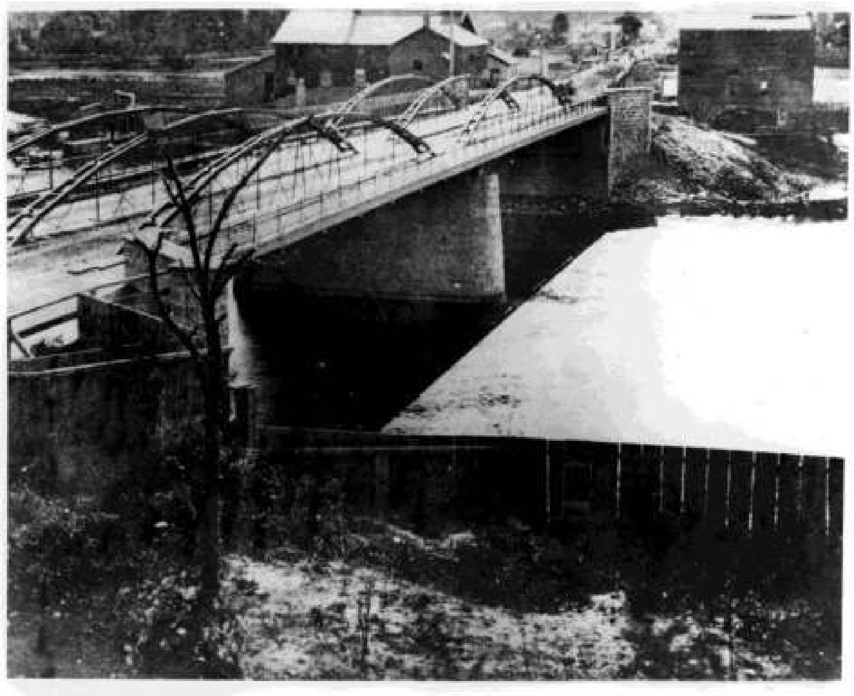

Figure 56: The "Old Iron Bridge" at the Lorne Bridge site (courtesy Brant Historical Society)

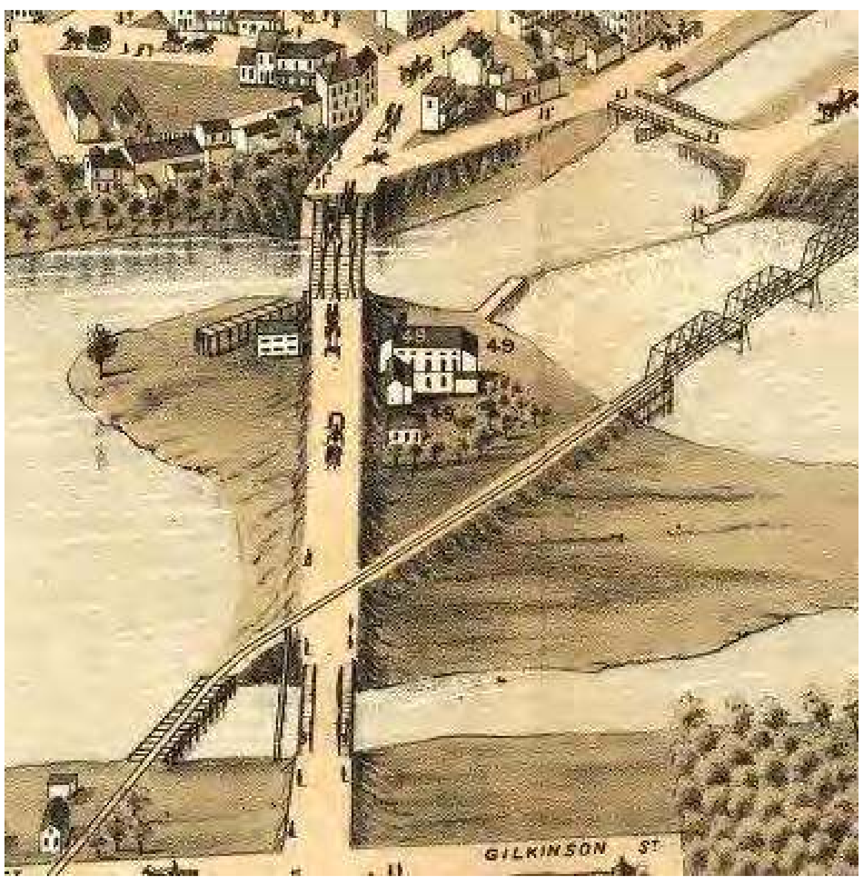

Figure 57: Detail from the 1875 *Bird's Eye View* showing the "Old Iron Bridge" and shorter span closer to "Gilkinson" (today Gilkison) Street

6.2.2 Phase 2: The First Lorne Bridge, 1878-1922

Construction of the first Lorne Bridge is described in Reville (1920:138):

> The abutments of the finest cut grey limestone from the quarries at Queenston and Beamsville, were commenced by the contractors, Hickey and Clarke of Buffalo [contractor John Hickler is also mentioned on the plaque marking the event], on October 24th, 1878, and completed in time for the superstructure on January 22nd, 1879. The iron work was completed by the Phoenix Works of Philadelphia not very long after, and the entire bridge opened for traffic in early March. The superstructure is of wrought iron and built on the triangular system, known as the "double cancelled-whipple truss." The entire cost was some $40,000…

John Douglas Sutherland Campbell, Marquess of Lorne and 9th Duke of Argyll, who had been appointed governor general of Canada the previous year, officially opened the bridge with a speech expressing his "wish to express regarding this bridge, and trust that its burdens may become heavier, and increase from the constant growth in traffic to your young and rising city". The inauguration featured "a blaze of color", handsome arch surmounted by a model agent, and a piper (Reville 1920:203; Waite 1998).

Though criticized as "Flimsy Device" (Reville 1920:138), the through truss Lorne Bridge had been designed by respected engineer Samuel Keefer, whose career had included service as chief engineer of the Department of Public Works and designer of suspension bridges over Chaudiere Falls (1843) and Niagara Falls (1868)(Cuming 1983:49). While photographs show the Lorne Bridge of light construction, Keefer had likely developed it on scientific principles, rather than empirical ones, which tended toward overbuilding. The Whipple truss system, combined with the high quality work and possible use of the patented Phoenix column of the Phoenix Bridge Company would have made the first Lorne Bridge more than capable of taking the heavy compressive loading and lateral wind and flood forces (Guise 52; Historicbridges.org; see ad Darnell 1984).

In addition to being featured in a number of photographs and postcards, a scaled section drawing of the first Lorne Bridge also appears in the plans for the second, concrete Lorne Bridge (Figure 58 to Figure 62). This plan also shows the short and lower Pratt through truss span that was added to the west side of the Lorne Bridge in 1899, which required the west abutment of the Lorne Bridge to be replaced with a pier. Reville (1920:139) records the abutment being replaced by a pier in 1908-9, but this could be a typographic error (i.e., meant to be 1899) and he makes no mention of the shorter span apart from the work costing $60,000 and that the pier was constructed to rock, as opposed to "the old abutment having rested on piles". The 1923 drawing indicate the shorter span had been built by the Dominion Bridge Works Company, who had earned a national reputation for the CP Rail cantilever bridge at Lachine (1886) and later built the 1893 TH&B Crossing Bridge.

Figure 58: The Dominion Bridge Works Company span and first Lorne Bridge, as seen facing east from south of the west abutment (Collection of Brant Railway Heritage Society)

Figure 59: Postcard of the Lorne Bridge as seen from the south on the east bank (Brantford Public Library)

Figure 60: Postcard of the Lorne Bridge facing southwest as seen from Jubilee Terrace Park on the east bank (Brantford Public Library)

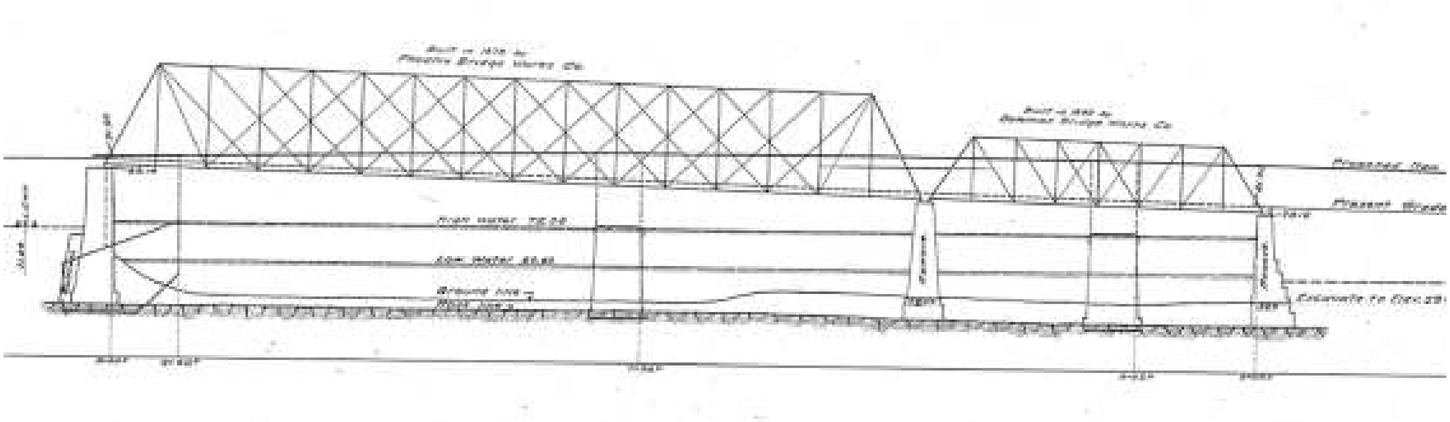

Figure 61: Elevation drawing of the Lorne Bridge in Adams' 1923 plans, elevations, and details

6.2.3 Phase 3: The Second Lorne Bridge, 1923-1967

By 1920, cracks were noted in the first Lorne Bridge, and during the municipal election that year ratepayers voted to replace the crossing with a substantially larger structure estimated to cost $210,000 (Reville 1920:139). It is unclear what was proposed for this cost, but it was not until February 1923 that City Engineer Frank Porter Adams drafted plans for the replacement Lorne Bridge, which was to be a considerable departure from the existing (0).

By the time he designed the Lorne Bridge, the Brantford born Frank Adams had served just three years as City Engineer but had joined the municipal staff in 1907 and had served as Assistant City Engineer under Harry T. Jones until 1910. For the next ten years he was the City Engineer for Chatham, although his position there was interrupted by his commission as Lieutenant (later promoted to Major) with the 10th Battalion Canadian Railway Troops during the Great War (Figure 62). He returned to Brantford to become City Engineer in 1920, and in 1924 was profiled in the *Brantford Expositor* as “designer of the Lorne Bridge which has come to be one of the show spots of the city” (reprinted, Great War Centenary Association). He later designed a major addition to the Brantford Waterworks (1931, still extant) and was Secretary of the Grand River Conservation Commission for several years, publishing in the 1938 *Transactions of the Engineering Institute of Canada* (Adams 1938). When he died in 1941 at 63, he was lauded in the local papers, which included a special tribute from Mayor J.P. Ryan.

Unfortunately Adams left no record of his design inspiration for the Lorne Bridge, but based on his other work in Brantford, such as the Art Deco extension to the Brantford Waterworks and his earlier Murray Street Bridge (1921), it appears that he favoured a balance of functionality and austere decoration adapted to the local context (Figure 63 and Figure 64). For the Brantford Waterworks he used a similarly hued buff brick as the existing late 19th century and early 20th century components, while for the Murray Street Bridge he applied a parapet similar to the Lorne Bridge, yet scaled to the single span. For the Lorne Bridge, a central feature of the City, he added more decoration to help frame the bridge from both its approaches and views from the river to the north and south.

In addition to swivelling the bridge’s axis slightly to the north, Adams raised the elevation of the deck to a consistent grade on either side of the river (the first Lorne Bridge descended from east to west) with the slight rise in the centre that brought it well above the high-water mark. For its material and form, Adams selected steel-reinforced concrete, the latter mixed to three different “classes” depending on their location of the bridge (0). Class A (today equivalent to 10 megapascals [MPa] at 28 days) appears to be used for areas with the highest stresses, which are the piers and abutments, while Class B (equivalent to 15 MPa at 28 days) was reserved for the arch ribs and spandrel columns. Class C (its 1-part cement and 6-parts “good clean cinders” has no clear modern equivalent) was used for the crown of the arches.

By 1923, use of concrete for bridge construction was widespread, though still in its infancy. In Europe and the United States, concrete had been applied to bridge construction since the 1870s and took off in the 1890s (Parsons Brinckerhoff & Engineering and Industrial Heritage 2005:2-17, 2-25), but in Canada engineers were more reluctant. The first concrete bridge in Canada, erected in Massey, Ontario (Miller 1981:330), had been built only 17 years before the second Lorne Bridge, and was still viewed with skepticism as late as 1919 (Walton 1995:9; Cuming 1983:51). Adams does not appear to have shared this reservation given the scale of the Lorne Bridge.

Adams also seems to have embraced the potential of concrete to create lightness and an aesthetic form. Unlike early concrete bridges that mimicked stone construction through not only incising mock joints to appear as ashlar stone but also high arches and enclosed spandrel walls, the second Lorne Bridge has open spandrels and flattened arches, all rendered in smoothed concrete. This had apparently stemmed from Adams’ belief that “concrete bridges were easier to maintain and were able to display beauty and design more prominently” (Jackowetz 2020: pers. comm.). In this he may have been following the lead of noted bridge engineers Frank Barber and C.W. Young, who in 1910 designed the first open spandrel concrete bridge in North America for a crossing in Weston, Ontario, and then on a grander scale, spanned the Otonabee River in 1921 with the open spandrel Ashburnham Bridge, which, for its time, was Canada’s longest reinforced concrete span (Cuming 1983:47, 51). However, Adams may also have been following precedents closer to home: the single-span Alfred Street Bridge built prior to 1911 had open spandrels with spandrel arches, as did a span of the New Victoria Bridge built in 1912 on South Market Street (Figure 65 and Figure 66).

Despite the modernity of its materials and substructure, elsewhere the Lorne Bridge looked to classical design, such as the symmetry in its three arch spans (two short spans flanking a wider centre span), its imposts at the spring of the arches, the moulding on the top of the sharp-nosed piers, the bracketed entablature at the parapet above the spandrel arches, the moulded caps with ball finials and curvilinear coping for the posts and short walls over the piers, and the "Renaissance" balusters in the balustrade for the bifurcated stairs on the north side of the west approach. Adams' application of these elements may have been influenced by the Beaux Arts Classicism popular into the inter-war period (Robinson Heritage Consulting 2004:14) or were picked up during Adams' war service overseas. For example, London England's Old Southwark Bridge built to span the Thames in 1819—one of many Classical Revival bridges erected across Britain during the 18th and 19th centuries— shares a number of features with the Lorne Bridge including a shallow arch span, moulding on the top of the sharp-nosed piers, and prominent parapet posts over the piers (Figure 67). By drawing on and stylizing this "heritage" of conservative Edwardian and Classical Revival models for the Lorne Bridge, Adams may well have hoped to make the bridge more acceptable to a public that was wary of concrete and its performance over a shallow arch span.

Construction of the Lorne Bridge was by the Port Arthur Construction Company Limited, who had incorporated in Port Arthur, Ontario in 1914 and by the end of that year had $500,000 in capital stock (Secretary of State for Canada 1914:162). However, little is known about the company except that it was a subsidiary of the Chambers, McQuigge and McCaffrey company in Toronto and that they worked on a variety of projects in the Port Arthur area.

In the years following its completion in 1924, the bridge appears to have undergone minimal alteration despite its heavy use and changes to its surrounding context from the pre-to-post World War II periods (Figure 69 and Figure 70).

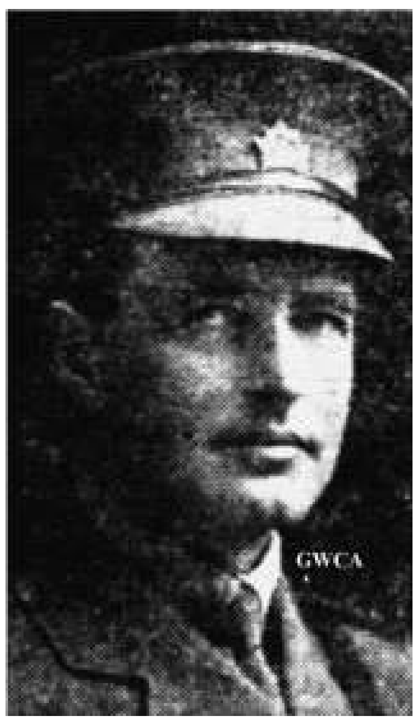

Figure 62: Francis Porter Adams circa 1914-18 (Great War Centenary Association)

Figure 63: Pump Room at the Brantford Water Works, designed by Adams in 1931 (Golder 2016)

Figure 64: 1921 Murray Street Bridge (Brantford Public Library)

Figure 65: The 1912 New Victoria Bridge (Brantford Public Library)

Figure 66: Pre-1911 Alfred Street Bridge (Brantford Public Library)

Figure 67: The Old Southwark Bridge spanning the Thames in London England, built in 1819 and replaced in 1921 (Historic England). Note the shallow arch spans, mouldings at the top of the sharp-nosed piers, and prominent parapet posts over the piers that match those of the Lorne Bridge (see Figure 68)

Figure 68: South elevation of the Lorne Bridge, 1926 (Toronto Public Library – Toronto Star Archives)

Figure 69: The Lorne Bridge in 1931, facing west from south of the Brantford Armoury (City of Brantford)

Figure 70: Aerial view facing southeast of the Lorne Bridge, 1952 (City of Brantford)

6.2.4 Phase 4: Structural Studies & Reconstruction, 1968 to 1980

By the late 1960s the wear of upwards of 2,300 vehicles per day was having an impact on the Lorne Bridge (J.D. Lee Engineering Ltd. 1969:1). A 1969 report found several issues, from spalling and cracking at the piers and abutments, to cracks in the arch rings and imperfect concrete repairs to the deck. Despite this, the report found that the “deterioration due to nearly fifty years of weather and use is comparatively minor” (J.D. Lee Engineering Ltd. 1969:6). In fact, the report recommended widening the bridge to accommodate even more traffic.

While this was explored through the 1970s, it was not until 1980 that an extensive reconstruction project was begun to widen the bridge to four lanes (see Lorne Bridge in the 1970s - Figure 71). The reconstruction brought considerable change to the bridge, which included refashioning the piers to a round nosed form and removing the mouldings, replacing the parapet, and raising the deck. The latter involved removing the spandrel arches and either adding new spandrel columns at the crowns or lengthening the existing columns. As the deck elevation from west to east was also changed, the symmetry of Adams original bridge was lost as the spandrel columns on the east span were higher than the central span, which were in turn taller than those of the west span. Mirroring the engineering approaches of its time, the reconstruction prioritized the purely functional over decoration, to the extent that except for the bifurcated stairs on the west approach, all earlier architectural design elements were removed (Figure 72). This reconstruction also included creating the pedestrian underpass on the west approach and replacing the Lorne Bridge girder span. Although nearly all of Adams’ classical design work had been removed, the reconstruction was still lauded as a major engineering effort (Figure 73 and Figure 51).

Figure 71: The Lorne Bridge in the 1970s (City of Brantford)

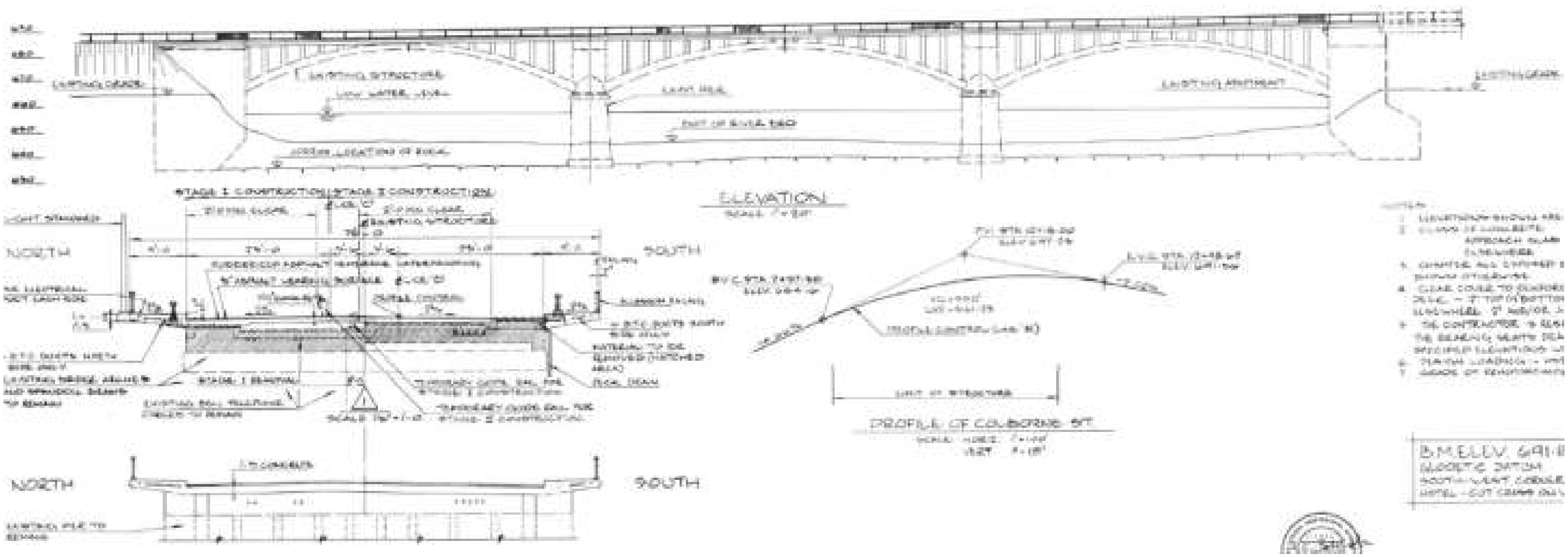

Figure 72: Sections and elevation from the 1980 reconstruction (J.D. Lee Engineering Ltd. 1980)

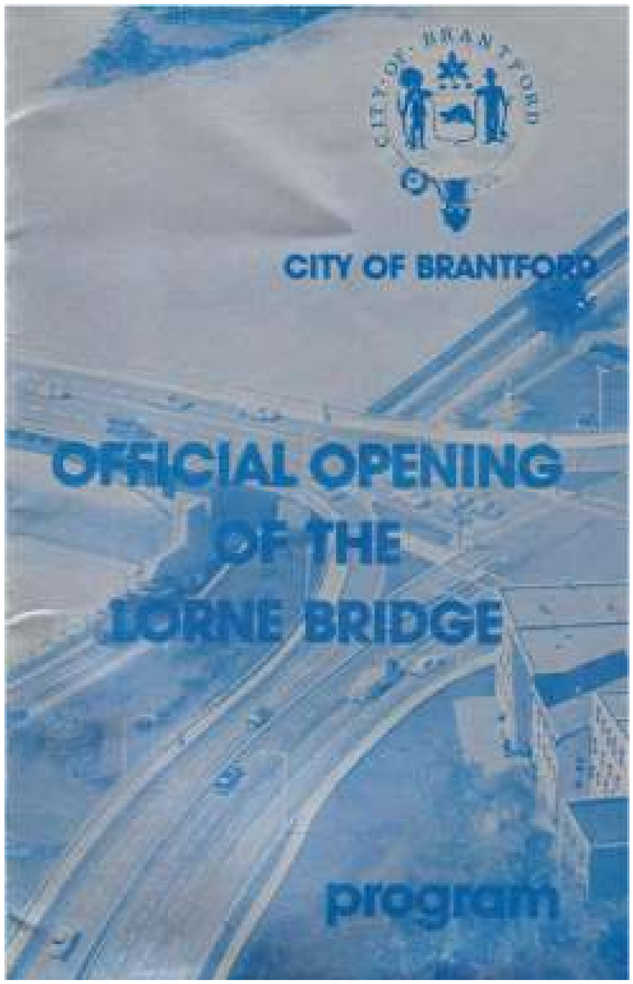

Figure 73: Program marking the official opening of the Lorne Bridge reconstruction, 1980 (Brantford Public Library)

6.2.5 Phase 5: Lorne Bridge since 1981

There were few substantial changes to Lorne Bridge since 1980 (see Figure 74) apart from installing a traffic barrier and railing (1986), and replacing the east and west expansion joints (1988 and 1994, respectively). A "rehabilitation" of the bridge in 2006 included replacing the waterproofing, concrete deck repairs, replacing the wearing surface, and reconstruction of the Lorne Bridge Girder Span (Figure 75).

Figure 74: Lorne Bridge in 1982 (Toronto Public Library – Toronto Star Archives)

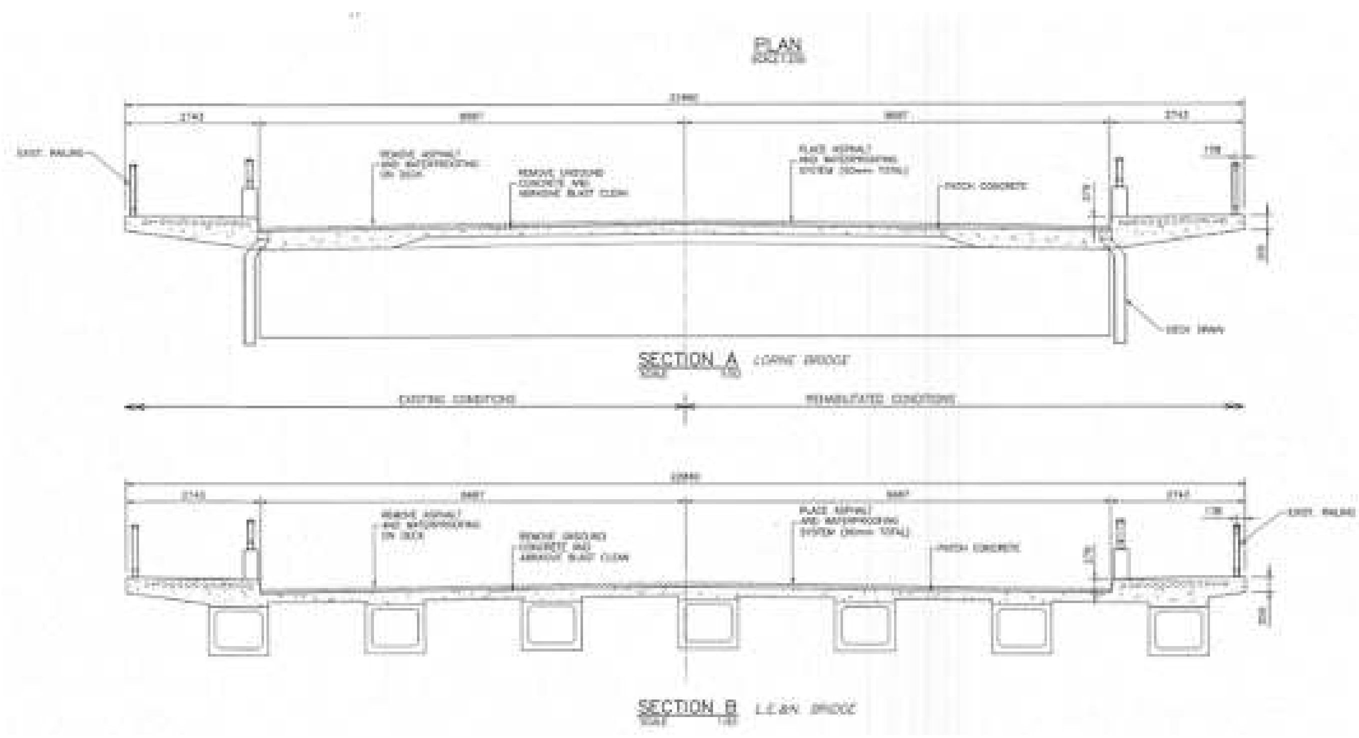

Figure 75: Sections from the LE&N span rehabilitation, 2006 (Phillips Engineering)

6.3 Integrity & Physical Condition

In a heritage conservation context, the concept of integrity is linked not with structural condition, but rather to the literal definition of “wholeness” or “honesty” of a place. The MHSTCI *Heritage Identification & Evaluation Process* (2014:13) and *Ontario Heritage Tool Kit: Heritage Property Evaluation* (2006:26) both stress the importance of assessing the heritage integrity in conjunction with evaluation under *O. Reg. 9/06*, yet do not provide guidance to measure integrity beyond referencing the *US National Park Service Bulletin 8: How to Evaluate the Integrity of a Property* (US NPS n.d.). In this latter document, integrity is defined as “the ability of a property to convey its significance”, so can only be judged once the significance of a place is known.

Other guidance suggests that integrity instead be measured by understanding how much of the asset is “complete” or changed from its original or “valued subsequent configuration” (Historic England 2008:45; Kalman 2014:203). Kalman’s *Evaluation of Historic Buildings*, for example, includes a category for “Integrity” with sub-elements of “Site”, “Alterations”, and “Condition” to be determined and weighted independently from other criteria such as historical value, rather than linking them to the known significance of a place.

A detailed and component-level integrity investigation was not undertaken for this CHER, but a visual analysis indicates that the Lorne Bridge has an overall fair to poor level of integrity, as a substantial proportion has changed from its initial construction and operation; this level of change is particularly marked when compared with photographs of the Lorne Bridge from shortly after it was completed (Figure 76 and Figure 77).

The bridge’s physical condition was reported in the 2017 OSIMs to be overall fair and requiring approximately $3.5 million to repair and rehabilitate the arched portion of the Lorne Bridge, and a further $2,870,000 to repair and rehabilitate the girder span.

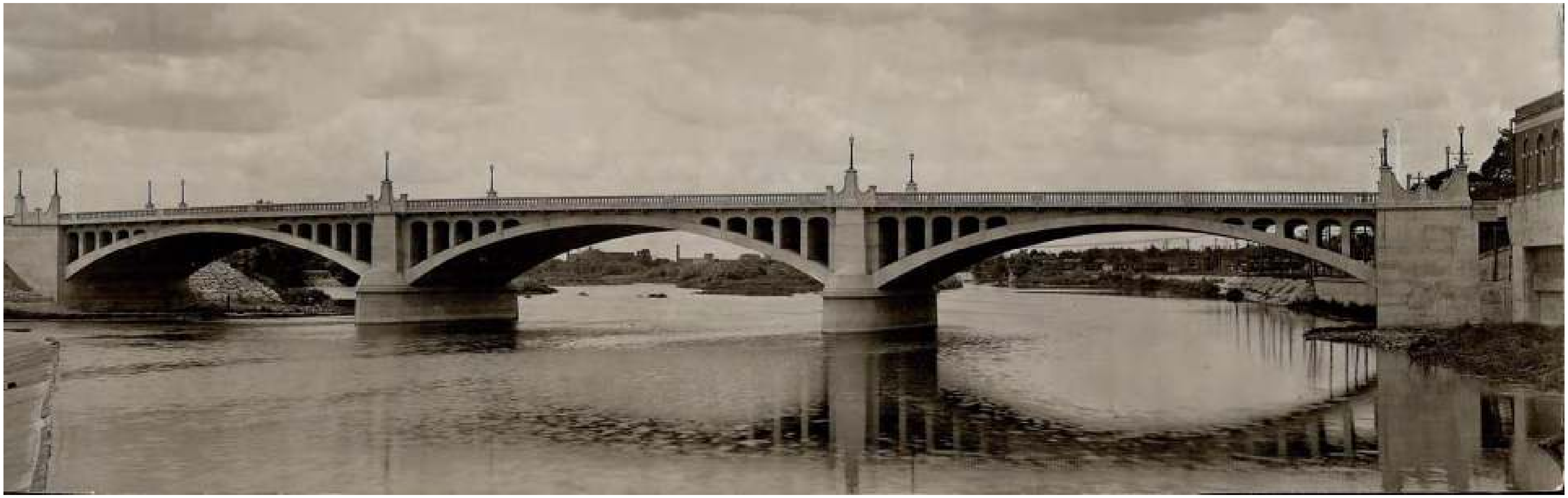

Figure 76: South elevation of the Lorne Bridge, 1924 (Toronto Public Library – Toronto Star Archives)

Figure 77: Visual integrity analysis of the Lorne Bridge

6.4 Evaluation of Cultural Heritage Value or Interest

The bridge was previously evaluated at a preliminary level in *Grand Old Bridges* as “Lorne Bridge” (2004), by Historicbridges.org as the “Lorne Bridge” (2012), and in *Arch, Truss & Beam* under the name “Lorne Bridge, City of Brantford Site Number 125020” (2013):

- *Grand Old Bridges* scored the bridge at 70 out of 100 (Robinson Heritage Consulting 2004:21).
- Historicbridges.org rated it as a 6 out of 10 for both national and local historic significance.
- *Arch, Truss & Beam* (Heritage Resources Centre 2013:34) determined that the bridge met seven of nine criteria of *O. Reg. 9/06* (1.i & ii., 2.i & iii, and 3.i, ii, & iii.). This evaluation also cited a *Lorne Bridge Designation Report, Heritage Resources Centre, 2009*, but this document was not available at the time of writing this CHER.

The following evaluation provides an independent evaluation based on the field investigations, research, and analysis conducted as part of this CHER, and uses the criteria prescribed in *O. Reg. 9/06*.

6.4.1 Design Value or Physical Value

Criteria	Meets criterion (Yes/No)
(i) Is a rare, unique, representative, or early example of a style, type, expression, material or construction method.	**Yes**
Rationale: The Lorne Bridge is a rare, unique, and early example of a reinforced concrete open spandrel deck bridge in Ontario. It is one of only nine concrete open spandrel bridges in Ontario, one of only four built before 1930 (Black Bay Bridge, Thunder Bay, 1912; Heffernan Street Bridge, Guelph, 1914; Ashburnham Bridge, Peterborough, 1921) and is the only surviving example with three open spandrel spans. Unfortunately, due to the extent of changes in the 1980 reconstruction, the bridge is no longer representative of a classically influenced early 20th century bridge, either in decoration or overall symmetrical form.	

Criteria	Meets criterion (Yes/No)
(ii) Displays a high degree of craftsmanship or artistic merit.	**Yes**
Rationale: Although mass reinforced concrete construction is not typically associated with craftsmanship, several elements suggest the Lorne Bridge was built to a high degree of craftsmanship and artistic merit. Its original design was classically influenced and was symmetrical in its three arch spans, had imposts at the spring of the arches, the moulding on the top of the sharp nosed piers, bracketed entablature at the parapet above the spandrel arches, moulded caps with ball finials and curvilinear coping for the posts and short walls over the piers, and the “Renaissance” balusters in the balustrade for the bifurcated stairs on the north side of the west approach. All of these contributed to its artistic merit as they were primarily decorative rather than functional. Of these artistic elements, only the bifurcated stairs on the north side of the west approach survive. The ability of the bridge’s substructure to take the continuous lateral water and ice loads, as well as the vertical dead and live loads that have actually increased over its 97 year history, also suggest that construction as a whole was built to a high degree of craftsmanship.	

Criteria	Meets criterion (Yes/No)
(iii) Demonstrates a high degree of technical or scientific achievement.	No

Rationale:

The Lorne Bridge does not demonstrate a high degree of technical or scientific achievement due to the relatively benign engineering challenges, such as the low elevation of the banks, and the velocity, depth, and width of the Grand River. Although the flatness of the arch spans is relatively unusual, these do not present engineering challenges as the properties of reinforced concrete for arch construction was well understood by the 1920s.

6.4.2 Historical Value or Associative Value

Criteria	Meets criterion (Yes/No)
(i) Has direct associations with a theme, event, belief, person, activity, organization or institution that is significant to a community.	**Yes**

Rationale:

The Lorne Bridge has direct associations with themes and a person that is significant to the community. It is directly associated with Brantford's most profound period of industrial development between 1880 and 1930, and with the development of the City's road transportation network over the same decades. Like the Brant's Crossing Bridge and TH&B Crossing Bridge it has direct associations with the recognized theme of bridge building over the Grand River and in Brant County, as well as representing the last in a long succession of bridges in this location and one of multiple historical crossings of the Grand in Brantford, which collectively contributed to the City's social and economic growth.

As the Lorne Bridge carried provincial highways 24 and 53 across the Grand River, the bridge is also related to the "Provincial Highway System Developments" subtheme of the "Transportation and the Integration of Economies and Communities" in the *Topical Organization of Ontario History*. In relation to local transportation the Lorne Bridge was recognized as "the most important single structure on the highway system of the City of Brantford" (J.D. Lee Engineering Ltd. 1969:1). Additionally, the Lorne Bridge has direct associations with the City's civic pride, which is still reflected today in the bridge being prominently displayed on the City's homepage.

The bridge has direct associations with Francis Porter Adams, who was a highly respected and Brantford-born City engineer, responsible not only for the "centrepiece" Lorne Bridge, but also the major expansion of the water treatment plant. Adams was also a leading figure in the Grand River Conservation Authority, and designer and engineer for a number of smaller projects such as the Murray Street Bridge.

Criteria	Meets criterion (Yes/No)
(ii) Yields or has the potential to yield information that contributes to an understanding of a community or culture.	**Yes**

Rationale

Further study of the bridge may yield information contributing to a greater understanding of early 20th century bridge construction and Brantford's exponential growth in the first quarter of the 20th century. Metallurgical and comparative studies could provide insights into early 20th century steel and concrete production as well as an understanding of the properties of concrete as applied for bridge construction during the 1910s to 1920s. Additionally, archaeological remains of the earlier bridges may survive and provide insights into how these structures were built, although the extent of these remains may be minimal.

Criteria	Meets criterion (Yes/No)
(iii) Demonstrates or reflects the work or ideas of an architect, artist, builder, designer or theorist who is significant to a community.	**Yes**
Rationale: The Lorne Bridge demonstrates and reflects the pinnacle of Francis Porter Adams' expertise in civil engineering. With the Brantford Water Works and Murray Street Bridge, the Lorne Bridge demonstrates his wide-ranging engineering repertoire, as well as a thorough understanding of classical design and the application of reinforced concrete to large-scale bridge construction. His tenure as City Engineer coincided with Brantford's rapid growth as a social and industrial centre, yet he met these challenges by creating visually appealing and well-built structures, rather than designing for the simply functional.	

6.4.3 Contextual Value

Criteria	Meets criterion (Yes/No)
(i) Is important in defining, maintaining or supporting the character of an area.	**Yes**
Rationale: Of all the Brantford bridges, the Lorne structure is the most important in defining, maintaining, and supporting the character of Brantford's core along the Grand River. With the nearby Brant's Crossing Bridge and TH&B Crossing Bridge, the Lorne Bridge defines the industrial aesthetic of the riverscape, and links directly to the community's pride as an industrial centre. Although no longer possessing the decoration and symmetry of its original design, the Lorne Bridge can be readily identified as central to the City's civil engineering and civic heritage.	

Criteria	Meets criterion (Yes/No)
(ii) Is physically, functionally, visually or historically linked to its surroundings.	**Yes**
Rationale: Through its continued use, the Bridge is physically, visually, and functionally linked to crossing the Grand River Canadian Heritage River at this location and retains physical and visual links to its long history as a central crossing in the City. There are also unimpeded visual and historical links between the Bridge and the Brant's Crossing and TH&B Crossing bridges.	

Criteria	Meets criterion (Yes/No)
(iii) Is a landmark.	**Yes**
Rationale: For nearly 100 years the Bridge has been a major local landmark, one central to Brantford's social, commercial, and industrial heritage and its current civic identity.	

6.4.4 Evaluation Results

The preceding evaluation has determined that the Lorne Bridge:

- **Meets eight of nine criteria of *O. Reg. 9/06* and therefore has cultural heritage value or interest as a built heritage resource**

Based on this evaluation, a Statement of CHVI is proposed below.

6.4.5 Statement of Cultural Heritage Value or Interest

Description of Property – the Lorne Bridge

The Lorne Bridge is a four-span arched and simply supported beam bridge composed of three arched open spandrel deck spans, and one girder approach span. It carries Colborne Street across the Grand River in the downtown core of the City of Brantford and lies to the north of the Brant's Crossing rail bridge.

Statement of Cultural Heritage Value or Interest

The Lorne Bridge has cultural heritage value or interest for its design or physical value, historical or associative value, and for its contextual value. The last in a long line of crossings in this location that date as early as the 1830s, the Lorne Bridge was built in 1923 to replace the 1878 Warren Truss bridge named for then Governor General of Canada the Marquess of Lorne. The reinforced concrete, open spandrel construction of the second Lorne Bridge is one of only four in the province dating prior to 1930 and the only one with three spans. Despite major reconstruction work in 1980, the craftsmanship in the bridge's execution by the Port Arthur Cement Company is evident in the long service of the Lorne Bridge, which now sustains live loads that exceed the specifications for which it was designed.

The Bridge has historical value for its direct association with Brantford-born City Engineer Francis Porter Adams, who was well respected for not only designing the Lorne Bridge but also for his work to complete many other critical infrastructure projects in the City during his tenure from 1920 to his death in 1941. It is also directly associated with the long history of bridge building in the community, with Brantford's development as a prosperous industrial centre in the early 20th century, and with the City's sense of civic pride.

The Bridge's prominence, relationship to the Grand River National Heritage River and nearby Brant's Crossing and TH&B Crossing bridges, and its classical design combined with industrial aesthetic of smooth concrete all contribute to its contextual value, and it is considered to be one of the City's most important landmarks.

Heritage Attributes

Four-span bridge with:

- three arches spans combined with a simply supported beam approach span
- construction in reinforced concrete in three different grades that have been smoothed and do not mimic masonry
- flattened arches with open spandrels
- concrete piers and abutments scaled to the form of the bridge
- bifurcated stairs on the north side of the west approach featuring a denticulated cornice, thick square newels, and a balustrade with low chamfered and moulded handrail and "Renaissance" balusters
- clear, wide vistas of the Grand River and Brant's Crossing and TH&B Crossing bridges

7.0 BRANT'S CROSSING BRIDGE

7.1 Existing Conditions

7.1.1 Setting

The general character around Brant's Crossing Bridge is urban, though it is surrounded on its east and west approaches by urban parkland with high-rise residential structures to the west (Figure 78 to Figure 80). To the immediate east is the Brantford Skate Plaza, and beyond lies the Elements Brantford Casino. The surrounding topography is mainly flat to the west, south, and southeast, with a significant slope down from the north and northeast toward the river. The vegetation on both sides is a mix of primarily deciduous trees, with some conifers intermixed within the adjacent park areas.

The rail line that used to cross this bridge has since been pulled up on both sides of the bridge and adjacent on the east and west are recreational areas and walking paths. The eastern approach to the bridge is paved with stones and includes a sitting area with benches, beyond which is the pavilion for the Brantford Skate Park (Figure 81). The western approach is reached via a walking path that runs along the riverbank north beyond Lorne Bridge, and south to the TH&B Crossing Bridge (Figure 82). To the north on the east bank of the river is terraced stone (Figure 84).

The bridge is oriented east-west and situated at the northern end of a relatively straight section of the river, at a point of a slight bend from a southeasterly to a southerly flow. It is a prominent feature of views from the north and south due to its tall through truss spans and iron construction (Figure 79). Views of the bridge from the east and west beyond the banks are generally obscured by vegetation in the riparian zone and in adjacent parkland; however, the bridge is appropriately visible from the Brant's Crossing entrance off Icomm Drive to the northeast (Figure 83). Views up-river from the bridge are of the Lorne Bridge, Brantford Armoury, and Brant County War Memorial (Figure 84) while those downriver are of the TH&B Crossing Bridge and BSAR Bridge beyond (Figure 85).

Figure 78: Setting of Brant's Crossing Bridge, facing southwest from the east bank

Figure 79: Setting of Brant's Crossing Bridge, facing south from the Lorne Bridge

Figure 80: Setting of Brant's Crossing Bridge, facing north from the TH&B Crossing Bridge

Figure 81: East approach to Brant's Crossing, with stone paving and seating area

Figure 82: West approach to Brant's Crossing

Figure 83: View from the Brant's Crossing entrance off Icomm Drive, facing southwest.

Figure 84: View upriver of the Lorne Bridge (left), Brantford Armoury (centre right) and Brant County War Memorial (far right) with terracing and the former rail lines in the foreground right.

Figure 85: View downriver of the TH&B Crossing Bridge

7.1.2 Brant's Crossing Bridge

The structure that carries the former Brantford-Tilsonburg Grand Trunk Railway line, today part of the Trans-Canada Trail, over the Grand River can be characterized as a fixed, four-span simply supported bridge with two flat beam through girder or pony plate girder approach spans and two through trussed frame centre spans (Figure 86 and Figure 87). The subject bridge is not included on the City of Brantford Heritage Register.

Overall, the Bridge is 121.4 m and 5.8 m wide, with a trackway width of 2.5 m. As recorded in the 2017 OSIM report, the approach spans measure 23.3 m (76 feet 6 inches) long, while the centre spans are 37.4 m long (122 feet 8 inches). The 1911 plan and elevations also record the approach spans as 23.3 m, and the centre spans as marginally larger 37.7 m (123 feet 10 inches), but the 1934 elevations produced by the CNR have the east approach span as 23.5 m (77 feet 4 inches), the west approach as 23.4 m (76 feet 9 inches), the west centre span as 37.8 m (124 feet) and the east centre span as 38 m (124 feet 9 inches).

Like for the Lorne Bridge, the reasons for the discrepancies in the recorded dimensions are unknown but likely result from the Bridge being measured from different structural landmarks at each point in time use advances in measurement technology. Also like the Lorne Bridge, this has had little effect on management of the Brant's Crossing Bridge, but it is interesting here too that such major and prominent engineered structure should have no consistent documentation.

Figure 86: North elevation of the Brant’s Crossing Bridge

Figure 87: South elevation of the Brant’s Crossing Bridge

7.1.2.1 Substructure

Supporting the Bridge at its approaches are simple front wall and conventional closed cast-in-place concrete abutments. The east abutment has short cast-in-place concrete wing walls that stand vertically and angle toward the embankment before terminating with a section that is parallel with the Bridge. Both the wing walls and ballast wall are backfilled to below the coping level with ballast rubble that lines the sides of the approach embankment. For the west abutment, the wing walls meet the front wall at a more acute angle and backfill is to the level of the coping for the wings and ballast wall (Figure 88).

There are three piers each approximately 9.5 m wide, 3 m thick, and standing 7 m high. They are solid shaft cast-in-place concrete, with curved ends and moderate batter on the upstream side, and flat face with minor batter on the downstream side (Figure 89 and Figure 90); an exception is the west pier (No. 3), which has a steeper batter than the others on the downstream side (Figure 91). The pier foundations stand on exposed bedrock in the riverbed.

Figure 88: Front wall and ballast wall of the west abutment

Figure 89: Upriver side of the piers, facing southwest

Figure 90: Downriver sides of the piers, facing northwest

Figure 91: Downriver and east side of Pier No. 3

7.1.2.2 Superstructure

Since the Bridge post-dates 1890, it can be assumed that all framing members are steel rather than cast or wrought iron. The approach spans have their bottom flange plates on fixed bearings, which are trapezoidal cast and perforated block support shoes resting directly on the bearing shelf, and are supported laterally by four transverse beams or cross girders on gusset plates, each with lateral cross bracing (Figure 92). Above this are two stringers linked by both the transverse beams and short intermediate lattice trusses, over which are closely spaced wood ties (Figure 93).

The webs for both approach spans are formed of fifteen riveted girder web plates with vertical stiffeners on the exterior and triangular stiffeners on the deck side, with narrower web plates at each end where the top flange plate curves to meet the bottom flange plate (Figure 94). Remnants of the rail track are still extant on the deck of the west approach span (Figure 95).

Resting on and bolted to the piers with wide and fluted cast block support shoes are the centre spans, both of which are six-panel Pratt through trusses modified with diagonal bracing between the base of the hip verticals and the inclined end posts (Figure 96 to Figure 98). Both the top and bottom chords are latticed on their lower sides, as are the struts and top lateral bracing, and the top chords are further supported by sway bracing (Figure 99). In contrast to the thin hip verticals, the vertical posts and diagonals are robust I-bars and all inclined post, post, and diagonal connections are rivetted with gusset plates (Figure 100 and Figure 101). An exception is the connection between the end floor beams and the bottom chords, which appear to be pinned. All floor beams have crossed lateral bracing, and the stringers have short intermediate trusses between the floor beams (Figure 101). The centre spans are identical except for their portals; while the west span has a pedimented strut and sheet portal bracing, the east span has only sheet portal bracing (Figure 102 and Figure 103). The database entry for the Bridge in Historicbridges.org also notes that “the cover plate at the base on the end post for the western span ends in a curved detail, while the cover plate for the eastern span lacks the curved end" and that on both spans a "number of the truss members have a rolled angle in them whose outside edge ends in a ribbed detail…called 'bulb angles'". While the latter bulb angles can be seen, the curved end cover plates were not observed during field investigations and may only be visible when the Bridge is fully accessible.

The deck is closely spaced wood ties, over which are the track sections, corrugated pipe utility corridor, and the planked walkway with aluminium stringers and aluminium post and chain-link balustrade. On the upriver sides of both approach spans are large perforated plates that appear to prevent access to the corrugated pipe utility corridor (Lance Brown 2020: pers. comm; Ken Chrysler 2020: pers. comm.) (Figure 104). Between the spans on the downriver side is a triangular platform formed with two lateral members and on either side are four-panel webs with vertical web stiffeners. This has been made into a viewing platform for the pedestrian walkway.

Figure 92: West approach girder span (includes some camera distortion).

Figure 93: Construction visible on the underside of the west girder including the fixed bearings, transverse beams or cross girders on gusset plates, and lateral cross bracing. Above this can be seen the two stringers with transverse beams and short intermediate lattice trusses, which are capped by closely spaced wood ties.

Figure 94: Riveted girder web plates with vertical stiffeners on the east approach span

Figure 95: Remnants of the rail track (centre right) on the deck of the west approach span

Figure 96: West and south sides of the west Pratt through truss span

Figure 97: South side of the west Pratt through truss span

Figure 98: West and south sides of the east Pratt through truss span

Figure 99: Detail of the end post of the west span showing the connection with the top chord, sway bracing, vertical post and diagonal and plating at the portal

Figure 100: Gusset plates at the diagonal and vertical post, and the wood ties of the deck

Figure 101: Detail of the west span construction showing the bottom chord with crossed lateral bracing, stringers with short intermediate trusses and lateral cross bracing on gusset plates

Figure 102: West portal of the west span

Figure 103: East portal of the east Pratt through truss span

Figure 104: Decking and utility corridor (with metal access barrier) at the east approach

7.2 Structural History

Of the three historical phases representing crossings at this specific bridge site, only the last two are evident in the bridge construction that survives today. Each phase is described in the following subsections.

7.2.1 Phase 1: BN&PB Railway at Brant's Crossing, circa 1875

The first bridge at the Brant's Crossing site was constructed by the BN&PB railway company. The BN&PB was first incorporated in 1869 as the Norfolk Railroad Company, but remained a company on paper only until it was revived and repurposed in 1874 in an effort led by Brantford citizens to establish a connection to Port Burwell on Lake Erie, via Tillsonburg. The president of the company was George H. Wilkes, who figures prominently in the City's railroading history. The line was completed as far as Tillsonburg and opened in April 1876, with service over 34 miles from the BN&PB's west-Brantford station. The line was subsequently leased in perpetuity to the Great Wester Railway (GWR) in 1877, but the connection south from Tillsonburg to Port Burwell was never completed.

Although the bridge appears on the 1875 Bird's Eye View (Figure 105), the depiction may have anticipated the bridge's completion as two articles in the *Brantford Expositor* from November 1875 note that the bridge was still incomplete as its masonry contractor, Andrew J. Brown of Syracuse, NY, had underbid the contract and was now delaying completion of the line (*Brantford Expositor* in Riff n.d.: 42-43). The bridge did not carry its first train until January 3, 1877 (*Brantford Expositor* in Riff n.d.: 62), but in April the same year, the GWR convinced the BN&PB to break its lease to pay its debts and lease the line to the GWR in perpetuity (*Brantford Expositor* in Riff n.d.: 65).

The BN&PB suffered a further setback on November 9, 1877 when the west span of the bridge collapsed under the weight of a train, throwing the engine and two freight cars into the river. Tragedy had been averted as the collapse left the 40-passenger car stranded on the second truss, and the engineer and fireman also survived, though badly injured (*Brantford Expositor* in Riff n.d.: 69-70). A newspaper description of the event and a photograph show that in contrast to the *Bird's Eye View*, which illustrates the bridge as a three spans of Warren through truss, the bridge's superstructure was wood in Pratt through trusses —a rare combination— with very lightly built, possibly wrought iron, diagonals (Figure 106) (Christianson *et al* 2015:62, 143). This portion had been built by Mr. Waterman of Buffalo in 1875 (*Brantford Expositor* in Riff n.d.: 69).

The original bridge may not have been repaired as in April 1878 it was reported that a temporary bridge was in place (*Brantford Expositor* in Riff n.d.: 88), and that this would be replaced with "an iron structure of the very best construction" that summer (*Tillsonburg Observer*). Although shown in a stylized manner on the 1892 *Bird's Eve View*, a clearer picture of this is "iron structure" is provided in 1893 plans for "Grand River Improvements", and as faint lines in the plans the GTR drafted to replace it with the Brant's Crossing Bridge in 1912-13 (Figure 108 and Figure 109). All three 100-foot spans (*Brantford Courier* 1912) were "true" Pratt through trusses and given its date of construction was likely rivetted wrought or cast steel. It was to have been 6 inches lower in elevation than the current bridge and had two piers spaced for "clear water way of 285 feet" (*Brantford Courier* 1912) and located several metres west of those proposed for the later GTR Bridge. These were likely ashlar masonry, were half the width of the piers that replaced them, and on the upriver side were either sharp nosed or had starlings to cut the flow. While the east abutment was originally west of the abutment that replaced it, the west abutment was in the same location as the location of the western most pier, and the ground behind it was dredged to create the fourth span for the replacement bridge. The new 1878 bridge was only under the BN&PB for four years before the BN&PB became a subsidiary of GWR, and then by the Grand Trunk Railway when it subsumed the GWR on August 12, 1882 (Scrimgeour 1990).

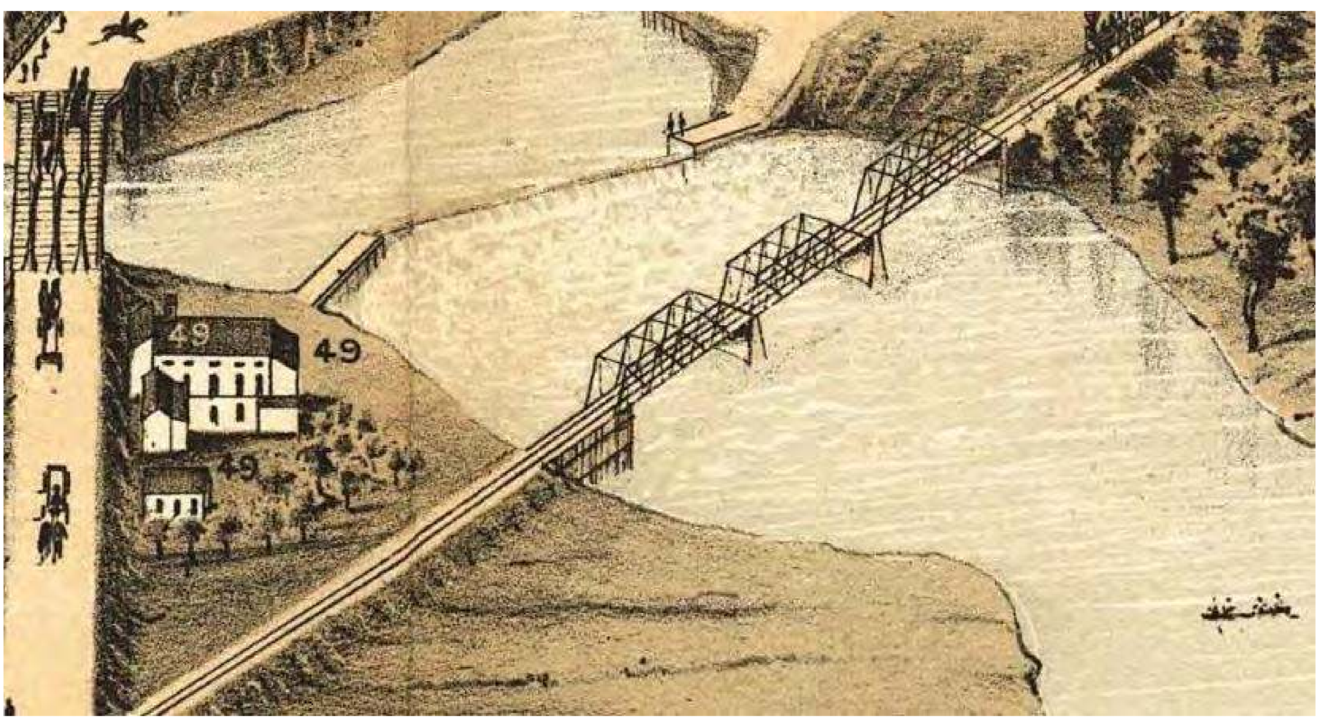

Figure 105: Detail from the 1875 *Bird's Eye View* depicting the three span BN&PB Railway Bridge at the Brant's Crossing site

Figure 106: Bridge collapse and BN&PB Railway train derailment at the Brant's Crossing site, November 9, 1877 (courtesy

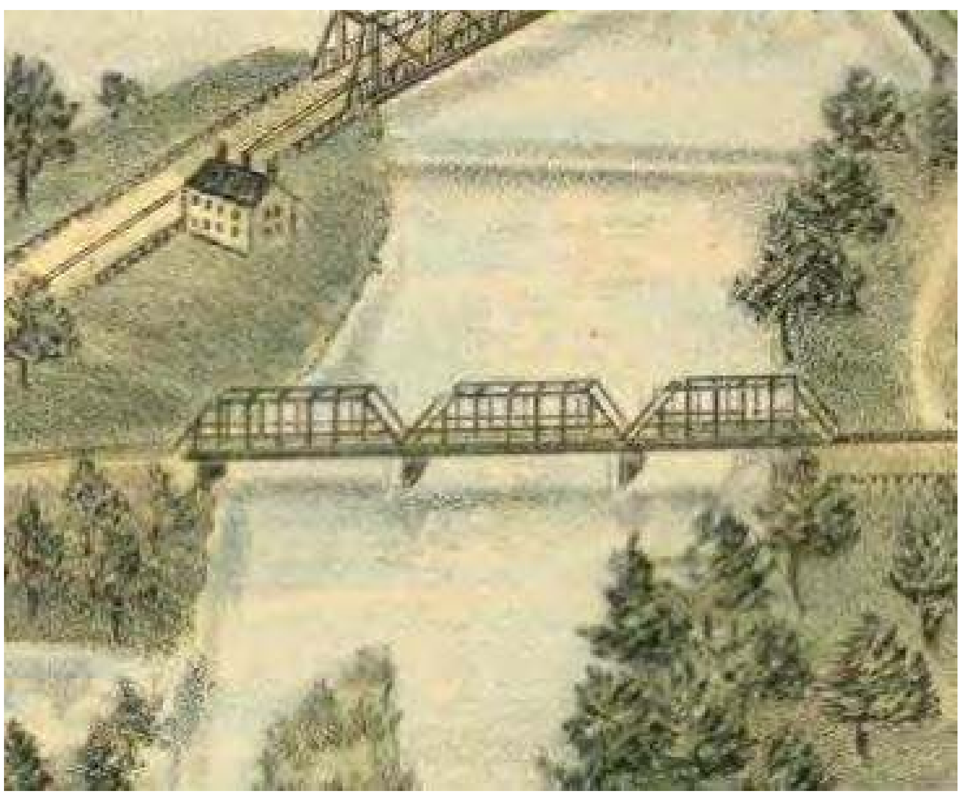

Figure 107: Detail from the 1892 *Bird's Eye View* of the second BN&PB Railway bridge at the Brant's Crossing site, by this point operated by the Grand Trunk Railway

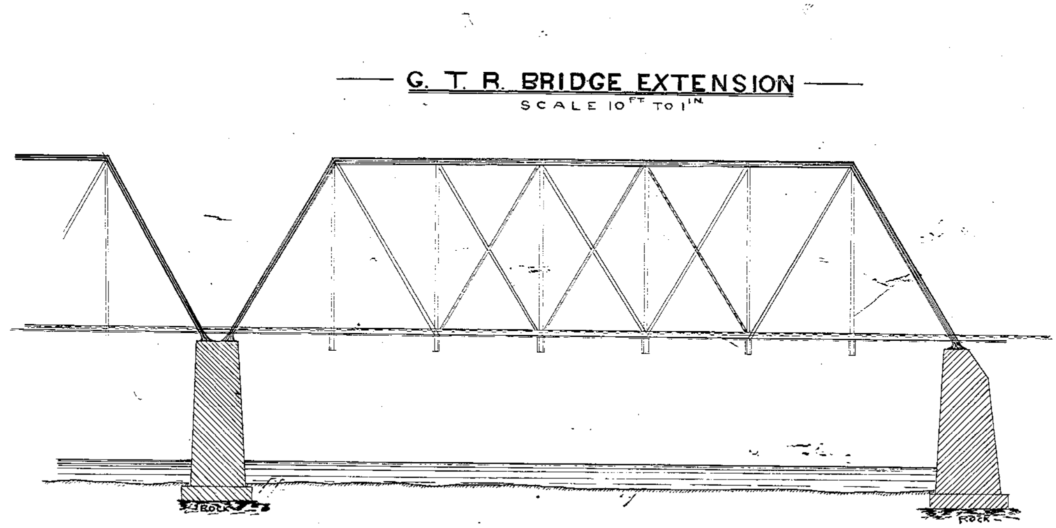

Figure 108: A proposed extension to the second BN&PB Railway bridge illustrated on an 1893 plan detailing "Grand River Improvements"

7.2.2 Phase 2: GTR to CNR, 1912-1990

Plans for the new bridge —named "Grand Trunk Railway Middle Division – 20th District Bridge No. 75 – Mile 8.21 Grand River Brantford" — had been drafted by February 1912 but as reported in the November edition of the *Canadian Railway and Marine World* (1912:559), work on the new bridge had not begun until October 14, 1912 and was not expected to be completed until the spring of 1913.

What led the GTR to completely replace the second BN&PB Railway bridge is unknown, but by then the 1878 bridge had been in service for 35 years, and the need to expand the crossing to four spans and dredge beneath the west approach had been recognized at least 14 years earlier as part of the 1898 flood control planning. Replacing, rather than modifying, the bridge may then have been the only option, yet with it came an opportunity to reduce flow beneath the bridge and raise the rail line above the extreme water levels. The 285-foot "water way" under the 1878 bridge was reported to be a long-time concern of City Engineer T. Harry Jones, but with the new bridge a "clear water way of 366 feet" was now possible. Jones remained concerned about GTR's plan to lower the piers, however, which would put the new bridge only 6 inches above flood level (*Brantford Courier* 1912).

In both its materials and design, the 1912 Brant's Crossing Bridge fits within the second phase of bridge development in the province as defined by Cuming (1983:39-50). Between 1880 and 1914, not only was steel locally manufactured and distributed, Canadian engineers and companies were standardizing their designs and builds, even innovating with new materials such as concrete. Selection of concrete for the piers and abutments of Brant's Crossing Bridge was therefore not unusual in 1912, though it does represent a relatively early adoption. While in Europe and the Unites States concrete was applied to bridge construction since the 1870s and took off in the 1890s (Parsons Brinckerhoff & Engineering and Industrial Heritage 2005:2-17, 2-25), in Canada engineers were more reluctant to apply concrete and it was not until as late as 1906 that the first concrete bridge in Canada was erected in Massey Ontario (Miller 1981:330). Even after concrete was widely applied through the 1910s both for sub and superstructures, in 1911 it was reported as "still used with great caution and seldom permitted to show itself above water level"; resistance to its use continued to at least 1919 (Walton 1995:9; Cuming 1983:51).

Equally as common by the 1910s was use of the Pratt truss, which had been patented in 1848 by Boston architect Caleb Pratt and his son Thomas Pratt, a railway engineer. For their design, the Pratts modified the earlier Howe truss, named in its 1840 patent for millwright William Howe, also from Massachusetts. To prevent the buckling potential of the Howe truss, the Pratts reversed the framing so that the long web members were in tension while its short web members were in compression (Christianson *et al* 2015:60-62). As mentioned above, wood versions of this truss type are rare, but with the later Warren and Parker trusses the Pratt truss and it variants the Baltimore and Pennsylvania became one of the most common designs for wrought iron and steel bridges (Hayes 2014:414; Cuming 1983:41-42). An advantage of the Pratt truss over other designs was the relatively simple calculations required to understand the distribution of stress throughout the structure (Parsons Brinkerhoff and Engineering and Industrial Heritage 2005:3-25). The Pratt truss bridge was also an important development in bridge design as it was stronger and more easily assembled by less skilled labourers than many contemporary types. Steel, with its greater compression and tension strength as well as economy to produce, was adopted widely in Ontario beginning in the 1880s and by 1900 was quickly replacing wrought iron. This development coincided with portable riveting machines, which allowed bridges to be assembled on site (Cuming 1983:42-43).

Riveting on site would have expedited constructing the pony plate girder approaches, which were probably selected over through trusses as the spans were shorter. The girder approaches with riveting on site may also have been a cost-saving measure; initially in the April 1912 *Brantford Courier* story the bridge construction was estimated to be "about $50,000", but by the November *Canadian Railway and Marine World* (1912:559) article the cost had dropped to "$40,000."

Modifications to the design during construction may account for the slight differences between the two Pratt spans. Although Historicbridges.org speculates that these differences could arise when "one or more spans of the bridge were destroyed (perhaps by flood or derailment)" there is no evidence this occurred. Additionally, as the February plan and elevation indicate, no portion of the 1878 bridge was incorporated into the new design. Instead, it seems more likely that minor changes reflect changes made as the project was underway. As for use of steel with bulb angles, which Historicbridges.org notes as unusual as these "were often listed as materials for shipbuilding", there is no evidence to suggest these were unusual at the time; as Darnell's research of fabricator catalogues found, bulb angles were "once common but rarely seen now" (Darnell 1984:53).

There is no indication in the bridge's construction that it was later modified when there was a change in ownership, such as after the Canadian National Railways absorbed the GTR in 1923, or between when passenger service on the Brantford to Tillsonburg line ended in 1948 and the line's decommissioning in the 1980s (Thompson 2003:3). Its piers were recorded in 1934 by a CNR dive crew to be in good condition, apart from some scouring near the base of Pier No. 3 (furthest west), which was presumably repaired and may account for the greater batter seen on that feature (Figure 110). Photographs from the 1950s to 1970s show the bridge nearly identical to how it appears today, as well as its visual and functional relationship with the industrial works in the Eagle's Nest area (Figure 111 to Figure 113)

The resilience of the construction may reflect the GTR's reputation for quality bridge and station construction (Greenhill 46). Though criticized for its poor management, the GTR ran the longest railway in the world and since the 1850s had attracted leading engineers for its bridge and viaduct construction, and these were executed with quality materials to a high degree of craftmanship (Greenhill 1989:46-50). During the Bridge's operation it would have been considered —along with its contemporaries the TH&B, LE&N Bridge, Lorne Bridge, and later BSAR Bridge — as part of Brantford's civic identity.

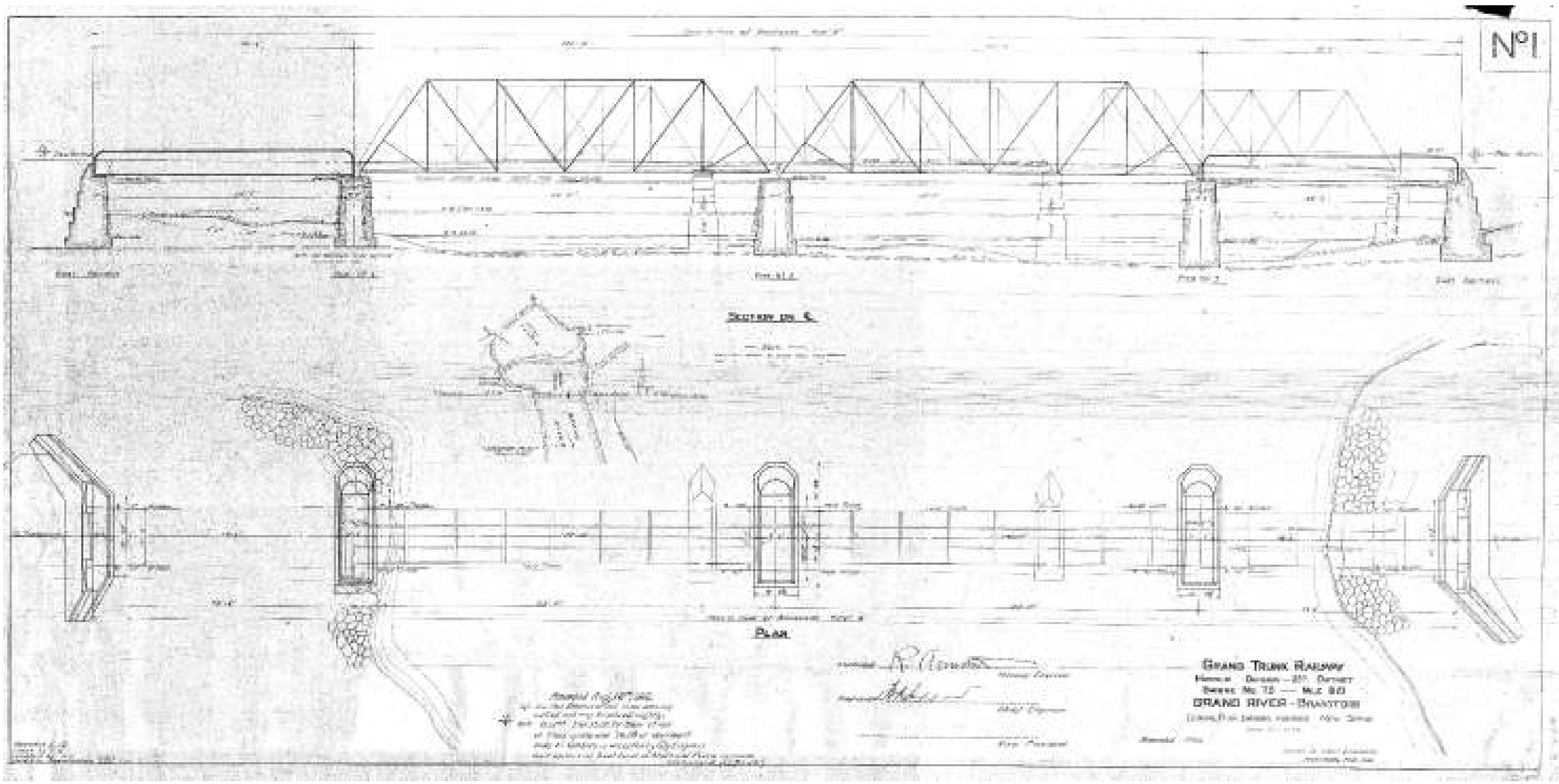

Figure 109: Plan and elevation proposed for the Brant’s Crossing Bridge, February 1912

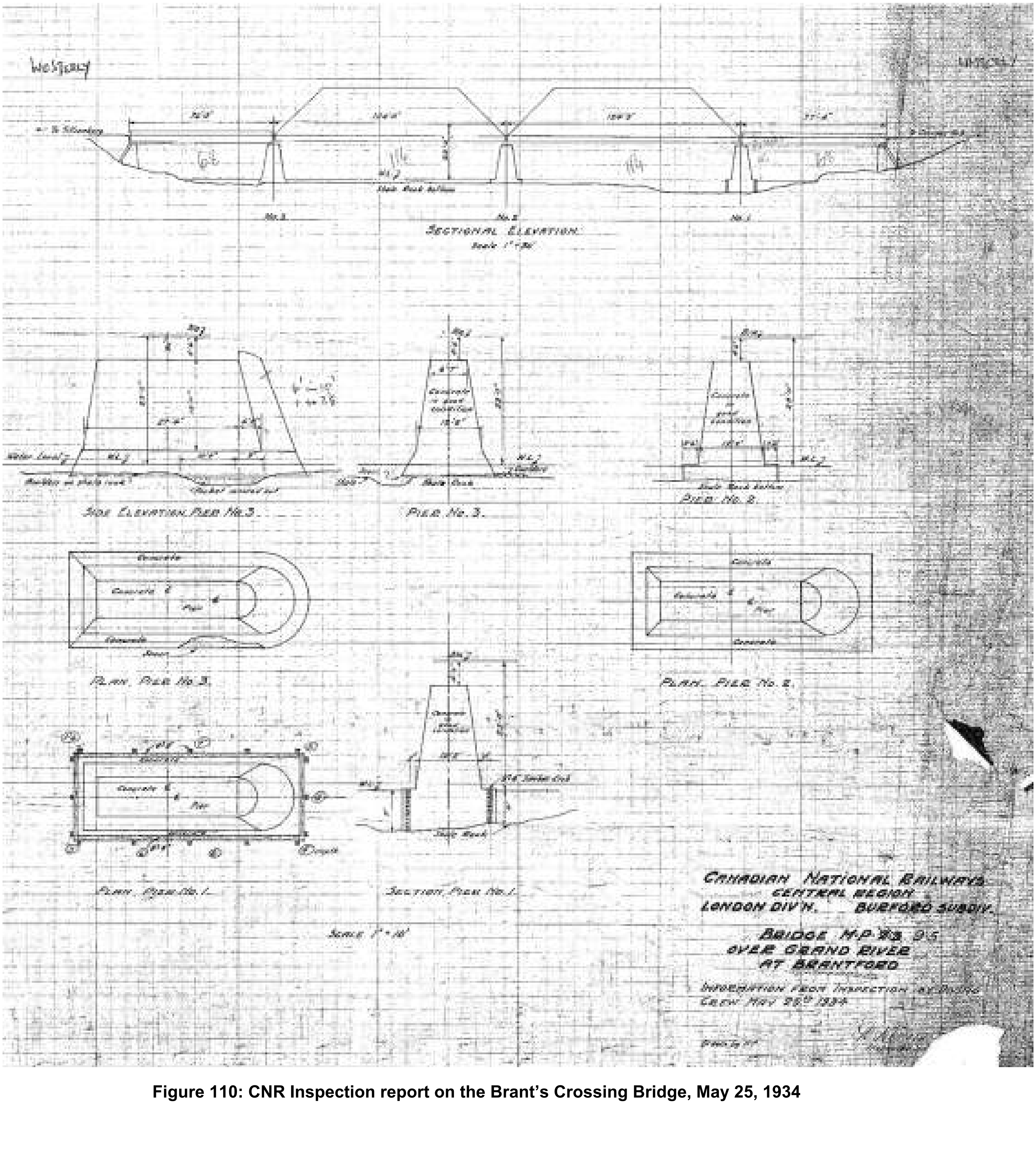

Figure 110: CNR Inspection report on the Brant's Crossing Bridge, May 25, 1934

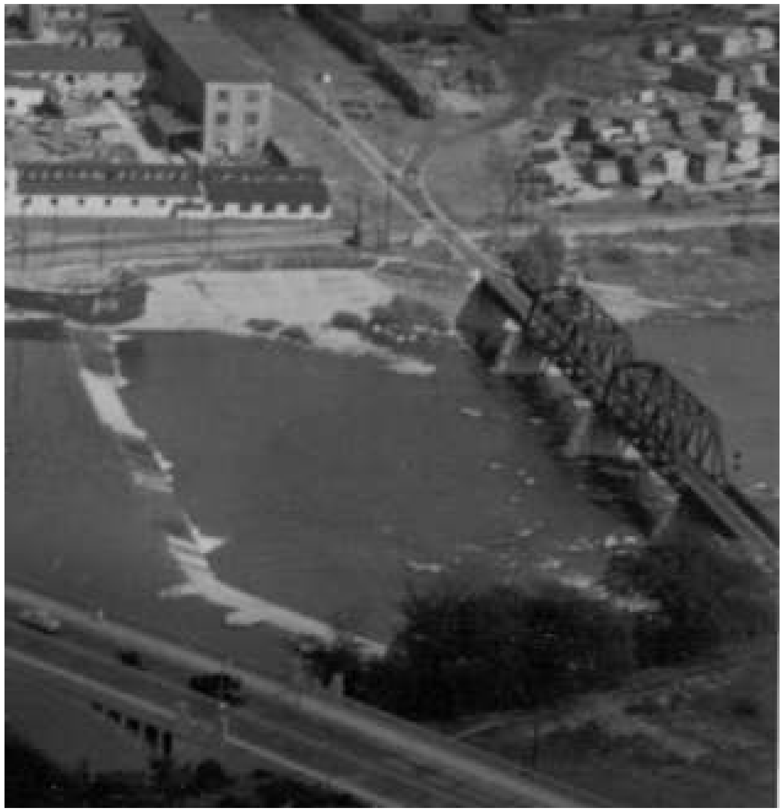

Figure 111: View facing east of Brant's Crossing Bridge in 1952 (City of Brantford)

Figure 112: View facing south of Brant's Crossing Bridge, February 11, 1957 (City of Brantford)

Figure 113: View facing east of Brant's Crossing Bridge in the 1970s, showing the relationship with nearby industries in Eagle's Nest (Collection of Brant Railway Heritage Society)

7.2.3 Phase 3: Brant's Crossing Trail, 1990-present

The first major intervention to the bridge since it ceased rail operations was the installation in 1988 of a 500 mm polyethylene watermain, which is housed in the galvanized steel pipe. The large plates preventing access to the pipe were also installed at this point.

More extensive change occurred as part of the 1996 conversion to a pedestrian crossing although this was visually and structurally sensitive to the original fabric of the bridge (Figure 114). Over this phase the bridge had deteriorated to the point that in 2017 it was closed to pedestrian traffic and estimated to cost $1.4 million to repair.

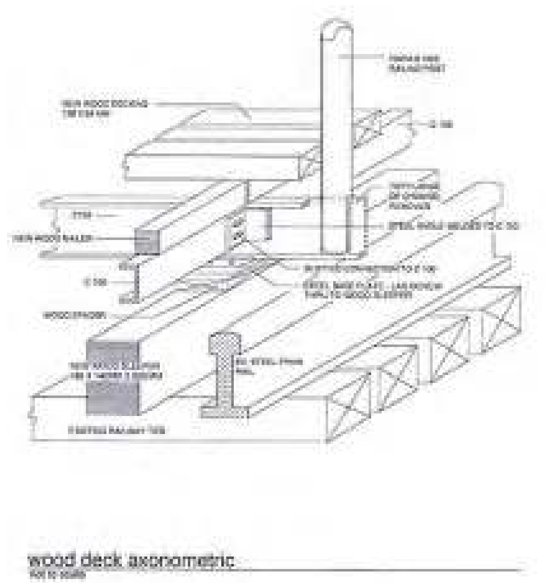

Figure 114: Detail from the 1996 conversion specifications indicating the relationship with new and existing components (PMA 1995)

7.3 Integrity & Physical Condition

In a heritage conservation context, the concept of integrity is linked not with structural condition, but rather to the literal definition of "wholeness" or "honesty" of a place. The MHSTCI *Heritage Identification & Evaluation Process* (2014:13) and *Ontario Heritage Tool Kit: Heritage Property Evaluation* (2006:26) both stress the importance of assessing the heritage integrity in conjunction with evaluation under *O. Reg. 9/06*, yet do not provide guidance to measure integrity beyond referencing the *US National Park Service Bulletin 8: How to Evaluate the Integrity of a Property* (US NPS n.d.). In this latter document, integrity is defined as "the ability of a property to convey its significance", so can only be judged once the significance of a place is known.

Other guidance suggests that integrity instead be measured by understanding how much of the asset is "complete" or changed from its original or "valued subsequent configuration" (Historic England 2008:45; Kalman 2014:203). Kalman's *Evaluation of Historic Buildings*, for example, includes a category for "Integrity" with sub-elements of "Site", "Alterations", and "Condition" to be determined and weighted independently from other criteria such as historical value, rather than linking them to the known significance of a place.

A detailed and component-level integrity investigation was not undertaken for this CHER, but a visual analysis indicates that the Brant's Crossing Bridge has an overall good level of integrity, as a substantial proportion reflects its initial construction and operation (Figure 115).

The bridge's physical condition was reported in the 2017 OSIM to be overall fair and requiring approximately $1.4 million to repair and rehabilitate.

Figure 115: Visual integrity analysis of Brant's Crossing Bridge

7.4 Evaluation of Cultural Heritage Value or Interest

The Brant's Crossing Bridge was previously evaluated at a preliminary level in *Grand Old Bridges* as "Grand Trunk Railway Bridge" (2004), by Historicbridges.org as the "Brantford Railway Truss Bridge" (2012), and in *Arch, Truss & Beam* under the name "Dike Trail CNR Truss Bridge" (2013):

- *Grand Old Bridges* scored the bridge at 55 out of 100 (Robinson Heritage Consulting 2004:21)
- Historicbridges.org rated it as a 7 out of 10 for both national and local historic significance
- *Arch, Truss & Beam* (Heritage Resources Centre 2013:39) determined that the bridge met five of the nine criteria of *O. Reg. 9/06* (1.i, 2.i & ii, and 3.i & ii.)

The following evaluation provides an independent evaluation based on the field investigations, research, and analysis conducted as part of this CHER, and uses the criteria prescribed in *O. Reg. 9/06*.

7.4.1 Design Value or Physical Value

Criteria	Meets criterion (Yes/No)
(i) Is a rare, unique, representative, or early example of a style, type, expression, material or construction method.	**Yes**
Rationale: The Brant's Crossing Bridge is a rare, unique, and representative example of a metal rail bridge, and is an early example of the application of concrete in bridge construction in Ontario. In the Historicbridges.org database there are 60 Pratt through truss metal bridges surviving in Ontario, 43 of which are constructed in rivetted frame. However, Brant's Crossing Bridge is one of only fourteen Pratt through truss types that remain in the Grand River Valley and of those just four were built before or at the same time. It is the only structure of its kind in the municipality, and unique as it is one of just three in the province (with the CPR Bridge over the Otonabee River in Peterborough and Mississagi River Railway Bridge in Algoma District) that combines a Pratt truss with girder spans. Despite its rarity and uniqueness, the good level of integrity also makes the Brant's Crossing Bridge a representative example of both early 20th century rail bridges and of the Pratt through truss type.	

Criteria	Meets criterion (Yes/No)
(ii) Displays a high degree of craftsmanship or artistic merit.	**Yes**
Rationale: Although Pratt through truss and plate girders spans were specifically designed for ease of assembly, the continued good level of integrity of the Brant's Crossing Bridge over its 107-year history and multiple high water and ice jam events, suggests that overall the structure was executed to a high degree of craftsmanship.	

Criteria	Meets criterion (Yes/No)
(iii) Demonstrates a high degree of technical or scientific achievement.	No
Rationale: As a simply supported flat beam bridge carrying a single rail line from relatively low banks over a narrow and shallow portion of the Grand River, the Brant's Crossing Bridge does not demonstrate a high degree of technical or scientific achievement.	

7.4.2 Historical Value or Associative Value

Criteria	Meets criterion (Yes/No)
(i) Has direct associations with a theme, event, belief, person, activity, organization or institution that is significant to a community.	**Yes**
Rationale: The Brant's Crossing Bridge has direct associations with themes and an organization that is significant to the community. It is directly associated with Brantford's most profound period of industrial development between 1880 and 1930, and with the development of the City's rail transportation network over the same decades. Like the Lorne Bridge and TH&B Crossing Bridge it has direct associations with the recognized theme of bridge building over the Grand River and in Brant County, as well as representing the last of a succession of bridges in this location and one of multiple historical crossings of the Grand in Brantford, which collectively contributed to the City's social and economic growth. In its early construction and operation, the Brant's Crossing Bridge is directly associated with the GTR, who at the time the bridge was erected were one of the world's largest rail companies and recognized for the high quality of their bridge and station construction. The GTR's role in the development of the province was recognized as its own sub-theme of the Transportation and the Integration of Economies and Communities in the *Topical Organization of Ontario History* (1974). The GTR also played a major role in Brantford's economic development and growth through the late 19th to 20th centuries, and the bridge both directly serviced the industrial area of Eagle's Nest and facilitated freight and passenger travel between Brantford and larger and smaller communities on the GTR line.	

Criteria	Meets criterion (Yes/No)
(ii) Yields or has the potential to yield information that contributes to an understanding of a community or culture.	**Yes**
Rationale Further study of the bridge, despite its common form and materials, may yield information contributing to a greater understanding of early 20th century bridge construction, the GTR, and Brantford's industrial development. It may reveal who designed or built it, and metallurgical and comparative studies could provide insights into early 20th century steel production and the prevalence of bulb angled steel for bridge construction in Ontario. Archaeological remains of the earlier bridge may still survive and provide insights into how that late 19^{th} structure was built, although the extent of those remains is probably minimal.	

Criteria	Meets criterion (Yes/No)
(iii) Demonstrates or reflects the work or ideas of an architect, artist, builder, designer or theorist who is significant to a community.	No
Rationale: Until the bridge's engineer or building contractor is identified, it cannot be determined whether the bridge demonstrates or reflects the work or ideas of individuals or companies that were significant to the community.	

7.4.3 Contextual Value

Criteria	Meets criterion (Yes/No)
(i) Is important in defining, maintaining or supporting the character of an area.	**Yes**
Rationale: The Brant's Crossing Bridge is important in defining, maintaining, and supporting the character of Brantford's urban core along the Grand River. As a component of the cultural heritage landscape with the nearby Lorne Bridge and TH&B Crossing Bridge, Brant's Crossing helps to define the industrial aesthetic of the riverscape, and links directly to the community's pride as an industrial centre. With its high level of integrity, it supports this character to a greater degree than the other two bridges, and through its steel construction and truss spans it can be readily identified as part of the City's industrial and railway heritage.	

Criteria	Meets criterion (Yes/No)
(ii) Is physically, functionally, visually or historically linked to its surroundings.	**Yes**
Rationale: Even now in its conversion for pedestrian use, the Bridge is physically, visually, and functionally linked to crossing the Grand River Canadian Heritage River, at this location and retains physical and visual links to its history as a rail bridge connected to the industrial Eagle's Nest area. There are also unimpeded visual and historical links between the Brant's Crossing Bridge and the Lorne and TH&B Crossing bridges.	

Criteria	Meets criterion (Yes/No)
(iii) Is a landmark.	**Yes**
Rationale: For over 100 years the Brant's Crossing Bridge has been a local landmark, one ingrained in Brantford's civic identity during its use as a rail line and more recently the subject of preservation efforts to incorporate it into the walking trail system.	

7.4.4 Evaluation Results

The preceding evaluation has determined that the Brant's Crossing Bridge:

- **Meets seven of nine criteria of *O. Reg. 9/06* and therefore has cultural heritage value or interest as a built heritage resource**

Based on this evaluation, a Statement of CHVI is proposed below.

7.4.5 Statement of Cultural Heritage Value or Interest

Description of Property – Brant's Crossing Bridge

Brant's Crossing Bridge is a four-span simply supported beam bridge with two pony plate girder approach spans and two 6-panel through Pratt truss frame centre spans. It carries the former Grand Trunk Railway line across the Grand River, immediately southwest of the downtown core of the City of Brantford and lies between the Lorne Bridge to the north and TH&B Crossing Bridge to the south.

Statement of Cultural Heritage Value or Interest

The Brant's Crossing Bridge has cultural heritage value or interest for its design or physical value, historical or associative value, and for its contextual value. Erected by the Grand Trunk Railway between 1912 and 1913, the bridge was to carry the freight and passenger line across the Grand River, servicing both the industrial area of nearby Eagle's Nest and facilitate transport to surrounding communities. Its rivetted steel Pratt and girder construction is representative of rail bridges of the time, though now structures of this age and type are increasingly rare in Ontario, especially in the municipality and surrounding area; it is also one of only three surviving examples in the province that combines girder and Pratt truss spans. Its concrete substructure represents a relatively early adoption of concrete for bridge construction in Ontario, and the survival of the bridge virtually intact over 100 years of heavy water and ice flow suggests it was built to a high degree of craftsmanship.

The Bridge has historical value for its direct association with the Great Trunk Railway, who played a significant role in the development of Ontario from the 1850s onward and were recognised for the quality of their bridges and stations. It is also directly associated with Brantford's development as a prosperous industrial centre from the late 19th century to late 20th century.

The bridge's prominence, relationship to the Grand River Canadian Heritage River and nearby Lorne and TH&B Crossing bridges, and its industrial aesthetic of rivetted steel and concrete, all contribute to its contextual value, and it is considered to be a local landmark.

Heritage Attributes

Four-span simple supported beam bridge with:

- substructure with three curved end concrete piers and concrete abutments with wing walls
- superstructure composed of two pony plate girder approach spans and two 6-panel through Pratt truss frame centre spans, with some members exhibiting bulb angles
- pedimented portal bracing on the west span
- deck with closely spaced wood ties with surviving sections of rail track
- clear, wide vistas of the Grand River and Lorne and TH&B Crossing bridges

8.0 TH&B CROSSING BRIDGE

8.1 Existing Conditions

8.1.1 Setting

The general character around the TH&B Crossing Bridge is urban, with low to midrise commercial and urban park land use on the east side and urban park and low to mid-rise residential and commercial on the west side (Figure 116 and Figure 117). The topography is flat at both approaches, with steep but low banks at the river's edge (Figure 118 and Figure 119). Both banks are covered in trees or tall grasses and there are no areas of exposed bedrock. Around the east abutment and concrete pier sediment has been deposited and is covered in tall grass.

The bridge, which runs east-west, is the southern-most crossing in the study area, and is approximately 270 m south from the Brant's Crossing Bridge on the north, approximately 400 m downriver from the Lorne Bridge, and 375 m upriver from the BSAR Bridge.

The east approach is immediately northwest of the junction between the north-south and east-west routes of the SC Johnson and Dike pedestrian trails. The east approach also borders Earl Haig Park and the Brant & District Civic Centre. At the west approach is the north-south running Fordview Trail.

Views to the north are expansive, and include the wide channel of the tree-lined river and the Brant's Crossing Bridge, the Lorne Bridge, as well as the Brantford Armoury and the Brant County War Memorial (Figure 120). Views to the south are not as expansive due to the BSAR Bridge and the curve of the river to the southwest approximately 500 m to the south (Figure 121).

Figure 116: Setting of the TH&B Crossing Bridge, facing south from the west bank below Brant's Crossing Bridge

Figure 117: Setting of the TH&B Crossing Bridge, facing north from the BSAR Bridge

Figure 118: East approach to the TH&B Crossing Bridge, facing west

Figure 119: West approach to the TH&B Crossing Bridge, facing east

Figure 120: View facing north from the TH&B Crossing Bridge of Brant's Crossing Bridge (foreground), Lorne Bridge (centre), Brantford Armoury (right), and Brant County War Memorial (far right)

Figure 121: View facing south from the TH&B Crossing Bridge of the BSAR Bridge

8.1.2 TH&B Crossing Bridge

The structure that carries the former TH&B line, today part of the Fordview public trail, over the Grand River can be characterized as a fixed, four-span simply supported bridge with four flat beam through girder or pony plate girders (Figure 122 and Figure 123). The subject bridge is not included on the City of Brantford Heritage Register. Overall, the bridge is 124.8 m (409 feet 6 inches) long and 5.8 m (19 feet) wide, with a trackway width of 5.4 m (17 feet 8 inches). As recorded in the 2017 OSIM report, all spans measure 30.7 m (100 feet 9 inches) long. However, the CP Rail Record —which shows only the three western most spans— lists the dimensions as east to west 101 feet 9 inches, 102 feet, and 101 feet 9 inches with a width of 17 feet 6 inches.

Figure 122: North elevation of the TH&B Crossing Bridge

Figure 123: South elevation of the TH&B Crossing Bridge

8.1.2.1 Substructure

At its west approach, the TH&B Crossing Bridge is supported by a simple front wall and conventional closed cast-in-place concrete abutment (Figure 124). Short, vertical and cast-in-place concrete wing walls extend into the bank perpendicular to the front wall. Long and frogged concrete masonry unit blocks crudely mortared with Portland cement have been used to extend the north wing. Both the bearing shelf and bridge seat have projecting concrete slabs with quarter-round moulding on their top outer margin (Figure 125).

The east abutment also is a simple front wall and conventional closed type but is constructed in rusticated ashlar masonry to a slight batter (Figure 126). Also, unlike the west abutment, the front wall has a cordon and the bearing shelf is narrower, with a thin coping in either concrete or thin stone slabs. The bridge seat on the west abutment has a stone coping with rounded top margin. Concrete has been used to repair two sections of the front wall —the full height of the south corner and top-most corner of the north corner and has been scored to match the masonry coursing (Figure 127). Photographs from 2002 show the east abutment is backed by wood cribbing (Figure 127).

There are three piers, two of which are concrete-filled riveted iron or steel caissons or bents and one in cast-in-place concrete. The concrete pier is the furthest west, has a sharp nose with relatively steep batter and iron or steel cut break on its upriver side (Figure 129). It is topped by a projecting concrete slab with quarter-round top margin, and overall measures 8.85 m long, 3.8 m wide, and stands 5.45 m high. The two easterly pier bents stand 6.05 m high, are 7.2 m long overall, and each caisson is 2.10 m in diameter (Figure 130 and Figure 131). Each caisson is faced with rounded panels connected with rivetted strips, and are connected to each other at their mid and upper section by a web wall with top and bottom flanges and by a capping beam of seven I-beams with the interstices filled with concrete. The pier foundations stand on exposed dolostone bedrock in the riverbed.

Figure 124: View facing southwest of the west abutment and pier

Figure 125: View facing east of the west abutment of the TH&B Crossing Bridge

Figure 126: View facing north of the east abutment of the TH&B Crossing Bridge

Figure 127: Wood cribbing at the east approach (Photo by Charles Cooper, Collection of Brant Railway Heritage Society)

Figure 128: View facing southeast of the east abutment with ashlar construction and concrete repairs

Figure 129: View facing south of the concrete pier

Figure 130: View facing southeast of the metal pier bents

Figure 131: View facing south of the central TH&B Crossing Bridge pier bent caissons

8.1.2.2 Superstructure

Since the superstructure elements post-date 1890, it can be assumed that all framing members are steel rather than cast or wrought iron. The bottom flange plates of the approach spans have pinned fixed bearings that are bolted to steel plates on the bearing shelf (Figure 132). The bottom flange plates of the mid spans over the pier bents rest directly on the capping beams, while the bearings on the concrete pier are fixed steel plates. Between the bottom flange plates are two stringers, which are linked to the flange plates by transverse beams or cross girders on gusset plates and lateral cross bracing. Over the stringers are closely spaced square wood ties.

The webs for all spans are formed of 14 riveted girder web plates with vertical stiffeners on the exterior and triangular stiffeners on the deck side, with adjoining vertical flanges over the piers (Figure 133 to Figure 135). Unlike on the exterior sides, in some places the interior construction varies in riveting pattern and stiffener dimensions (Figure 136).

The deck is a planked walkway and on the top flange on the downriver side is a small diameter conduit that runs to aluminium light standards mounted on U-shaped steel plates (Figure 137).

Figure 132: Capping beam over the central pier bent, which supports the girder composed of bottom flange plates and stringers linked by transverse beams or cross girders on gusset plates, all with lateral cross bracing.

Figure 133: View facing west of the girder spans

Figure 134: View facing northwest of the girder spans

Figure 135: Interior side of the girders, showing the top flange plate and rectangular and triangular vertical web stiffeners

Figure 136: Joint between the west approach span and centre west span showing varying construction

Figure 137: Conduit and aluminium light standard mounts on the top flange plate

8.2 Structural History

Of the four historical phases representing crossings at this specific bridge site, three are evident in the bridge construction that survives today. Each phase is described in the following subsections.

8.2.1 Phase 1: The Free Bridge, 1854 to 1892

The first permanent structure confirmed to be at this location was a "free" bridge built in 1854, which provided an alternative to the toll bridge at the site of today's Lorne Bridge (Reville 1920:137). Reville reports it was linked to the Gilkison Estate, which is shown on the west bank of the river on the 1858 county atlas (Figure 138)(Tremaine 1858). When this bridge was demolished is unknown, but it may not have been replaced until the first Lorne Bridge was completed in 1879, which allowed free passage.

Although incorporated in 1884, the TH&B railway did not commence operations in Brantford until August 1892 when it acquired the Brantford, Waterloo & Lake Erie Railway and connected Michigan Central Railway (MCR). The next year the TH&B came under the joint ownership of the New York Central and the CP (Smith 2000:70). With these mergers, the railway needed a bridge to cross the Grand River.

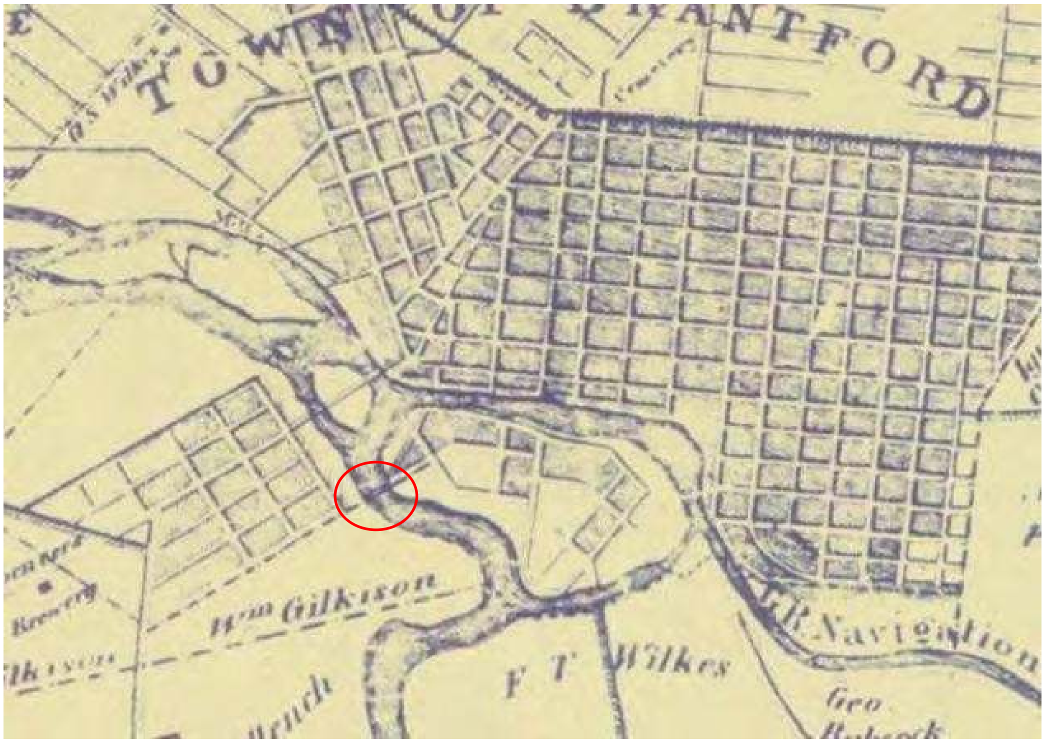

Figure 138: Free Bridge (circled) as illustrated on the 1858 Tremaine county atlas

8.2.2 Phase 2: The TH&B Crossing Bridge, 1893 to 1920

Erecting the TH&B Crossing Bridge in 1893 was initially delayed by spring flooding but could eventually be completed by the Dominion Bridge Works Company (*Canadian Engineering News* 1893:58). The Dominion Bridge Works Company had earned a national reputation for the CP Rail cantilever bridge at Lachine (1886) and for that project had recruited local Mohawks of Kahnawá:ke, initially as labourers but who quickly transitioned to skilled riveters (Middleton 2001:63). In this trade men from the community travelled widely now only with Dominion Bridge Works but were highly sought for a wide range of "high steel" projects across North America (Blanchard 1983:44). Although it is not recorded, it is possible that through this connection Six Nations of the Grand River also worked to construct the TH&B Crossing Bridge. Three years after the bridge was completed, it was joined by the station that, though modified, still stands at 60 Market Street South, approximately 340 m east of the east bridge approach (Figure 139).

Within two years of its construction, the bridge was found to be "considerably lower than the extreme height of flood level" (Fairchild 1895:69), and it was recommended that work be done immediately to raise it. Nothing appears to have been done until 1901, when changes to the river course and possibly also an attempt to reduce the flow also necessitated changes. As indicated on a 1901 elevation drawing (Figure 140) and described in the November 1902 issue of *Railway and Shipping World*, improvements to the bridge (at that time nearly completed) included adding a 100-ft. through girder span with concrete abutment at the west approach, a new concrete abutment at the east approach, and raising the entire bridge by 3 ½ feet. The earliest images of the bridge —an inset in the 1892 *Bird's Eye View* and an aerial image from 1919— indicates that the three eastern spans were five panel Pratt through trusses (Figure 141 and Figure 142).

Figure 139: 1896 TH&B station at 60 Market Street South, approximately 340 m east of the bridge

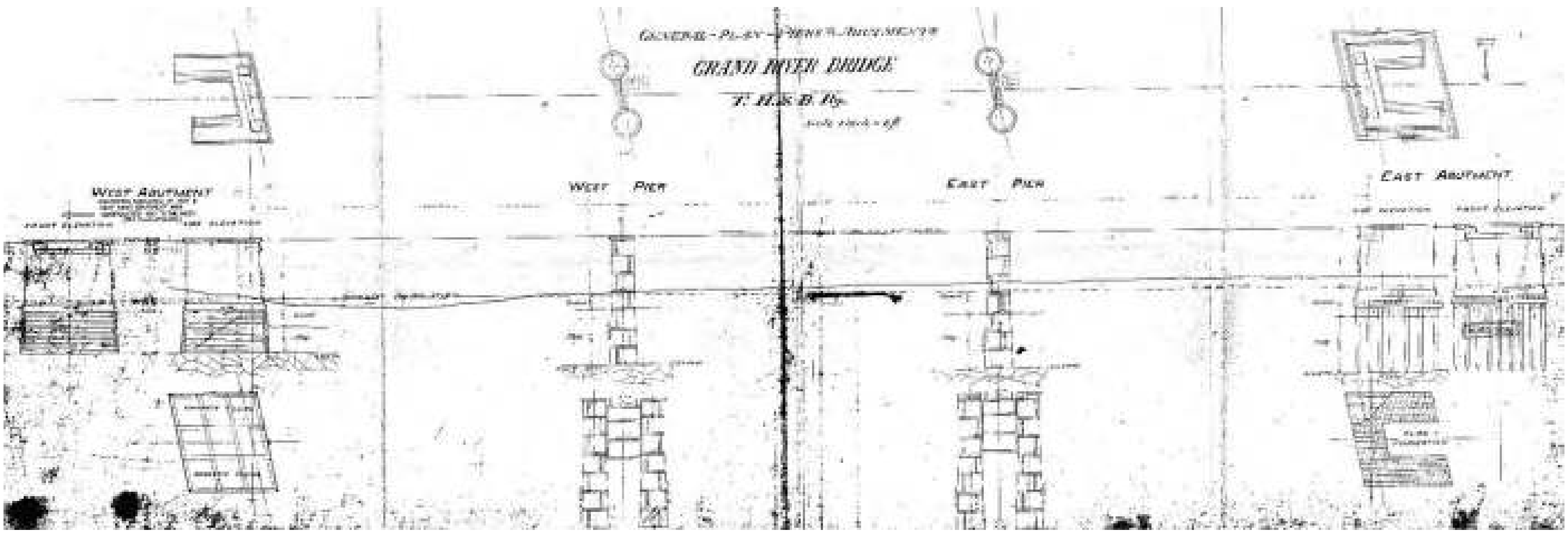

Figure 140: 1901 “General Plan – Piers and Abutments” for the “Grand River Bridge” of the TH&B Railway

Figure 141: Inset on the 1892 *Bird's Eye View* of the TH&B Crossing Bridge

Figure 142: Detail from a 1919 oblique aerial photograph of the TH&B Crossing Bridge (Collection of Brant Railway Heritage Society)

8.2.3 Phase 3: Reconstruction & Abandonment, 1921 to 1989

Major changes were made to the bridge in 1921, although these are not well documented and limited only to a single section and elevation drawing in the CP Rail Record of Bridges and Culverts (Figure 143). Dated to April 1980 this lists the construction date and abutment modifications as 1893 and 1902 respectively, and that the "new thru pl. girders" were added in 1921. The illustration matches the existing bridge features and dimensions in nearly every way except that it shows only three spans instead of the four spans of the bridge as it stands today. Based on the consistent location of the caissons, the 1921 alterations included not only replacing the through trusses, but also removing the west approach span and reinstating the original 1893 west riverbank substructure from a pier back to an abutment.

The continuity in design and materials of the east approach span with the others suggests that it too, though omitted from the CP Record, was added during the 1921 alterations. Adding this span necessitated converting the east abutment into a pier and constructing a new abutment with bearing shelf on the west riverbank. These changes were no doubt required to adapt to changes in the river course, and represent the TH&B adapting to the changing conditions, rather than fighting the river through retaining walls, embankments, or other defences.

Despite these investments, the TH&B was entering a period of decline. Passenger service on the Hamilton to Waterford line had already been reduced in 1917 and ended entirely between Brantford to Waterford on September 25 and October 2, 1954 (Lefler 2013; Smith 2000:79). All TH&B passenger service to Hamilton ended on April 26, 1981, and freight service ended in May 1986 with a slope failure in Cainsville, east of Brantford (Thompson 2003; Lance Brown pers comm. 2020). The Hamilton-Waterford line was officially abandoned by CP on May 2, 1989 (Lefler 2013).

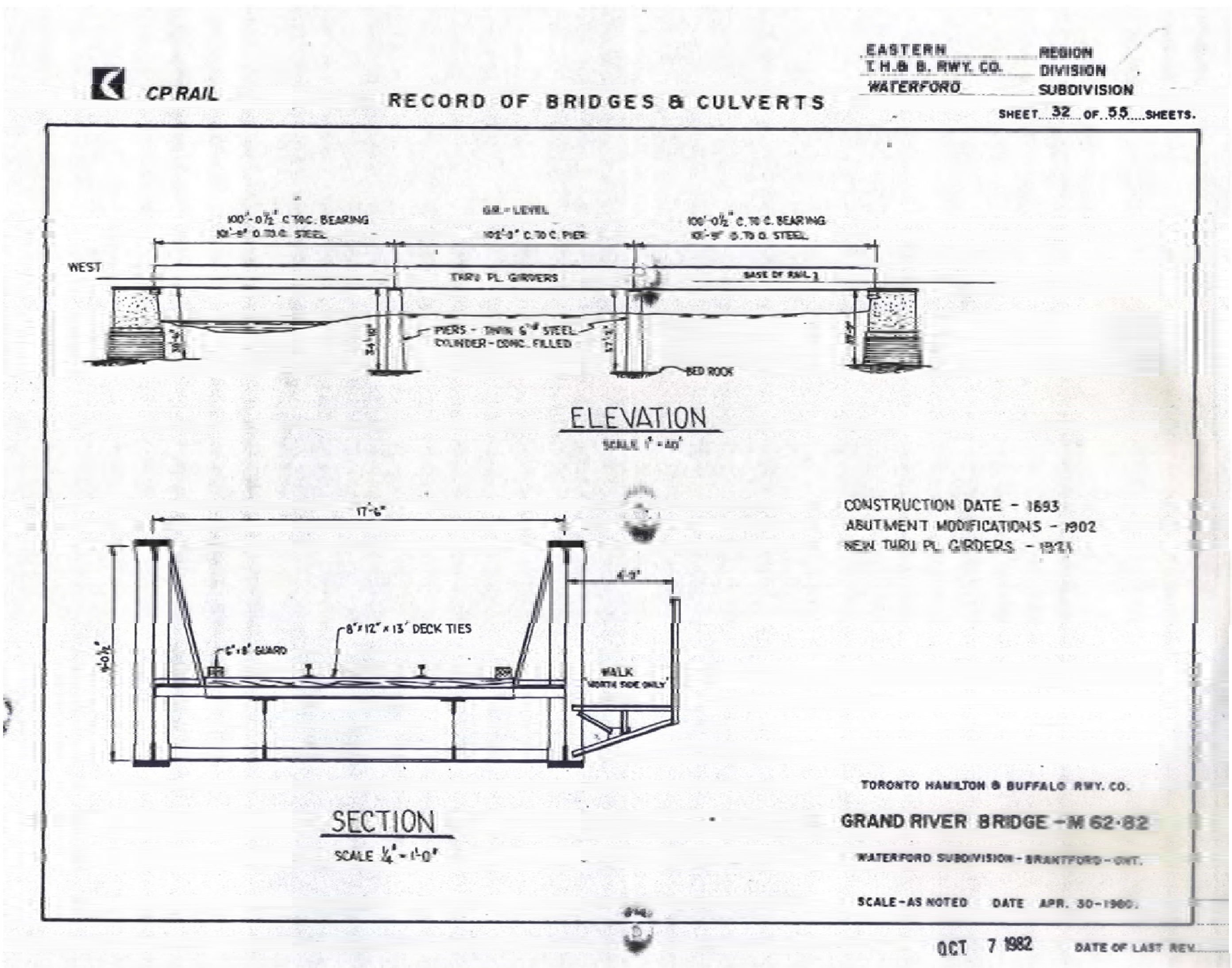

Figure 143: 1980 CP Rail Record of Bridges and Culverts for the TH&B Crossing Bridge (courtesy TH&B Historical Society)

8.2.4 Phase 4: Walking Trail Conversion, 1990 to present

Sixteen years after it carried its last train, the dormant TH&B Crossing Bridge was included in the 4 km of abandoned rail beds within Brantford purchased by the City in 2006. Plans were drafted by Wiebe Engineering Group Inc. to repair the east abutment in concrete (Figure 144) and refurbish the bridge for pedestrians, and within two years the TH&B structure was part of the City's walking trails system (Lefler 2013).

Figure 144: East abutment as found in 2006 (Wiebe 2006)

8.3 Integrity & Physical Condition

In a heritage conservation context, the concept of integrity is linked not with structural condition, but rather to the literal definition of "wholeness" or "honesty" of a place. The MHSTCI *Heritage Identification & Evaluation Process* (2014:13) and *Ontario Heritage Tool Kit: Heritage Property Evaluation* (2006:26) both stress the importance of assessing the heritage integrity in conjunction with evaluation under *O. Reg. 9/06*, yet do not provide guidance to measure integrity beyond referencing the *US National Park Service Bulletin 8: How to Evaluate the Integrity of a Property* (US NPS 2005). In this latter document, integrity is defined as "the ability of a property to convey its significance", so can only be judged once the significance of a place is known.

Other guidance suggests that integrity instead be measured by understanding how much of the asset is "complete" or changed from its original or "valued subsequent configuration" (Historic England 2008:45; Kalman 2014:203). Kalman's *Evaluation of Historic Buildings*, for example, includes a category for "Integrity" with sub-elements of "Site", "Alterations", and "Condition" to be determined and weighted independently from other criteria such as historical value, rather than linking them to the known significance of a place.

A detailed and component-level integrity investigation was not undertaken for this CHER, but a visual analysis indicates that the TH&B Crossing Bridge has an overall good level of integrity, as a substantial proportion reflects its initial construction and operation, as well as its later early 20th century reconstruction (Figure 145).

The bridge's physical condition was reported in the 2017 OSIM to be overall fair and requiring approximately $1,030,000 to repair and rehabilitate.

Figure 145: Visual integrity analysis of the TH&B Crossing Bridge

8.4 Evaluation of Cultural Heritage Value or Interest

The TH&B Crossing Bridge was previously evaluated at a preliminary level Historicbridges.org as the "Brantford Railway Girder Bridge" (2012) and in *Arch, Truss & Beam* under the name "T.H. & B. Railway Bridge" (2013).

- *Arch, Truss & Beam* (Heritage Resources Centre 2013:2013:37) determined that the bridge met five of the nine criteria of *O. Reg. 9/06* (1.i, 2.i & ii, and 3.i & ii.)
- Historicbridges.org rated it as a 4 out of 10 for both national and local historic significance.

The bridge was not evaluated in *Grand Old Bridges* (Robinson Heritage Consulting 2004).

The following evaluation provides an independent evaluation based on the field investigations, research, and analysis conducted as part of this CHER, and uses the criteria prescribed in *O. Reg. 9/06*.

8.4.1 Design Value or Physical Value

Criteria	Meets criterion (Yes/No)
(i) Is a rare, unique, representative, or early example of a style, type, expression, material or construction method.	**Yes**
Rationale: The TH&B Crossing Bridge is a relatively rare, unique, representative, and early example of a metal rail bridge in Ontario. Only 24 metal girder through bridges are listed in the Historicbridges.com database for Ontario, of which 20 are surviving. Except for the Freeport Railway Bridge over the Grand River in Kitchener (8 spans), Smiths Falls Railway Bridge (5 spans), and Woodstock Railway Bridge (4 spans), all have fewer spans than the TH&B Crossing Bridge. Most are of unknown date, with the earliest confirmed and surviving example being the 1909 Dufferin Street Bridge in the City of Toronto. While the relatively small number of comparative girder through bridge structures may reflect an incomplete inventory rather than rarity, the metal caisson pier bents of the TH&B Crossing Bridge do appear to be unique among all bridge types in Ontario. Like the Brant's Crossing Bridge, the good level of integrity at the TH&B Crossing Bridge makes it a representative example of early 20th century rail bridges and representative of the pony plate girder type. Additionally, though its superstructure was entirely replaced in 1921, the TH&B Crossing Bridge is an early example of an Ontario rail bridge, one of only 43 surviving in the province known to predate 1900 (Historicbridges.org).	

Criteria	Meets criterion (Yes/No)
(ii) Displays a high degree of craftsmanship or artistic merit.	**Yes**
Rationale: The good level of integrity of the TH&B Crossing Bridge —sustained in its superstructure for nearly a century, and the survival of its substructure in multiple flood and ice jam events over 127 years— suggests the bridge was built to a high degree of craftsmanship.	

Criteria	Meets criterion (Yes/No)
(iii) Demonstrates a high degree of technical or scientific achievement.	No
Rationale: As a multi-span beam bridge carrying a single rail line from relatively low banks over a narrow and shallow portion of the Grand River, the bridge does not demonstrate a high degree of technical or scientific achievement.	

8.4.2 Historical Value or Associative Value

Criteria	Meets criterion (Yes/No)
(i) Has direct associations with a theme, event, belief, person, activity, organization or institution that is significant to a community.	**Yes**
Rationale: The TH&B Crossing Bridge is directly associated with themes and organizations that are significant to the community. It is directly associated with Brantford's most profound period of industrial development between 1880 and 1930, and with the development of the City's rail transportation network over the same decades. Like the Lorne Bridge and Brant's Crossing Bridge, it also has direct associations with the recognized theme of bridge building over the Grand River and in Brant County, as well as representing the last of a succession of bridges in this location and one of multiple historical crossings of the Grand in Brantford, which collectively contributed to the City's social and economic growth. In its initial construction and operation, the TH&B Crossing Bridge is directly associated with the TH&B Railway Company and the Dominion Bridge Works Company. On a provincial level, the TH&B is not recognized in the Transportation and the Integration of Economies and Communities theme in the *Topical Organization of Ontario History*, yet locally the railway played a significant role in Brantford's economic development and growth through the late 19th to late 20th centuries, and the bridge both directly serviced the industrial area of Eagle's Nest and facilitated freight and passenger travel between Brantford and larger and smaller communities on the TH&B line. The bridge's connection to the Dominion Bridge Works Company is also significant, as by the time the bridge was built Dominion had a national reputation for their CP Rail cantilever bridge at Lachine; while the TH&B Crossing Bridge was not one of the Company's signature projects, it does represent the range of structures in Dominion's repertoire and may have been erected with the assistance of the Company's skilled Mohawk of Kahnawá:ke riveters, who travelled widely with the company.	

Criteria	Meets criterion (Yes/No)
(ii) Yields or has the potential to yield information that contributes to an understanding of a community or culture.	**Yes**
Rationale Further study of the bridge, despite its common form and materials, may yield information contributing to a greater understanding of late 19th to early 20th century bridge construction, the TH&B, and Brantford's development. It may reveal who designed or built it, and metallurgical and comparative studies could provide insights into late 19th to early 20th century steel production and the prevalence of metal caissons for bridge construction in Ontario. Additionally, archaeological remains of the earlier bridge may survive and provide insights into how this structure was built, although the extent of these remains is probably minimal.	

Criteria	Meets criterion (Yes/No)
(iii) Demonstrates or reflects the work or ideas of an architect, artist, builder, designer or theorist who is significant to a community.	No

Rationale:
Until it is identified who engineered the bridge in 1893, or who constructed the 1921 spans, it cannot be determined whether the bridge demonstrates or reflects the work or ideas of individuals or design firms that were significant to the community. A portion of the substructure can be attributed to the Dominion Bridge Works Company but its primarily functional design does not demonstrate or reflect the Company's expertise in bridge construction.

8.4.3 Contextual Value

Criteria	Meets criterion (Yes/No)
(i) Is important in defining, maintaining, or supporting the character of an area.	**Yes**

Rationale:
The bridge is important in defining, maintaining, and supporting the character of Brantford's core along the Grand River. With the Lorne Bridge and Brant's Crossing, as well as its historical links to the TH&B station just 340 m away, TH&B Crossing Bridge defines the industrial aesthetic of the riverscape, and links directly to the community's pride as an industrial centre. As the bridge with the oldest surviving elements in the area, it has supported this character longer than the other three structures, and through its steel construction it can be readily identified as part of the City's industrial and railway heritage.

Criteria	Meets criterion (Yes/No)
(ii) Is physically, functionally, visually, or historically linked to its surroundings.	**Yes**

Rationale:
Even now in its conversion for pedestrian use, the bridge is physically, visually, and functionally linked to crossing the Grand River Canadian Heritage River at this location and its retains physical and visual links to its history as a rail bridge connected to the industrial Eagle's Nest area. There are unimpeded visual and historical links between the Bridge and the Lorne and Brant's Crossing bridges, as well as historical links to the TH&B station a short distance to the east.

Criteria	Meets criterion (Yes/No)
(iii) Is a landmark.	**Yes**

Rationale:
For between 100 and 127 years the bridge has been a local landmark, one ingrained in Brantford's civic identity during its use as a rail line and more recently the subject of preservation efforts to incorporate it into the walking trail system.

8.4.4 Evaluation Results

The preceding evaluation has determined that the TH&B Crossing Bridge:

- **Meets seven of nine criteria of *O. Reg. 9/06* and therefore has cultural heritage value or interest as a built heritage resource**

Based on this evaluation, a Statement of CHVI is proposed below.

8.4.5 Statement of Cultural Heritage Value or Interest

Description of Property – The Brantford Toronto, Hamilton, and Buffalo (TH&B) Crossing Bridge

The TH&B Crossing Bridge is a four-span simple supported beam bridge with four identical girder spans. It carries the former TH&B Railway line across the Grand River and lies southwest of the downtown core of the City of Brantford between the Brant's Crossing Bridge to the north and BSAR Bridge to the south.

Statement of Cultural Heritage Value or Interest

The TH&B Crossing Bridge has cultural heritage value or interest for its design or physical value, historical or associative value, and for its contextual value. Erected by the Dominion Bridge Works Company in 1893, the bridge was to carry a freight and passenger line across the Grand River, servicing both the industrial area of nearby Eagle's Nest and facilitate transport to surrounding communities. Its original substructure survives in its masonry west abutment and rivetted steel caisson pier bents, the latter of which is rare in Ontario rail bridge construction. In 1921, its three Pratt through truss and one pony girder spans were replaced with four pony girder spans, which after a century remain virtually unaltered. This girder construction is representative of rail bridges of the time, yet the number of surviving examples with four or more spans is increasingly rare in Ontario, especially in the municipality and the surrounding area. The survival of the bridge's substructure over 127 years of heavy water and ice flow suggests the bridge was built to a high degree of craftsmanship.

The bridge has historical value for its direct association with the TH&B Railway, who played a significant role in Brantford's development from the late 19th century to the mid-20th century, and with the Dominion Bridge Works Company, who were nationally renowned for their bridge construction and for their highly skilled Mohawk riveters. It is also directly associated with Brantford's development as a prosperous industrial centre in the late 19th century and early 20th century.

The bridge's prominence, relationship to the Grand River Canadian Heritage River and nearby Lorne and Brant's Crossing bridges and TH&B station, as well as its industrial aesthetic of rivetted steel, ashlar masonry, and concrete all contribute to its contextual value, and it is considered to be a local landmark.

Heritage Attributes

Four-span simple supported beam bridge with:

- substructure with rivetted metal caisson pier bents and east stone masonry abutment
- superstructure composed of four identical pony plate girder spans
- deck with closely spaced wood ties
- clear, wide vistas of the Grand River and Lorne and Brant's Crossing bridges

9.0 SUMMARY STATEMENT AND RECOMMENDATIONS

In February 2020, GM BluePlan Engineering Limited (GM BluePlan) retained Golder Associates Ltd. (Golder) on behalf of the City of Brantford (the City) to conduct a Cultural Heritage Evaluation Report (CHER) to support the two-phase Three Grand River Crossings Schedule B Municipal Class Environmental Assessment (EA). The study area for the Class EA includes an approximately 800 m long by 150 to 300 m wide portion of the watercourse and banks of the Grand River in downtown Brantford, as well as the three crossings of the "Lorne Bridge", "Brant's Crossing Bridge", and "Toronto, Hamilton, and Buffalo (TH&B) Crossing Bridge". The concrete Lorne Bridge was built for road traffic in 1923, while the metal and concrete Brant's Crossing and TH&B Crossing Bridge rail crossings were erected in 1912-13 and 1893, respectively. The study area is also associated with the historic crossing of the Grand River by Indigenous leader Thayendanegea (Joseph Brant) in 1784, and includes remnants of crossings, rail lines, dams and recreational and institutional land-use dating from the late 19th century to 20th century.

The CHER was initiated to identify whether each bridge and the study area as a whole met the *Ontario Regulation 9/06 Criteria for Determining the Cultural Heritage Value or Interest* and if a subsequent Heritage Impact Assessment (HIA) was required to inform the short and long-term management options for each bridge and wider study area.

Following guidance developed by the Ministry of Heritage, Sport, Tourism and Culture Industries (MHSTCI) and other sources, this CHER outlines the purpose and requirements of cultural heritage evaluation and the methods used to investigate and evaluate built heritage resources and cultural heritage landscapes, describes the study area's geographic and historical context, inventories the built and landscape elements in the study area and at each bridge site, and for each discusses the structural history, architectural and engineering influences, integrity, and the physical conditions. It then evaluates the study area and each bridge using the criteria prescribed in *Ontario Regulation 9/06* and provides a Statement of Cultural Heritage Value or Interest (SCHVI) with Heritage Attributes for the study area and each bridge. Finally, it recommends future action.

From the results of research, field investigations, analysis, and evaluation conducted for this CHER, Golder concludes that:

- **the "Brantford Crossings" corresponding to the study area should be considered a potential cultural heritage landscape as it meets six of nine criteria of *O. Reg. 9/06***
- **the Lorne Bridge is a built heritage resource since it meets eight of nine criteria of *O. Reg. 9/06***
- **the Brant's Crossing Bridge is a built heritage resource since it meets seven of nine criteria of *O. Reg. 9/06*, and,**
- **the TH&B Crossing Bridge is a built heritage resource since it meets seven of nine criteria of *O. Reg. 9/06***

Based on these findings, Golder recommends to:

- **Conduct a Heritage Impact Assessment to identify the direct and indirect impacts of the preferred alternatives on the cultural heritage value or interest and heritage attributes of the Brantford Crossings cultural heritage landscape, the Lorne Bridge, the Brant's Crossing Bridge, and the TH&B Crossing Bridge and, if necessary, recommend conservation measures to avoid or reduce any identified adverse effects.**

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11.0 CLOSURE

We trust that this report meets your current needs. If you have any questions, or if we may be of further assistance, please contact the undersigned.

Golder Associates Ltd.

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Cultural Heritage Specialist

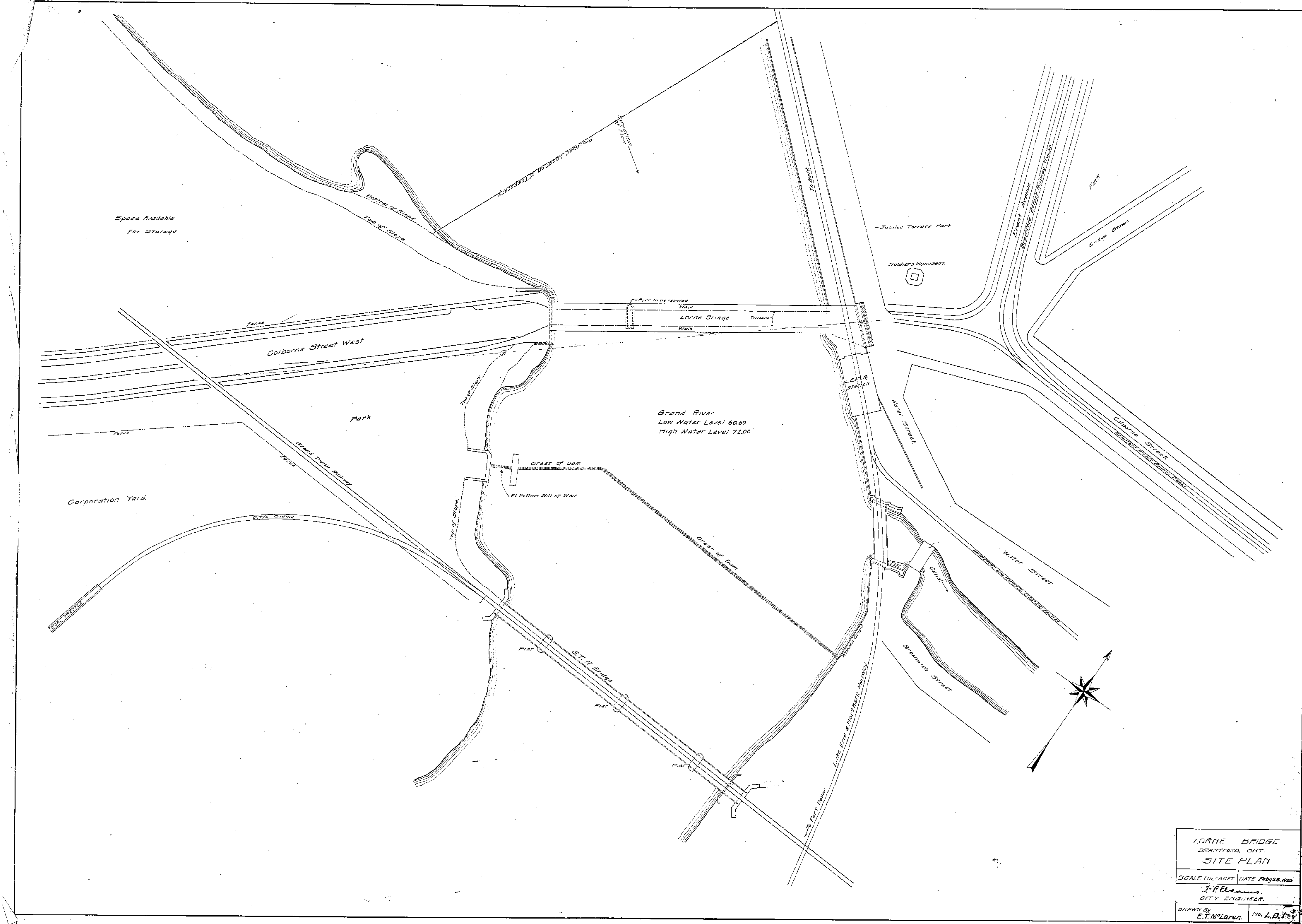
Michael Teal, MA
Associate, Senior Archaeologist

HC/MT/ly/LW/JK/AM/ca

https://golderassociates.sharepoint.com/sites/113598e/gmbprfp201982grandriverbrantford/shared documents/3. deliverables/edited cher and hia for golder/19128292-2000-r01-rev1-dec 6 2021 gm blueplan three bridges cher.docx

APPENDIX A

1923 Lorne Bridge Plans, Elevations, Details & Construction Specifications



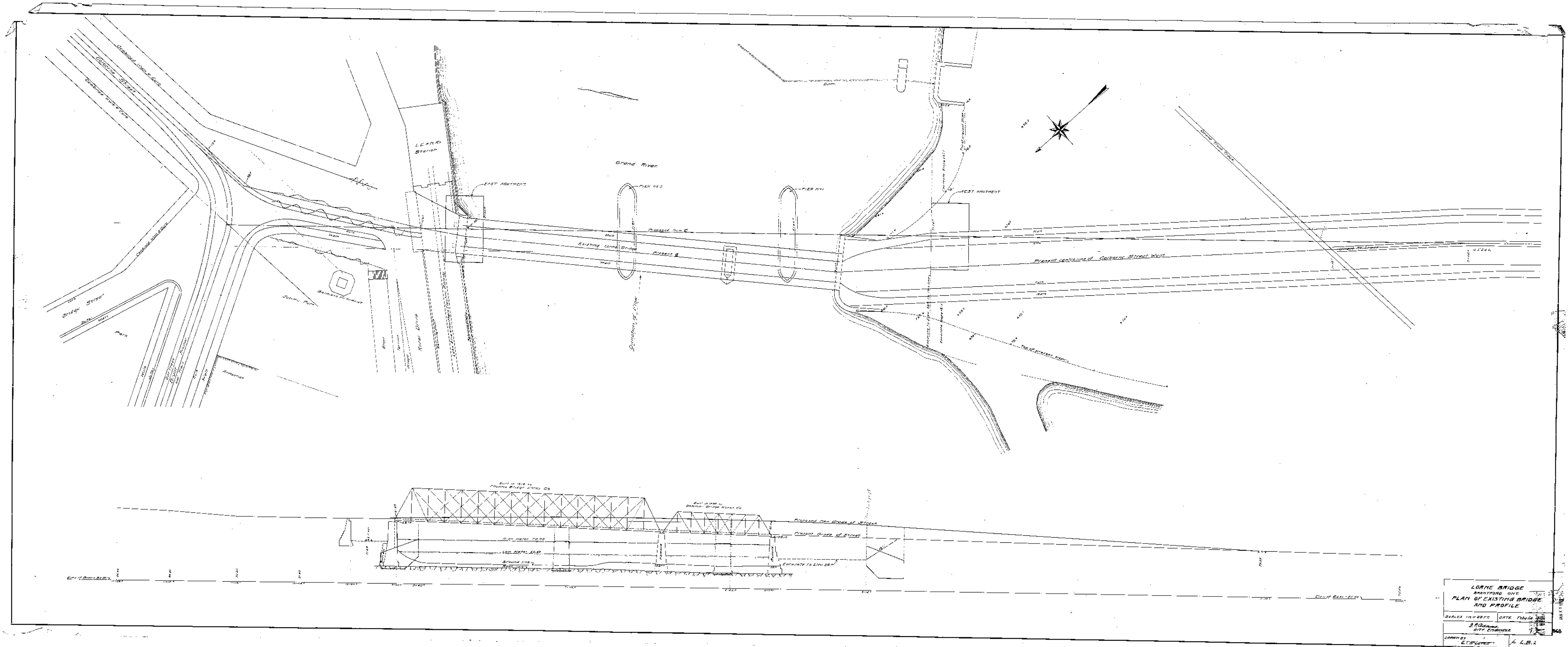
LORNE BRIDGE
BRANTFORD, ONT.
SITE PLAN

SCALE 1 IN. = 40 FT.	DATE Feby 26. 1925

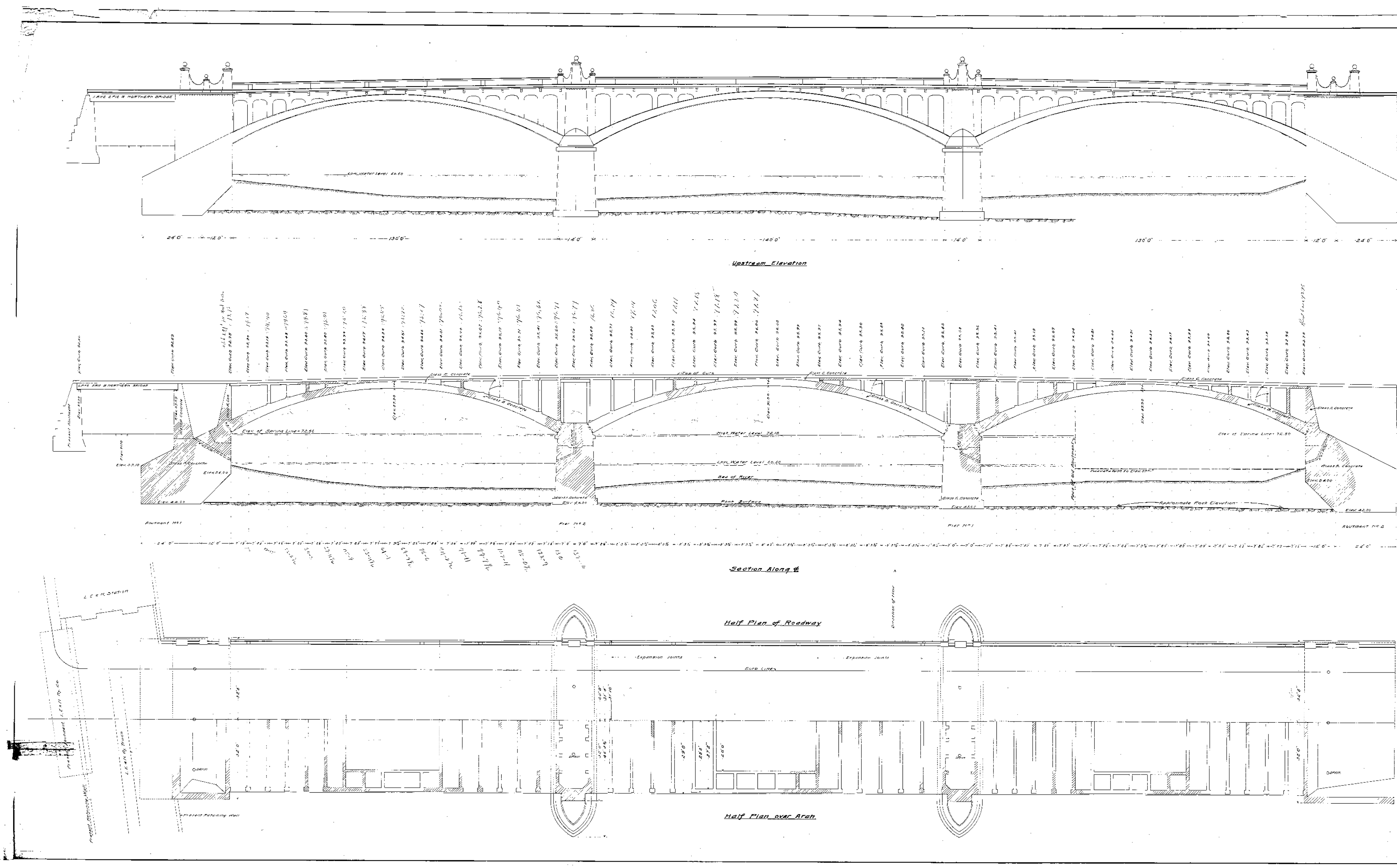
J. P. Adams.
CITY ENGINEER.

DRAWN By E.T. McLaren.	No. L.B. 1

1-83



Grand River
L.E.&N.Ry. Station
EAST ABUTMENT
PIER No 2
PIER No 1
WEST ABUTMENT
Existing Lorne Bridge
Present centreline of Colborne Street West
Bridge Street
River Drive
Phoenix Bridge Works Co.
Dominion Bridge Works Co.
Proposed New Grade of Street
Present Grade of Street
High Water 72.99
Low Water 66.66
Ground line
Excavate to Elev. 58
LORNE BRIDGE
BRANTFORD, ONT.
PLAN OF EXISTING BRIDGE
AND PROFILE
SCALES 1in.=20FT.
DATE Feby 26
CITY ENGINEER
DRAWN BY
E.T. McLaren
L.B.

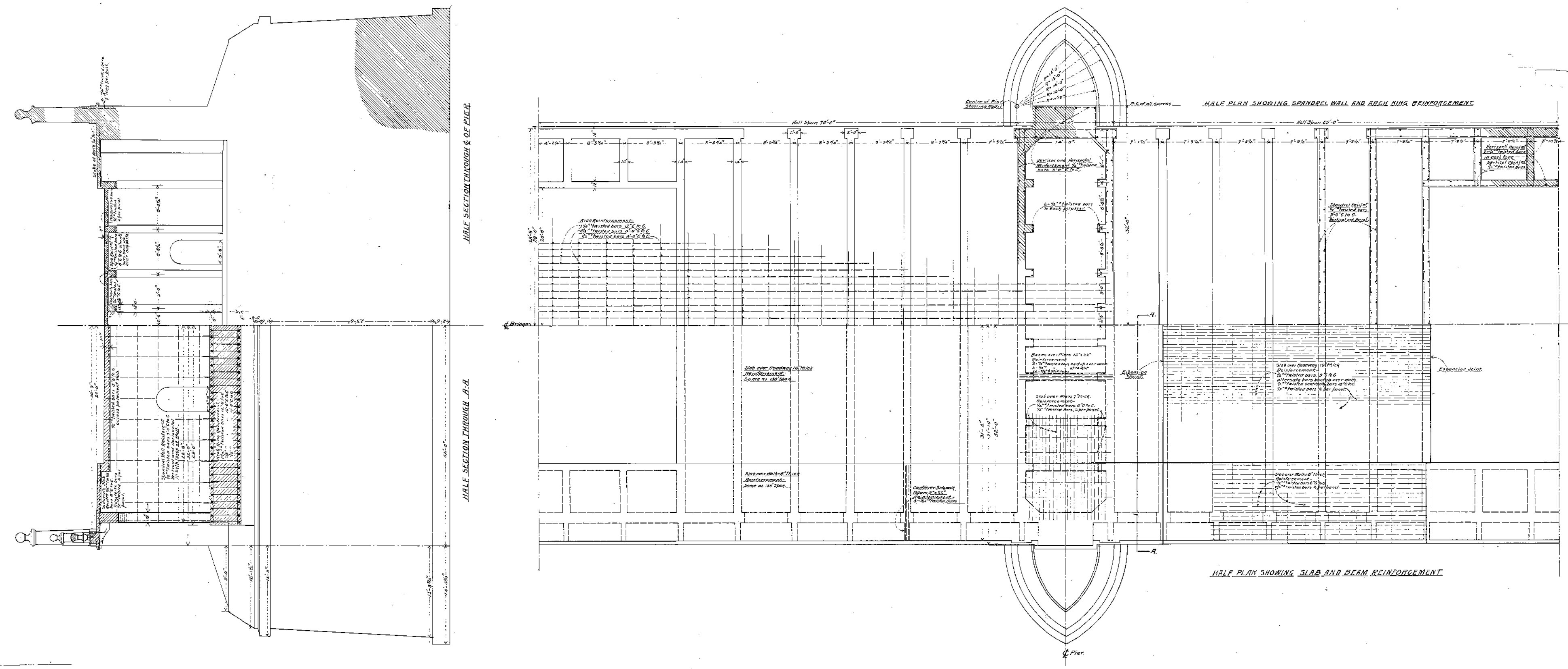


LORNE BRIDGE
BRANTFORD ONT.
GENERAL ELEVATION, SECTION, AND PLAN.

SCALE. 1 IN. = 10 FT.	DATE. Feby 26 1925.
J. P. Adams CITY ENGINEER	
DRAWN BY: E. T. McLaren	No. LB 5.

FEB X X 1972

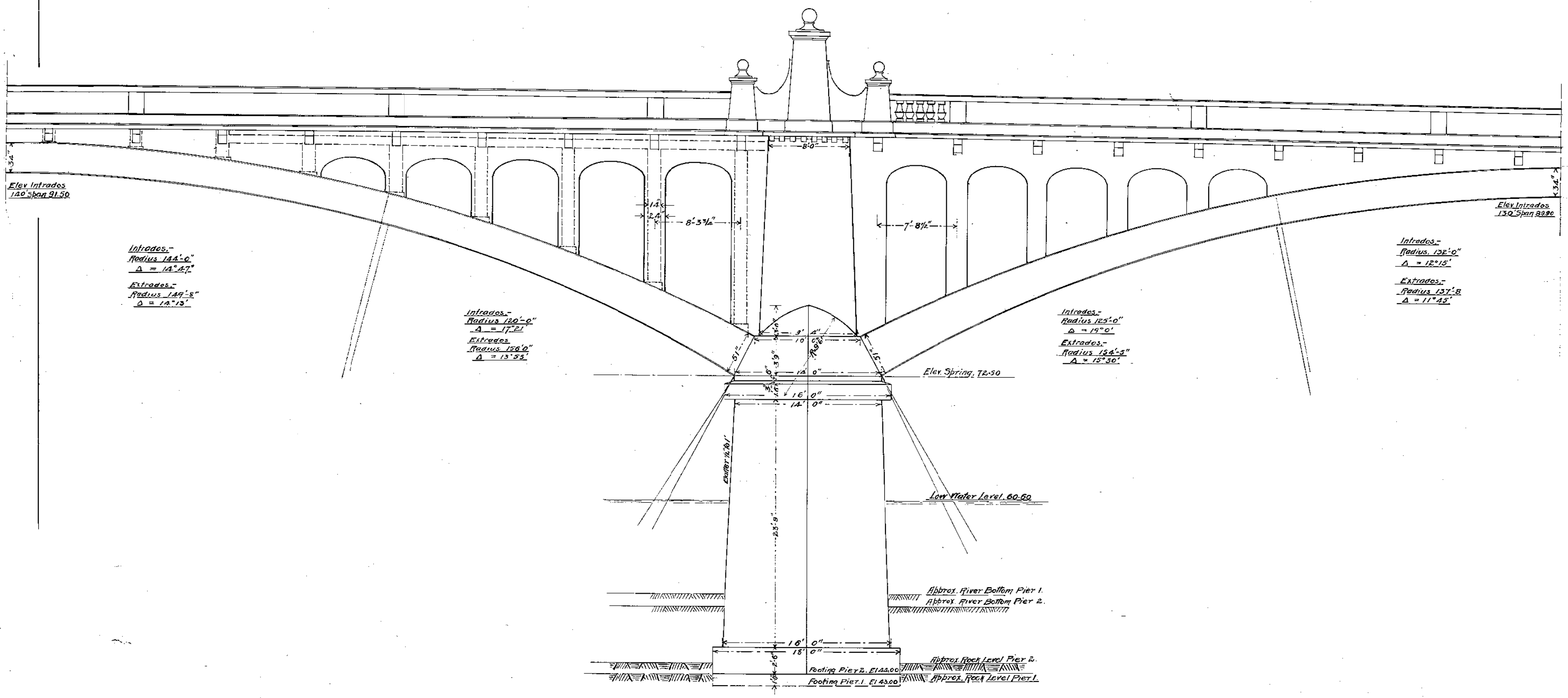
1-533



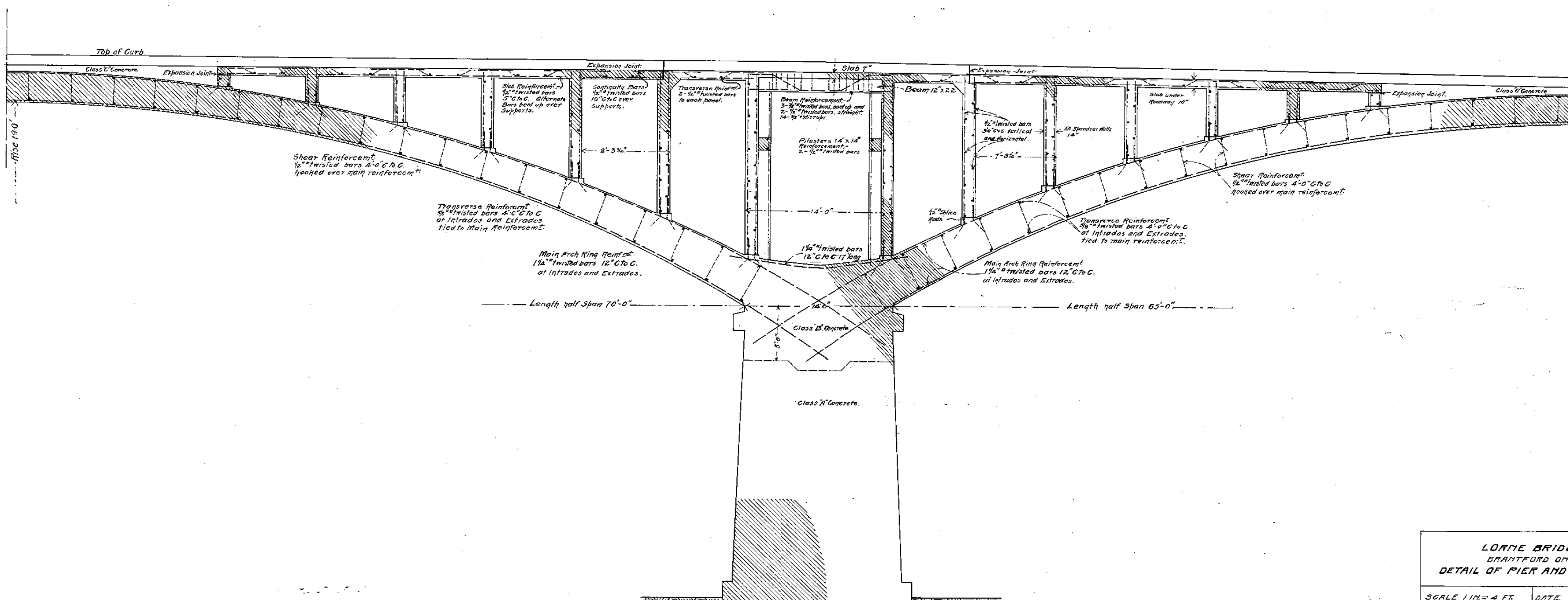
LORNE BRIDGE
BRANTFORD ONT.
DETAIL OF PLAN AND SECTIONS.

SCALE 1 IN. = 4 FT.	DATE. Feby 26. 1923
J. P. Adams. CITY ENGINEER.	
DRAWN BY. G. R. Hagey.	No. L.B. 4.

B-68
1-834



ELEVATION OF PIER AND ARCHES.

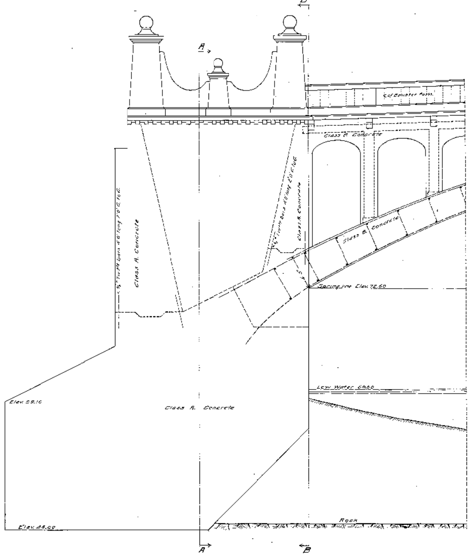


SECTION THROUGH ℄ OF BRIDGE

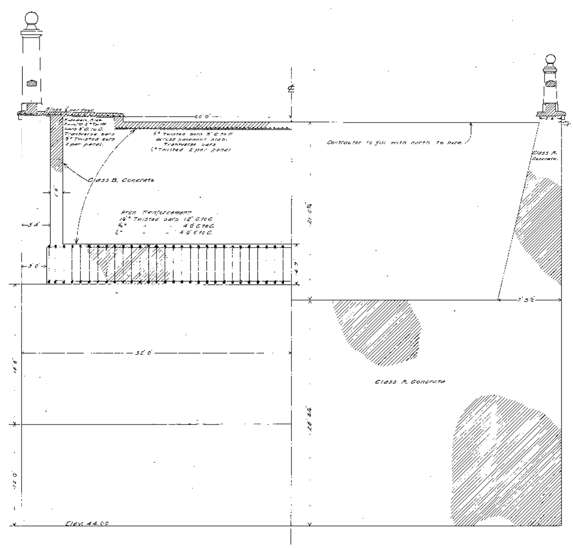
LORNE BRIDGE
BRANTFORD ONT.
DETAIL OF PIER AND ARCHES.

SCALE 1 IN. = 4 FT.	DATE. Feby 20. 1923.
J. P. Adams CITY ENGINEER.	
DRAWN BY. G. R. Hagey.	No. L.B.5.

868
1-835

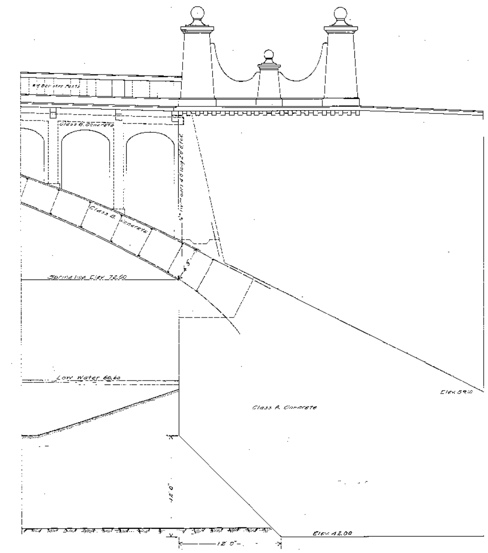


ELEVATION OF EAST ABUTMENT.

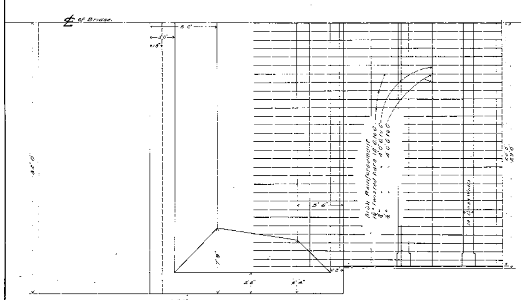


HALF SECTION ON B-B.

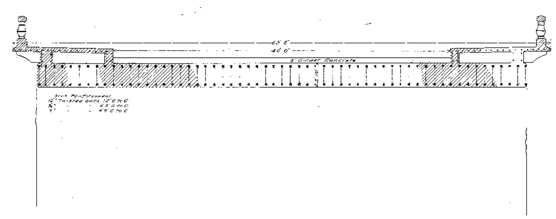
HALF SECTION ON A-A.



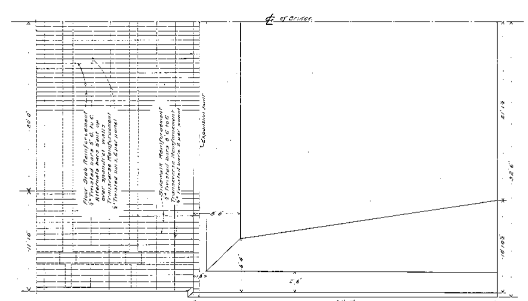
ELEVATION OF WEST ABUTMENT.



HALF PLAN OF EAST ABUTMENT
WITH FLOOR SLAB REMOVED.



TYPICAL CROSS SECTION AT
CENTRE OF ARCH.



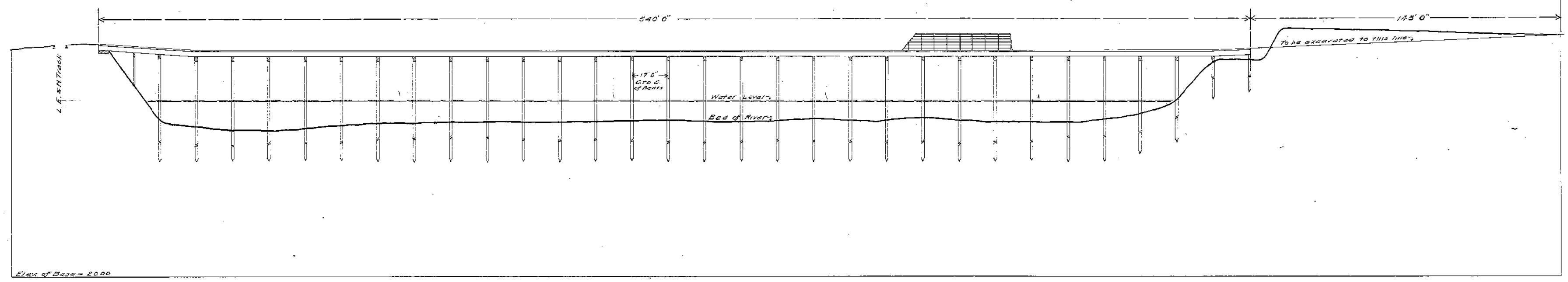
HALF PLAN OF WEST ABUTMENT
AND FLOOR SLAB

LORNE BRIDGE
BRANTFORD ONT.
DETAIL OF ABUTMENTS AND
TYPICAL CROSS SECTION

SCALE. 1 IN. = 4 FT.	DATE. Feby 26. 1923
F. P. Adams. CITY ENGINEER	
DRAWN BY E. T. McLaren.	No. L.B.6.

1-836

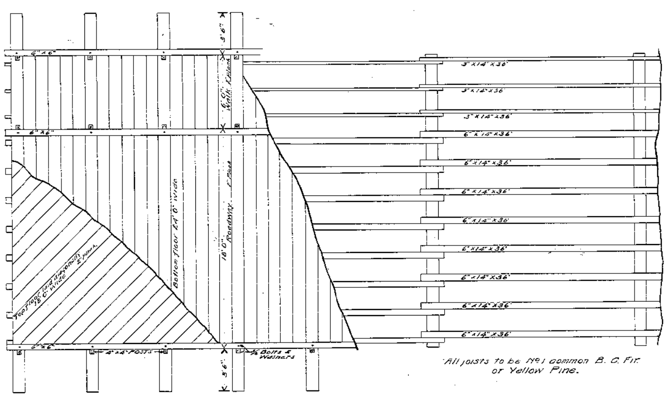
B-68



PROFILE OF PROPOSED PILE TRESTLE.

Scale Hor. 1in = 20ft. Ver. 1in = 10ft.

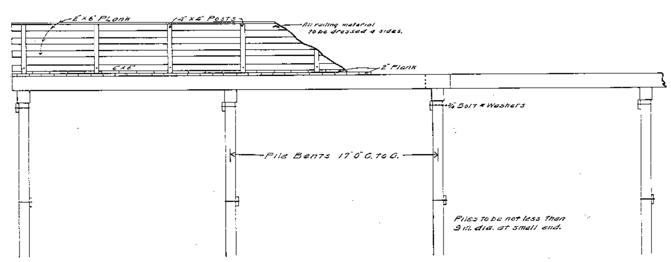
Formula for driving piles.
$P = \frac{2Wh}{S+1}$
P = safe load in tons = 10 tons.
W. = weight of hammer in tons.
h. = height of fall in feet.
S = penetration under last blow.
For a steam hammer use. $P = \frac{2Wh}{S+0.1}$



'All joists to be No. 1 common B. C. Fir. or Yellow Pine.

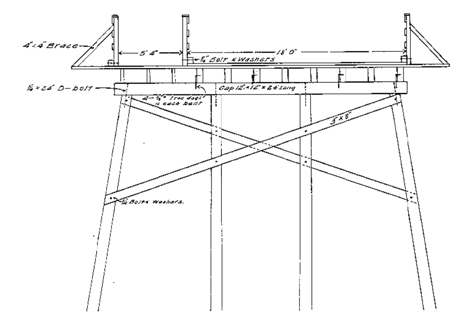
TYPICAL FLOOR PLAN.

Scale 1in = 4ft.



TYPICAL ELEVATION OF BENTS. AND RAILING.

Scale 1in = 4ft.



TYPICAL CROSS-SECTION OF BENT.

Scale 1in = 4ft.

PILE TRESTLE BRANTFORD ONT. DETAIL OF BENTS	
SCALE AS SHOWN	DATE. Feby 26 1923
J. P. Adams. CITY ENGINEER.	
DRAWN BY E.T. McLaren	No. L.B. 7.

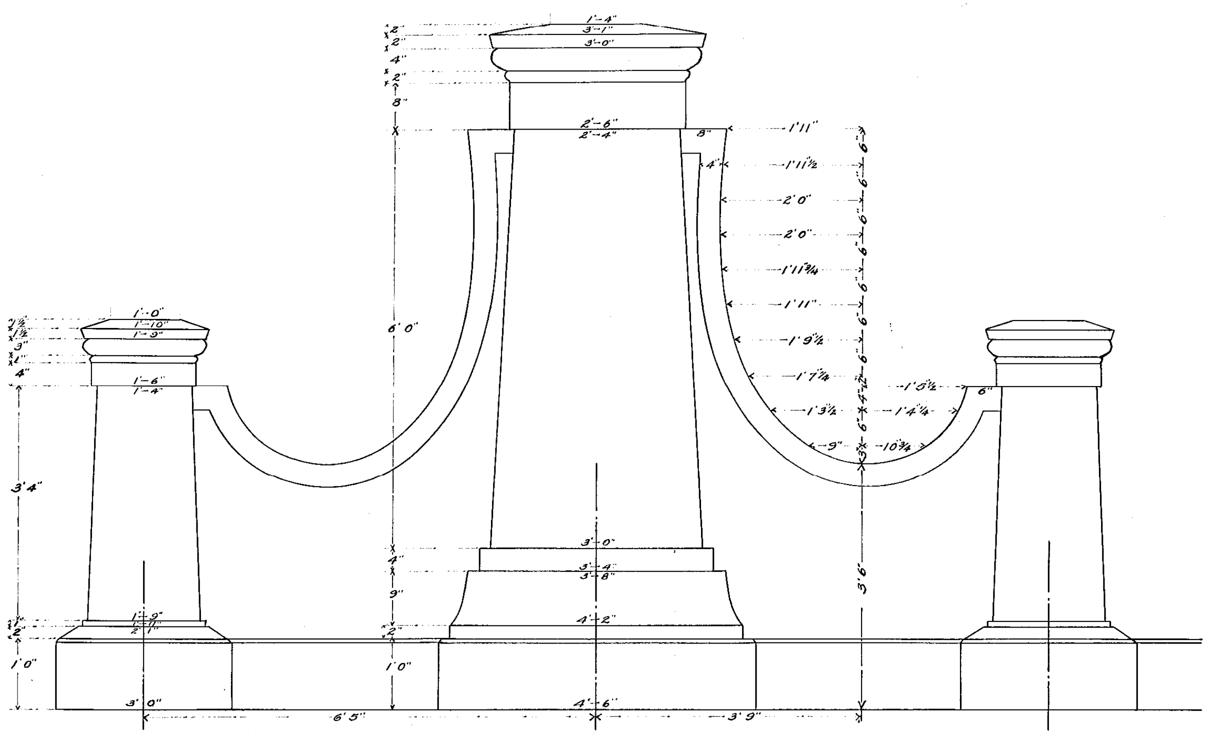
1-837

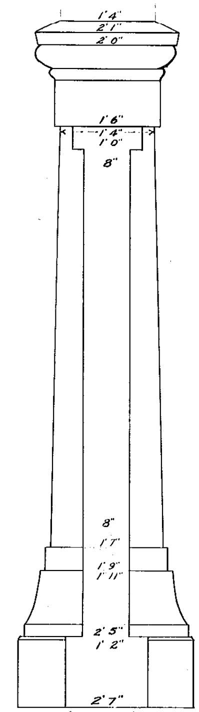
LORNE BRIDGE

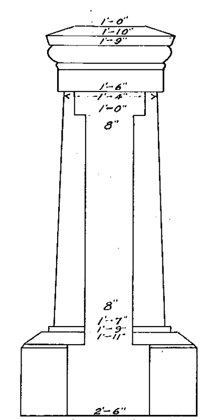
DETAIL OF POSTS OVER PIERS

Scale 1in.=1ft. ——— City Engineer

Brantford, Jan. 18th 1924





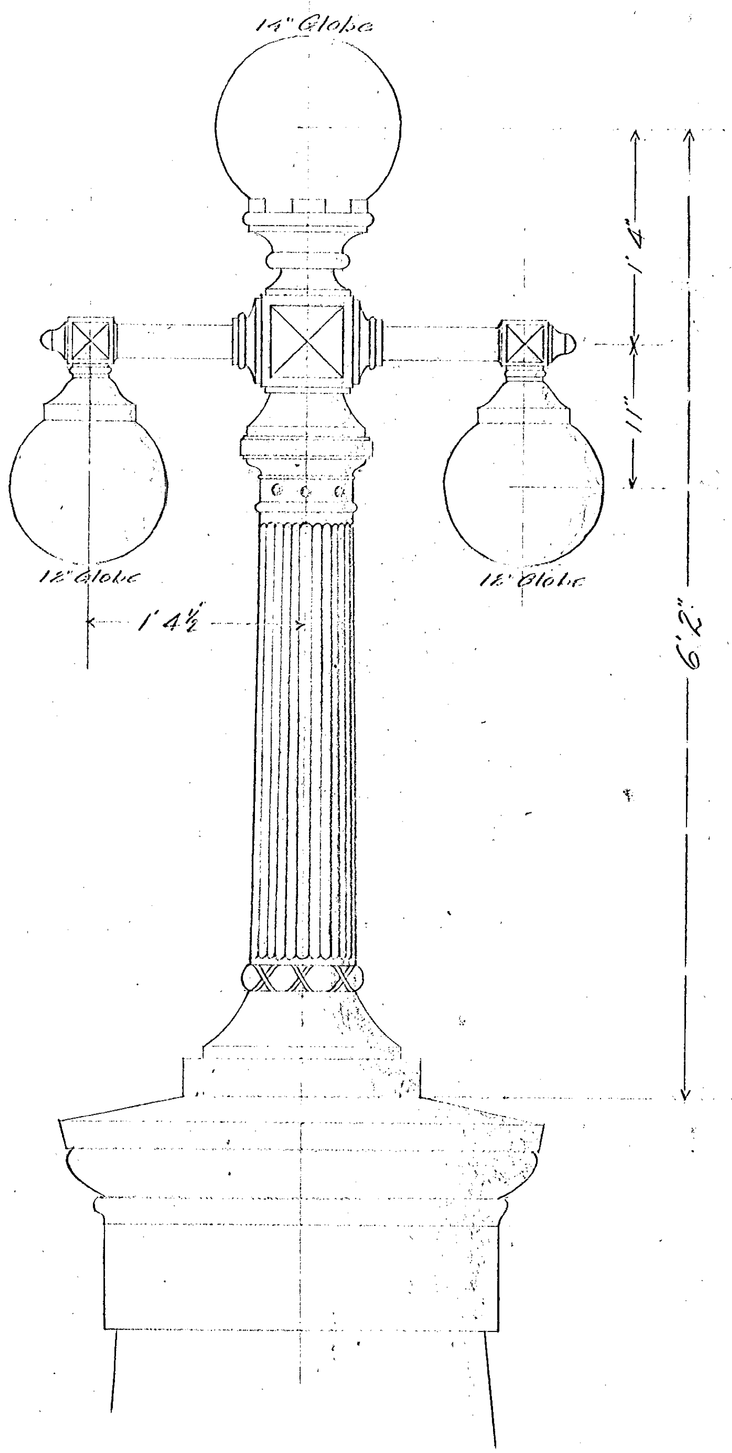


1-838

868

Lorne Bridge Brantford
Bronze or Cast Iron
Lighting Standard

Scale 1½" = 1'



City Engineers office
Brantford March [illegible]

B68

1-839

- SPECIFICATIONS -

- FOR THE CONSTRUCTION OF -

- LORNE BRIDGE -

for

THE CITY OF BRANTFORD, ONTARIO

These Specifications supplement the following drawings :-

L.B. 1	-	Site Plan.
L.B. 2	-	Plan and profile of Existing Bridge.
L.B. 3	-	General Elevation Section and Plan.
L.B. 4	-	Detail of Plan and Sections.
L.B. 5	-	Detail of Pier and Arches.
L.B. 6	-	Details of Abutments and Typical Cross Sections.
L.B. 7	-	Details of Temporary Bridge.

Frank P. Adams,

City Engineer.

City Engineer's Office,

Brantford, Ont. Feb. 26, 1923.

G E N E R A L

The work to be done under these Specifications comprises the construction of a three span reinforced concrete arch bridge across the Grand River in the City of Brantford, Ontario, connecting Colborne Street with Colborne Street West.

The work in general consists of :-

Item (a) The construction and maintenance of a temporary pile trestle bent bridge of the size and dimensions shown on drawings.

" (b) The dismantling and removal of the present steel truss bridge, abutments and pier.

" (c) The dismantling and removal of the superstructure of the bridge over the Lake Erie and Northern Ry. tracks.

" (d) The construction of a three span reinforced concrete bridge, complete, up to and including roadway and sidewalk slab of the dimensions shown on drawings.

EQUIPMENT, LABOR AND MATERIALS

The Contractor shall supply all equipment, labor and materials necessary for the completion of this work, except those materials particularly mentioned in these Specifications as being furnished by the City of Brantford.

TEMPORARY BRIDGE

Item (a) The Contractor shall erect and maintain upon the site indicated upon the plans, a temporary pile trestle bridge and approaches thereto, to accommodate the ordinary vehicular and pedestrian traffic crossing the river. This bridge shall be in place and ready to receive traffic before the present bridge is closed.

After erection the Contractor shall maintain the temporary bridge and approaches in a safe and serviceable condition and shall be responsible for its maintenance until the roadway and sidewalk slabs of the new bridge are ready to receive traffic.

Should the bridge or any part of it be damaged or carried away by floods or damaged or destroyed by other means the contractor shall immediately proceed to replace same so that traffic will not be interrupted for a longer time than is necessary.

DISMANTLING AND REMOVAL OF PRESENT BRIDGE PIERS AND ABUTMENTS

Item (b) The Contractor shall remove the two existing steel and wrought iron truss spans comprising the present Lorne Bridge. The various members of these trusses shall be properly matchmarked, taken apart and piled in the Corporation Yard, West Brantford.

The City will undertake to remove all wires, pipes and Public Utility Services from the bridge.

The existing concrete and stone abutments, wing walls and pier shall be taken down by the Contractor. The pier and Westerly abutment being dismantled to elevation 52 which is approximately the present bed of the river. The easterly abutment of the old bridge which is located on the site of the easterly abutment of the new bridge, will be entirely removed.

The stone from the old abutments and pier may be placed in the mass concrete of the new abutments and piers in the manner hereinafter provided or it may be deposited in the Corporation Yard, West Brantford, at the option of the Contractor.

DISMANTLING OF SUPERSTRUCTURE OF BRIDGE OVER L.E.& N. RY. TRACKS

Item (c) The Contractor shall take down and pile upon a site adjacent to the present bridge the flooring, steel beams and reinforced concrete slab of the superstructure of the approach span over the L.E.& N. Railway tracks. During this work he shall not interrupt the traffic of the L.E.& N.Ry. beneath the bridge. He shall also erect and maintain a safe and ample temporary entrance to the L.E.& N. Ry. station at the present level of the bridge.

REINFORCED CONCRETE BRIDGE

Item (d) Extent of work - The extent of the work covered by Item (d) of these Specifications shall consist of the supplying of all equipment, labor and materials necessary for the completion of a three span reinforced concrete bridge with the following exceptions:-

Cement - The City will supply all the Portland Cement F.O.B. cars, Corporation Yard, West Brantford, to be used in the structure.

The Contractor shall provide suitable storage and shall protect same from theft, or damage by weather until used in the work. The Contractor will be responsible for the return of empty cement sacks neatly tied in bundles of fifty, to the Corporation Yard and shall be responsible for any loss or shortage in same

Bridge Railing - The City will construct the reinforced concrete railing and parapet including ornamental posts over piers and abutments above the sidewalk level, but the Contractor will supply and place in position steel anchor bars to retain same as shown on plans.

Lighting Fixtures - The City will supply and instal the lighting standards for lighting the bridge including conduit for wiring same. The Contractor will place in position such conduits before concreting as required by the Engineer.

Trolley Poles - The City will supply the trolley poles for operating street railway cars over the bridge and the castiron or steel sockets to receive the same. The Contractor will place the sockets in position before concreting as directed by the Engineer.

Street Railway Tracks and Pavement - The City will lay the street railway track over the bridge and will pave the roadway including the approaches.

F O U N D A T I O N S

EXCAVATION

The Contractor shall do the necessary excavation for the construction of the abutments and piers.

The abutments and pier footings shall be carried to bed rock. The rock shall be cleaned from dirt and other soft material and excavated to an average depth of one foot. The surface of the rock shall be left rough for a proper bonding of the foundation.

Before concreting is commenced a boring ten feet deep shall be made in each pit to ascertain the condition of the sub surface rock.

DISPOSAL OF EXCAVATED MATERIAL

All excavated material not required for backfill around abutments shall be placed on the westerly approach to the bridge as directed by the City Engineer and surplus material will be spoiled on the vacant property owned by the City adjacent to the Westerly end of the bridge. No excavated material is to be placed in the river bottom.

SHEET PILING AND UNWATERING

The Contractor shall make all excavations for foundations water tight by suitable coffer dams and shall do all unwatering in connection with the excavation of same so that concrete can be placed dry.

EXCAVATIONS IN RIVER CHANNEL

REMOVAL OF OLD PIERS AND ABUTMENTS

The westerly abutment of the present bridge and the stone pier in the river shall be dismantled and removed to elevation 52 shown on plans which is approximately the present river bottom.

The easterly abutment of the present bridge which is located on the site of the new abutment will be removed to the rock.

The stone from the old abutments and pier may be used by the Contractor in the mass concrete of the new abutments in the manner hereinafter specified. Any surplus stone shall be removed to the Corporation Yard, West Brantford as directed by the City Engineer.

WIDENING RIVER CHANNEL

The Contractor shall excavate to elevation 59 as shown upon the plans that portion of the work extending from the old abutment to the face of the new abutment at the westerly end of the bridge. The new river bank being left at a slope of one and one half horizontal to one vertical. The material from this excavation shall be placed on the westerly approach of the bridge and over the two abutments up to the level of the top of the wing walls, care being taken to thoroughly compact the same as it is being placed. Surplus material being deposited upon the City property at the westerly end of the bridge.

C O N C R E T E

CEMENT

The cement will be furnished by the City on cars at the Corporation Yard West Brantford and the Contractor will take delivery at this point and provide suitable storage. Car shipments are to be kept separate in storage for the purpose of identifying tests. Cement shall not be used until notice is given of its passing the required tests.

If any cement is allowed to become wet or otherwise damaged or lost in storage after being delivered on the job, the value thereof at actual cost, is to be deducted from the amount due the Contractor.

Cement which may be rejected by the City Engineer shall be hauled from the Contractor's storage shed to the Corporation Yard at the expense of the City.

*CLASSES OF CONCRETE

The following classes of concrete shall be used in the work:- For abutments, piers and gravity retaining walls, Class "A" concrete shall be used. This shall consist of 1 part cement to 3 parts fine aggregate and 6 parts coarse aggregate.

For arch ring, spandrel walls, beams and floor slabs class "B" concrete shall be used which shall consist of 1 part cement, 2 parts fine aggregate and 4 parts coarse aggregate.

For filling over the crown of the arch Class "C" concrete shall be used which will consist of 1 part cement to 6 parts good clean cinders.

AGGREGATES

The concrete aggregates used throughout the work shall be clean and free from all earth, loam, sod or other material which in the opinion of the Engineer would tend to weaken the concrete. They shall pass the colorimetric test for aggregates suitable for use in high grade concrete adopted by the American Society for Testing Materials.

Sand, gravel and broken stone must be from a source of supply known to and approved by the Engineer.

FINE AGGREGATE

The fine aggregate (meaning sand) shall pass when dry a $\frac{1}{4}$ inch screen. Not more than 25 per cent shall pass a screen having 50 meshes per lineal inch and not more than 5 per cent shall pass a screen having 100 meshes per lineal inch. Fine aggregate shall be well graded from coarse to fine within the above limits. It shall be of such quality that mortar composed of 1 part of Portland Cement and 3 parts of fine aggregate by weight, when made into briquettes or cylinders, shall show a tensile or compressive strength at 7 and 28 days, at least equal to the strength of briquettes or cylinders composed of 1 part same cement and 3 parts of standard Ottawa sand by weight.

COARSE AGGREGATE

The coarse aggregate shall be gravel or broken stone retained when dry on $\frac{1}{4}$ inch screen, for class "A" concrete it shall contain no particles larger than 3 inches in their greatest dimensions.

For Class "B" concrete it shall contain no particles which will not pass $1\frac{1}{2}$ inch screen.

The coarse aggregate shall be clean and free from vegetable or other organic matter and soft, flat or elongated particles.

It shall be well graded from coarse to fine within the above limits.

GRAVEL

Pit run gravel may be used for Class "A" concrete providing it meets the requirements for aggregates specified above. It shall consist of 66 per cent coarse aggregate and 34 per cent fine aggregate and if it is found upon testing that the materials vary from these proportions, they shall be made up by adding the necessary quantities of sand, or of screened gravel or broken stone.

Pit run gravel may also be used for Class "B" concrete providing it is run through a crusher and reduced to a size, no particles of which, will be retained upon a 1½ inch screen. It shall consist of 66 per cent coarse aggregate and 34 per cent fine aggregate and if it is found upon testing that the materials vary from these proportions, they shall be made up by adding the necessary quantities of sand, or screened gravel or broken stone.

WATER

Water must be clean and free from acids, alkalies or other chemicals that would injure the concrete.

PROPORTIONS

All concrete shall contain enough cement to fill all voids in the fine aggregate and there shall be enough of the cement-sand mortar to fill the void in and coat all surfaces of the coarse aggregate.

Where 1:3:6 concrete is called for on the drawings, a mixture of one part Portland Cement to 3 parts of fine aggregate to 6 parts of coarse aggregate (parts to be measured by volume) is meant.

If pit gravel is used, the mixture shall consist of 1 part cement to 6 parts of the graded gravel. Concrete of this class shall not have less than 1.10 barrels of cement for each cubic yard of concrete in place.

Where 1:2:4 concrete is required, a mixture of 1 part of Portland Cement to 2 parts of fine aggregate to 4 parts of coarse aggregate (parts to be measured by volume) is meant.

If pit gravel is used the mixture shall consist of 1 part of cement to 4 parts of graded gravel. Concrete of this class shall contain not less than 1.50 barrels of cement for each cubic yard of concrete in place.

In no case shall sections, the surfaces of which are visilbe from any one point be poured with concrete composed of different aggregates. That is, gravel is not to be indiscriminately substituted for sand and broken stone during construction.

If it is practicable to make daily tests of aggregate and provided this aggregate runs uniform as to quality, it may be feasible to reduce the amount of cement above specified. In no case is this minimum to be changed without the approval of the City Engineer.

MEASURING

The method of measuring the materials for the concrete or mortar including water, shall be one which will insure separate and uniform proportions for each of the materials at all times. A sack of Portland Cement (94 lbs. net) shall be considered as one cubic foot.

MACHINE MIXING

All concrete shall be mixed by machine in a batch mixer of a type satisfactory to the engineer. The ingredients of the concrete or mortar shall be mixed to the specified consistency and the mixing shall continue at least one minute after all materials are in the drum before any part of the batch is discharged from the drum. The drum shall be completely emptied before receiving materials for the succedding batch. The volume of the mixed materials used per batch, shall not exceed the manufacturer's rated capacity of the drum in cubic feet of mixed material. The mixer shall be equipped with water storage.

CONSISTENCY

The consistency of the concrete shall be measured by the slump test in the manner described in Specifications of the American Society for Testing Materials. The slump for different types of concrete shall not be greater than indicated in the following table:-

Workability of Concrete

	Type of Concrete	Slump in inches
1.	Mass concrete	2
2.	Reinforced concrete	
	(a) thin vertical sections & columns	6
	(b) heavy sections	2
	(c) thin confined horizontal sections	8
3.	Mortar for floor finish	2

The amount of water to be used shall be only such as to permit the mixture to reach its place in the forms without tamping, but puddling with bars, spades or paddles around reinforcing steel and into the corners and crevices will be necessary.

PLACING On the top of wet masses of concrete of considerable thickness there will form a layer of a light substance called "laitance" which has no strength. In all cases this must be thoroughly removed before carrying the concrete higher.

The Contractor's plant for placing concrete shall be so arranged and operated that not more than 10 minutes shall elapse from the time of mixing the cement with the wet aggregate before the batch reaches its place in the forms.

Concrete shall not be dropped from a height, nor in such a way as to cause the ingregients to separate.

Layers of concrete shall not be tapered off in the forms, but instead shall have square ends.

The arch ring will be divided into transverse sections by bulkheads placed radially to the arch. Each section shall constitute a complete unit and the Contractor will be required to complete one or two units by continuous pouring as directed by the Engineer.

Before commencing to pour the arch ring, the Contractor will arrange to have sufficient materials on the ground to complete each section without stopping.

PROTECTION Surfaces shall be protected from sun and wind and the concrete sprinkled in dry weather so that the whole surface will be kept wet for a period of at least one week after placing.

If at any time during the progress of the work the temperature is below or in the opinion of the Engineer will within twenty-four hours drop to 35 degrees F. the aggregate and mixing water shall be heated and adequate precautions taken to protect the work from freezing for at least seven days after placing.

JOINTS All horizontal joints in a wall, abutment or pier, subject to shear, as from a thrust due to earth, water pressure or arch action shall be made with roughened and saw-toothed surfaces, or have stones inserted, or both, so as to prevent any possibility of sliding in the planes of such horizontal joints. As far as practicable such joints shall not be exactly level, but rather somewhat higher on the side or end opposite the pressure, to aid in preventing such sliding.

In general, construction joints shall be made in beams and floor slabd at right angles to line of stress and proper keys provided and in the location as may be directed by the Engineer.

Joints in arch rings shall be made by means of a bulkhead placed radially to the curve of the arch and having a key of proper porportions.

LARGE STONE IN MASS CONCRETE

The Contractor may use the large stone from present abutments and pier in the mass concrete of new abutments, providing same is first cleaned of all adhering mortar and dirt. The stone shall be lowered carefully by means of a hoist to a fresh concrete mortar bed and spaces of at least 12 inches left between the stones.

Stones shall not be placed closer than 24 inches to the outside faces of forms.

R E I N F O R C E M E N T

The steel reinforcement used throughout the work shall consist of square, twisted, new bars made either from new steel billets or from re-rolled rail steel and shall comply to the Specifications of the American Society for Testing Materials, Serial Designation A 15-14 Intermediate grade or hard grade deformed bars, or to Serial Designation A 16-14 for rail steel concrete reinforcing bars.

All bars supplied shall be free from rust, scale, paint or coatings of any character which would tend to destroy the bond.

The net cross-sectional area of the bars shall be equivalent to that of the plain bars of same size.

All metal reinforcement shall be stored so as to insure its being in the structure in a clean condition.

PLACING REINFORCEMENT

Reinforcement shall be placed in the exact location shown on the plans and wired at intersections so that it will not become disarranged during the depositing of the concrete.

The following lap shall be allowed for splices on the different sized bars:-

1-~~1/8~~ 1/4th	inch	square	twisted	bars	4 feet
¾	"	"	"	"	2 feet
5/8	"	"	"	"	1½ feet
½	"	"	"	"	1½ feet.

Splices in the reinforcement shall be made only as approved by the Engineer.

Steel reinforcing bars shall be placed at the following distances from the forms and held rigidly in place in these positions.

1-~~1/8~~ 1/4 inch	square	twisted	bars		in arch ring 3 inches from centre of bar to form.
3/4	"	"	"	"	in beams 2 inches from centre of bar to form.
5/8	"	"	"	"	in beams 2 inches from centre of bar to form.
1/2	"	"	"	"	in walls and floor slabs $1\frac{1}{2}$ in. from centre of bar to form.

The main reinforcing bars at the intrados of the arch ring shall be laid on reinforced concrete saddles or blocks, precast and of such dimensions that the reinforcement will be held at the proper distance from the forms.

The $\frac{1}{2}$ inch shear bars in the arch ring shall be bent to hook over the main reinforcing bars at the intrados and extrados of the arch.

Any reinforcement which has become coated with rust, concrete or dirt shall be thoroughly cleaned before concrete is poured.

INSPECTION OF REINFORCING STEEL

The City will require an inspection of all steel used throughout the work to be made at the mill. The Contractor to pay for such inspection. The City to appoint the Inspector.

F O R MS

Forms shall be substantial, unyielding and so constructed that the concrete conforms to the designed dimensions and shall be made tight to prevent the leakage of mortar. The forms for exposed surfaces shall be of sound lumber, tongued and grooved and planed to a uniform thickness.

Forms shall be filleted at all sharp corners and to be given a bevel or draw sufficient to insure their easy removal.

Forms shall be constructed of sufficient strength and rigidity to prevent any motion while the concrete is being placed.

In any case where metal anchorage within or through the face forms is required to hold the forms in true position, such anchorages shall be so constructed that the metal work can be removed to a depth of 2 inches from the face of the concrete without injury or damage to same. The cavities thus produced shall be filled with a mix similar to that in which the cavity occurs.

Face work shall be considered as the exposed surfaces of abutments, piers, outside face of spandrel walls and faces of arches.

OILING FORMS

Forms shall be painted with boiled linseed oil or other equally good preparation to prevent the concrete from adhering.

CLEANING FORMS

Ample provision shall be made for the removal of all saw-dust, shavings and other debris from forms just before placing concrete, and a sufficient number of openings left through which this material can be disposed of.

REMOVAL OF FORMS

Side forms shall not be removed before forty-eight hours and the supports for floors, slabs, beams and walls shall remain in place at least twenty-one days after concrete is poured.

When freezing weather occurs the supports shall remain in place for an additional time equal to the time the structure has been exposed to temperature of 40 degrees Fahrenheit or less.

Arch centering shall remain in place until the earth filling over the abutments is on position, and it shall be removed at such time as the Contractor may determine and at his own risk, but in no case shall the forms be taken down in less than forty-five days from the time concrete was poured.

To facilitate the removal of arch forms, hard wood wedges will be provided at all bearing points of arch centre forms. These will be well oiled before they are put in position and the centering lowered uniformly and slowly by means of the wedges.

F A L S E W O R K

The Contractor shall submit with his bid, plans of the falsework which he proposes to use to enable the Engineer to judge of its adequacy.

STRESSES IN FALSEWORK

In order that undue deflection or crushing of the caps, stringers and sheeting for the superstructure concrete may be avoided, the following stresses shall not be exceeded for B.C. Fir, Yellow pine or Oak timber:--

Fibre stresses in cross-bending, two thousand (2000) pounds per square inch.
Crushing across the grain, yellow pine, six hundred (600) pounds per square inch.
Crushing endwise of the grain for short blocks or stiff columns, Four thousand (4000) pounds per square inch.

Long posts must be braced in both directions so as to insure no failure of same, on account of slenderness. The unsupported length in any direction shall not exceed fifteen diameters of the stick when the unit stress equals that given above.

All of the above stresses shall be reduced one-half for green timbers and for sapwood.

F I N I S H

After the removal of the forms all exposed surfaces shalllbe carefully examined and cavities filled with mortar of the same proportion as that used in the original work.

All projections shall be chipped off and carefully ground down and the work left smooth and true to line.

The surfaces of abutments, piers, arch faces and face spandrel walls, shall be treated as follows:-

After cavities have been filled and projections removed, a creamy mortar consisting of one part cement to one part sand, shall be applied to the surface and before same has dried it shall be rubbed into the surface with a concrete brick made of a mixture of one part cement to two parts sand. After thoroughly rubbing in the mortar, the surplus mortar will be cleaned off with water and the surface left smooth, hard and of a uniform color.

The sidewalks and face of curbs shall be finished with a 1 to 2 cement mortar 1½ inches in thickness deposited when the concrete is placed.

Walks shall be trowelled smooth, blocked off and indented with suitable tools in a neat and workmanlike manner.

D R A I N A G E

The Contractor shall place in position drain pipes at the spring line of the arches in both abutments and over the piers as shown on drawings.

E X P A N S I O N   J O I N T S

Expansion joints shall be made in the floor slabs and faces of spandrel walls at the positions shown on the drawings. They shall be made by anchoring a wrought iron or steel plate seven inches in width and the full length of the joint on top of the spandrel wall over which the joint is to be made.

Elastite expansion joint material 5/8 inch in thickness and the full depth of the floor slab shall be placed between adjacent floor slabs to form the joint.

C O N D U I T S AND W I R I N G

The Contractor will leave openings in the spandrel walls and place in position such sleeves as may be necessary to accommodate all public service pipes, conduits and wires as may be required. He shall also place four manhole frames in the floor slab.

The Corporation and the Companies interested will furnish all materials required for this work and will lay all pipes and conduits but the Contractor will provide the openings for same.

P R O T E C T I O N   D U R I N G
C O N S T R U C T I O N

During construction the contractor shall protect adjoining structures against damage. At the easterly abutment he shall shore up excavations so that there will be no movement to existing abutment, station, retaining walls or roadbed, and during construction the traffic on the L.E.& N. Ry. shall not be interrupted.

C L E A N I N G   U P

After completion of the work the contractor shall remove all falsework piles and debris from the river channel, trim up slopes and leave the site of the bridge in a neat and orderly condition.

GENERAL CONDITIONS FOR
THE CONSTRUCTION OF LORNE BRIDGE

SUB-LETTING

No part of this contract shall be sublet without the consent of the Municipal Council of the City of Brantford.

INSPECTION OF PREMISES

It is assumed that before submitting a proposal every bidder has personally gone over the plans and Specifications and inspected the site of the proposed Bridge to satisfy himself of the local conditions. No allowance will be made for any extra work arising from the Contractor's failure to determine these local conditions.

EXTENT OF WORK

The Contractor shall give a separate price in his tender for Items A, B, C and D of these Specifications and the City reserves the right to eliminate from the Contract Items A and C and to let the remainder of the work to one Contractor under the terms and conditions of these Specifications.

FORM OF TENDER

Sealed tenders for the work shall be addressed to Ald. C. S. Moyer, Chairman of the Board of Works and shall be handed to the City Clerk, City Hall, Brantford, Ontario, not later than 12 o'clock noon, Saturday, March 24th, 1923. Tenders shall be marked plainly "TENDER FOR LORNE BRIDGE" and shall be properly sealed when delivered to the Clerk.

Tenders shall be made upon the Form of Tender supplied with these Specifications.

The above conditions must be strictly observed by bidders or their tenders may be declared informal.

BIDDER'S GUARANTEE

A Marked cheque or Bidder's Bond from an approved Surety Company for five per cent (5%) of the amount of the tender shall accompany each bid which will be forfeited should the bidder refuse to sign the necessary contract if the work is awarded to him.

Such marked cheque or Bidder's Bond will be returned when the Contract is signed and a construction bond furnished.

GUARANTEE

The Contractor shall execute a contract and furnish a Surety Company's Bond from an approved Surety Company, to the value of fifty per cent (50%) of the amount of the contract to construct said works according to the plans and Specifications and Instructions of the City Engineer and to guarantee that the same shall last and remain in all respects in perfect order and condition for a term of One year from the date of completion and in case they shall fail to do so, the Contractor will well and sufficiently repair the same as good as new at his own expense within ten days (10) after having been notified by the Engineer to do so.

PAYMENTS

Eighty-five per cent (85%) of the value of the completed work will be paid monthly as the work progresses, the remaining Fifteen per cent (15%) of the contract price will be paid thirty days after the completion of the whole work.

RATE OF WAGES

The Contractor shall pay the prevailing rate of wages to mechanics and laborers prevailing in the City of Brantford at the time they are employed.

BRANTFORD LABOR

In the employment of labor, preference shall be given to residents of Brantford.

COMPLETION OF WORK

The work shall be completed within nine months (9) after signing the Contract.

FORFEITURE FOR NON-COMPLETION

The Contractor shall pay the City the sum of One Thousand Dollars ($1,000.00) per month for every month after the time limit for the completion of this Contract has expired, as liquidated damages due to his failure to complete the Contract in the time specified.

MATERIALS

All materials furnished shall be of the best quality of their respective kind and shall be subject to the approval or rejection of the City Engineer, who shall have full power to condemn any work or material not in accordance with these Specifications and to require the Contractor to remove any such condemned work or material and to replace the same with new to the satisfaction of the City Engineer, whose decision shall be final as to the quality of the work and material.

The Contractor must at his own expense furnish such laborers as the City Engineer may deem necessary to assist in inspecting or laying out the work.

UNLOADING AND STORING MATERIALS

The Contractor shall have the right to unload materials for the construction of the bridge, on the Railway Spur in the West Brantford Corporation Yard and the same may be stored on the Corporation property at the Westerly end of the bridge on the North side of Colborne Street West, entirely at the Contractor's risk.

Traffic over the temporary bridge and the approaches thereto shall not be interfered with at any time due to the removal of materials or the storage of same.

PROTECTION

The Contractor shall close off, erect and maintain all necessary barricades to Streets stopped up by reason of the works. He shall place lights on material piles at night where necessary to protect the public and use every reasonable precaution to prevent accidents while prosecuting the work.

CLAIMS FOR SAMAGES

The Contractor shall pay all losses, damages or claims recovered that the City may be liable for and save harmless the City in all things from any accident or casualty, damages, losses or claims which may happen or arise by reason of any failure, neglect or refusal on his part or that of his agents, to prevent the same and to comply with any of the ordinances of the City in protecting the public.

The Contractor shall be responsible for all claims and damages due to accidents to workmen under the Workmen's Compensation Act.

CLAIMS FOR EXTRA WORK

Any work not herein specified, which may be fairly implied as included in this Contract of which the Engineer shall judge, shall be done by the Contractor without extra charge. The Contractor shall also do such extra work in connection with this Contract as the Engineer may in writing especially direct and when no price for such work is specified in the Contract, such price shall be fixed by the said Engineer, but no claim for extra work shall be allowed unless the same is done in pursuance to a written order aforesaid and the claim presented at the first estimate after the work is done.

Unit prices for each class of work are to be given in each proposal. These prices to be applied to quantities of work omitted from the Contract as a deduction from the contract price and to quantities of work found necessary as an addition to the Contract price.

DELAYS

No charge shall be made by the Contractor for hindrance or delay from any cause during the progress of any portion of the work embraced in this Contract.

To prevent all disputes and ~~liquidations~~ litigations the City Engineer for the time being of the City of Brantford, shall in all cases determine the amounts of the work to be done which are to be paid for under the Contract and he shall decide all questions which may arise relative to the execution of the Contract or of said work and his estimates, directions and decisions shall be final and conclusive and unimpeachable for any cause.

GOLDER
MEMBER OF WSP

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