APPENDIX A: COH 2011 B-LINE LIGHT RAIL TRANSIT (LRT) ENVIRONMENTAL PROJECT REPORT (EPR)

METROLINX

HAMILTON LRT LIGHT RAIL TRANSIT

Hamilton

Ministry of the Environment

Environmental Approvals Branch

2 St. Clair Avenue West
Floor 12A
Toronto ON M4V 1L5
Tel.: 416 314-8001
Fax: 416 314-8452

Ministère de l'Environnement

Direction des autorisations environnementales

2, avenue St. Clair Ouest
Étage 12A
Toronto ON M4V 1L5
Tél. : 416 314-8001
Téléc. : 416 314-8452

Ontario

Log: ENV1283MC-2011-3515
X-ref: ENV1283MC-2011-3343

December 22, 2011

Mr. Justin Readman
Manager, Rapid Transit
Environment and Sustainable Infrastructure Division
Public Works Department
City of Hamilton
400 – 77 James Street North
Hamilton ON L8R 2K3

Dear Mr. Readman:

Thank you for submitting your Notice of Completion of the Environmental Project Report (EPR) for the B-Line Rapid Transit project on October 14, 2011, in accordance with Ontario Regulation 231/08 – Transit Projects and Greater Toronto Transportation Authority Undertakings (Transit Regulation).

In accordance with the Transit Regulation, you can now proceed to issue a Statement of Completion to complete the transit project assessment process. The City of Hamilton must implement the Project in the manner it was developed and designed, as set out in the final Environmental Project Report (EPR). It must also obtain any other permits and approvals required to proceed with the construction and operation of the Project.

Given that you indicated you would amend the final EPR in specific places to address certain concerns, I also expect you will be providing revised individual pages of the final EPR to all agencies, individuals and public viewing locations which were provided with copies of the final EPR previously within 30 days of receipt of this letter and post the revised pages on the project web site.

Should you require further assistance please contact Lorna Zappone, Project Officer of the Environmental Approvals Branch, at 416-314-7106 or by e-mail at lorna.zappone@ontario.ca.

Yours sincerely,

George Karlos
Manager
Environmental Approvals Branch

Ontario Ministry of the Environment

Statement of Completion
Transit Projects

Ce formulaire est disponible en français

For Office Use Only		
Reference Number	Date Submitted *(yyyy/mm/dd)*	Initials

General Information and Instructions

General:

The information provided on this form is collected under the authority of the Ministry of the Environment's Transit Project Assessment Process as prescribed under Ontario Regulation 231/08 of the *Environmental Assessment Act*.

Instructions:

1. Questions regarding the completion and submission of this form should be directed to Client Services at the Environmental Assessment and Approvals Branch (416-314-8001 or 1-800-461-6290).
2. Please send the completed form to: Ministry of the Environment
   Director, Environmental Assessment and Approvals Branch
   2 St. Clair Avenue West, Floor 12A, Toronto, ON M4V 1L5
   Fax: 416-314-8452
3. If additional space is needed, please attach a separate sheet.
4. Please print or type all information clearly.

Proponent Information – *For mailing address, complete A and C* **or** *B and C.*

Proponent Name *(legal name of organization)*		Contact Name *(First, Last)*
City of Hamilton		Justin Readman
Telephone Number *(including area code and extension)*	Fax Number *(including area code)*	E-Mail Address
905-546-2424 ext. 1473	905-546-4435	justin.readman@hamilton.ca

Proponent Type

☒ Municipal ☐ Provincial ☐ Federal ☐ Other *(describe)*:

☐ Check here if more than one proponent *(List name(s) of co-proponent(s). Attach completed and signed Additional Proponent Information form for each co-proponent)*

Name(s) of Co-proponent(s):

A. Civic Address – Street Information *(applies to an address that has civic numbering and includes street number, name, type and direction)*	Unit Identifier *(identifies type of unit, such as suite and number)*
77 James Street North	

B. Delivery Designator

☐ Rural Route ☐ Suburban Service ☐ Mobile Route ☐ General Delivery

Delivery Identifier *(a number identifying a Rural Route, Suburban Service or Mobile Route delivery mode)*

C. Municipality/Unorganized Township	County/District	Province	Postal Code
Hamilton		Ontario	L8R 2K3

Project Information – *If project is a building, complete A. If project is a linear facility, complete B.*

Project Name

B-Line Rapid Transit Project

A. Site Address – Street Information *(applies to an address that has civic numbering and includes street number, name, type and direction)*	Unit Identifier *(identifies type of unit, such as suite and number)*

Non-Address Information *(includes any additional information to clarify physical project site location)*

B. Brief Project Description: The project involves the introduction of high frequency Rapid Transit service using Light Rail Transit (LRT). The 13.9 km dual-track line will run along Main Street between McMaster University and Highway 403, along King Street from Highway 403 through Downtown to the junction of King Street and Main Street, and along Main Street and Queenston Road to Eastgate Square. In addition to the terminus stops at McMaster University and Eastgate Square, 16 on-street stops will be strategically located along the route for access by walking, cycling and north-south bus routes. A new 325m, multi-span LRT-only bridge will be built to cross the Highway 403 corridor, the skywalk pedestrian bridge in the downtown area needs further assessment to define the extent of required modification, and the bridge over the Red Hill Valley Parkway requires improvements to be able to take the LRT loading. The B-Line LRT will operate with one vehicle per train, on a combination of shared and exclusive at grade guideway to allow cross-movements and access to properties. The LRT service will receive priority at signalized intersections, achieving high operating speeds compared to other modes of transport (such as buses and private vehicles), particularly during peak travel periods. Seven (7) power sub-stations will be built with a relatively even spacing arrangement along the corridor to feed power to the system via a network of overhead wires using a centenary system. These sub-stations will be fed from the main hydro grid at different locations. Special trackwork will be incorporated to provide efficient and reliable operation at key locations to be determined during subsequent design phases.

Date Notice of Commencement distributed *(yyyy/mm/dd) (date of first publication)*:	2011/06/17
Date Notice of Completion of Environmental Project Report given *(yyyy/mm/dd) (date of first publication)*:	2011/10/14
Date Minister's Notice given *(yyyy/mm/dd)*:	
Were any conditions imposed by the Minister?	☐ Yes ☒ No
Were any notices to suspend the 120-day period given?	☐ Yes ☒ No If yes, provide number of days project timelines were suspended:
Were any objections submitted to the Minister?	☒ Yes ☐ No
Was a Revised Environmental Project Report prepared?	☐ Yes ☒ No If yes, date Revised Environmental Project Report submitted *(yyyy/mm/dd)*: and date Minister's Notice given *(yyyy/mm/dd)*:

Location of Public Available Documentation*

Civic Address – Street Information *(applies to an address that has civic numbering and includes street number, name, type and direction)*	☐ Same as Site Address	Unit Identifier *(identifies type of unit, such as suite and number)*
77 James Street North		Suite 400
Municipality/Unorganized Township	County/District	Postal Code
Hamilton		L8R 2K3
Contact Name for information about project documentation *(First, Last)*		Telephone Number *(including area code and extension)*
Justin Readman		905-546-2424 ext. 1473
Website containing project documentation *(if applicable)*		
www.hamiltonrapidtransit.ca		

* Proponents are required to retain, either on site or in another location where they will be readily available, any publicly available pre-planning reports/information; Environmental Project Report; Revised Environmental Project Report; Addendum to Environmental Project Report; and all given or received notices and Statements of Completion prepared under the Transit Project Assessment Process, as well as documentation of any commitments made by the proponent to address concerns in any of the above-noted reports.

Statement of Proponent

I, the undersigned hereby declare that, to the best of my knowledge, the information contained in this Statement is complete and accurate and I have complied with the Transit Project Assessment Process requirements set out in Ontario Regulation 231/08 under the *Environmental Assessment Act*.

I, the undersigned, intend to proceed with the above-noted project in accordance with the: *(check only one)*

☒ Environmental Project Report
☐ Environmental Project Report, subject to the conditions set out in a Minister's Notice
☐ Revised Environmental Project Report

I have the authority to bind the proponent.

Name *(please print)*	Position Title
Gerry Davis	General Manager
Signature	Signature Date *(yyyy/mm/dd)*
	January 11, 2012

steer davies gleave

SNC·LAVALIN

Hamilton Rapid Transit Preliminary Design and Feasibility Study

B-LINE

ENVIRONMENTAL PROJECT REPORT

v1.0

With Updated Table 4.5

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RAPIDTransit moving HAMILTON forward

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DIALOG

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Hamilton Rapid Transit Preliminary Design and Feasibility Study

B-LINE

ENVIRONMENTAL PROJECT REPORT

v1.0

October 2011

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GLOSSARY OF TERMS AND ACRONYMS

Following are definitions of the common terms and acronyms referred to when discussing the B-Line Rapid Transit initiative.

AAQC - Ambient Air Quality Criteria

A-Line

Proposed north/south rapid transit corridor along James/Upper James (from the Waterfront to the Airport) in the City of Hamilton.

ANSI – Area of Natural and Scientific Interest

BHR – Built Heritage Resource

B-Line

Existing east/west express route and proposed east/west rapid transit corridor along King Street (from McMaster University to Eastgate Square) in the City of Hamilton.

BRT – Bus Rapid Transit

Similar to light rail transit, operating predominantly in protected rights-of way, separate from other traffic, but using advanced bus technology. Combines stations, vehicles, running ways, a flexible operating plan and technology into a high quality, customer focused service that is frequent, fast, reliable, comfortable and cost-efficient. The capacity of BRT is typically 2,000 to 10,000 passengers per hour, peak direction. Average speed: 15 to 40 km/h depending on station spacing, with higher speeds possible on grade separated rights-of-way on controlled access highways. Example: Vancouver 98B Line (Richmond section), Ottawa Transitway system.

CEAA – Canadian Environmental Assessment Act

CHL – Cultural Heritage Landscape

Class EA - Municipal Engineers Association Class Environmental Assessment

A planning process that must be applied to all municipal infrastructure projects. It is an evaluation of all environmental implications of a project and involves extensive public consultation to identify and mitigate any adverse impacts.

COSEWIC – Committee on the Status of Endangered Wildlife in Canada

COSSARO - Committee on the Status of Species at Risk in Ontario

CTA – Canada Transportation Act/Canadian Transportation Agency

CWR – Continuous welded rail

dBA – A-weighted decibels

Environmental Assessment (EA)

An Environmental Assessment (EA) is a process used in Ontario to determine the possible impacts that proposed infrastructure projects may have on the environment so that the best possible decisions can be made on if, where, when and how to construct such projects.

EMME – Name of software used for design for modelling multi-modal networks with all modes integrated, particularly used in public transport modelling

GRIDS – Growth Related Integrated Development Strategy

GRIDS was an integrated planning process that identified a broad land use structure, associated infrastructure, economic development strategy and financial implications for the growth for the City of Hamilton over the next 30 years. It is based on the development of nodes (central foci of community activity) and corridors (mixed use, transit friendly linkages) throughout the city that will be interconnected as a result of their high transit potential.

GTHA – Greater Toronto and Hamilton Area

The metropolitan region encompassing the City of Toronto, the four surrounding Regional Municipalities (Durham, Halton, Peel and York) and the City of Hamilton.

HADD - harmful alteration, disruption or destruction of fish habitat, as defined in the federal *Fisheries Act*

HCA – Hamilton Conservation Authority

Headway

The scheduled time between successive transit vehicles on a given route.

High Order Transit

Bus or light/heavy rail that operates in its own right-of-way or in a priority situation, and, therefore, moves more efficiently than the regular flow of traffic and can carry large numbers of people quickly and comfortably.

Intensification Corridors

Intensification areas along major roads, arterials or higher-order transit corridors that have the potential to provide a focus for higher density mixed-use development consistent with planned transit service levels. [Source: Ministry of Energy and Infrastructure, Growth Plan for the Greater Golden Horseshoe, 2006.]

MBCA – Migratory Birds Convention Act

LRT – Light Rail Transit

A lightweight rail car (LRV) rapid transit service operating on fixed rails in the right-of-way, usually at street-level, is typically propelled by overhead electrical wires, and offers a frequent, fast, reliable, comfortable and high quality service that is environmentally sustainable. Capacity of 2,000 to 10,000 passengers per hour in the peak direction, with higher capacities where there are significant stretches of completely segregated rights-of-way. Average speed: 15 to 35 km/h depending on station spacing and extent of grade

Examples: Calgary and Edmonton LRT systems.

LRV – Light Rail Vehicle

Major Transit Station Areas

The area including and around any existing or planned higher-order transit station within a settlement area, or the area including and around a major bus depot in an urban core. Station areas generally are defined as the area within an approximate 500 metre radius of a transit station, representing about a 10-minute walk. [Source: Ministry of Energy and Infrastructure, Growth Plan for the Greater Golden Horseshoe, 2006.]

Metrolinx

The public authority that manages transportation planning, including public transport, within the Greater Toronto Area and Hamilton in the province of Ontario. Metrolinx is legally known as the Greater Toronto Transportation Authority (GTTA).

MOE – Ontario Ministry of the Environment

MNR – Ontario Ministry of Natural Resources

MoveOntario 2020

A Provincial program to invest in 52 rapid transit projects across the GTHA, including two projects in Hamilton (A-Line and B-Line). The vision of the program is to improve the quality of life in the GTHA, by investing $17.5 billion in projects that will move people efficiently around the region. The goal is to create 800 million new transit trips per year, taking 300 million car trips off the GTHA roads.

MTC – Ontario Ministry of Tourism and Culture

MTO – Ministry of Transportation of Ontario

OCS – Overhead Catenary System

Particulate Matter

Particulate matter is the general term used for a mixture of solid particles and liquid droplets found in the air. These particles, which come in a wide range of sizes, are emitted directly from sources or formed in the atmosphere by the transformation of gaseous emissions into secondary pollutants. Total suspended particulate matter, or TSP, refers to the fraction of PM having a diameter less than or equal to 100 microns. Inhalable particulate matter, or PM_{10}, refers to the fraction of PM having a diameter less than or equal to 10 microns. Respirable particulate matter, or $PM_{2.5}$, refers to the fraction of PM having a diameter less than or equal to 2.5 microns. The smaller the particle size, the farther the particle can penetrate into the lungs. Therefore, smaller particles pose the greatest potential for human health effects. The greatest effect on human health is from particles 10 microns or less in diameter, which can aggravate bronchitis, asthma, and other respiratory diseases. People with asthma, cardiovascular or lung disease, as well as children and elderly people, are considered to be the most sensitive to the effects of airborne PM_{10} or $PM_{2.5}$.

POR – Point of Reception (in the context of noise sensitive areas and receptors).

Rapid Transit

Transit service separated partially or completely from general vehicular traffic and, therefore, able to maintain higher levels of speed, reliability and vehicle productivity than can be achieved by transit vehicles operating in mixed traffic.

ROW – Right-of-way

RTFS - Rapid Transit Feasibility Study

The primary purpose of the Rapid Transit Feasibility Study was to provide City of Hamilton Council, staff and the public with an initial view of the opportunities that rapid transit can represent, and the constraints that need to be addressed in making the decision to pursue rapid transit.

Streetscaping

Streetscaping refers to design of urban roadways and conditions as they affect the people that use them. Streetscapes are an important part of the public spaces where people safely interact, which help define a community's transport conditions, activities, aesthetic quality and identity. Streetscaping (programs to improve streetscape conditions) can include traffic management, sidewalk conditions, landscaping, street furniture (utility poles, benches, refuse disposal cans, etc.), building fronts and materials specifications.

TDM – Transportation Demand Management

TDM encompasses alternatives to the single occupancy vehicle (i.e., transit, walking, biking, car pooling) and the measures or techniques that encourage the use of these alternate modes in order to maximize the people moving capability of the overall transportation system.

TMP or HTMP - Transportation Master Plan (Hamilton Transportation Master Plan)

The TMP was endorsed by Public Works Committee and Council in February 2007. The preferred strategy is to rely on transit, transportation demand management (TDM), in combination with road capacity optimization. It included a high-order transit strategy and outlined three potential rapid transit corridors:

- King/Main between Eastgate Square and McMaster University;
- James/Upper James between Downtown and Rymal Road; and
- An East-West route across the Mountain.

TOD - Transit Oriented Development

A form of development that represents an alternative to urban sprawl. Major characteristics include: a sufficient density to encourage public transit use; location of residences, jobs, and retail destinations close to public transit; mixed uses, with retail and employment within walking distance of residential areas; and urban design guidelines and design features to encourage a safe pedestrian orientation.

TPSS – Traction Power Substation

VISSIM - A micro simulation and modelling software package for modelling complex interactions between different transport modes. Can be used at a network or intersection level.

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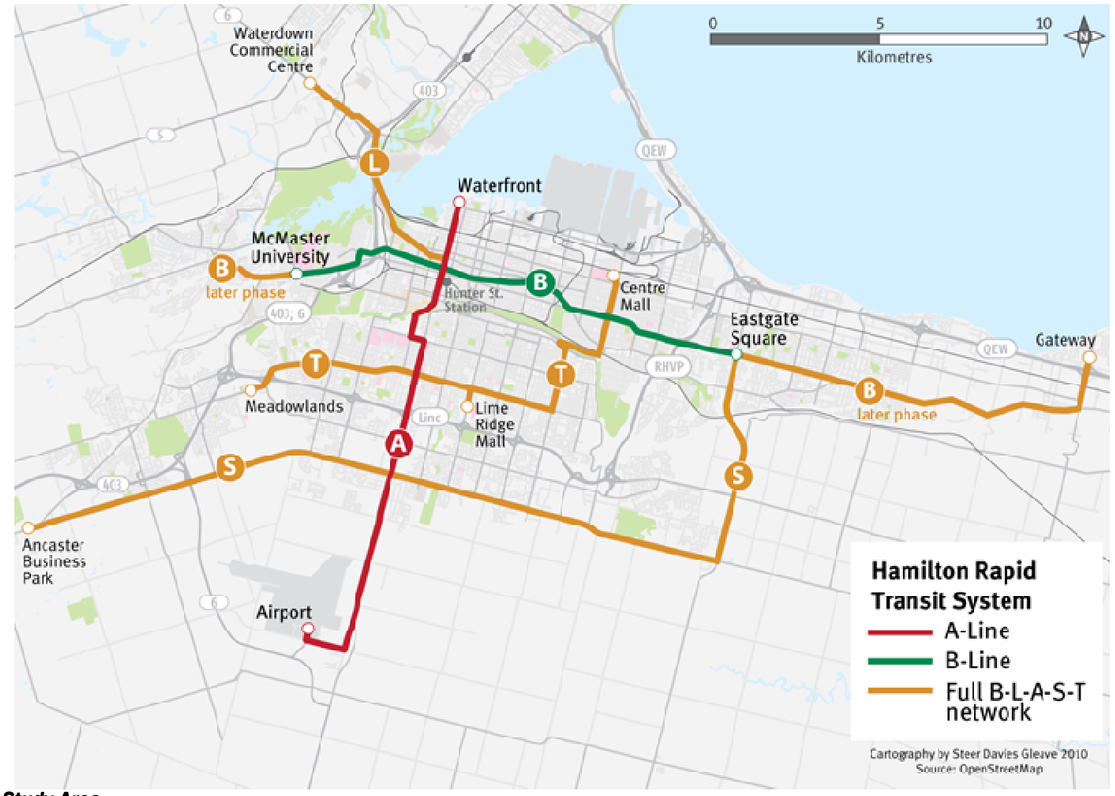
EXECUTIVE SUMMARY

ES.1 Introduction and Study Process

The City of Hamilton has undertaken an environmental assessment and preliminary design for the introduction of Light Rail Transit (LRT) in its primary east/west transit service corridor, the B-Line, as part of the broader Rapid Transit (RT) initiative, referred to as "B-L-A-S-T" (refer to Figure E.1), a long term vision encompassing five corridors, connecting key destinations across the City. The B-Line LRT service will run along Main Street West, King Street, Main Street East and Queenston Road, between McMaster University and Eastgate Square.

Figure ES.1: Hamilton Rapid Transit – Proposed Network



Study Area

The immediate study area for the LRT service alignment development and related environmental impact assessment is the B-Line corridor, as shown in Figure E.1 above. For the purposes of the traffic impact assessment, the overall demand modelling was based on the use of an existing traffic model that covered an area extending from Oakville to Niagara. For the purposes of detailed traffic modelling in the immediate study area, the area modelled is broadly between the Niagara Escarpment to the south, Barton Street to the north, Cootes Drive to the west and Centennial Parkway to the east.

Project Context

The provision of rapid transit in Hamilton is closely linked with the Province's MoveOntario 2020 vision (June, 2007). As part of this vision, the Province established a Greater Toronto Transportation Authority (later named Metrolinx) to implement an integrated transportation system for the Greater Toronto and Hamilton Area (GTHA) over the next 25 years and beyond, through the development of a Regional Transportation Plan (RTP) *The Big Move*, long term Investment Strategy (IS) and rolling 5-year Capital Budget. The Big Move, endorsed in November 2008, included five rapid transit corridors for Hamilton, with two corridors, the A-Line and the B-Line, identified for implementation within 15 years. The Big Move identifies the A-Line limits extending from the Downtown to the Airport, along the James/Upper James corridor and the B-Line limits extending from Eastgate Square/Centennial Parkway to McMaster University along the Main/King corridor. In addition, the B-Line was identified as a "top 15 priority project" for implementation within the first 15 years.

Environmental Assessment Process

This project is being implemented in accordance with Ontario Regulation 231/08, Transit Projects and Greater Toronto Transportation Authority Undertakings (Transit Projects Regulation) of the Environmental Assessment Act. The Transit Projects Regulation exempts proponents of all public transit projects from the requirements under Part II of the Environmental Assessment Act if they adhere to the requirements of the Transit Projects Assessment Process (TPAP), including preparation of an Environmental Project Report (EPR) to document the process. The TPAP is described in more detail in Section 1.3 of this EPR. Proponents must follow the prescribed steps in the TPAP within specified time frames, including provision of adequate opportunities for review and comment by a broad range of stakeholders, culminating with the Minister of the Environment's decision within six (6) months of the start of the process, which is marked by the Notice of Commencement. Once the TPAP has been completed to the satisfaction of the Minister of the Environment, the City may file a Statement of Completion and proceed to the next phase of the project.

The Transit Project Assessment Process also includes an addendum process for proponents to make changes to a transit project after the Statement of Completion for the transit project is submitted. Modifications to the design and implementation of the B-Line LRT proposed in this Environmental Project Report may occur due to unforeseen circumstances, including: changes in environmental conditions in the corridor that may affect anticipated project impacts and means of mitigating adverse effects; technological advancements; and funding availability. This may result in the project being inconsistent or non-compliant with commitments made in the EPR. Modifications to the project proposals will require preparation of an addendum to the EPR. Changes to the project may also be required if there is a significant lapse of time (i.e., ten years) between the Statement of Completion and the start of construction, which will require a formal review of the project by the City. The EPR addendum process is described in more detail in Section 5.4 of this EPR.

Study Organization

The City of Hamilton has established a dedicated Rapid Transit Team to implement the city's Rapid Transit Vision, including providing direction to the Project Team responsible for completing the B-Line planning and design process. The team includes representation and receives support from a range of city divisions and departments. The RT program also involves participation by a Corporate Working Team, consisting of nearly 70 staff members from all city divisions, whose members are responsible for communicating their present and future initiatives with the Rapid Transit team and commenting and disseminating information on the planning and design for the B-Line.

In addition to the aforementioned input, the RT Team has established a forum for receiving formal input from various public interest groups – the Rapid Transit Citizen Advisory Committee. The role of the RTCAC is to provide input and advice to the City of Hamilton regarding the planning and development of the rapid transit initiative and related land use planning studies.

A multi-disciplinary consultant team led by Steer Davies Gleave has been appointed by the City of Hamilton to undertake the environmental assessment and preliminary design of the B-Line corridor LRT service.

Policy Framework

Planning and design of the B-Line RT corridor has been based on provincial and City of Hamilton transportation planning and growth policies and guidelines. Table E.1 provides a summary of the principal policy/guideline framework that governs this study.

Table ES.1: Summary of Project Policy Framework

Policy/Guideline	Relevance
Provincial Policy Statement (PPS)	This project is consistent with the PPS, the objectives of which include that transportation, transit and infrastructure facilities are to be planned to meet current and projected needs, providing for an efficient, cost-effective and reliable multi-modal transportation system that supports long-term economic prosperity. The Statement also requires that public transit and other alternative modes of transportation are to be supported to improve energy efficiency and air quality.
Growth Plan for the Greater Golden Horseshoe	This project is consistent with the general objectives of the Growth Plan for the Greater Golden Horseshoe (2006), and transportation policies related to moving people, including those related to: public transit as the first priority for transportation programming; transit investment criteria; Official Plan designation of major transit station areas and intensification corridors; planning to maintain the viability of existing and planned transit service levels; and planning of major station areas to accommodate various transportation modes, including pedestrians, bicycles and passenger drop-off.
MoveOntario 2020 (June 2007)	This project is part of the a integrated transportation system for the Greater Toronto and Hamilton Area (GTHA) over the next 25 years and beyond, through the development of a Regional Transportation Plan (RTP) The Big Move, a long term Investment Strategy (IS) and a rolling 5-year Capital Budget.
Regional Transportation Plan (The Big Move) (November 2008)	The RTP identifies the B-Line limits extending from McMaster University to Eastgate Square/Centennial Parkway along the Main Street/King Street/Queenston Road corridor. In addition, the B-Line is identified as a "top 15 priority project" within the first 15 years.
Transit Supportive Land Use Planning Guidelines (1992, as amended (draft) in Spring 2011	This project will be developed considering the guidelines' ideas and guidance on planning and development practices that support public transit. Transit-friendly land use planning and urban design practices development patterns that make transit less expensive, less circuitous, more efficient and more convenient, as well as those that make access to the system more attractive to the potential transit user.
Metrolinx Mobility Hub Guidelines (2011)	Hamilton has three identified mobility hubs of which one, downtown Hamilton, is on the B-Line LRT route. This project will be developed considering the guidelines' focus on creating successful mobility hubs which address a number of key identified objectives. For each of these objectives the guidelines provide detailed strategies, best practices, case studies and suggested resources.
Growth Related Integrated Development Strategy (2006)	GRIDS evaluated a series of growth options for future urban structure and recommended a node and corridor system for future growth. The Study also identified corridors for the locations of higher order transit services to link nodes and facilitate movement of people from place to place. The B-Line corridor is an identified corridor in GRIDS.
Urban Hamilton Official Plan (Minister approved 2011, currently under appeal to Ontario Municipal Board)	The new Urban Official Plan takes the node and corridor growth strategy from GRIDS and establishes the future urban structure in policy. This project will be developed in compliance with the guiding principles for nodes and corridor Transportation policies in the Plan recognize and support the relationship between transportation and land use planning in connecting communities, land uses and activities and the role of an integrated transportation network in creating complete communities and improving overall quality of life.
Hamilton Transportation Master Plan (2007)	The HTMP introduced a "higher order" transit infrastructure plan, which was identified as being fundamental to providing an enhanced level of accessibility without requiring major expansion of the roadway network. Includes complementary policies regarding land use intensification within the corridors designated for higher order transit, along with aggressive parking supply restrictions, pricing policies and other transportation demand management strategies, are also included in the HTMP and have become an important component in the overall planning for rapid transit in Hamilton. Also includes policies on active transportation that promote the coordination of transit trips with walking and cycling trips.
Hamilton Transit Oriented Development Guidelines (2010)	This project will be developed considering the TOD guidelines, which establish a guiding framework within which secondary planning, corridor studies and transit station planning can occur.

Related Studies

This project is founded on project-specific investigations related to the broader provincial and City of Hamilton policy directions for the implementation of rapid transit in the B-Line corridor. These studies, summarized below, established the basis for the current planning and design of the B-Line RT project in terms of feasibility and benefits to be derived from the system.

Rapid Transit Feasibility Study - In November 2007 the City of Hamilton initiated a Rapid Transit Feasibility Study (RTFS) to review the constraints and opportunities for the development of either a BRT or LRT higher order transit system, along the A-Line and B-Line corridors. Phase 1 investigated the major considerations in route selection including such things as land use, existing transit service, rights of way (widths, users, infrastructure [surface and subsurface], construction impacts), timing, signal priority, dedicated lanes, as well as an analysis of the feasibility and requirements for the implementation of a rapid transit system to assist in the determination of the type of technology, LRT or BRT that should ultimately be implemented. Phase 2 of the RTFS focused primarily on the B-Line corridor, given its higher priority in the provincial Regional Transportation Plan, and looked at means by which to address the constraints identified as part of Phase 1, with a focus strictly on LRT. Phase 3 of the RTFS was integrated with preparation of the benefits case analysis that was required to be undertaken by Metrolinx and focussed strictly on LRT along the B-Line corridor, including a set of multi-disciplinary studies that addressed transportation planning, potential environmental and municipal infrastructure constraints, and LRT technology and functional planning.

The B-Line RTFS (Phases 1, 2 &3) was completed fall 2009. Full copies of the reports produced during these studies can be found at http://www.hamiltonrapidtransit.ca/index.php/project-information/funding-proposal/.

Economic Potential Study - The Economic Potential study looked at the potential economic benefits that could be realised by the introduction of RT on the B-Line. The study examined the likely impacts of both BRT and LRT and concluded that not only are supportive policies in place to help shape the B-Line corridor, but that there are significant tangible and quantifiable benefits associated with implementation of the project, including those related to: land use intensification and diversity; increases in city-wide mobility; job creation; improvements in environmental conditions, particularly air quality; and breaking down barriers to those with special social needs.

Benefits Case Analysis - A Metrolinx Benefits Case Analysis (BCA) for Hamilton's B-Line corridor was completed in February 2010. This considered three options for evaluation – full Bus Rapid Transit (BRT), full Light Rail Transit (LRT) and partial LRT. The analysis demonstrated that all three options would generate positive benefits for Hamilton and the region, but identified LRT as the most beneficial from an overall perspective. The BCA can be viewed in full at http://www.metrolinx.com/en/regionalplanning/projectevaluation/benefitscases/Benefits_Case_Hamilton_FINAL_Feb2010.pdf.

The conclusions from the Rapid Transit Feasibility Study work and the Metrolinx BCA resulted in Metrolinx awarding the City of Hamilton funding to progress development of LRT on the B-line through a Planning, Design and Engineering (PDE) study which commenced in the Summer of 2010. This EPR is one of the major outputs of the PDE study.

ES.2 Project Description

The 14 km dual track guideway runs from the McMaster stop at McMaster University to the Eastgate Square stop just west of Centennial Parkway. Figure E.2 shows the key plan of the B-Line LRT alignment with the proposed stop locations indicated. In addition to the terminus stops at McMaster University and Eastgate Square, 16 on-street stops will be strategically located along the route for access by walking, cycling and north-south bus routes. The guideway runs either in the existing median (Figure E.3) wherever possible (mostly from McMaster to the west edge of the Highway 403 crossing along Main Street West, and from Strathearne Avenue to Eastgate Square on Queenston Road). Along the

remainder of the corridor, the alignment is side-running (from Highway 403 to Strathearne Avenue along King Street, and along Main Street East), as shown in Figure E.4. When in the median, the LRT will be fully segregated from other traffic, except at intersections. For the on-street/side-running arrangement, the LRT guideway is flush with the existing road elevation, allowing for access to adjacent properties across the guideway right-of-way.

Figure ES.2: Key Plan of B-Line LRT Alignment

Figure ES.3: Typical Centre Running Dual Guideway Cross-section – Track Centres 3.99 m

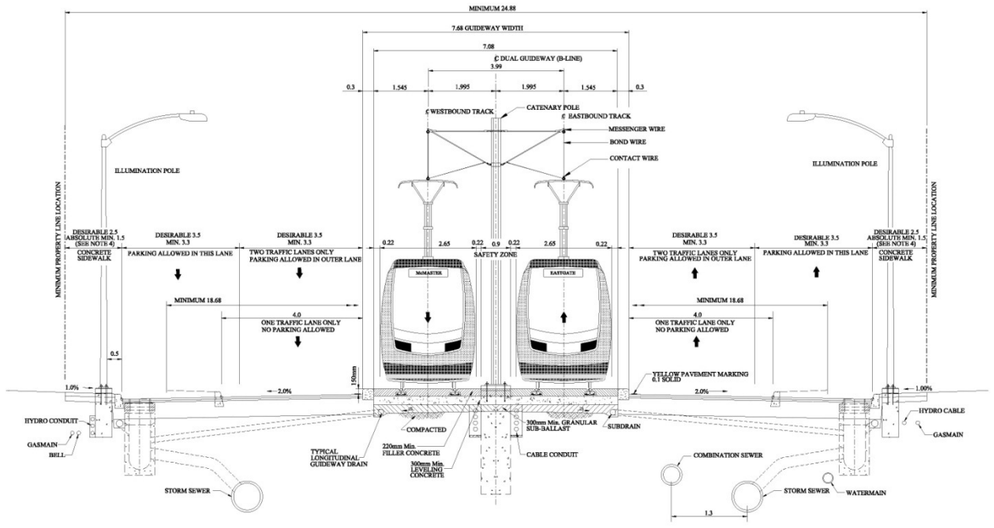
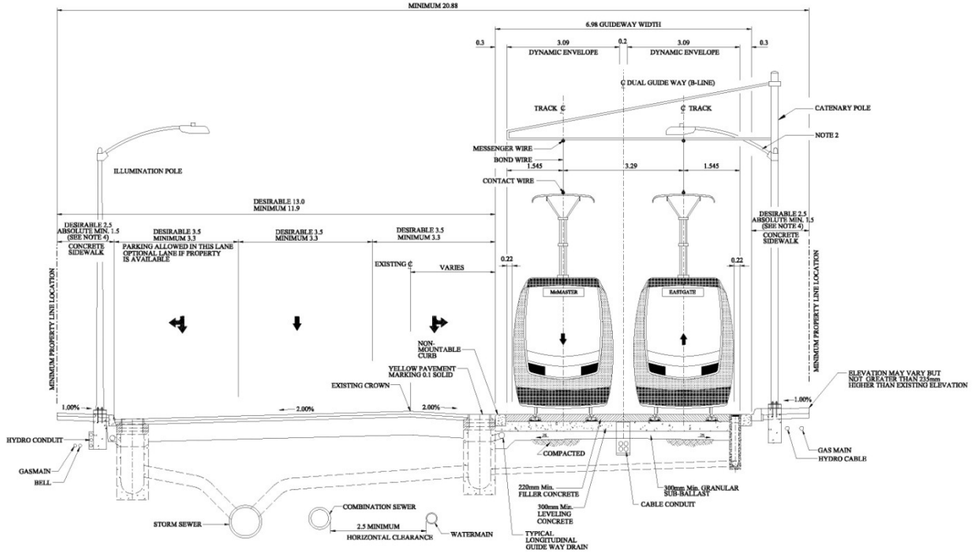


Figure ES.4: Typical Side Running Dual Guideway with traffic lanes on one side only – Track Centres 3.29m



The B-Line design is based on a set of established design criteria to ensure an LRT that will be attractive and affordable, having minimum adverse environmental adverse impacts, being segregated from existing traffic as much as possible, avoiding property acquisition. The LRT design philosophy is to create a fully integrated solution, enabling maximum accessibility to the public as a major connector for this corridor.

The LRT criteria and corridor-wide design philosophy were used to evaluate different options along different sectors within the B-Line Corridor. A series of alternatives were developed and discussed with concerned stakeholders along the corridor.

Results of the discussions with stakeholders revealed that there were relatively few issues arising along the route between McMaster University and Wellington Street, and between Queenston Traffic Circle and Eastgate Square, but there were more concerns in relation to the sections on King Street East, from Wellington Street to the Delta, and on Main Street East, from the Delta to Queenston Traffic Circle.

LRT System Criteria and Characteristics

The following is a summary of the design criteria and characteristics of the recommended B-Line LRT system:

Vehicle:

Design vehicle length	32 metres
Design vehicle width	2.65 metres

Alignment:

Guideway width	7.7 metres (with central catenary pole for median running guideway)
	7.0 metres (with side catenary pole for side running guideway)
Minimum Horizontal Curve radius =	25 metres (minimum radius applied along corridor ~100m)

Stops:

Length	40 metres
Width	3 metres, side platform (combined with sidewalk in some locations)
	4 metres, island platform
	5 metres, terminal stops

The locations of stops are integrated with the existing pedestrian crossings at intersections, as appropriate.

The McMaster terminus stop and the Eastgate Square stop are finalized at the conceptual level and further dialog is required with both property owners to develop the design further and ensure integration with the existing transit/and or GO Bus facilities. This dialog will continue throughout the design process to deliver the best solution for the project and these two major facilities.

Special Structures/Features

The LRT alignment passes over or under certain key structure. Special attention was given to ensure the structures will enable the LRT vehicles to cross them safely.

Highway 403 crossing:

Discussions with the Ontario Ministry of Transportation (MTO) were held to determine the most appropriate crossing structure and alignment over Highway 403. Three alternatives were developed and are discussed in the main report, with the recommended option highlighted. Further design development will be required at the next phase of design, including dialog with MTO regarding the final applicable guideway cross-sections. The pier locations and spacing were discussed with MTO and agreement in principle was reached in consideration of potential future widening of lanes along this section of the highway. The chosen alignment provides higher operational speeds in this segment of the corridor (50 km/h), thereby providing better overall operating conditions and lower maintenance costs. Careful consideration will be made in the detail design phase to the guideway abutment walls, as protection is required for adjacent structures in the vicinity of the abutment wall locations.

Railway Crossings:

There are two rail crossings along the corridor.

The first is a grade separated crossing along King Street West just west of Dundurn Street South where the LRT will cross over the CP Rail corridor using the existing King Street Bridge. A preliminary structural assessment confirmed that the existing five girder structure can support the additional load of the guideway and the LRT vehicles.

The second crossing is an at grade crossing along King Street East just east of East Bend Avenue. This CP Rail spur line connects CP's Kinnear Yard on the TH&B line to industrial areas north of Barton Street.

Discussions with CP confirmed that the LRT can cross the spur line by means of a level crossing. Heavy rail vehicles on the CP line will continue to have priority, as at present, and there will need to be appropriate communication integration between the railroad, LRT and traffic signal systems to ensure safe operation between the two rail modes.

As per the Ontario Highway Act, the LRT vehicles will be required to stop at all times before proceeding across the CP Rail track (as per current practice for any public transportation vehicle).

Pedestrian Skyway Crossing:

The existing pedestrian Skyway crossing over King Street West, just east of Summers Lane, has a clearance of 4.2m. Based on historical information, there have been incidents of tractor trailers scraping the underside of the Skyway. The introduction of the LRT will require hanging the overhead catenary wire below the existing Skyway overpass. As the clearance will be further diminished due to the addition of the catenary contact wire, the City may wish to assess the feasibility of either removing or raising the skyway bridge when constructing the B-Line LRT.

International Village:

As part of the B-Line proposals, through traffic will not be allowed along this section of King Street East except for deliveries and for emergency vehicles. The Walnut Street stop is located in the sector between Mary Street and Walnut Street. No traffic other than Light Rail Vehicles (LRVs) and emergency service vehicles will be permitted through this sector.

From Walnut Street to Wellington Street, two-way local traffic will be permitted, which will share the two centre lanes with the LRT, with the existing curbside loading and parking bays being retained. Access to and from this area is provided at Wellington Street and by the streets linking to Main Street to the south and King William Street to the north.

Between Catharine Street and Mary Street, the direction of traffic flow on King Street East is reversed from westbound to eastbound, to allow traffic to access the Crowne Plaza Hotel and Effort Square parking.

Scott Park:

The stop at Scott Park will have three tracks, and three platform faces to allow for additional services during major events at Ivor Wynne Stadium, and to provide a spare storage track on which an additional vehicle can be positioned to meet the peak passenger demand at the end of an event.

Red Hill Valley Parkway:

Three alternative solutions were evaluated for the crossing of this structure. The existing structure is made up of two independent structures, comprising post-tensioned hollow slab decks with wings, which do not currently carry any significant load. The joining wings of the two structures are currently carrying the load of an island and the exterior wings only carry the sidewalks. The preferred solution includes the construction of the tracks along the existing island; therefore, imposing a load larger than the bridge can sustain. Consequently, the structure requires strengthening of the wings between the hollow slabs. The modifications may require construction of additional pier supports between the existing piers; however, this must be confirmed through future design investigations. The final configuration will carry the guideway with two tracks and accommodate two traffic lanes per direction, plus a left-turn lane in the eastbound direction.

Maintenance and Storage Facility:

The location of the Maintenance and Storage Facility (MSF) to provide stabling for the vehicles, shops for maintenance and office space for the operations was not decided before the conclusion of this report. Further investigation and consultation are required to firm up the location. These activities will be conducted and documented, and approval sought for the MSF through either an addendum to this Environmental Project Report or a separate Environmental Project Report, in accordance with the Transit Project Assessment Process. Approvals for the MSF will be in place prior to construction of the B-Line LRT project.

Transit System Elements

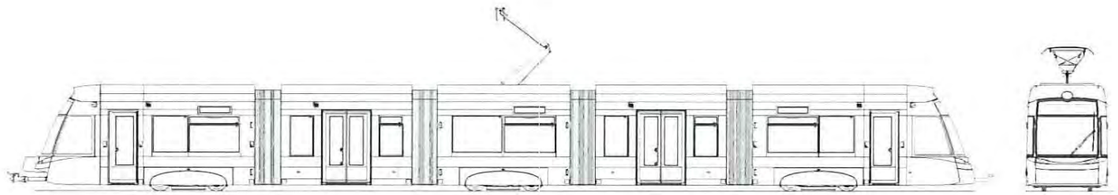
Operational Design

The objective of the operational design criteria was to set out specifications that will help ensure reliable operation, even during downgraded operation. The operations will also vary to cater to the expected demand throughout the hours of operation. On a daily basis, revenue service is expected to commence at 5:00 a.m. from both terminal stops and end at 1:30 a.m. The headway will be adjusted throughout operational service in order to comply with scheduling demands, with a minimum headway of 4 minutes and a maximum headway of 8 minutes. The design speed for the system is 70 km/h in order to meet the objectives of providing a higher operational speed than the bus service. The current operations plan will result in an average operating speed of 25.3 km/h and a one-way journey time of 32 minutes between the two end stops. This is achieved through partial segregation from other vehicular traffic and providing priority to LRT vehicles at signalized intersections.

Prototypical Vehicle

The LRT vehicle will be 100% low floor in order to accommodate adequate seating, standing, bicycle, wheelchair and stroller spaces. As no procurement of vehicles has commenced, the dimensions assumed for the preliminary design phase have characteristics similar to those recently adopted by Metrolinx on similar projects in Ontario.

Figure ES.5: Similar Metrolinx Vehicle Example



LRT Guideway

The guideway will accommodate two LRT vehicles. The design criteria were developed by considering the operational parameters (static and dynamic vehicle envelope), the placement of the catenary poles, and the required spacing between LRT vehicles, adjacent traffic lanes and sidewalks.

Power Supply and Distribution

For this system, the external power supply will be provided by Horizon Utilities from the existing 115 kV/13.8 kV or 27.6 kV transformer stations. The traction power substations (TPSS) will be prefabricated and placed in locations close to the alignment. Exact locations of the substations will be determined in the detail design phase.

The power will be supplied to the vehicles through an overhead catenary pantograph feed system. The catenary configurations will vary, and include poles located in the centre, as well as side and side double cantilevered configurations.

Trackwork

The LRT tracks will be embedded (standard gauge 1435 mm) to enable rubber tired vehicles to run on the guideway (such as services vehicles and emergency vehicles). Initial service plans will have this area segregated for LRT-only.

Generally, the track surface will be made of concrete, and provisions for additional drainage requirements for the guideway are included in the design.

Traffic Signals and Illumination

The LRT system will operate on an LRT vehicle priority green signal basis. In order to achieve this, an integrated system of location sensors will be installed, with specialized traffic controllers that use logical algorithms to define optimum cycle times for an LRT priority system throughout the corridor.

Continuous illumination exists along the whole corridor in the form of independent light poles, and future design considerations will include joint use of poles for utilities and LRT catenary support.

LRT Communications Systems

The communications systems are based around a centralized operations concept, where decisions regarding service delivery and safety are made at the Operations Control Centre (OCC) and supported by drivers in each vehicle. The communication systems also facilitate stop operations and roving vehicle attendants in their role as support to service delivery and safety.

The Hamilton LRT will be provided with a public address (PA) system covering all stops and vehicles. The PA system will allow automated, manual and emergency audible announcements to be made to passengers and operations and maintenance personnel.

The communications system will also be installed at all stop locations for emergency and security purposes.

Road Elements

Generally, roads within the corridor will be modified to accommodate the LRT running way; either flush with the road or segregated by a raised curb. The number of lanes and the lane widths may be modified in order to accommodate the LRT right-of-way.

Urban Design Elements

Many of the strategic and system objectives for Rapid Transit involve urban design and planning, particularly of the public realm. Hamilton aspires to a European style innovative approach, where the infrastructure is of an appropriate form to complement the existing urban fabric. This in turn provides the opportunity for complementary measures in the rest of the street width, to accommodate the needs of other street users in a holistic fashion. In this respect, the introduction of rapid transit into existing developed areas is regarded as a "linear urban design" project that includes LRT.

The City of Hamilton approach to Urban Design follows the overarching principles of Urbanism; of Design Excellence; and of Scale, Connections and Context. These include:

Urbanism: Enhancing the City; the Neighbourhood, the District, the Corridor; the Street, the City-block and the Building;

Design Excellence: Exemplifying design excellence by incorporating, interpreting and integrating design principles of Quality; Innovation; Sustainability and Durability to the greatest extent possible, consistent with best contemporary practice;

Scale, Connections and Context: Reflecting Location, Human Scale and Neighbourliness; Respecting Heritage and Environment; Making Connections;

Rapid Transit Public Realm Design Objectives for Hamilton: The B-Line LRT will operate in a constrained corridor, where there are many competing demands for the limited space that exists. Within this context, and as far as is practicable and deliverable, the City of Hamilton proposes to take an aspirational, collaborative approach to the wider urban design and public realm.

Opportunities will be taken, when they present themselves, to strengthen and improve the streetscape through additional tree planting, hard and soft landscaping and the provision of, and integration of, public art in elements of the project itself and as stand-alone "features".

Cross-Section Design

The cross-sections to be used along the B-Line RT alignment are based on the following guidelines:

- Integrate a dedicated transit path either in the centre or on one side of the roadway
- Provide (maintain) streetscape elements;
- Minimize traffic inconvenience;
- Avoid (where possible) private property effects.

Integrated Land Use Concept

Hamilton's Growth Related Integrated Development Strategy (2006) (GRIDS) put in place the direction for integrated land use and transportation planning, with the adoption of a node and corridor system for future growth. GRIDS identified corridors as key areas for intensification in the chosen growth concept, describing the future development of the corridors to include a broad mix of uses, including higher-density residential uses, retail, institutional and recreational uses. The Study also identified corridors for the locations of higher order transit services, linking the nodes together and facilitating movement of people from place to place.

Following GRIDS, the Urban Hamilton Official Plan integrates transportation and land use planning through its policies which recognize that land uses and transportation are mutually inclusive; land uses are connected and accessible through the transportation network, and transportation is made more efficient when complemented by appropriate locations and densities for various land uses. Public transit and planning for active transportation is to be an integral component of planning for new development and redevelopment.

Policies in the Urban Hamilton Official Plan direct secondary planning activities to take a similar integrated approach when planning for smaller scale areas, whether a greenfield neighbourhood, an existing urban neighbourhood, or an existing or planned node or a corridor.

Official Plan policies for secondary planning include:

- Establishment of a road network for efficient movement of people, cyclists, transit and automobiles;
- Organization of land uses in a manner that reduces automobile developments and improves modal choice and movement of goods;
- Placement of higher density land uses near existing and planned transit stops or station locations; and
- Coordination of rapid transit planning projects and higher order transit services with policy direction on land uses, height, densities, built form and design within designated Nodes, corridors and Major Activity Centres.

B-Line Corridor Plan/Secondary Plan (in progress)

In July 2010, the City initiated the B-Line Corridor Land Use Study to develop a Corridor Plan/Secondary Plan for the B-Line Corridor. The purpose of the B Line Land Use Planning study is to develop a long term strategic plan to guide future growth and change along the B-Line Corridor. The study will establish a high level vision for the corridor including a set of development principles through the engagement of corridor and community stakeholders. The vision and principles will guide future change and development in the corridor. The study will identify appropriate transit-supportive land use and development patterns that:

a) Recognize and support the future well-being of adjacent neighbourhoods along the corridor;

b) Support and facilitate a viable future rapid transit line along the corridor; and

c) Support the intended function, scale and design of nodes and corridors, while being focus areas for intensification.

The study will consist of a land use and urban design plan. The Corridor Plan/Secondary Plan is being developed concurrently and in conjunction with Planning, Design and Engineering work for a future B-Line LRT project.

The scope of the Plan includes:

- A Vision and set of principles to guide development along the B-Line Corridor;
- A Land use plan and set of development policies, including the identification of appropriate mixes of land uses along the corridor, around designated nodes and at stop locations;
- Identification of sites for intensification and redevelopment;
- Public realm and urban design components policies and guidelines;

- Policies on corridor-specific issues, such as parking and loading, commercial uses, cultural heritage, etc.

In addition to a Secondary Plan and zoning by-law amendment adopted under the Planning Act, an Implementation Strategy will be prepared, with recommendations for additional future actions that may be required to implement the vision and directions of the Secondary Plan. The strategy may include development of capital improvement plans, incentive programs, other city projects, programs and actions.

Land and Property Requirements

The general approach adopted in developing the B-Line LRT alignment has been to fit the route within the existing road right-of-way. This approach has minimised land and property requirements outside the existing road ROW.

Transit System Interface

Preliminary proposals for bus network changes to accompany the introduction of the B-Line LRT have been developed using the following key design principles:

- The objective of an integrated network wide solution;
- Maintenance of key links and accessibility;
- Through services retained wherever possible, although perhaps at reduced frequency and/or with an increased journey time;
- Does not force transit passengers to transfer unnecessarily, or for short distances;
- Where transfers are necessary, the facilities should be of a high quality;
- A network that:
  - links people to jobs, homes, leisure and key services;
  - meets current and future passenger needs;
  - adheres to HSR's service standards;
  - creates space for rapid transit;
  - ensures that feeder services to the LRT and bus network are provided where necessary; and
  - provides cost savings (when set against additional revenue generated).

Bicycles

Provision will be made on LRT vehicles to enable a limited number of bicycles to be carried.

Project Implementation

Following the Minister of the Environment's decision on this EPR, and preparation of the Statement of Completion by the City of Hamilton under the Transit Project Assessment Process, the project may proceed to subsequent phases of the implementation program. Following is summary of the preliminary approach to moving forward with the project.

It has been assumed at this stage of the project development that implementation of the project should be based on a design/build approach, where a single company (or Consortium or Joint Venture of companies), qualified in implementing urban rail systems, takes the responsibility for design, construction and commissioning of the system.

The project implementation includes a preliminary estimate of the time required for definition of the particular specifications of the vehicles, bid document, bid process, manufacturing and testing. Such timeframes can be adjusted later if the vehicles are being procured under a program-wide agreement.

At the time of completion of this report, the site for the Maintenance and Storage Facility was not fixed; therefore, it should be the subject of further evaluation and required environmental assessments and approval, as part of the project implementation process.

The recommended preliminary overall project work program schedule (provided in more detail in the main report) is as follows:

Phase A:	Project Procurement Process	Approximately 20 Months
Phase B:	Design/Build Contract	Approximately 51 Months

ES.3 Existing Conditions/Potential Impacts/Mitigation and Net Effects

The environmental effects of the proposed B-Line LRT project were assessed in terms of impacts to municipal transportation and transit service and networks, utilities infrastructure, and the natural, socio-economic and cultural environments, including:

- Road Network
- Transit Network
- Active Transportation Initiatives and Infrastructure
- Surface and Subsurface Utilities
- Urban Structure and Land Use Policy
- Land Use and Community Features
- Surface Water and Aquatic Ecosystems;
- Terrestrial Ecosystems;
- Hydrogeology and Contaminated Soils;
- Noise and Vibration;
- Air Quality;
- Built Heritage and Cultural Landscapes; and
- Archaeology

Transit Service and Transportation Network

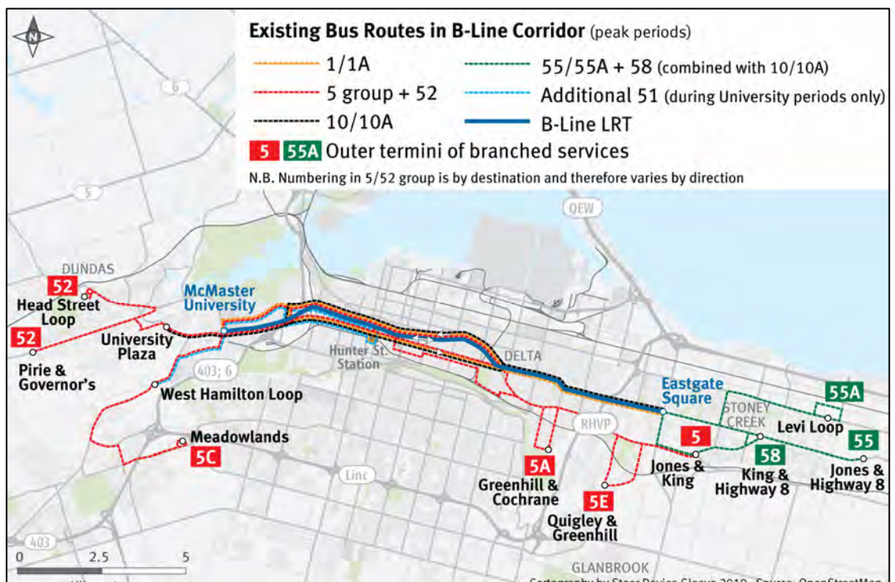
The City of Hamilton road network in relation to the B-Line corridor is shown in Figure E.1. The existing bus routes in the B-Line corridor are shown in Figure E.6.

The B-Line is an east-west route following the major corridor of existing transit demand through Hamilton. The LRT is planned to run from McMaster University to Eastgate Square, with possible long term extensions westward towards Dundas, eastward into Stoney Creek and from Eastgate north to meet the proposed new GO station at Centennial Parkway.

Much of the B-Line route is currently 4-lane two-way road. The main exception to this the King Street section, between The Delta in the east and Main Street West in the west, where both King Street East and King Street West generally operate as 4 lanes in a westbound only direction. Over this same length Main street carries the eastbound traffic flow. Alternative east-west routes exist via Cannon Street or Barton Street, both located to the north of the B-Line corridor.

Along the B-Line corridor there are approximately 440 on-street parking spaces, with most spaces concentrated in the Downtown and Central sections. Overall weekday daily average occupancy along the corridor is approximately 150 cars.

Figure ES.6: Existing Bus Routes in B-Line Corridor



Within a 400-metre boundary area of the B-Line, there are on average about 5,270 on-street daytime vacant parking spaces around the corridor.

There are approximately 510 commercial properties requiring loading and delivery access in the corridor

Transit bus services on the B-line corridor are operated by Hamilton Street Railway (HSR). The corridor is currently served by an intensive transit service on a number of routes, which together provide 22 to 24 buses per direction per hour on the core sections. Two of these routes follow the whole length of the corridor, namely:

- 1A: McMaster University Medical Centre to Eastgate Square (4 buses per hour (bph) local; runs via Sterling Street).
- 10/10A: University Plaza/McMaster University Medical Centre to Eastgate Square (6 bph, B-Line Express).

Several other routes serve parts of the corridor, including:

- 1: GO Centre to Eastgate Square, supplementing the 1A (4 bph);
- The complex 5/5A/5C/5E/52 group from Dundas (2 termini), University Plaza, West Hamilton or Meadowlands to Greenhill/Cochrane, Quigley/Greenhill or Jones/King (8 bph in total);
- 51: West Hamilton to Hamilton GO Centre (4-6 bph, except summer and Christmas University vacations).

Transfers between services occur to the largest extent in the Downtown area along King Street and Main Street East and at the hubs of Eastgate Square, Gore MacNab Transit Terminal, GO Centre and also at McMaster. Eastgate Square is a hub where local services intersect with the east-west services, and here all routes call in at the off-street terminal or at the adjacent stops on the near side of Queenston Road.

A number GO bus services also operate in the B-line corridor, including:

- Route 16: Hamilton QEW express GO bus;
- Route 18(A): Lakeshore West Train-Meet GO Bus;
- Route 47: Highway 407 West GO Bus; and
- Route 15: McMaster Train-meet Bus.

In addition, the Niagara GO Rail Service Extension identified a new station at Centennial Parkway. This would provide an opportunity to link the inter-regional rail service with the LRT. The City will continue to discuss this connection with Metrolinx and will seek to protect the ability for LRT to link to this proposed station in the future.

The B-Line LRT will be integrated into the wider transit network. While a full analysis of bus routing changes will be undertaken between 12 and 24 months prior to opening the B-Line LRT a set of preliminary proposed changes have been developed to guide discussions and develop an integrated network wide solution.

Details of the full changes are set out in Section 4.1.1 and, in general, comprise replacing the 10/10A service with the LRT service and changes to the 1/1A, 5/52 group of services and some amendments to Routes 3 and 4.

As a result of implementing LRT on the B-Line a number of changes to permissible traffic movements are proposed.

At the western end, between McMaster University and the Highway 403 crossing, traffic will continue to use Main Street West as it does currently. Over this section, the LRT will be in the median and at existing non-signalized intersections and driveways or private accesses there will be a right-in/right-out arrangement to ensure safe LRT operation by not permitting crossing of the alignment by other motor vehicles. The design has considered each location to ensure that either an existing or new signalized intersection is nearby to provide a convenient u-turn opportunity. There will be some impacts on the capacity for motorized vehicle movements because of the re-assignment of some left-turn traffic to U-turn manoeuvres at intersections. LRT operation will also be given priority through signalized intersections along the length of the B-Line route.

In the vicinity of the Highway 403 crossing, the existing one-way circulation (westbound on King Street West and Paradise Road South; eastbound on Main Street West) is retained. King Street West, from west of Dundurn Street to James Street, and King Street East, from James Street to Catharine Street, remain one way westbound, with the traffic lanes on the north side and the LRT on the south side.

Between Catharine Street and Mary Street, the direction of traffic flow on King Street East is reversed from westbound to eastbound, to allow traffic to access the Crowne Plaza Hotel and Effort Square parking.

The Walnut LRT stop is located between Mary Street and Walnut Street. This section is closed to all traffic except LRVs and emergency services vehicles. The introduction of this non-trafficked section breaks King Street as a through route, and causes through westbound traffic to divert to other routes, principally Cannon Street and, to a slightly lesser extent, Barton Street. Within the International Village (between Walnut Street and Wellington Street) there is two-way shared running of local traffic and the LRT to allow for essential frontage access, but so as to prevent use of this as a through traffic route.

From Wellington Street to the Delta, King Street East remains one-way westbound, but with 1-2 traffic lanes in place of the existing 4 lanes.

From the Delta to Queenston Traffic Circle, Main Street East is converted to one way westbound, with one lane for local traffic, with curb bumpouts introduced to provide bays for parking and loading. Westbound through traffic uses a combination of King Street East, Britannia Avenue/Cannon Street East and Barton Street East. Eastbound traffic will use King Street East from the Delta onwards, either accessing Queenston Road via Parkdale Avenue, or continuing on King Street East.

In addition to traffic routing changes there will also be changes to the turning movements which are permitted along the B-Line route, particularly where these cross the LRT tracks. These generally do not affect right-turn movements, but do affect some left-turn movements and u-turns, which are generally only permitted at signalized intersections. Full details are contained in Section 4.1.2. While access to property will generally be maintained, some access arrangements will be affected, either in the manner in which access is gained or through the restriction of certain directional movements.

Development of the project has sought to minimise possible reduced vehicle access to the area and potential loss of on-street parking and loading areas, and this work will continue throughout the further development and detail design of the project.

It is anticipated that of the 440 on-street parking spaces available in the B-Line corridor, up to 80 could be displaced. Key impact areas for displaced parking are downtown between Queen Street and James Street, and between Wentworth Avenue and Gage Street. However, there are currently, on average, some 5,240 vacant on-street parking spaces within 400 m of the B-Line corridor. Given this, the surrounding side streets could easily handle displaced demand for on-street parking during the day along the corridor.

An evaluation of potential impacts to loading and delivery access to approximately 510 commercial properties along the B-Line corridor revealed:

- The majority of parcels along the B-Line corridor will have minimal impacts to their loading access, with the main impact identified as having to use a back alleyway, where properties could have previously used front-door on-street loading;
- 126 commercial parcels were assessed to have moderate impacts, such as changes in entry point to on-site parking and having to use loading facilities via side or back street where parcels had access via King Street or Main Street;
- Over 50 commercial parcels were identified to require mitigation measures to address the loss or impact to loading capacity. Impacts include loss of on-street loading in front or near the front of property (with no alternate access point) and loss of access to on-site loading spaces. The majority of properties affected are on the south side of the corridor where on-street loading is proposed to be removed due to the LRT tracks or stops.

A number of properties will also be affected due to changes in loading access points or delivery routes arising from changes in traffic patterns (e.g., conversion to one-way, no left turn, etc.) that are proposed as part of the B-Line design.

Every attempt will be made to minimize or replace any short-term parking loss for individual homes and businesses both in the short term during the construction stages and in the longer term, once the project is constructed and operational. As part of the detail design of the project, delivery and loading arrangements and potential parking replacement solutions will be formulated and discussed with the affected property owners.

The overall assessment of traffic impacts has concluded that implementation of the B-Line LRT can be accommodated by the road network. However, some minor networks improvements are proposed to minimise impacts as follows:

To facilitate traffic movements to and over the King Street bridge (over Highway 403), improvements are proposed in the following locations:

- Dundurn/King - Additional free-flow right-turn lane provided on southbound approach. Third party land take required on northwest corner of intersection;
- Dundurn/York - Additional left-turn lane required on westbound approach. Extra flared approach can be accommodated within existing road boundaries; and
- Southbound exit on Dundurn has been revised to allow two southbound lanes as far as Tom Street. Therefore, the northbound section of Dundurn has been assumed to merge to a single lane at Florence Street, with a single lane in each direction between Tom Street and Florence Street.

Other improvements included to mitigate adverse effects of the operational changes to the road network are:

- Banning of left-turn movements at Queenston Road/Reid Avenue – U-turn movements available at Parkdale to the west, and Red Hill Valley Parkway (RHVP) to the east; and
- Increasing traffic signal cycle time to 110 seconds (from 90 seconds) at King Street/Parkdale Avenue, King Street/RHVP West and King Street/RHVP East, with resultant increase in capacity (but removal of co-ordination with adjacent intersections).

In addition, as a result of the re-assignment of traffic between the Highway 403 ramps (due to the reduction in capacity on the approach to the King Street on-ramps), additional traffic is predicted to use Aberdeen Avenue as a route to join Highway 403. To accommodate this, the following modest improvement works are included:

- Aberdeen Avenue/Longwood Road – provide additional third lane as dedicated right-turn bay (approximately 140 m long) on the Aberdeen Avenue to Longwood Road right- turn movement; and
- Aberdeen Avenue/Dundurn Street – provide dedicated left-turn bays on both Aberdeen Avenue approaches, and modify existing signal timing operation.

A detailed traffic management plan, comprising a construction staging and street closure or lane reduction plan will be prepared as part of the detailed design stage of the project. During construction, street closures and interruptions during construction will generally be limited to closing two out of four lanes at a time, or if a total street closure is required for a short period of time, alternative access to businesses and residences will be provided. In those cases, a strategic site-specific traffic management protocol and plan will be developed and implemented. The plan will be designed to cause minimal disruption to traffic along the corridor. However, it is expected that some inconvenience to car users will occur along the corridor. Bus services along the corridor will also be affected, with temporary re-routing of the B-Line and other bus services during the construction period.

As part of the traffic management plan and construction contract(s), a monitoring and complaint process will be in place to ensure timely response to stakeholder concerns over construction related effects.

Surface and Subsurface Utilities

The surface and subsurface utilities include both private and municipal services. The underground utility infrastructure includes duct banks, sewer lines, water mains and gas mains. The surface infrastructure includes street lighting poles, hydrants and maintenance holes access covers. Of particular interest is the dense network of City water mains, combined sewers, sanitary sewers and storm sewers along the corridor, with some areas having up to 3 mains running along the corridor. Communications and hydro electric power transmission facilities are also present in the corridor in the form of both underground ducts and aerial lines.

The preliminary design has identified the utility relocation requirements for the alignment, which are generally as follows:

- The underground utilities that cross the LRT guideway will be protected to minimize long term vertical impact to these (by use of sleeves, where necessary).
- Any underground utility line that currently runs under and parallel to the proposed LRT guideway may be relocated, where space permits, to avoid being directly beneath the guideway, in order to prevent any shutdown of the LRT when such utility needs maintenance or repair. Some of the utilities under the future LRT guideway/track include older combined sanitary and storm sewers that should be retained and protected in their existing locations, rather than moved.

The aforementioned traffic management, construction staging and monitoring plans will integrate utilities and services relocation in an effort to ensure that there are no undue service interruptions during the construction phase.

Socio-Economic Environment

The assessment of effects on the socio-economic environment included consideration of transit project's impacts on land use planning, existing homes and businesses, the economic viability of the corridor and adjacent areas, and community cohesion.

Land Use - The B-line corridor traverses several distinct sections of the City exhibiting a wide diversity in urban form, land use, function, physical features, and community connectivity. In summary, land use along the corridor is quite varied both by section of the corridor, as well as by individual stop area. The incidence of commercial uses tends to be highest between Queen Street and Wentworth Street and in the east end at Nash Road and Eastgate. Residential uses are prevalent throughout the corridor, although it is the dominant land use in the middle section of the corridor. Institutional uses are spread fairly evenly through the corridor, with the largest concentration located near the McMaster stop area. Other major institutional uses include educational institutions; places of worship; retirement centres; and dental, medical and veterinary clinics.

There are few industrial uses along the corridor. Office uses are almost entirely concentrated in the Downtown section of the corridor (with some offices located in the western and eastern sections, as well). This is reflected in the high number of jobs within 400 m of the corridor between Bay Street and John Street. Transportation and utility uses represent a small proportion of the corridor land uses and generally cross the corridor (e.g., Highway 403 in the West section; CP Rail spur lines in the West and Middle sections; the Red Hill Valley Parkway in the East section; and Hydro One and natural gas line in the Middle section). Finally, Open Space is located throughout the corridor, including at Cathedral Park (at Highway 403) Victoria Park (between Strathcona Avenue and Locke Street), Gore Park (between James Street and John Street), Wellington Park (between Wellington Street and West Avenue) and Scott Park (at Melrose Avenue), which directly abut the corridor. Gage Park (between Gage Avenue and Kensington Avenue) is situated immediately adjacent to the corridor at the Main Street/King Street junction in the Delta area.

The Downtown and the middle section of the corridor have the highest concentration of population, while the end points of the corridor contain lower populations. The lower density residential areas in the eastern and western section of the corridor are in part due to the amount of non-residential land use, which has a greater focus on large format commercial or major institutional uses, and lower residential housing densities in the neighbourhoods in general. Not surprisingly, the highest concentration of jobs located within 400 m of the B-Line corridor is in the Downtown area. A high number of jobs are also located at the eastern end of the corridor, where several large scale commercial uses are located, and on the west end, where the McMaster University Medical Centre and other related commercial uses are located.

Economic Impacts - City of Hamilton's *B-Line Land Use Opportunities and Challenges Study* has identified the B-Line's potential to achieve the City's overall land use objectives with respect to intensification, diversity, neighbourhood enhancement and renewal, and redevelopment of lands in the corridor to higher and better uses. In addition, the B-Line is expected to support the economic viability of existing land uses and regional destinations in and adjacent to the corridor. The City's studies on the impact of the B-Line on property values and economic viability have concluded that:

- The transit project will result in benefits associated with travel time savings, increased travel time predictability, reduced auto ownership and operating costs, and reduced accident costs;
- Implementation of the B-Line LRT will provide individuals with high social needs with greater mobility and access to employment opportunities and health and wellness activities
- LRT along the B-Line corridor could create a property market uplift ranging from $50.0 Million to $143.5 Million, representing a 1.5% to 4.3% impact;
- Some 6,000 jobs would be created during the B-Line LRT construction phase, with up to 1,000 ongoing jobs due to operations and maintenance.

During the preliminary design process it was identified that 80 properties will have impacts on access to their property, or impacts to their frontages. The two properties that will experience significant impacts are at the proposed terminal stops at McMaster University and Eastgate Square. Some of the impacts may require full acquisition of the parcels affected. Temporary property needs may include working easements to facilitate construction; these will be identified during the detail design stage of the project. Property acquisition required for this project will be undertaken by the City of Hamilton, with the objective being to ensure that individual rights are respected and protected, and to provide fair compensation within the framework of the City's policy and associated legislative instruments governing the acquisition of property for City projects.

The City will establish a construction liaison committee during construction to provide quick access to construction related information, specifically schedule and timing information for business owners and residents. The committee will be made up of City and Contractor staff who will meet on site periodically. In addition to monitoring that will occur through the construction liaison committee forum during construction, the City will establish storefront locations dedicated to receiving public comments and concerns about construction activities and impacts.

Natural Environment

Surface Water and Aquatic Ecosystems - There are few natural features within the B-Line corridor due to its location in the urbanized area of the City. However, the corridor does cross the Chedoke Creek and Redhill Creek valley systems, including the two watercourses within the valley features. Both watercourses have been significantly altered from their natural state, but support warmwater and coldwater fisheries respectively. There are no aquatic species at risk in the project area. The proposed B-Line LRT does not involve any in-water work or work near the banks of the Chedoke Creek and, therefore, does not have the potential to directly impact fish habitat by altering/removing their physical habitat (i.e., channel bed, substrates, riparian vegetation, instream cover, etc.). At the Red Hill Creek crossing, due to the manner in which the LRT will make use of both structures that comprise the Queenston Road bridge, it is likely that the bridge substructure (piers and abutments) will require reinforcement, resulting in the need to work on the valley floor and the potential for impacts from near-water construction.

Environmental design and construction mitigation measures to avoid and/or minimize potential impacts to the aquatic environment and surface water through the use of best management practices for erosion and sediment control; excavation dewatering; constraints on construction timing, equipment movement, fuelling and maintenance, and materials storage; use of a debris containment system for bridge works at Redhill Creek; and appropriate construction period compliance monitoring.

With respect to surface drainage, the majority of the proposed B-Line LRT alignment will have surface runoff collected and fed into the City of Hamilton's storm sewer system. The study area is urbanized and the LRT alignment will generally remain within existing roadway allowances where the road sections are already built to urban standard. Consequently, the amount of impervious area will not increase substantially and the impacts on stormwater drainage are not expected to be significant. Where the B-Line LRT guideway represents an increase in impervious surface and will result in increased stormwater runoff, alternative best management practices will be assessed in accordance with MOE's Stormwater Management Planning and Design Manual (2003) and consultation with regulatory agencies and affected property owners. Consideration will also be given to enhancing runoff conditions in existing road segments, where practical. Areas of focus in these regards include the grounds of McMaster University and the Chedoke Creek valley adjacent to the new guideway. A detailed surface water management plan will be prepared and used for monitoring throughout construction.

Terrestrial Ecosystems – The Chedoke Creek valley, Red Hill Creek valley and Gage Park were identified for detailed examination of impacts to vegetation communities based on the presence of reasonably large blocks of natural/semi-natural vegetation in the highly urbanized setting through which the proposed B-Line LRT will run. These were identified as. These areas have been subjected to significant anthropomorphic pressure, which has degraded the natural attributes of those vegetative assemblages that remain. A number of these landscapes have also been created to provide park settings and landscaped property holdings, which are subject to constant maintenance. All areas examined exhibit significant degradation of the historic natural systems and remnants still present. There are no vegetation species at risk in the project area. The transit project will result in only nominal loss of natural vegetation from the Chedoke Creek and Redhill Creek valleys, since the line crosses these areas on an elevated guideway or existing road. In addition to these impacts, the preliminary design investigations identified that 43 small trees and 64 mature trees will be directly affected.

The project area provides limited wildlife habitat, which is generally restricted to small parks and the Chedoke Creek and Red Hill Creek valleys. Preferred breeding habitat for significant bird species of concern known to be in the vicinity of the project area is not found directly within the transit corridor, with the exception of peregrine falcon and chimney swift. Generally, the effects of the proposed B-Line RT on wildlife species are anticipated to be minimal, as extensive vegetation clearing is not required and the project has been designed to avoid displacement of adjacent buildings that may provide habitat for peregrine falcons and chimney swifts.

To minimize the effects of construction of the B-Line LRT on those natural and/or semi-natural vegetative assemblages found within the project area, and their function as wildlife habitat, the City will engage in best management practices for the protection of trees not scheduled for removal, including: preparation of a Tree Protection Plan; implementation of hard and soft landscaping in the corridor, including planting of additional street trees, where opportunities present themselves; compensation/reimbursement for displacement of publicly owned roadside trees; and timing constraints on clearing within the migratory bird nesting/breeding period, with associated construction period compliance/effects monitoring and post-construction (warranty period) monitoring of the health of newly planted trees.

Hydrogeology and Contamination - The proposed B-Line LRT line runs through various soil types, including Iroquois Plan glaciolacustrine deposits (sand and silt, and beach gravel), Paleozoic bedrock (shale and dolomite), Halton Till (silty to clayey till), and modern alluvial deposits. These soils range from a few meters thick to approximately 30 m thick. The water table generally occurs about 2 m below ground grade to about 16 m below grade. A perched water table about 1 m below grade may be present along central and west portions of the route.

Shallow groundwater levels may be temporarily affected if dewatering is required for excavation. If required, a Permit to Take Water application will be prepared and submitted to the MOE for approval in accordance with Ontario Regulation 387/04, as amended. Some contaminated soil and groundwater may be encountered during construction and will require proper storage and handling in accordance with Ontario Regulation 153/04, as well as the City of Hamilton's Contaminated Sites Management Program for Municipal Works manual, in order to maintain public and worker safety and avoid potential runoff/interaction with surface water. Groundwater contamination may occur from excavation (leaching of contaminants into groundwater), construction equipment and/or associated spills. Mitigation plans to address the aforementioned construction impacts will be developed based on construction methods developed in the detail design phase, completion of geotechnical testing along the route, and an update of potential and actual sources of contaminated sites along the route during detailed design. Temporary or localized plans will be prepared on an as needed basis (e.g., in proximity to Chedoke Creek and Red Hill Creek).

Noise and Vibration - The existing ambient noise within the study area is dominated by road traffic, light industrial and commercial activities. Existing sound levels in the B-Line corridor range from 64 decibels (dB) (at King Street/Wentworth Street) to 77 dB (at Main Street West/Highway 403), which is typical for a busy urban environment. The future ambient sound levels without the B-Line LRT in place are expected to be slightly higher based on growth in background traffic. The B-Line corridor has also been inventoried for uses that may be susceptible to vibration impacts. In the order of 280 such uses have been identified.

With minor exceptions (at the west and east ends), noise sensitive locations in the LRT corridor will experience reductions in sound levels ranging from 1-2 dB at night to 1-8 dB during the daytime. This is primarily a result of LRT vehicles replacing buses and other motorized vehicles in the corridor. Adjacent roads receiving traffic diverted from the LRT corridor may experience noise increases of 1-3 dB. A change in sound level of 3 dB is considered noticeable, and a change of 5 dB is considered significant. Stationary noise sources associated with the B-Line LRT system include the

Traction Power Substations. Attempts will be made to locate power substations at least 25m away from a sensitive receptor, where no further noise control should be required. It is assumed that there will be a basic level of vibration isolation installed throughout the system. This will include encapsulated rail (rail embedded in a rubber casing to dampen vibration). At distances of more than 20 m from the nearest track, the vibration levels from the LRT system will meet the applicable guidelines. For residential receptors located closer than 20 m, various levels of upgraded vibration isolation will be required (e.g., improved encapsulated rail systems or floating slab track). A construction phase protocol will be developed for addressing noise and vibration complaints in keeping with the City's standard practice. The City does not currently have a post-construction transit noise monitoring policy. Though not required, noise monitoring can be conducted once the project is completed to provide an indication of the actual sound levels along the LRT route. For the operations phase, a noise and vibration monitoring plan will be considered, along with a complaints protocol.

Air Quality - Existing air contaminant levels in the study area are within acceptable thresholds set out in MOE Ambient Air Quality Criteria (AAQCs), with the exception of particulate matter, benzene and benzo(a)pyrene. With respect to inhalable and respirable particulate matter, 24-hour concentrations are within the thresholds most of the time, but do exceed them from time to time. In the case of benzene and benzo(a)pyrene, their annual average concentrations exceed proposed new annual average AAQC's, and their daily concentrations exceed proposed new 24-hour AAQC's relatively frequently. Sulphur dioxide levels easily meet the applicable Ontario AAQC's, but occasionally exceed the more stringent 24-hour guideline for SO_2 set out by the World Health Organization.

Introduction of the B-Line LRT system will result in a number of air quality benefits. Since the LRT is an electrified rail system, it does not produce any significant local air emissions. On the contrary, it displaces emissions that otherwise would be generated by alternative methods of carrying its passengers, either automobile or bus. For example, along King Street and Main Street, the maximum cumulative benzene concentrations are expected to improve slightly due to the projected decrease in traffic volume on these roads, with the LRT in place. The air quality analysis indicated that, with minor exceptions, for most of the pollutants assessed, the maximum cumulative concentrations will remain within acceptable thresholds at residences and other sensitive receptors adjacent to the roadways (i.e., concentrations remain within applicable ambient air quality criteria, or AAQC's). This is true even in the areas where traffic volumes are projected to increase with the LRT in place. The construction tendering process will include requirements for implementation of an emissions management plan, including monitoring and measure to minimize emissions and prohibit visible emissions from escaping beyond the contract limits of a construction site.

Cultural Environment

Built Heritage and Cultural Landscapes - Twenty-one (21) Built Heritage Resources (BHR) were identified in the B-Line corridor. BHR are defined as one or more significant buildings, structures, monuments, installations or remains associated with architectural, cultural, social, political, economic, or military history and identified as being important to a community. BHR may include features designated under the Ontario Heritage Act, or those in the City of Hamilton's registry of properties considered to be worthy of conservation. In addition, twenty-two (22) Cultural Heritage Landscapes (CHL) (defined geographical areas of heritage significance that have been modified by human activities, are valued by a community, and are of significance to the understanding of the history of a people or place) were identified in or adjacent to the corridor. The B-Line LRT corridor has been designed to generally avoid displacing any Built Heritage Resources or adversely affect Cultural Heritage Landscapes. However, the transit project has the potential to directly or indirectly affect these identified cultural heritage resources. Where recommended, avoidance, minimization of encroachment, maintenance of vehicular access to identified cultural heritage resources, minimization of negative visual impacts through sensitive design of LRT stops and platforms in areas where cultural heritage resources have been identified, and documentation of resources in advance of alteration will be addressed during subsequent design phases.

Archaeological Resources and Areas of Archaeological Potential - includes artifacts, archaeological sites, and areas with the likelihood to contain archaeological resources. Twenty (20) archaeological sites have been registered with 2 km of the B-Line LRT corridor; three of these sites are located within 100 m of corridor. The corridor also has potential for the identification of Aboriginal and Euro-Canadian archaeological sites. The B-Line LRT corridor has been designed to generally avoid encroachment on areas with archaeological potential. Additional archaeological investigations will be conducted on lands determined to have archaeological potential, if the proposed project will impact these lands.

ES.4 Permits and Approvals Required For Project Implementation

The City of Hamilton will obtain the necessary municipal, provincial and federal permits and approvals for the construction and implementation of the B-Line RT project, including additional environmental assessment approvals required for implementation of the Maintenance and Storage Facility and any changes to the design of the project that is presented in this Environmental Project Report, in accordance with the Transit Project Assessment Process regulation and other applicable EA processes. This will include conducting additional environmental investigations to obtain information that supports the various applications and facilitates negotiations with regulatory agencies.

ES.5 Consultation and Commitments to Further Work

Consultation

The general public, government agencies and various interest groups have been provided with numerous opportunities to review and comment on the B- Line Rapid Transit project as it has developed. These include from development of the RT vision through the Feasibility and Pre-Planning stages to the current Transit Project Assessment Process.

A number of communication methods have been used to notify stakeholders of events, latest project news and opportunities to input and comment. These include a project web site, regular newsletters, a project Facebook page, Twitter, a mailing list of over 2,300 contacts and a telephone number, fax, email and mailing address for contacting the project team.

A technical working team, comprising specialists from within the planning and public works departments at the City of Hamilton, along with representatives from Metrolinx, the Regional Transportation Agency in the Greater Toronto and Hamilton Area (GTHA), have met frequently and shaped development of the project. This has been supplemented and strengthened by quarterly meetings of a Corporate Working Team comprising specialists from across City departments who have reviewed and commented on the project and helped to shape its development. A Rapid Transit Citizen Advisory Committee (RTCAC), comprising 26 representatives from City residents, business owners and community groups, has also provided input and advice to the City of Hamilton in developing the B-Line LRT proposals on a monthly basis since mid-2010.

Externally the public, technical agencies, including federal, provincial and municipal agencies, utilities, and potential interested groups, were able to choose their involvement from a range of options including face to face meetings, presentations and/or direct contact. The City of Hamilton RT team has directly contacted First Nations and Local Aboriginal organizations for their views and input to development of the project, including milestone notification of all opportunities to review and comment on project proposals.

Six formal rounds of consultation have been undertaken, five as part of the Pre-Planning phase and the sixth as part of the TPAP phase. During these Public Information Centers were held for the public, to view plans and have direct communication with project team members. Flyers were distributed throughout the study area and the dates/locations were advertised in local newspapers prior to each open house. The project team, including representatives from the City of Hamilton and the consultant team, were in attendance at the meetings to answer questions regarding the study and display panels and video presentations were used to present information about the project.

During the Pre-planning phase consultation, between April 2008 and May 2011, extensive consultation, including five rounds of Public Information Centers or open houses, was held. These demonstrated wide-scale support for Rapid Transit in Hamilton and for the B-Line proposals which were being developed. In addition two property owner workshops and a loading and delivery survey were undertaken. Extensive consultation was also undertaken with technical agencies and municipal staff whose comments were used to shape development of the project. Full details of the Pre-Planning consultation are contained in Section 6.2.

During the TPAP phase, four Public Information Centers were held during August 2011. Again the project team, including representatives from the City of Hamilton and the consultant team, were in attendance at these to answer questions regarding the project and display panels and video presentations were used to present information. A copy of the Notice of Commencement and follow up letters were sent to 18 First Nations representatives, followed up with telephone calls and emails. No comments have been received and the City remains committed to engagement with the First Nations and will meet with their representatives should they express any interest or concerns.

As was the case during the Pre-Planning phase the RT team have consulted with federal, provincial and technical agencies. Full details of their comments and how these have been addressed are contained in Section 6.3 of the EPR.

Commitments to Further Work and Consultation

During this Transit Project Assessment Process, the City of Hamilton Rapid Transit Team has worked closely with other City staff, and key stakeholder agencies to address and resolve any issues or concerns. Commitments to future work for the project, and related consultation activities, are listed below.

LRT Design

- Continue consultation with the public, property owners, business operators, regulatory and other government agencies, Aboriginal communities, and other interested stakeholders during design of the LRT alignment, stops and ancillary facilities, such as traction power substations and the location of maintenance and storage facility.
- Consultation with Red Hill Valley Stewardship Board - The City will circulate to the Board, via the coordinator, proposed design plans for their input and will attend any Board meetings to discuss the project. Extensive construction management, mitigation and restoration programs were utilized for the construction of the Red Hill Valley Parkway and the City will commit to following these practices for any work In the Red Hill Valley. In addition, for design and implementation of works in the Red Hill Valley, the City will work collaboratively with the Board to develop Environmental and Ecological Principles, which will initially be prepared and provided to the RT Team by the Board.
- Continue consultation on integration of the LRT system and public realm enhancement initiatives.
- Work with residents and business along the corridor to develop parking and loading strategies to minimize impacts
- Continue discussions with McMaster University with regard to:
  - the location and configuration of the terminal stop at the University;
  - potential for electromagnetic interference impacts;
  - drainage and other infrastructure requirements; and
  - the most effective way to provide the interface between the campus, the LRT service, GO Transit bus service and other possible transit initiatives in the area.
- Consult with the owners and tenants of Eastgate Square with regard to the location and configuration of the terminal stop at the Mall.
- Continue discussions and liaison with Metrolinx/GO Transit to ensure that opportunities for high quality service integration are realised and good pedestrian connectivity is achieved between LRT stops, GO transit bus service stops and GO Rail service stations.

Detail Design Investigations

- Red Hill Creek structure enhancement.
- Geotechnical investigations.
- Noise and vibration.
- Archaeological resources.
- Built heritage conservation.

Property Acquisition

- Refine property requirements through the design phase.
- Develop a property acquisition strategy based on how implementation of the project will be staged.
- Proceed with acquisition of the required property through negotiation, or expropriation if required.

Address Construction Issues

- Establish a community liaison committee during construction to provide quick access to construction related information, specifically schedule and timing information for business owners and residents. The committee will be made up of City and Contractor staff who will meet on site periodically.
- Develop and implement a detailed traffic management plan, comprising a construction staging and street closure or lane reduction strategy, including an emergency response component (Fire, Police, Emergency Medical Services).
- Develop and implement a detailed utilities relocation/replacement plan that is fully integrated with the traffic management plan to ensure minimum disruption of services.
- Strictly control air, noise and vibration emissions.
- Implement a strategic erosion and sediment control plan to protect watercourse crossings (Red Hill Creek and Chedoke Creek), including provision of adaptive management to address construction staging requirements.
- Minimize impacts to street trees and natural areas not scheduled for removal through development and implementation of a Tree Management Plan.

Monitoring

- Monitor construction activities for compliance with environmental protection commitments made during the Environmental Assessment phase.
- Monitor construction activities for effectiveness of environmental protection and mitigation measures adopted to reduce or eliminate any adverse effects.
- Monitor during the operations phase to assess predicted benefits and net environmental effects of the project, including:
  - property redevelopment;
  - assessed property values;
  - integration of LRT and public realm;
  - air quality, noise and vibration;
  - traffic operations;
  - Parking and Loading; and
  - LRT/Bus system usage.

In cooperation with the appropriate funding agencies, the City will also negotiate the necessary funding, service and project implementation agreements.

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1.0 INTRODUCTION AND STUDY PROCESS

1.1 Introduction

The City of Hamilton has embarked on an aggressive plan to implement rapid transit, with a long term vision that encompasses five corridors and connects key origins and destinations across the City. This proposed system is referred to as "B-L-A-S-T" (refer to Figure 1.1). Currently, the City's focus is on implementing Light Rail Transit (LRT) along the City's primary east/west B-Line corridor, Main Street West, King Street, Main Street East and Queenston Road between Eastgate Square and McMaster University and defining a potential corridor and rapid transit mode for future rapid transit implementation along the City's primary north/south A-Line corridor, James/Upper James between the Waterfront and the Airport. This Environmental Project Report addresses planning, design and implementation of the B-Line LRT corridor.

The provision of rapid transit in Hamilton is closely linked with the Province's MoveOntario 2020 vision (June, 2007). As part of this vision, the Province established a Greater Toronto Transportation Authority (later named Metrolinx) to implement an integrated transportation system for the Greater Toronto and Hamilton Area (GTHA) over the next 25 years and beyond, through the development of a Regional Transportation Plan (RTP) *The Big Move*, long term Investment Strategy (IS) and rolling 5-year Capital Budget. The Big Move, endorsed in November 2008, included five rapid transit corridors for Hamilton, with two corridors, the A-Line and the B-Line, identified for implementation within 15 years. The Big Move identifies the A-Line limits extending from the Downtown to the Airport, along the James/Upper James corridor and the B-Line limits extending from Eastgate Square/Centennial Parkway to McMaster University along the Main/King corridor. In addition, the B-Line was identified as a "top 15 priority project" within the first 15 years.

Figure 1.1: Hamilton Rapid Transit – Proposed Network

Light Rail Transit (LRT) has been selected as the preferred mode for the B-Line with LRT and Bus Rapid Transit (BRT) both under consideration for the A-Line.

The development and implementation of Rapid Transit in Hamilton is much more than a transit project. The Rapid Transit Vision developed and endorsed by Council is expressed as follows:

"Rapid Transit is more than just moving people from place to place. It is about providing a catalyst for the development of high quality, safe, environmentally sustainable and affordable transportation options for our citizens, connecting key destination points, stimulating economic development and revitalizing Hamilton".

A team led by Steer Davies Gleave has been appointed by the City of Hamilton and Metrolinx to undertake the Preliminary Design and Feasibility Study for Hamilton Rapid Transit, covering detailed development of the B-Line and preliminary assessment of the A-Line. One of the main aims set out for the Study is to *"take the project to a maximum state of implementation readiness"*. To this, Steer Davies Gleave has added a demand-led, network-wide approach which emphasizes *"putting the passenger first"*.

This sits within the context of a hierarchy of users of the roadway and other public space, which responds to the Rapid Transit Vision, and is particularly appropriate for the Downtown areas of Hamilton:

- People
- Bicycles
- Transit
- Local Vehicular Traffic
- Goods Movement
- Through Traffic

1.2 Study Area

The Study Area for the alignment development and related road layout changes is the B-Line corridor, as shown in Figure 1.1 above.

The overall transportation demand modelling was based on the use of an existing EMME model which covered in detail an area extending from Oakville to Niagara. For the purposes of detailed traffic modelling the area modelled is broadly between the Niagara Escarpment to the south, Barton Street to the north, Cootes Drive to the west and Centennial Parkway to the east.

1.3 Transit Project Assessment Process

This project is being implemented in accordance with Ontario Regulation 231/08, Transit Projects and Greater Toronto Transportation Authority Undertakings (Transit Projects Regulation) of the Environmental Assessment Act. The Transit Projects Regulation exempts proponents of all public transit projects from the requirements under Part II of the Environmental Assessment Act if they adhere to the requirements of the Transit Projects Assessment Process (TPAP). Proponents must follow the prescribed steps in the TPAP within specified time frames, culminating with the Minister of the Environment's decision within six (6) months of the start of the process, which is marked by the Notice of Commencement.

A TPAP Guide was developed by the Ministry of the Environment in March 2009 and is available on the Ministry of the Environment's website:
(http://www.ene.gov.on.ca/stdprodconsume/groups/lr/@ene/@resources/documents/resource/std01_079568.pdf).

The TPAP decision-making framework and associated time frames are illustrated in Figure 1.2.

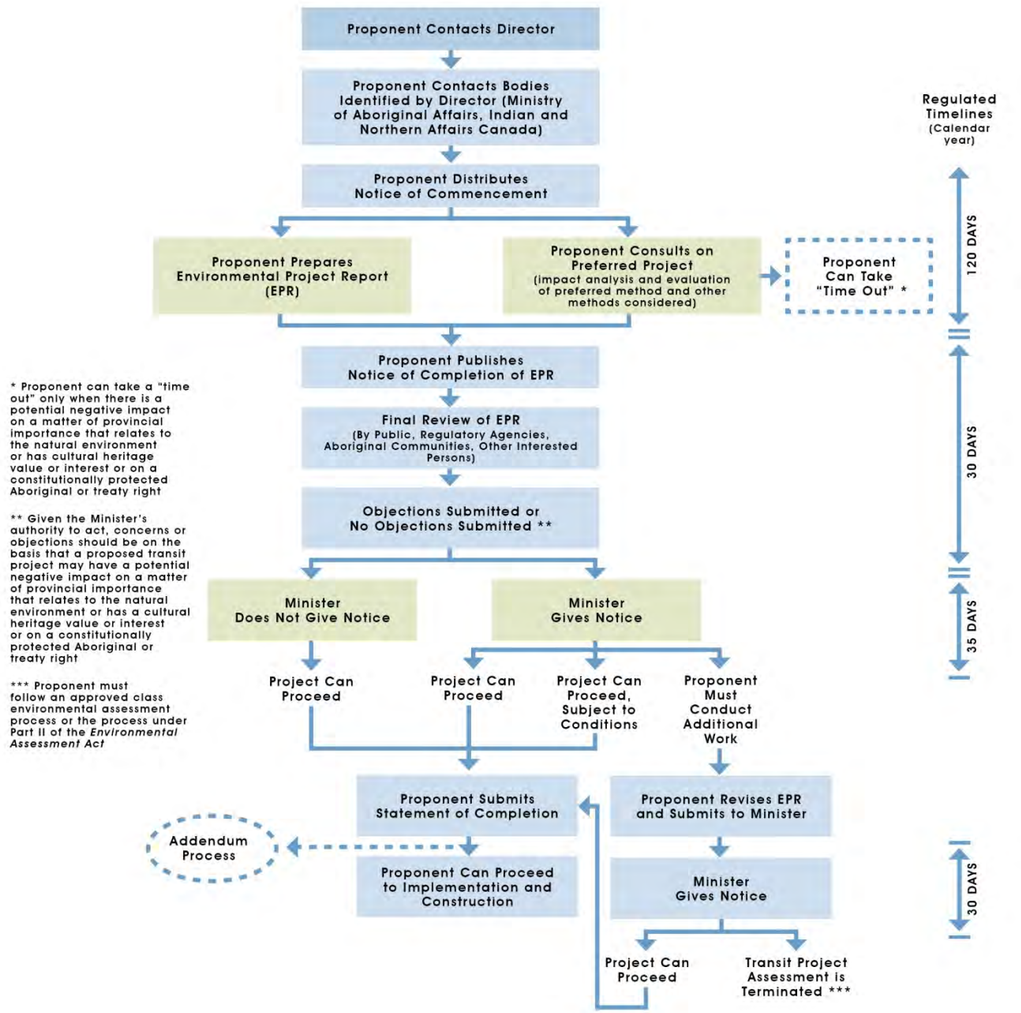
The six-month timeline includes:

- 120 days for consultation on positive or negative environmental impacts and the preparation of an Environmental Project Report (EPR);
- 30 days for the public, regulatory agencies, aboriginal communities and other interested parties to review and comment on the final EPR; and

- 35 days for the Minister of the Environment to respond to public requests for a review of the project.

The relatively short decision-making process does not mean that the general precepts of the *Environmental Assessment Act* are circumvented. The proponent must still engage in "good planning" and make choices based on sound scientific methods. Further, assessment of potential effects of a proposed transit project, mitigation measures, traceable documentation and appropriate opportunities for stakeholder consultation/objections are still required. However, the process is focused so that the assessment of potential impacts and decision-making can be completed within the prescribed time frames.

Figure 1.2: Transit Project Assessment Process Framework and Timelines



The process starts with the transit project that the proponent has selected based on a comprehensive planning program. Given the universally recognized benefits of transit projects, the regulation does not require proponents to document the planning alternatives to public transit (alternatives to the undertaking), or the rationale and planning alternatives to the particular transit project. Identification of the selected project is completed within the Pre-planning Stage and may include feasibility studies; master planning; preliminary environmental reports (inventories, potential impacts); consideration of project alternatives; and pre-consultation activities with the public, regulatory agencies, aboriginal communities and other interested parties.

Under the TPAP, the Minister of the Environment does not have the authority to either approve or refuse a transit project. However, the Minister may consider whether a transit project may have negative impacts on:

- Matters of provincial importance; and
- Constitutionally protected Aboriginal or treaty rights.

A matter of provincial importance means:

> *"a matter of provincial importance that relates to the natural environment or has cultural heritage value or interest."*

Where issues related to such matters remain unresolved, the Minister may request that the proponent conduct additional investigations and consultation. Such direction will likely mean initiation of a "time out" or termination and restarting the TPAP, a highly undesirable interjection in the schedule for any undertaking.

Therefore, as part of the natural environmental conditions and archaeological and built heritage/cultural landscape update/consolidation, the City of Hamilton has ensured that full closure is achieved on any matter deemed significant enough to be of provincial importance in the context of the Minister's 35-day review period, through the appropriate level of traceable investigation, consultation and documentation. Efforts in this regard are discussed in the Transit Project Assessment Process Guide. Consideration has also been given to the Provincial Policy Statement; however, it does not directly apply.

The LRT corridor under consideration here does not affect any First Nation reserve lands. However, the corridor has been assessed with respect to use of lands and resources for traditional purposes by aboriginal persons. The assessment has been conducted by taking into account knowledge of the study area and identifying potential impacts on specific resource areas (e.g., watercourses, valley corridors, forested areas) used for traditional aboriginal purposes (fishing, hunting and harvesting/gathering of plants). Information and advice in this regard has been sought from aboriginal communities. Potential impacts on resource areas will be limited based on the proposal to implement the transit project largely in pre-existing rights-of-way that have been in use since the middle of the nineteenth century.

1.3.1 B-Line Pre-Planning Activities

In keeping with the intent of the Transit Project Assessment Process, a number of pre-planning activities were conducted to facilitate completion of TPAP-phase activities within the prescribed timeframe. Following is a summary of the key activities completed prior to publication of the Notice of Commencement (June 17, 2011).

- Contacting and meeting with Ministry of the Environment staff to obtain initial input to this study, including agreement on the scope of various environmental impact assessment factors;
- Undertaking a feasibility study for the project (refer to Section 1.5.3 Related Studies);
- Preparing and implementing consultation plan to obtain stakeholder input, including establishment of a project website;
- Initiating pre-notification and pre-consultation activities with aboriginal communities, adjacent property owners, and regulatory agencies;
- Identifying matters of provincial importance (for example, built heritage resources, cultural heritage landscapes, archaeological resources, and designated natural areas along the study area);
- Identifying potential federal environmental assessment and other federal regulatory requirements;
- Conducting various studies to identify the existing natural environment, social environment conditions (constraints/challenges and opportunities);

- Conducting other technical investigations comprising development of the project to be carried forward to the TPAP phase (refer to Section 2.1 Design Philosophy and Development of the Preferred Design). ***It is most important to note that this planning activity included consideration of design alternatives and their respective advantages and disadvantages prior to publication of the Notice of Commencement;***
- Preparing a proposed schedule for conducting the TPAP phase activities, including identifying opportunities for interested persons to review and comment on the proposed design, environmental impact assessment and proposed mitigation measures; and
- Commencing preparation of the Environmental Project Report.

1.4 Study Organization

The City of Hamilton has established a dedicated Rapid Transit Team to implement the city's Rapid Transit Vision, including providing direction to the Project Team responsible for completing the B-Line planning and design process. The team includes representation and receives support from a range of city divisions and departments responsible for transportation planning, transit operations, land use and environmental assessment, planning and economic development, and infrastructure/asset management. The RT program also involves participation by a Corporate Working Team, consisting of nearly 70 staff members from all city divisions, whose members are responsible for communicating their present and future initiatives with the Rapid Transit team and commenting and disseminating information on the planning and design for the B-Line.

In addition to the aforementioned input, the RT Team has established a forum for receiving formal input from various public interest groups – the Rapid Transit Citizen Advisory Committee. The role of the RTCAC is to provide input and advice to the City of Hamilton regarding the planning and development of the rapid transit initiative and related land use planning studies. The RTCAC meets with the RT project team at key points in the process to provide feedback on emerging ideas and conclusions. Details of the RTCAC's involvement are provided in Section 6.0 Consultation Process.

A consultant team led by Steer Davies Gleave has been appointed by the City of Hamilton to undertake the preliminary design and environmental assessment of the B-Line. The multi-disciplinary team includes a range of specialists to provide the appropriate technical input for successful completion of the Transit Project Assessment Process and move forward to the design phase of project implementation:

- Steer Davies Gleave – Project management; transit and transportation planning; financial assessment; stakeholder consultation.
- SNC-Lavalin Inc. – transit system engineering; environmental assessment process; natural environment (fisheries/vegetation); property contamination.
- Dialog – urban planning and public realm.
- Thurber Engineering Limited – geotechnical and foundations.
- J. E. Coulter Associates Limited – noise and vibration.
- RWDI AIR Inc. – air quality.
- Archaeological Services Inc. – built heritage resources; cultural heritage landscapes; archaeology.
- Natural Resource Solutions Inc. – natural environment (wildlife; species at risk).

1.5 Background and Context

Planning and design of the B-Line LRT corridor has been based on provincial and City of Hamilton transportation planning and growth policies. The following sections provide descriptions of the policy frameworks that govern this study.

1.5.1 Provincial Planning Process and Policies

Provincial Policy Statement

Municipal infrastructure is not strictly governed by the Ontario Provincial Policy Statement (PPS), as the PPS typically apply to Planning Act matters. However, at a high level, this project is consistent with the PPS, the objectives of which include that transportation, transit and infrastructure facilities are to be planned to meet current and projected needs, providing for an efficient, cost-effective and reliable multi-modal transportation system that supports long-term economic prosperity. The Statement also requires that public transit and other alternative modes of transportation are to be supported to improve energy efficiency and air quality.

Growth Plan for the Greater Golden Horseshoe

This project is consistent with the objectives of the Growth Plan for the Greater Golden Horseshoe (2006), which is a 25-year plan that aims to:

- Revitalize downtowns to become vibrant and convenient centres;
- Create complete communities that offer more options for living, working, learning, shopping and playing;
- Provide housing options to meet the needs of people at any age;
- Curb sprawl and protect farmland and green spaces; and
- Reduce traffic gridlock by improving access to a greater range of transportation options.

Pertinent transportation policies related to moving people include:

- Public transit will be the first priority for transportation and major transportation investments;
- All decisions on transit planning and investment will be made according to the following criteria:
    - Using transit facilities to shape future growth, and planning for high residential and employment densities that ensure the efficiency and viability of existing and planned transit service levels;
    - Placing priority on increasing the capacity of existing transit systems to support intensification areas;
    - Expanding transit service to areas that have achieved or will be planned so as to achieve, transit-supportive residential and employment densities, together with a mix of residential, office, institutional and commercial development wherever possible;
    - Facilitating improved linkages from nearby neighbourhoods to urban growth centres, major transit station areas and other intensification areas;
    - Consistency with the strategic framework for future transit investments outlined in the Plan (i.e., Hamilton identified as an Urban Growth Centre); and
    - Increasing the modal share of transit.
- Major transit station areas and intensification corridors will be designated in official plans;
- Major transit station areas and intensification corridors will be planned to ensure the viability of existing and planned transit service levels; and
- Major transit stations will be planned and designed to provide access for various transportation modes including pedestrians, bicycles and passenger drop-off.

MoveOntario 2020

The provision of rapid transit in Hamilton is closely linked with the Province's MoveOntario 2020 vision (June 2007). As part of this vision, the Province established a Greater Toronto Transportation Authority (later named Metrolinx) to implement an integrated transportation system for the Greater Toronto and Hamilton Area (GTHA) over the next 25 years and beyond, through the development of a Regional Transportation Plan (RTP) The Big Move, long term Investment Strategy (IS) and a rolling 5-year Capital Budget.

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The Big Move

The RTP (entitled *The Big Move: Transforming Transportation in the Greater Toronto and Hamilton Area*), endorsed in November 2008, included five rapid transit corridors in Hamilton to be implemented consecutively over the next 25 years and beyond, with two corridors, the A-Line and the B-Line, identified for implementation within 15 years. The RTP identifies the A-Line limits extending from the Downtown to the Airport, along the James/Upper James corridor, and the B-Line limits extending from McMaster University to Eastgate Square/Centennial Parkway along the Main Street/King Street/Queenston Road corridor. In addition, the B-Line was identified as a "top 15 priority project" within the first 15 years.

Transit Supportive Land Use Planning Guidelines

In 1992, MTO and MMAH developed the *Transit Supportive Land Use Planning Guidelines* to provide ideas and guidance to a variety of public and private stakeholders on planning and development practices that support public transit.

The document contains a set of guidelines for making all forms of urban development and redevelopment more accessible by public transit. The guidelines provide transit-friendly land use planning and urban design practices drawn from experience in Ontario and from elsewhere in North America and abroad. The purpose of these guidelines is to provide ideas and guidance to land use planners, transportation planners, municipal politicians, developers, transportation engineers, transit operators and others on planning and development practices that support the provision and use of public transit. These include development patterns that make transit less expensive, less circuitous, more efficient and more convenient, as well as those that make access to the system more attractive to the potential transit user. Draft revised guidelines were published in spring 2011.

Metrolinx Mobility Hub Guidelines

The Mobility Hub Guidelines, 2011, focus on creating successful mobility hubs which address a number of key identified objectives. For each of these objectives the guidelines provide detailed strategies, best practices, case studies and suggested resources. Hamilton has three identified mobility hubs of which one, downtown Hamilton, is on the B-Line LRT route.

1.5.2 City of Hamilton Planning Process and Policies

The Growth Related Integrated Development Strategy (GRIDS), the City's Transportation Master Plan and the Urban Hamilton Official Plan (pending approval) all recognize the Main-King-Queenston Road Corridor as a primary corridor linking important nodes and activity areas in the City (Eastgate Square, Downtown and McMaster University). These policy and planning documents describe, and set in policy, the future function of the corridor and the nodes which lie along the corridor.

GRIDS

The City of Hamilton's Growth Related Integrated Development Strategy (GRIDS), 2006 evaluated a series of growth options for future urban structure and resulted in the choice of a node and corridor system for future growth. The Study also identified corridors for the locations of higher order transit services to link nodes and facilitate movement of people from place to place. The B-Line Corridor is an identified corridor in GRIDS.

Urban Hamilton Official Plan (Minister approved 2011, currently under appeal to OMB)

The new Urban Official Plan takes the node and corridor growth strategy from GRIDS and establishes the future urban structure in policy. A series of guiding principles for nodes and corridors is contained within the Plan. Nodes and corridors are:

- The focus of reurbanization activities (i.e. population growth, private and public redevelopment and infrastructure investment);
- Focal points of activity for Hamilton's local communities and neighbourhoods;
- Connected and internally served by various modes of transportation, including higher order transit;
- Provide a vibrant pedestrian environment and facilitated active transportation through careful attention to urban design; and
- Evolve with higher residential densities and mixed use development.

Land uses along the B-line corridor are primarily mixed use, allowing a variety of uses to occur. The policies of the Plan call for more detailed secondary planning to occur to provide more direction for land uses and urban design in the corridor. Existing secondary plans are in place for the areas of Ainslie Wood-Westdale (west section of the corridor) and Downtown. These secondary plans identify a variety of mixed use land use designations along the B-Line corridor. In addition, the Strathcona Secondary Plan study will be influenced by, and will inform design deliberations on the B-Line LRT corridor.

Transportation policies in the Urban Hamilton Official Plan reflect the importance of an integrated transportation network that also integrates with land use. Through identification of the B-L-A-S-T network, the policies recognize and support the relationship between transportation and land use planning in connecting communities, land uses and activities and the role of an integrated transportation network, including Rapid Transit, in creating complete communities and improving overall quality of life.

Hamilton Transportation Master Plan

The Hamilton Transportation Master Plan (HTMP) first introduced a "higher order" transit infrastructure plan, which was identified as being fundamental to providing an enhanced level of accessibility without requiring major expansion of the roadway network. The HTMP identified three (3) potential Bus Rapid Transit (BRT) corridors, with the potential for Light Rail Transit in the long term. Complementary policies regarding land use intensification within the corridors designated for higher order transit, along with aggressive parking supply restrictions, pricing policies and other transportation demand management strategies, are also included in the HTMP and have become an important component in the overall planning for rapid transit in Hamilton. In addition, the HTMP includes complementary policies on active transportation that promote the coordination of transit trips with walking and cycling trips, so multi-modal trips are convenient, safe and comfortable, including promoting cycling and walking connections with public transportation in transit marketing programs.

At the conclusion of the HTMP process in 2007, no timeframe had been identified for planning or construction of the higher order transit network, due to the significant costs related to the implementation and operation of rapid transit. However, in 2007, rapid transit planning in Hamilton was accelerated in response to the aforementioned MoveOntario 2020 vision statements and the allocation of $11.5 billion for rapid transit initiatives in the GTHA.

Other relevant planning and policy directions are provided in:

- The Hamilton-Wentworth Regional Official Plan (1995)
- City of Hamilton Official Plan (Consolidated 2006)
- Vision 2020 (2003)

Hamilton Transit Oriented Development Guidelines (2010)

Hamilton's TOD Guidelines support and facilitate current and future transit use while further guiding the implementation of the Urban Hamilton Official Plan goals and the directions of the Transportation Master Plan. The Guidelines complement existing policies and programs but also provide further guidance on implementing land use policies and zoning. The TOD Guidelines establish a guiding framework within which secondary planning, corridor studies and transit station planning can occur.

The influence of these documents is discussed in Section 3.2.1 Urban Structure and Land Use Policy Directions.

1.5.3 Related Studies

Following are descriptions of project-specific investigations related to the broader provincial and City of Hamilton policy directions for the implementation of rapid transit in the B-Line corridor. These studies established the foundation for the current planning and design of the B-Line LRT project in terms of feasibility and benefits to be derived from the system.

Rapid Transit Feasibility Study

In November 2007 the City of Hamilton initiated a Rapid Transit Feasibility Study (RTFS) to review the constraints and opportunities for the development of either a BRT or LRT higher order transit system, along the A-Line and B-Line corridors.

The Rapid Transit Feasibility Study, Phase 1 investigated the major considerations in route selection including such things as land use, existing transit service, rights of way (widths, users, infrastructure [surface and subsurface], construction impacts), timing, signal priority, dedicated lanes, as well as an analysis of the feasibility and requirements for the implementation of a rapid transit system to assist in the determination of the type of technology, LRT or BRT that should ultimately be implemented. However, LRT was determined to generate the highest user benefits.

Based on the need to further investigate opportunities to address the constraints identified as part of Phase 1, Phase 2 of the Rapid Transit Feasibility Study primarily focused on the B-Line corridor given its higher priority in The Big Move and looked at means by which to address the constraints identified as part of Phase 1, with a focus strictly on LRT. The decision to focus on LRT was a result of overwhelming support for LRT identified during an aggressive public consultation component and was supported unanimously by City Council.

Following the release of the Regional Transportation Plan, the City initiated Phase 3 of its Rapid Transit Feasibility Study in order to prepare for the benefits case analysis that was required to be undertaken by Metrolinx. Phase 3 focused strictly on LRT along the B-Line corridor and included studies that addressed:

- Traffic Modelling
- Archaeology
- Built Heritage and Cultural Landscapes
- Noise and Air Quality
- Economic Potential
- Hydrogeology
- Terrestrial and Avian Ecology
- LRT Technology Review
- Subsurface Infrastructure Impact Assessment
- LRT Functional Planning Analysis – B-Line Corridor
- Air Quality Assessment

All of the above studies, with the exception of the Economic Potential study, have directly fed into the current study work and in that context their findings and conclusions, or those of the work that replaced/superseded them, are summarized in the relevant parts of this EPR.

The Economic Potential Study

The Economic Potential study looked at the potential economic benefits that could be realised by the introduction of RT on the B-Line. The study examined the likely impacts of both BRT and LRT and concluded:

- Supportive policies are in place to help shape corridor.
- All Hamilton residents benefit from rapid transit - Approximately 17% of the City's population and 20% of the City's employment are within 800 m of the B-Line corridor. Additionally, 80% of HSR's current routes connect to the B-Line corridor.
- The potential for intensifying development in the corridor is significant.
- With rapid transit comes jobs, some 6000 created due to construction expenditures with over 1,000 ongoing jobs due to on-going operations and maintenance.
- Environmental benefits translate into economic benefits - annual emissions costs due to travel in the study area could be reduced by approximately 7.5% equating to some $2 million annually.
- An exceptional mix of land uses in the corridor will enhance economic activity.
- The proposed rapid transit corridor covers areas of relatively high social need.
- Economic potential should be maximized by constructing a single corridor.
- Light Rail Transit will require a greater capital investment than Bus Rapid Transit but will provide greater long term benefits to the City.
- Economic benefits are contingent on significantly changing land-use.

The B-Line RTFS (Phases 1, 2 &3) was completed fall 2009. Full copies of the reports produced during these studies can be found at http://www.hamiltonrapidtransit.ca/index.php/project-information/funding-proposal/.

Benefits Case Analysis

A Metrolinx Benefits Case Analysis (BCA) for Hamilton's B-Line corridor was completed in February 2010. This considered three options for evaluation – full Bus Rapid Transit (BRT), full Light Rail Transit (LRT) and partial LRT. The analysis demonstrated that all three options would generate positive benefits for Hamilton and the region, and would be capable of accommodating long-term travel demand growth in the corridor.

Although the BCA identified full LRT as the highest cost option, it also noted that LRT generates the highest transportation user benefits in terms of travel time savings, ridership attraction and overall qualitative travel experience. LRT also carries a stronger potential to reduce greenhouse gas emissions and generate more significant economic development impacts including employment, income, and Gross Domestic Product growth for the city and region. The BCA also identified LRT as having the greater potential to shape land uses and uplift land values along the King-Main corridor. The BCA can be viewed in full at http://www.metrolinx.com/en/regionalplanning/projectevaluation/benefitscases/Benefits_Case_Hamilton_FINAL_Feb2010.pdf.

The conclusions from the Rapid Transit feasibility study work and the Metrolinx BCA resulted in Metrolinx awarding the City of Hamilton funding to progress development of LRT on the B-line through a Planning, Design and Engineering (PDE) study which commenced in the Summer of 2010. This EPR is one of the major outputs of the PDE study.

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2.0 PROJECT DESCRIPTION

The City of Hamilton's Rapid Transit Vision statements and the subsequent Rapid Transit Feasibility Study have established the basis for development of the B-Line Rapid Transit project and the use of Light Rail Transit for operating the service. The following section describes the principle components of the proposed project, including:

- Design philosophy and evolution of the preferred design, including consideration of alternative configurations for various system elements;
- Site-specific design considerations;
- Detailed criteria adopted for designing the RT system elements within the corridor, including the prototypical LRT vehicle;
- The preferred B-Line LRT design;
- How the B-Line RT will be integrated with the land use plan for the corridor;
- Property requirements for implementation of the B-Line LRT plan; and
- How the project will be implemented.

The project involves the introduction of high frequency Rapid Transit service using Light Rail Transit (LRT). The 13.9 km dual-track line will run along Main Street between McMaster University and Highway 403, along King Street from Highway 403 through Downtown to the junction of King Street and Main Street, and along Main Street and Queenston Road to Eastgate Square. In addition to the terminus stops at McMaster University and Eastgate Square, 16 on-street stops will be strategically located along the route for access by walking, cycling and north-south bus routes. The B-Line LRT will operate with one vehicle per train, on a combination of shared and exclusive at grade guideway to allow cross-movements and access to properties. The LRT service will receive priority at signalized intersections, achieving high operating speeds compared to other modes of transport (such as buses and private vehicles), particularly during peak travel periods.

A key plan of the B-Line LRT alignment and stop locations is shown below in Figure 2.1, and the proposed B-Line LRT corridor design plates are presented in Appendix A of this report.

Figure 2.1: B-Line LRT Overall Key Plan

2.1 Design Philosophy and Development of Preferred Design

Working within the hierarchy of users, and in order to achieve the overall project aims, the Steer Davies Gleave team's approach was to seek to design an LRT alignment that features a series of "best practice" Design Principles. The aim was to produce a comprehensive Integrated Transit Solution.

The LRT alignment should have the following attributes:

- Competitive journey times;
- Journey time reliability;
- Affordable capital and operating costs; and
- Minimize adverse impacts on:
    - The environment;
    - The urban realm;
    - Abutting property owners and occupiers; and
    - Other traffic.

Measures which help to achieve these attributes are:

- 100% segregation from other traffic (i.e., dedicated rapid transit only lanes),or as close as can be achieved;
- Minimizing property acquisition;
- Developing complementary road traffic measures, such as:
    - Alternative routes for traffic displaced from the LRT route;
    - Changes to bus routes (to provide a complementary and integrated transit network); and
    - Provision for pedestrians/cyclists.
- Considering the access requirements of frontages.

2.1.1 Corridor Design Philosophy

The introduction of rapid transit and the removal of major traffic movements from the route provide an opportunity for improving the urban realm of the transit corridor. This can improve the environment for local residents and businesses; provide better conditions for pedestrians, cyclists and public transit users; and create opportunities for mixed use development and new public spaces. A System Design Guide, containing system specification details along with the urban design approach to be taken along the corridor is being produced. This is informed by the City's B-Line Opportunities and Challenges document and land use planning work.

The urban realm vision and principles in the system design guide are applied to a number of locations, to demonstrate the sorts of urban realm enhancements that could be achieved.

Examples of measures which may be appropriate include:

- Improvements to the pedestrian network to achieve efficient and practical circulation and movement patterns;
- Wider sidewalks and improved road crossings for pedestrians;
- Improved sidewalk lighting, sightlines and connections to surrounding areas;
- Dedicated cycle lanes;
- Physical integration of transit infrastructure with the existing built environment;
- Provision of hard and soft landscaping pocket parks and community gardens;
- Identification of new public spaces and development opportunities;
- Minimizing street clutter;
- Pedestrian wayfinding; and
- The introduction of public art.

2.1.2 The Design Workbook Process

The development of the B-Line LRT alignment was carried out as an iterative approach, incorporating a range of inputs from planners, engineers, transit designers and operators, urban designers, economic development practitioners and other disciplines to achieve the Integrated Transit Solution that meets business case requirements and the City's Rapid Transit Vision objectives. To reach this end point, a series of Design Workbooks were produced, documenting the development of the project, setting out options and choices considered as the project has evolved. The Design Workbooks provide a commentary on the issues, impacts and opportunities that arise as the alignment development is progressed. The initial alignment design was prepared to a level of detail that allowed the identification and documentation of a range of factors - cross-section impacts; revisions to traffic lane layouts; intersection arrangements; intersections requiring transit signal priority; urban development opportunities; pedestrian and cycle improvement opportunities; and the scope to improve the urban realm.

To support this process, a set of LRT outline design principles was defined, which determined the design parameters to be applied in developing the project.

Design Workbook 1

Design Workbook 1 (DW1) was produced in August 2010 at the start of the process, presenting LRT design principles and standards, which were then applied to produce the first set of DW1 alignment plans. These plans formed the basis for discussion on all aspects of the project, from area-wide traffic and bus changes to detailed LRT design issues.

Design Workbook 1 contained:

- An outline of the corridor design philosophy adopted;
- A brief summary of previous patronage forecasts, in relation to system capacity and vehicle and stop platform length;
- Outline design criteria used for the layout development, including the basis for the stop platform length used;
- An overview of the key features of the LRT alignment design;
- A list of the proposed stop locations;
- A summary of the changes to bus transit services in the corridor; and
- The DW1 1:2000 scale alignment plans of the B Line LRT alignment supported by a description of the layout shown on each plan and a summary of issues yet to be addressed at that stage.

Following discussions with the City of Hamilton, Metrolinx, their partners and stakeholders and others to gather together views on each section of the transit corridor, the proposals were amended, with further design detail added.

The discussions established that there were relatively few issues arising along the route between McMaster University and Wellington Street, and between Queenston Traffic Circle and Eastgate Square, but there were more concerns in relation to the sections on King Street East, from Wellington Street to the Delta, and on Main Street East, from the Delta to Queenston Traffic Circle.

In addition, it was recognised that the DW1 layouts for the terminus stops at McMaster and Eastgate Square could be improved. At McMaster, it was considered that locating the terminus on the north side of Main Street West would allow better integration with the University and Hospital, the prime locations to be served here. However, pending separate discussions with the University authorities, it was agreed to keep the DW1 stop location in the centre of Main Street West for the next Design Workbook. Similarly, at Eastgate Square, it was considered that there is a better opportunity for an integrated B-Line LRT and bus terminal on the north side of Queenston Road. However, again, pending further discussions, the DW1 layout was retained.

DW1.1 Drawings

An updated set of drawings, labelled DW1.1 was issued in October 2010. DW1.1 contained a number of relatively small changes to the scheme, addressing the issues raised between McMaster and Wellington Street and between Queenston Traffic Circle and Eastgate Square.

Options between Wellington Street and Parkdale Avenue

Discussions on the section between Wellington Street and Queenston Traffic Circle, as shown in DW1 and DW1.1, identified a number of issues, including:

- The need for and acceptability of reversing the direction of traffic on King Street East from westbound to eastbound;
- The proposed diversion of the principal westbound traffic flow to Strathearne Avenue, Britannia Avenue and Cannon Street East;
- Diversion of westbound bus services to Dunsmure Avenue;
- Potential alternative solutions to the Main Street East section, involving significant property demolition, which could allow current traffic capacity to be maintained with the introduction of a segregated LRT alignment;
- Alternative routes for diverting the main through eastbound and/or westbound traffic flows, together with alternative bus routings, including diversion of through bus services away from Main Street East, with the addition of a new neighbourhood service using smaller buses.

Fourteen possible alternative conceptual layouts for the section from Wellington Street to Parkdale Avenue were prepared and set out in the "Options between Wellington Street and Parkdale Avenue" report. The report also gave background to the issues arising on this section, set out the strengths and weaknesses of each alternative, together with an initial assessment of each alternative against a set of criteria agreed to by the City and Metrolinx.

Design Workbook 2

At a workshop in November 2010, two options were selected to be taken forward for further development and assessment. These were Alternatives M and a modified version of Alternative E, termed Alternative P. These two alternatives were identical between Wellington Street and the Delta, but differed between the Delta and Queenston Traffic circle. Over this latter section, 1:2000 scale drawings of both alternatives were prepared and included in DW2. Typical cross-sections along the route were also shown.

Alternatives P and M were subject to further review to determine which should be taken forward to public consultation. The further assessment showed that Alternative P provides the better solution in terms of urban realm, pedestrian space, parking and loading and land and property impacts, and so helps to deliver the wider project objectives.

An updated version of the DW2 v1.0 B-Line drawings, including the Alternative P preferred layout and various mainly minor alignment changes was issued in January 2011 as DW2 v1.1, and formed the basis of the plans shown during the January - February 2011 Public Information Centres and Open Houses.

Design Workbook 2 v1

Design Workbook 2 v1.0 was an updated version of Design Workbook 1. The text was updated to reflect the further development of the project. Also, a number of additional elements of the project were included.

The DW2 plans incorporated the DW1.1 changes between McMaster and Wellington Street and from Queenston Traffic Circle to Eastgate Square, the new common alignment on King Street East from Wellington Street to the Delta, and the Alternative M and Alternative P layouts for the section from the Delta to Queenston Traffic Circle.

A further set of plans was included, showing the following additional features:

- The existing and proposed on-street parking along the route;
- The proposed permitted and prohibited turning movements at each of the intersections along the route;
- Impacts on existing vehicular access points to property frontage; and
- Land acquisition and building demolition required for the project.

Typical cross-sections along the route were also shown.

An updated version of the DW2 v1.0 B-Line drawings, including the Alternative P preferred layout and various mainly minor alignment changes was issued in January 2011 as DW2 v1.1, and formed the basis of the plans shown during the January - February 2011 Public Information Centres and Open Houses.

Design Workbook 2 v2.0

Following the January - March 2011 public consultation sessions, and further review of the alignment by the project team and other City of Hamilton departments, Alternative P was selected as the preferred layout for the Main Street East section. The drawings were amended and reissued as DW2v2.0. The DW2 v2.0 report included the DW2 v2.0 drawings, together with a brief commentary on the changes since DW2 v1.0, and setting out some issues which remained to be resolved. Where alternative layouts were proposed during the development of DW2 v2.0, these alternatives were included in an appendix.

The drawings were further reissued to accommodate wider sidewalks and revised as DW2 v2.1. The DW2 v2.1 drawings, together with the issues still to be resolved, formed the basis of the Functional Planning and Route Analysis work and the preparation of the Environmental Project Report.

The preliminary design which includes the alignment plan, profiles and cross sections are provided in Appendix A.

Outline Design Criteria

The proposed outline design criteria for the corridor are as follows:

Vehicle:

- Length ≈ 32 metres
- Width ≈ 2.65 metres

Alignment:

- Alignment width of ≈ 7 metres, on tangent alignment.
- Running at grade generally (except at Highway 403 and Red Hill Valley Parkway crossings).
- Central or side running.
- Minimum horizontal curve radius of 25 metres
- Minimum vertical curve radius
  Crest Curve Radius 520m (K=2.5)
  Sag Curve Radius 260m (K=4.0)
- Maximum gradient (B-Line) 6% (maximum gradient will be 5% at maximum speed of 25 km/h for an unlimited distance and 6% sustained for 250m)

Segregation:

- Target of 100% segregation (Reserved rapid transit only space within the road).
- Reallocation of road space for the exclusive use of the LRT system, whilst retaining appropriate levels of road capacity to meet the differing local needs along the length of the route.

Priority:

- Target of 100% priority at signalled intersections.
- Automatic Vehicle Location System employed to provide priority through signalled intersections

Stops

- Length ≈ 40 metres

- Width ≈ 3 metres, side platform (combined with sidewalk in some locations)

  ≈ 4 metres, island platform
- The locations of stops to be integrated with the existing pedestrian crossings at intersections as appropriate

Stop Infrastructure

- Stop facilities to provide a distinct image for the system, with the stop infrastructure built up from a standard kit of parts to meet the expected demand.
- Stops elements may include:
  - Dedicated stop infrastructure;
  - Branding;
  - Shelters;
  - Seating;
  - Ticketing;
  - Passenger Information;
  - Real Time Information;
  - CCTV;
  - Help Points;
  - Passenger Announcements

Roadway

- The development of the route to, where possible, minimise impacts to parking and access or provide alternative arrangements, where required.
- The design to minimise cross corridor traffic impacts, although a number of more minor intersections are converted to right-in, right-out traffic movements or otherwise restricted to maintain safety and capacity and to provide greater length of segregated running.

Refer to Appendix A for the complete Design Criteria document.

2.2 Site-Specific Design Considerations

During the development of the preferred design, in addition to the operational issues in the various corridor segments described above, there were site specific operational and design issues that had to be resolved to address the requirements of other agencies or operators of transportation corridors crossed by the B-Line. In addition, the Maintenance and Storage Facility requirements for the B-Line corridor were addressed to the degree possible at this time. These design elements are described in the following sub-sections.

2.2.1 McMaster University Terminus

In early work on the project, it was proposed that the McMaster University terminus would be located in the centre of Main Street West, to the east of the University/Hospital entrance. This location would require all LRT users to cross several traffic lanes to reach the stop. Since most of the demand for this stop will be from McMaster University, the McMaster Medical Centre and McMaster Children's Hospital, all on the north side of Main Street West, an alternative arrangement on the north side is now proposed.

The original location was close to the hospital entrance, but remote from much of the University campus. The preferred layout proposed addresses both of these issues. Two stops are provided to serve the University and Hospital campus; McMaster Medical Centre Stop is located outside the hospital entrance, with the route extended west to the McMaster University stop located on the west side of the campus, close to Cootes Drive. The exact layout of this section of route and the terminus location and design are currently under discussion with the University.

The terminal stop is provided with double length tracks to allow for the storage of an out-of-service light rail vehicle. LRT staff restroom facilities will also be provided here.

Although not included in the scope of the B-Line LRT project, this layout provides an opportunity to relocate the McMaster GO Bus terminal to a location alongside the LRT terminus, to provide a high quality transfer between LRT and bus services. The terminal is a major inter-regional transit connection in the City. This ability to interchange between high frequency transit/GO and LRT will provide significant overall benefits to users. The City acknowledges that GO Transit was responsible for having this Terminal constructed and there is an existing Memorandum of Understanding between them and the University. GO Transit staff will be included as a primary stakeholder in any future discussion on providing better interchange between LRT and transit/GO services.

2.2.2 Highway 403 Crossing

On Main Street East, the B-Line passes over Highway 403. The main criteria established to define the optimal alignment across the Highway 403 corridor were related to achieving an alignment that would maintain the operational speed, and provide an adequate structural interface (piers) without major traffic interference.

An initial "Alternative 0" was presented as part of the conceptual design which had the alignment use the existing King Street Bridge. The alignment would have shared the bridge with existing westbound traffic then follow south along Paradise Road South to Main Street where is would turn west and continue to McMaster University and Cootes Drive.

This alternative posed numerous challenges along the King Street West Bridge over Highway 403, where ramps to the Highway affect both the LRT operation and traffic flow onto east or westbound Highway 403 depending on which side of the road the LRT guideway was placed. The traffic flows to these ramps are significant and any conflicts between the LRT and this traffic was considered both unsafe for the drivers as they weave with the LRT to get to the ramp, and a significant flow restrictor to both the LRT and the traffic.

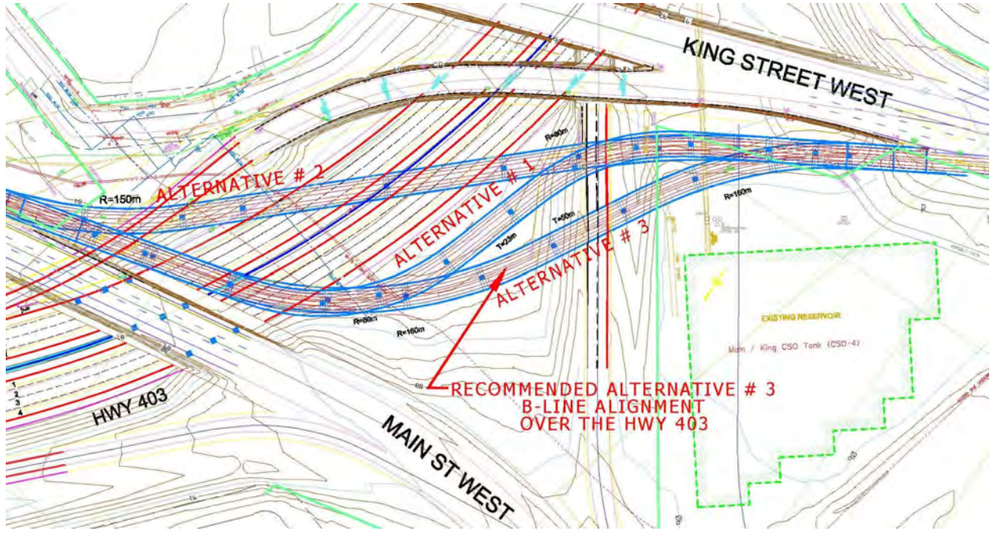
Discussions regarding the structure resulted in the development of three alternatives. Alternative #1 considered the LRT alignment on the north side of Main Street from the Paradise Road intersection and broadly follows the Main Street existing alignment until the west end of Highway 403. From there, the LRT route diverges from Main Street West onto a new segregated LRT bridge which crosses over the southbound on-ramp, the main expressway, and the southbound off-ramp. It then runs along the south side of King Street West, along the northern edge of Cathedral Park. The relatively low speed, combined with the curvilinear alignment of the proposed structure, results in an increase in overall travel time, as well as higher maintenance costs due to increased wear and tear of the rails and the wheels of the vehicles.

Alternative #2 considered a much smoother geometric alignment, based on larger curve radii, resulting in longer, continuous span sections. The geometric alignment has two curves, one with a radius of 150 m and a maximum operating speed of 50 km/h, and the other with a radius of 320 m, and a maximum the operating speed of 70 km/h, using the highest permissible superelevation. While the radius of the second curve allows a higher operational speed and encourages shorter travel times, it is the difference between the speeds along both curves that may result in more complex operations. If the operator maintains the speed of the first curve at 50 km/h along the entire structure, it results in higher travel times. If the operator increases the speed after the first curve from 50 km/h to 70 km/h along the rest of the structure, it would result in greater wear and tear of the rails and the wheel flanges, potentially resulting in higher maintenance costs.

Alternative #3, as shown in Figure 2.2, also follows the north side of Main Street and crosses over the southbound onramp, the main expressway, and the southbound off-ramp. This alternative has two major horizontal curves, but each has a larger radius than in Alternative #2, making them smoother for ease of operation and maintenance of the light rail vehicle. Due to the space required for the smoother curves, some encroachment of the adjoining reservoir property is required, both during construction and operation. This alternative provides a higher speed of 50 km/h, with a minimum horizontal radius of 160 m. The operator would be able to maintain a fairly constant speed over the proposed structure.

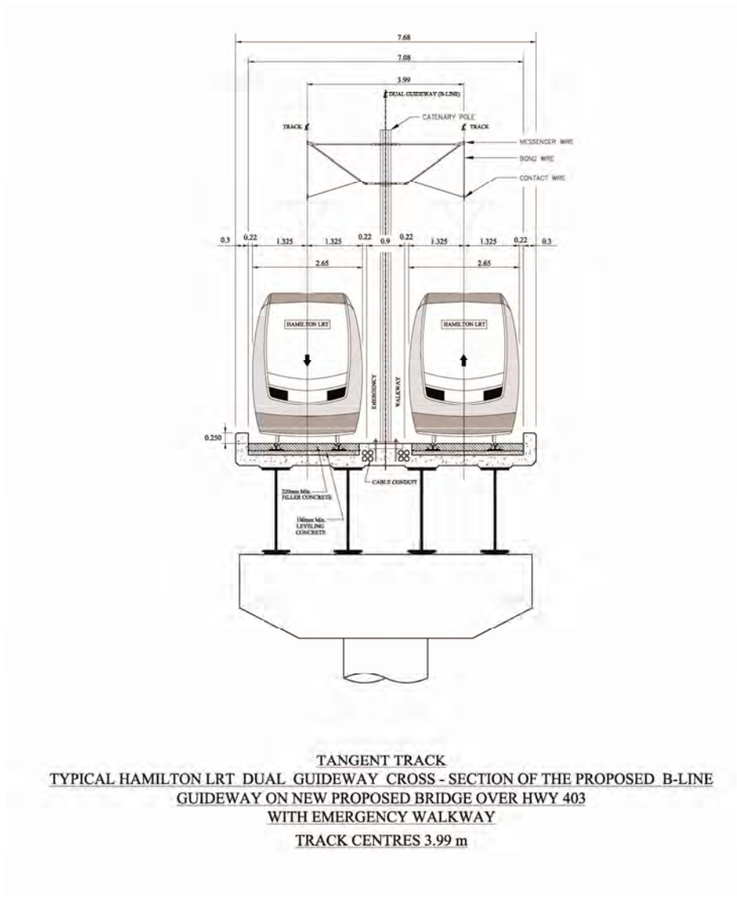
Based on smooth geometrics and increased constructability, Alternative #3 was recommended. Further design, structural review and geotechnical investigations will define the exact configuration and structural plans for the elevated guideway. The figure below shows the conceptual alignment of Alternative #3.

Figure 2.2: Alternatives for Bridge over Highway 403



This structure will have a centre-running guideway with an emergency walkway in between the two tracks to provide enough walking space in case of vehicular failure. (Refer to Figure 2.3).

Figure 2.3: Tangent Track Typical Dual Guideway Cross-Section



TANGENT TRACK
TYPICAL HAMILTON LRT DUAL GUIDEWAY CROSS - SECTION OF THE PROPOSED B-LINE
GUIDEWAY ON NEW PROPOSED BRIDGE OVER HWY 403
WITH EMERGENCY WALKWAY
TRACK CENTRES 3.99 m

2.2.3 CP Rail Crossing

On King Street East, near East Bend Avenue, the B-Line route crosses a Canadian Pacific (CP) spur line, which connects CP's Kinnear Yard on the TH&B line to industrial areas north of Barton Street. There is currently a level crossing at this point.

Discussions with CP have established that, in principle, the LRT can cross the spur line by means of a level crossing. Heavy Rail vehicles would continue to have priority, as at present, and there would need to be appropriate interconnection between the railroad, LRT and traffic signal systems to ensure safe operation.

As per the Ontario Highway Act, all LRT vehicles will be required to come to a complete stop before crossing the CP Rail spur line. The LRT vehicles will be required to stop at all times before proceeding across the CP Rail track (as per current practice for any public transportation vehicle).

When crossing the CP Rail track, the LRT vehicle will draw power from an on-board battery, and will not require catenary wires to be laid across the CP tracks. This is to eliminate the imposition of height restrictions on the CP trains, unless CP, through future discussions, wave these restrictions.

2.2.4 International Village

The International Village section of King Street East (between Catharine Street and Wellington Street) is currently subject to high volumes of westbound traffic. Much of this traffic is simply passing through the downtown, and is not travelling to or from downtown locations. The City has already recognised the opportunity to revitalise this area and streetscape improvements have been carried out to provide two lanes for through traffic, and loading and parking areas on either side, between curb bumpouts.

As part of the B-Line proposals, through traffic is to be removed from this section of King Street East. Between Mary Street and Walnut Street, where the Walnut stop is located, no traffic except LRV's will be pemitted. The Walnut stop is located here.

From Walnut Street to Wellington Street, two-way local access traffic will be permitted, which will share the two centre lanes with LRT, the existing curbside loading and parking bays being retained. Access to and from this area is provided at Wellington Street and by the streets linking to Main Street to the south and King William Street to the north.

Between Catharine Street and Mary Street, the direction of traffic flow on King Street East is reversed from westbound to eastbound, to allow traffic to access the Crowne Plaza Hotel and Effort Square parking.

2.2.5 Scott Park Stop

In response to the recent announcement of the expansion and renovation of Ivor Wynne Stadium, discussions took place with the City LRT team to ensure adequate stop facilities can be included at the Scott Park stop. The stop at Scott Park will have three tracks, and three platform faces to allow for additional services during major events at the Ivor Wynne Stadium and to provide a spare storage track in which an additional vehicle can be positioned to meet the peak passenger demand at the end of an event.

An added benefit of having a third track at Scott Park is during downgraded operations, when sections of the track may be unusable, the third track can be used to redirect LRT vehicles in order to continue revenue operations in certain active sections of the alignment.

2.2.6 Queenston Traffic Circle

The initial conceptual design proposed a centre stop platform, with two active traffic lanes on either side and with the Traffic Circle unchanged, limiting property access adjacent to the LRT tracks. Also, the initial configuration placed the stop platform under Hydro One wires. On further discussion with Hydro One, it was expressed that no stops should be placed under the wires. The alignment was therefore reconfigured and moved further to the south, with two active traffic lanes westbound and one eastbound traffic lane south of the stop platform to allow for better property access, as well as moving the platforms further to the west in order to ensure it was no longer under the Hydro One wires.

2.2.7 Red Hill Valley Parkway Bridge

The existing bridge is a three-span structure consisting of two hollow slab deck structures which sit side-by-side accommodating 6 traffic lanes (3 westbound lanes and 3 eastbound lanes), two sidewalks, and two median/left turn lanes. The longitudinal joint between the eastbound and westbound bridges is a construction joint, not an expansion joint. Therefore linking the two bridge decks together to form a single track bed for the LRT should not be an issue. However, the structural capacity of the cantilever portion will not be sufficient and will need to be upgraded to carry the LRT loads, as the preliminary estimate indicates that the LRT loading of the new guideway will be approximately 10% over the existing capacity.

Potential alternatives were evaluated based on structural feasibility, impact to overall construction schedule, and cost.

Alternative A was to accommodate the guideway in the centre of both deck slab structures, with two active lanes on either side. Alternative A was deemed not structurally feasible if done on the existing bridge with no structural modifications.

Alternative B was to accommodate the guideway on the south side of the westbound structure. As mentioned previously, with no structural modifications, the loading on the bridge will exceed the carrying capacity of the bridge, and the only solution would be to restrict LRT operations; having only one loaded LRT vehicle on both tracks at a time. While this is possible to implement with signalization, it will cause delays in the vehicle schedules. This alternative also causes reduction in the traffic lane widths and takes away the safety separations between both the sidewalk and road and the road and LRT guideway. Therefore, Alternative B was not recommended

Alternative C was to construct a new LRT bridge on the south side of the existing bridge. This alternative will also require modifications to the signalized intersections, as well as heavily impact the construction scheduling and cost, so Alternative C was not recommended.

The preferred recommendation was to use the alignment configuration from Alternative A, but also implement retrofitting measures in order to sustain the additional loading demands imparted by the new LRT guideway. Possible retrofitting measures include adding a deck in the place of the two cantilevered parts, filling and connecting piers and abutments between the eastbound and westbound structures, and adding the required foundation to sustain loading of the LRT and the required catenary poles. The extent of the structural modifications will be further assessed in the next design phase.

2.2.8 Eastgate Square Terminus

The eastern terminus of the B-Line route is at Eastgate Square. The route approaches the terminus in the centre of the road, so a central location for the terminal stop is shown. This allows for the possible future extension of the route along Queenston Road. Queenston Road is widened on the north side to provide space for the terminus.

Some amendments to the layout of the existing Eastgate bus transit terminal are required to accommodate the road widening, to provide for high quality passenger transfer between the LRT stop and bus terminal, and to accommodate changes to the Eastgate Square car park access and circulation. The sidewalk width will also be modified to accommodate a 2 m clearway and a preferred additional area for utilities and street furniture of 0.5m.

An alternative terminus layout on the north side of Queenston Road may be developed to provide improved integration with the bus terminal and Eastgate Square shopping centre.

2.2.9 Maintenance and Storage Facility

A Maintenance and Storage Facility (MSF) is required to provide facilities for the storage and maintenance of the light rail vehicles, the system control room, management offices and staff facilities. It is proposed that the site should be sized to accommodate the B-Line fleet, and the vehicles to be operated on the A-Line if LRT is chosen for this corridor in due course.

A number of candidate MSF sites along the B-Line route have been examined, but at the time of writing, no site has been selected. Therefore, this Environmental Project Report does not include specific MSF site proposals. These will be developed and documented, and approval sought through either an addendum to this Environmental Project Report or a separate Environmental Project Report, in accordance with the Transit Project Assessment Process. Approvals for the MSF will be in place prior to construction of the B-Line LRT project.

2.3 Design Criteria

Based on the foregoing design philosophy and evolution of the B-Line RT corridor plan, the following criteria were adopted for bringing the plan to a preliminary design level of detail.

2.3.1 Transit Elements

Operational Design

The objective of the operational design criteria was to set out specifications that will help ensure reliable operation, even during downgraded operation. The operations will also vary to cater to the expected demand throughout the hours of operation; more vehicles will be in operation during peak hours and fewer will be in operation during off-peak hours. For the preliminary operations plan, the peak hours have been assumed to be between 7-10 am and 2 -6:30 pm. Preliminary traffic modeling simulations have shown that an average of 15 vehicles will be in operation during peak hours and 6 vehicles will be in operation during off-peak hours. In the detailed design phase, the operational plan will define how the vehicles are registered in and out of service. Please refer to Table 2.1 for further design specifications.

The revenue service is expected to commence at 5:00 a.m. from both terminal stops and end revenue service at 1:30 a.m. The headway will be adjusted throughout operational service in order to comply with scheduling demands, with a minimum headway of 4 minutes and a maximum headway of 8 minutes. The average dwell time at each stop will be approximately 20 seconds, with the minimum dwell time at each terminal being 5 minutes. All dwell times may be adjusted to meet the schedule.

The design speed for the system is 70 km/h in order to meet the objectives of providing a higher operational speed than the bus service. This is achieved through partial segregation from other vehicular traffic and priority signalling.

Trackside signs are required for safe vehicle operation on the right-hand side of the tracks and should be installed facing the driver in the normal direction of operation. This will include:

- Stop boards;
- Stop limit boards;
- Location signs.

Permissible speeds, temporary speed restrictions and associated warnings for degraded mode of operation should be displayed at the wayside to allow continued operation when the permissible speed cannot be displayed in the cab. Signs along the guideway should be auto-reflective.

Table 2.1: Operational Design Criteria Specifications

Specification	Unit
Minimum Headway	4.0 minutes
Average dwell time at intermediate stops (assumed)	20 seconds
Maximum Cruising Speed	60 km/h
Acceleration	1.0 m/sec^2
Deceleration	0.9 m/sec^2
Minimum Dwell time at terminals	5.0 minutes
Target commercial operational speed at peak periods	25 km/h
Operational Hours - first vehicle from terminal - last vehicle from terminal	 5:00 a.m. 1:30 a.m.
Degraded operations with track segment between crossovers of operations - maximum directional headway	8.0 minutes
Fare Collection System	Will be determined in detailed design phase. Considerations include applying a system-wide integration system, such as the Presto card

Prototypical Vehicle

The LRT vehicle will be 100% low floor in order to accommodate adequate seating, standing, bicycle, wheelchair and stroller spaces. As no procurement of vehicles has commenced, the dimensions assumed for the preliminary design phase have characteristics similar to those recently adopted by Metrolinx on similar projects in Ontario. Please refer to Table 2.2 for further design specifications.

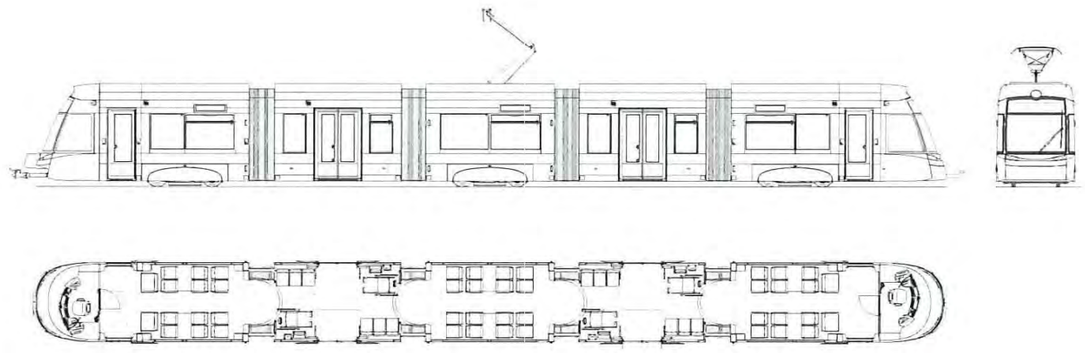
Table 2.2: Proposed Performance Specifications

Dimensions and Weight:	
Length of Vehicle	32 m
Height above top of rail (TOR)	3.6 m
Width	2.65 m
Floor height above TOR - Low floor entrance	 350 mm +/- 11 mm
Percentage of low floor area	100% (level boarding)
Electric double-sliding doors door clearance height door clearance width	4 per side 2,070 mm 1,300 mm
Electric single-sliding doors door clearance width	1 per side 800 mm
Aisle width	630 mm
Gauge	1,435 mm
Minimum horizontal curve radius	25 m
Minimum vertical curve radius (crest)	520 m
Minimum vertical curve radius (sag)	260 m
Car weight (empty)	50 t
Maximum Car weight (AW2 load 6 pass./m^2)	70 t
Maximum axle load	12 t
Buffer Load	400 kN
Height of Pantograph in lock position	3.70 m
Minimum Pantograph operating height	3.9 m
Maximum Pantograph operating height	6.8 m
Performance Capacity	
Maximum Speed	70 km/h

Dimensions and Weight:	
Acceleration Rate	1.1 m/s²
Deceleration - service brake - emergency braking rate	 1.2 m/s² Min. 2.2
Maximum gradient	6% (maximum gradient will be 5% at maximum speed of 25 km/h for an unlimited distance and 6% sustained for 250m)
Seated passengers	50
Standing passengers (4 pass./m2)	128
Bicycle, pram and wheelchair locations	Included

Below is an example of a similar vehicle, with similar characteristics as defined in Table 2.2 proposed by Metrolinx for similar types of projects, such as the Metrolinx Eglinton – Scarborough Crosstown project.

Figure 2.4: Similar Metrolinx Vehicle Example



LRT Guideway

The guideway will accommodate two LRT vehicles. The design criteria were developed by considering the operational parameters (static and dynamic vehicle envelope), the placement of the catenary poles, and the required spacing between LRT vehicles, adjacent traffic lanes and sidewalks.

Depending on the required traffic movements adjacent to the LRT guideway, several segregation options are being considered. Either the guideway will have a raised curb (typically, 150 mm high) or the guideway will be flush with the road where traffic is permitted to cross the tracks, a visual segregation will be considered. The exact detail and locations of the segregation options will be defined in the detailed design phase.

Power Supply and Distribution

For this system, the external power supply will be provided by Horizon Utilities from the existing 115 kV/13.8 kV or 27.6 kV transformer stations. The traction power substations (TPSS) will be prefabricated and placed in locations close to the alignment. Exact locations of the substations will be determined in the detailed design phase.

A simulation program was used to verify the capacity and spacing of the traction power substations was suitable for the operation of the vehicle fleet. This program simulates the vehicle movements and calculates the electrical current through equipment and cables in the power system as well as calculates the voltage at the vehicles. To ensure the power system can deliver sufficient power to the vehicles for normal and anomalies in operations, the criteria for the RMS current was limited to 80% of the equipment and cable ratings. As well the criteria for the voltage to the vehicles should not go below 525V and with less than 10% of the time the voltage is below 600V.

If all above conditions are met, the electrical network meets adequate operation requirements. If any condition shown above cannot be met, the electrical network is deemed to have failed to meet the operation requirements.

The power will be supplied to the vehicles through an overhead catenary pantograph feed system. The placement of the catenary poles will be a maximum of 50 metres apart, but shorter spacing is expected at curves. The exact locations of the catenary support will be developed in the detailed design phase. The catenary configurations will vary, and include:

- Centre
- Symmetrical
- Side-double cantilever
- Both sides suspended OCS
- Side-single cantilever

Table 2.3 presents additional detail on the power supply design specifications.

Table 2.3: Power Supply Characteristics

Feed Cables Main Transfer Stations - Traction Power Stations		Underground conduit to be installed by Horizon Utility Corporation
Traction Power Substations Basic Specifications - Type	Prefabricated	
- Size - Length - Width - Height - Access - Optimum Distance between TPSS and OCS feed point	 17 m 5.0 m 7.0 m Adjacent to road Not more than 25 m	 To minimize section gap arching during vehicle acceleration
Overhead Catenary System - Supports - Type	- Centre - Symmetrical - Side-double Cantilever - Both Sides suspended OCS - Side-single Cantilever	Contact wire to be designed to uniformly sweep width of pantograph to minimize localized pantograph wear
- Distance between Poles - On Tangent - On Curves	 50 m (max) Variable	 Depending on radius and length of curve

Trackwork

Where prudent from an interface design perspective, the LRT tracks shall be embedded such that the trackway can accommodate rubber tired vehicles such as City service vehicles and emergency services.. Initial service plans will have this area segregated for LRT-only; however, opportunities exist for limited shared use by transit buses. This would facilitate queue-jumping and other engineered traffic management solutions.

Generally, the track surface will be made of concrete, and provisions for additional drainage requirements for the guideway will be included in the design.

In order to ensure reliable operation, special track components, such as crossovers will be used to facilitate continuous service, even during downgraded operation. For a system of this nature, crossovers are typically placed every 4 km.

The track will be of standard gauge of 1435 mm.

Traffic Signals and Illumination

The LRT system will operate on an LRT vehicle priority green signal basis. In order to achieve this, an integrated system of location sensors will be installed, with specialized traffic controllers that use logical algorithms to define optimum cycle times for an LRT priority system throughout the corridor.

Continuous illumination exists along the whole corridor in the form of independent light poles, and further consideration will be made for future joint use traffic and joint use utility poles. In some areas towards the city's downtown, independent decorative lighting poles/luminaires are installed that provide a unique character to the section of roadway likely to encourage economic activity in the area, generally during the hours of darkness. Although portions of the lighting may be unaffected, in certain areas where the new trackwork and stop platforms are to be installed, existing lighting will need to be relocated, or possibly new lighting installed, depending on the age of the lighting system.

Communications Design Criteria

The communications systems are based around a centralised operations concept, where decisions regarding service delivery and safety are made at the Operations Control Centre (OCC) and supported by drivers in each vehicle. The communication systems also facilitate stop operations and roving vehicle attendants in their role as support to service delivery and safety.

The Hamilton LRT will be provided with a public address (PA) system covering all stops and vehicles. The PA system will allow automated, manual and emergency audible announcements to be made to passengers and operations and maintenance personnel.

Other communication features which will be looked at further during the detailed design process include:

- Operations and Maintenance Radio
- Vehicle Radio and Data System
- Passenger Emergency Intercom
- Integrated Alarm Data Acquisition System (IADS) and Supervising Control and Data Acquisition (SCADA)
- Information Management System
- Vehicle Public Address
- Stop Public Address
- Public Address System in the depot
- Passenger Information Displays
- Closed Circuit Television System
- Stop Emergency Cabinets
- Operations Control Centre (OCC)
- OCC Equipment

2.3.2 Road Elements

Generally, roads within the corridor will be modified to accommodate the LRT running way, either flush with the road or segregated by a raised curb. The number of lanes and the lane widths may be modified in order to accommodate the LRT right-of-way.

Table 2.4 presents the proposed road design criteria.

Table 2.4: Road Design Criteria

Design Parameters	Proposed Standards
Horizontal Alignment	Horizontal alignment will be revised to encourage pedestrian usage. Where possible, sidewalk will be widened to a minimum of 1.5 m, and a desirable width of 2.5 m.
Vertical Alignment	Maintain existing road alignment, except as required for LRT operation
Design Speed	50 - 70 km/h
Posted Speed	To be defined in the detailed design phase
Left-Turn/U-turn Lanes	At major intersections
Bike Lanes	To remain the same as existing, no bike lanes to be removed

2.3.3 Urban Design Elements

Many of the strategic and system objectives for Rapid Transit involve urban design and planning, particularly of the public realm.

Hamilton aspires to a European style innovative approach, where the infrastructure is of an appropriate form to complement the existing urban fabric. This in turn provides the opportunity for complementary measures in the rest of the street width, to accommodate the needs of other street users in a holistic fashion. In this respect the introduction of rapid transit into existing developed areas is regarded as a "linear urban design" project that includes LRT.

Accordingly, the City of Hamilton's approach to Urban Design follows the overarching principles of Urbanism; of Design Excellence; and of Scale, Connections and Context. These include:

Urbanism: Enhancing the City; the Neighbourhood, the District, the Corridor; the Street, the City-block and the Building:

- Restoring and enhancing the urban fabric;
- Developing sustainable communities and diverse districts;
- Conserving the natural environment;
- Respecting Hamilton's historic and built legacy.

Design Excellence: Exemplifying design excellence by incorporating, interpreting and integrating design principles of Quality; Innovation; Sustainability and Durability to the greatest extent possible, consistent with best contemporary practice:

- Sustainability as an integral component of the Design;
- Appropriate use of Innovation;
- Integration and encouragement of Public Art and Culture;
- Use of durable, permanent and timeless Materials.

Scale, Connections and Context: Reflecting Location, Human Scale and Neighbourliness; Respecting Heritage and Environment; Making Connections:

- Demonstrating appropriate scale, integration of design elements and fit within the context of the precinct;
- Celebrating Hamilton as 'the Community of Communities'; exemplifying Neighbourliness; celebrating, engaging and enhancing the specific context of Location;
- Celebrating and respecting Heritage;
- Enhancing and preserving Connections.

Rapid Transit Public Realm Design Objectives for Hamilton The B-Line LRT will operate in a constrained corridor where there are many competing demands for the limited space that exists. Within this context, and as far as is practicable and deliverable, the City of Hamilton proposes to take an aspirational, collaborative approach to the wider urban design and public realm as follows:-

- **People-generating and City-shaping**: To use introduction of LRT both to stimulate and to maximize its role in people-generating and city-shaping, including at Stations/ Stops, Mobility Hubs and for Transit Oriented Development (TOD).
- **Integration with the Public Realm:** To fully integrate Rapid Transit into key urban situations, taking advantage of opportunities to improve the urban realm, attracting ridership and increasing value in its surroundings. Special attention should be placed at priority locations such as key nodes, rapid transit stops, community destinations and major pedestrian traffic areas.
- **High Quality Public Spaces** - To create attractive, efficient, usable public spaces, including public art.
- **Integration with Environmental, Historic and Heritage settings and Development context** - To respond sensitively to the surrounding built environment and to contribute to the setting of important and historic buildings, spaces and parks, as well as of proposed new developments.
- **Improving Pedestrian, Cyclist and Public Accessibility and Environment** - To improve the pedestrian, cyclist and public environment, including its safety, climate and weather protection and usability, including fully accessible barrier-free street environments.
- **Zoning Streetscape/ Minimizing Street Clutter** - To optimize usability through zoning of infrastructure and activities across the street cross-section; minimizing the impact of signage, signalling, lighting, overhead catenary system (OCS/ OLE), utilities and general street furniture within the streetscape, through rationalization and combining of these elements.
- **Appropriate Materials and Landscape** - To use materials (natural and man-made) and landscape appropriate to context and sustainability.
- **Sustainability and Energy-efficiency** - To adopt low-maintenance and sustainability principles, including cost and energy-efficiency, durability, cost-in-use and whole-life-costing approaches.

It is envisaged that throughout the detailed design and project development process applying these urban design techniques will help create places for people. The "urban fit" and integration within communities is also important. Retention of existing features (buildings, trees etc.) is encouraged to generate a high quality design that complements existing assets. In this regard opportunities will be taken, when they present themselves, to strengthen and improve the streetscape through additional tree planting, hard and soft landscaping and the provision of, and integration of, public art in elements of the project itself and as stand-alone "features".

Rapid Transit should take advantage of the opportunity to generate or reinforce civic spaces and activities, improving the streetscape and public realm and developing a sense of place and integrating movement within transit oriented development. Equally, all transit passengers are pedestrians at some stage in their journey. Stop areas and public plazas are key locations in which to provide accessibility, amenity and attraction for transit.

Similarly, streetscapes should be the gateways to cities, and neighbourhoods; their ability to include transit and provide "transit-oriented communities" with a wider transportation choice (walk, bike, transit) will be central to the success of the Hamilton project and fulfilling the Vision Statement

2.3.4 Typical Cross-Sections

The typical cross-sections to be used along the B-Line RT alignment are based on the following guidelines:

- Integrate a dedicated transit path either in the centre or on one side of the roadway
- Provide (maintain) streetscape elements
- Minimize traffic inconvenience
- Avoid (where possible) private property effects.

Based on the above guidelines, the following typical cross-sections were developed.

Refer to the Appendices for a complete list of Typical Cross Sections.

Centre Running Guideway

The centre running guideway will be in the centre of the road, with the catenary poles being either in the middle of the guideway or on the sides adjacent to the existing curb. The centre running guideway, in accordance with the Guidway Design Criteria in Section 2.3.1, will either have a raised curb of 150 mm, or will be at-grade with the adjacent traffic lanes (refer to Figures 2.5 to 2.7).

Examples of where the guideway will be centre running include along Main Street from near Cline Avenue to Paradise Road, along King Street from near John Street to Wellington Street, and along Main Street East, near Strathearne to Kenora Avenue, and then along Queenston Road to Eastgate Square.

Figure 2.5: Tangent Track Typical Dual Centre-Running Guideway Cross-Section

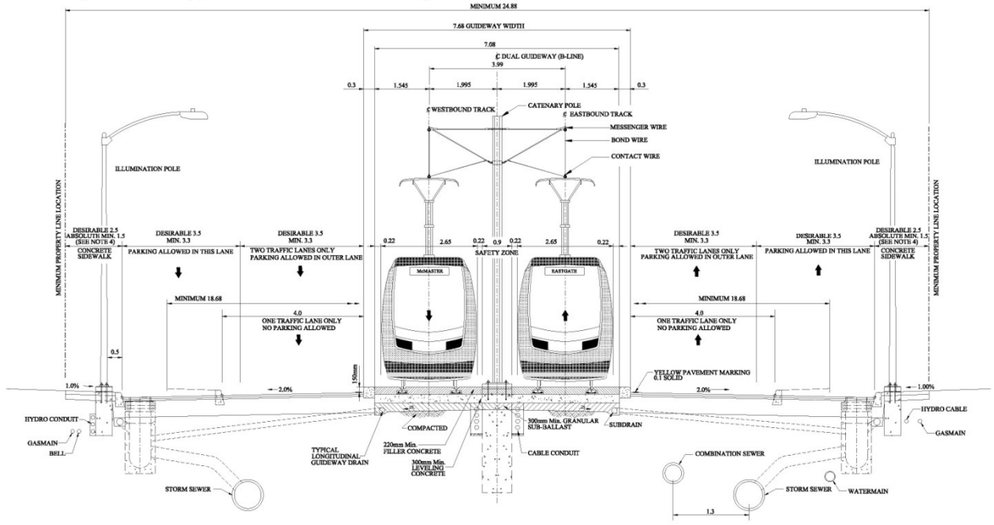


Figure 2.6: Tangent Track Typical Dual Centre-Running Guideway With Stop Platform on Either Side Cross-Section

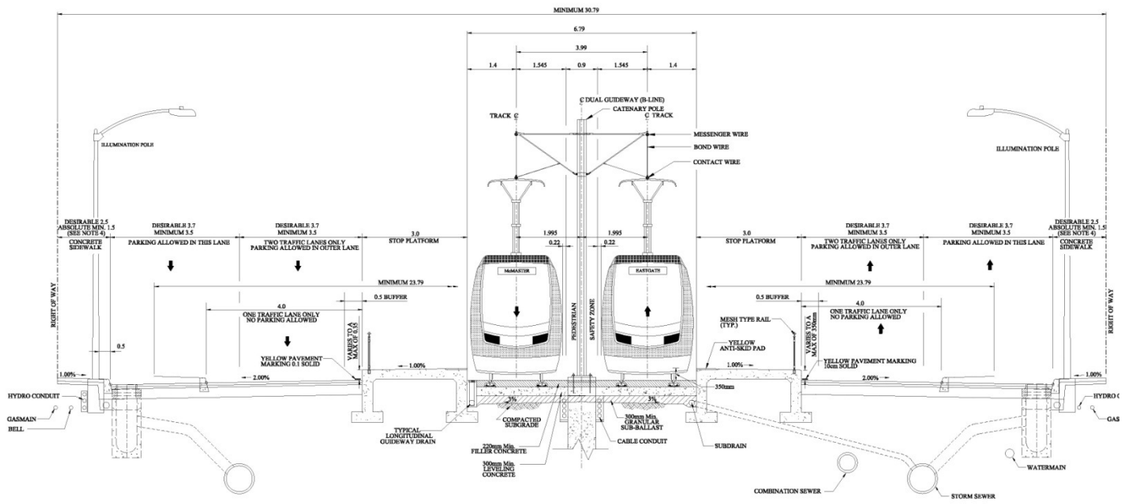
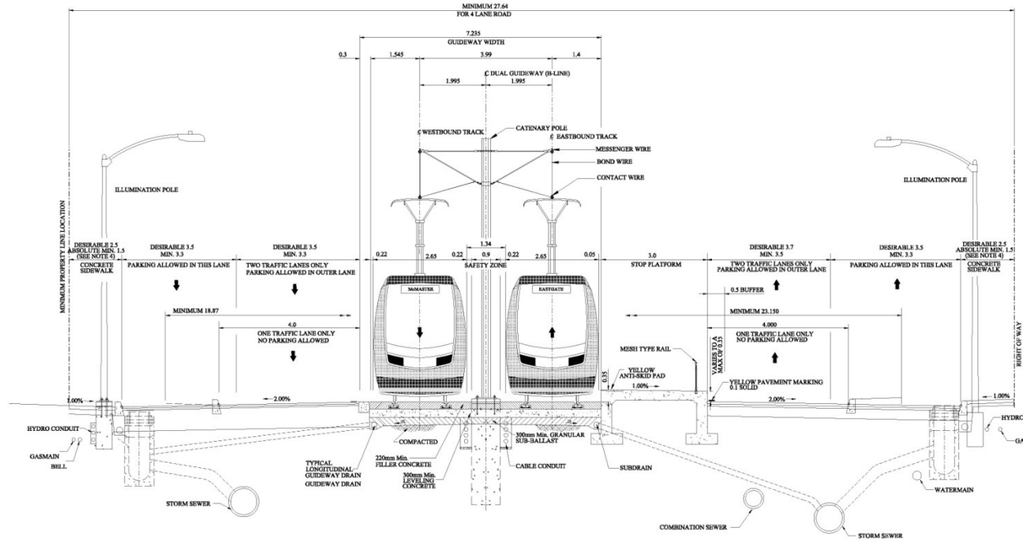


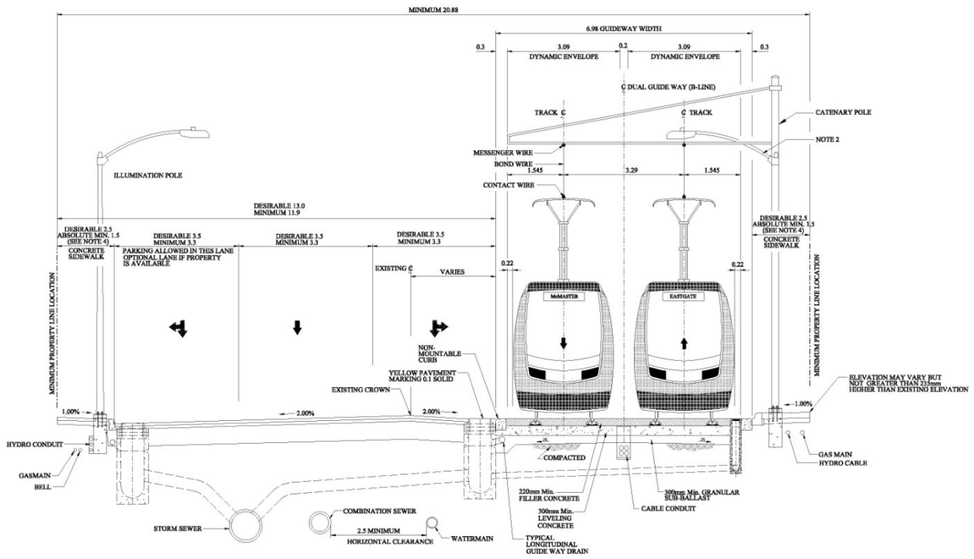
Figure 2.7: Tangent Track Typical Dual Centre-running Guideway with stop platform on one side Cross-Section



Side Running Guideway

The side running guideway will be situated on one side of the road, with either a side or central catenary pole configuration. This configuration will provide traffic lanes on the adjacent side of the guideway. Examples of this are along King Street from Dundurn to Catherine and at the Queen Street stop (refer to Figure 2.8).

Figure 2.8: Tangent Track Typical Dual Side-running Guideway Cross-Section



2.4 Preferred Design

2.4.1 Track Alignment

The preferred track alignment has been developed using the operational criteria as defined in Section 2.3.1 of this report. Please refer to Appendix A for the plan and profile drawings of the alignment.

The horizontal alignment to accommodate the 2 LRT tracks can generally be accommodated within the confines of the existing corridor, and follows the existing alignment throughout the corridor, except at Highway 403. However, in order to stay within the confines of the existing corridor and mitigate curb relocation and property impacts, the number of traffic lanes will be reduced.

The vertical alignment is in agreement with the track developed in Design Workbook 2 Version 2 (as described in Section 2.1) and follows the track segregation conditions described in Section 2.3.1 (Trackwork Design Criteria).

The design follows standard track design guidelines for an LRT system of this type.

2.4.2 Stop Locations, Spacing and Platform Length

The stop locations along the B-Line route are based on those of the existing B-Line Express Route 10, as well as where key destinations need to be served, with the detailed platform locations developed to fit with LRT alignment requirements, the proposed traffic circulation and intersection layouts. Some additional stops have been inserted where the existing B-Line stop intervals are particularly long.

The location and design of LRT stops is particularly important as they should become a new focal points for local communities and businesses. Supportive land use policies will also encourage mixed use and higher density "transit oriented development" that is less reliant on car use and which generates additional transit riders. The design of Flagship, Downtown and Outside Downtown categories of stops, all of them applying barrier-free principles that allow access for all, will ensure system coherence and wide community support.

The full list of proposed locations is set out in Table 2.5.

Table 2.5: Proposed B-Line Stop Locations

Stop Location	Approximate Distance from Previous Stop (km)	Approximate Distance* from McMaster University Stop (km)	Comments
McMaster University		0.00	
McMaster Medical Centre (Main Street at Emerson Street)	0.4	0.4	Existing B-Line Stop
Longwood	1.4	1.8	Existing B-Line stop
Dundurn	1.2	3.0	Existing B-Line stop
Queen	0.8	3.8	Existing B-Line stop
MacNab	0.8	4.6	Replaces existing James (W/B) and MacNab (E/B) B-Line stops. Provides interchange with MacNab Bus Facility. Serves Downtown
Walnut	0.5	5.1	Replaces existing Hughson (W/B) and John (E/B) B-Line stops. Serves International Village
First Place	0.4	5.5	Additional Stop (not served by B-Line) Serves International Village and First Place
Wentworth	0.8	6.3	Existing B-Line stop
Sherman	0.9	7.2	Existing B-Line stop
Scott Park	0.6	7.8	Additional Stop (not served by B-Line) Serves Ivor Wynne Stadium
Delta	0.8	8.6	Additional Stop (not served by B-Line) Serves Gage Park
Ottawa	0.4	9.1	Existing B-Line stop
Kenilworth	0.8	9.9	Existing B-Line stop
Strathearne	0.8	10.7	Additional Stop (not served by B-Line)
Parkdale	0.8	11.5	Existing B-Line stop
Nash	1.6	13.2	Existing B-Line stop
Eastgate Square	0.6	13.8	Existing B-Line stop

The functional planning alignments have been prepared showing platforms 40 m long (plus end ramps) at the majority of stops, with double length platforms provided at the McMaster and Eastgate termini, to provide space to store a disabled vehicle pending its recovery, or where additional features need to be served.

The LRT stops are one of the most important elements of any system, being a passenger's first point of contact with the network. The design of stops provides opportunities to create more vibrant, active people focused dynamic areas integrated within the community. Their development provides an opportunity for the stops to become destinations in their own right. In this regard it is expected that the B-Line stops will:

- Define the system as modern, state-of-the-art;
- Reinforce the system identity;

- Create community focal points;
- Create, reinforce or reflect an image for an area (with the potential for area-specific stop design in key locations);
- Be integrated with public spaces;
- Be integrated with parks or open spaces;
- Incorporate public art;
- Provide connections with other transportation modes;
- Be integrated with Transit-Oriented Development.

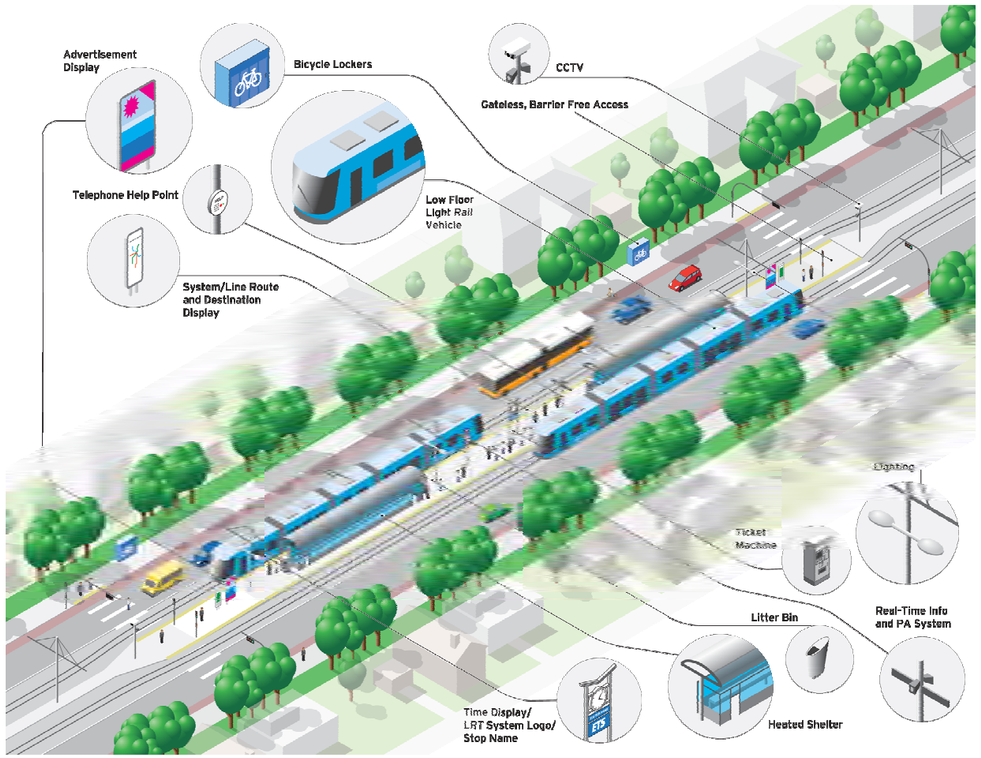
LRT stops will require a range of facilities and equipment. Many of these will be common to all stops and are intended to be standardised as a "kit-of-parts", illustrated in Figure 2.9, not all of which may be required at each stop, but which can be co-ordinated and integrated to form a common design across the LRT network.

This approach will allow stops to be designed to support the location and context of each stop. The City of Hamilton has identified three classifications for stops: Flagship, Downtown and outside of Downtown.

Although all the LRT stops will be based upon a standard design, the three classifications will vary to according to their function and location within the City. The allocation of stops by type is to be determined but the following characteristics can be identified:

- Flagship stops: These are likely to be at high profile locations with a concentration of passengers and adjacent to prominent non-transit land uses. The urban form may allow a larger footprint to be adopted than at other stops. Examples might be McMaster University, Eastgate Square and the busiest Downtown stops such as MacNab.
- Downtown stops: The remainder of the Downtown stops, with a concentration of passenger boardings but with less focus on adjacent land uses.
- Outside of Downtown stops: A standard design covering the majority of stop locations, built using a standard kit-of-parts.

Figure 2.9: Typical "Kit of Parts" to be Employed at B-Line LRT Stops



2.4.3 Traffic Control and Signal System

As per the Traffic Control and Signalling design criteria in Section 2.3.1, the LRT operations will be based on a priority green signalling phase system. Detection loops will convey to the traffic intersection controller the approach of an LRT vehicle. The traffic intersection controller will then commence a priority green signalling phase. As per preliminary design traffic models, some new signals will be required to ensure continuous and reliable LRT service.

The existing illumination is generally sufficient for most of the route, with additional illumination infrastructure to be provided in stop shelters, on platforms where necessary and at any new cross-walks. As part of the wider public realm works there is the opportunity to improve illumination levels on pedestrian routes to stops.

2.4.4 Structures

The following structures will support the proposed B-Line RT system, and will be examined in more detail during the detailed design phase:

- New Bridge over Highway 403: As mentioned in Section 2.2.1, several alternatives were discussed in the design of a new structure to be used exclusively for the LRT system. By assessing the operational criteria and construction considerations, Alternative #3 was recommended. Further geotechnical and structural assessment is required and will be undertaken in the next design phase.

- For the Highway 403 crossing, the new bridge will have a retaining wall along the north side on the west abutment. The purpose of the retaining wall is to contain fill under the guideway. The current configuration of the proposed retaining wall may impact construction cost and schedule. Therefore, it is recommended to assess the feasibility of reconfiguring an adjacent parking lot to allow for some spilling of fill, in order to avoid the construction of a full retaining wall.
- On the east abutment of the bridge over Highway 403, a retaining wall along the south side of the new LRT bridge is being proposed. It is needed to protect the existing asphalt path along the valley and protect some mature trees.
- East of the King Street West and Dundurn Street South intersection, there is a CP Rail overpass with a grade separation to existing track. A preliminary structural assessment confirmed that the existing structure with five girders directly under the guideway was sufficient to carry the additional load of the guideway and the LRT vehicles.
- East of the King Street and Summers Lane intersection, there is a pedestrian bridge with a vertical clearance of 4.2 m, which is considered substandard. There have been recorded incidents of tractor-trailers scraping the underside of the bridge. With the addition of the LRT, this becomes an even greater concern as the clearance will be further diminished due to the addition of a catenary contact wire attachment to the underside of the bridge. Due to the possible safety risk as a result of substandard clearance under the walkway, it is recommended that the City of Hamilton assess the feasibility of removing the bridge prior to the construction of the B-Line. The City should consult with the relevant stakeholders, particularly the Convention Centre and the Sheraton Hotel, as well as study the usage of the walkway. If the walkway is deemed necessary, the feasibility of raising the pedestrian bridge to comply with the recommended clearance of 5.3m to the underside of the bridge should be investigated. The raised walkway can be partially accommodated by ramps/stairs which can be constructed over the sidewalks on either side of the bridge. A safe attachment of contact wires to the underside with sufficient insulation should be included in the redesign for the reconfiguration of the raised structure.
- Bridge over Red Hill Valley Parkway: As mentioned in Section 2.2.7, several alternatives were evaluated for the alignment and structural modification options for the bridge over Red Hill Valley Parkway. By assessing the operational requirements, construction considerations and cost, Alternative A with certain structural modifications on the existing bridge, was recommended. Further structural and geotechnical assessment will be undertaken in the next design phase.

2.4.5 Special Trackwork

Special Trackwork is installed at locations where it is necessary to transition light rail vehicles from one track to another either to change direction or to run on a single-track around an obstruction or maintenance activity. These will be situated at the terminal stops and elsewhere along the alignment as required facilitating normal and emergency operating scenarios. In the event of a malfunctioning vehicle, or otherwise blocked track, crossovers have been placed such that operations can be maintained on non-affected sectors.

A preliminary track plan has identified that special trackwork will be located near the McMaster Terminal stop, the Queen stop, the Scott Park stop and the Eastgate Terminal stop. Special trackwork will also be required at the CP crossing, which will be a diamond shape rail arrangement to allow the eastbound and westbound LRT tracks to cross the existing CPR tracks.

2.4.6 Traction Power Substations

Electrical substations are placed along the corridor to ensure adequate voltage supply to provide reliable service both in normal and downgraded conditions. If one substation fails, the adjacent substations on either side will have the capacity to provide power to the extended track section. In the case of the terminal stops, which have only one adjacent substation, their substation will be placed closer to its adjacent substation in order to ensure reliable coverage.

As per the Power Supply and Distribution Criteria in Section 2.3.1, and with the consideration that the B-Line alignment is fairly flat (except along the Highway 403 bridge), following is a list of approximate locations of the substations:

- TPSS 1 – Near Main St and Bowman Street
- TPSS 2 – Next to Highway 403 bridge at Main Street
- TPSS 3 – West of King Street and John Street
- TPSS 4 – King Street and St. Clair Avenue
- TPSS 5 – King Street and Province Street
- TPSS 6 – Main Street and Beland Street
- TPSS 7 – East of Main Street and Kenora Drive

Please see Appendix A for the Traction Power Substation approximate locations on plan.

2.5 Integrated Land Use Concept

Hamilton's Growth Related Integrated Development Strategy (2006) (GRIDS) put in place the direction for integrated land use and transportation planning with the adoption of a node and corridor system for future growth. GRIDS identified corridors as key areas for intensification in the chosen growth concept, describing the future development of the corridors to include a broad mix of uses including higher-density residential uses, retail, institutional and recreational uses. The Study also identified corridors for the locations of higher order transit services, linking the nodes together and facilitating movement of people from place to place.

Following GRIDS, the Urban Hamilton Official Plan integrates transportation and land use planning through its policies which recognize that land uses and transportation are mutually inclusive; land uses are connected and accessible through the transportation network and transportation is made more efficient when complemented by appropriate locations and densities for various land uses. Public transit and planning for active transportation is to be an integral component of planning for new development and redevelopment.

Policies in the Urban Hamilton Official Plan direct secondary planning activities to take a similar integrated approach when planning for smaller scale areas, whether a greenfield neighbourhood, an existing urban neighbourhood, or an existing or planned node or a corridor.

Official Plan policies for secondary planning include:

- Establishment of a road network for efficient movement of people, cyclists, transit and automobiles;
- Organization of land uses in a manner that reduces automobile developments and improves modal choice and movement of goods;
- Placement of higher density land uses near existing and planned transit stops or station locations; and,
- Coordination of rapid transit planning projects and higher order transit services with policy direction on land uses, height, densities, built form and design within designated Nodes, corridors and Major Activity Centres.

B-Line Secondary Corridor Plan/Secondary Plan (in progress)

In July 2010, the City initiated the B-Line Corridor Land Use Study to develop a Corridor Plan/Secondary Plan for the B-Line Corridor. The purpose of the B Line Land Use Planning study is to develop a long term strategic plan to guide future growth and change along the B-Line Corridor. The study will establish a high level vision for the corridor including a set of development principles through the engagement of corridor and community stakeholders. The vision and principles will guide future change and development in the corridor. The Study will identify appropriate transit-supportive land use and development patterns that:

a) Recognize and support the future well-being of adjacent neighbourhoods along the corridor, and

b) Support and facilitates a viable future rapid transit line along the corridor.

c) Support the intended function, scale and design of nodes and corridors while being focus areas for intensification.

The study will consist of a land use and urban design plan. The Corridor Plan/Secondary Plan is being developed concurrently and in conjunction with Planning, Design and Engineering work for a future B-Line LRT project.

The scope of the Plan includes:

- A Vision and set of principles to guide development along the B-Line Corridor;
- A Land use plan and set of development policies, including the identification of appropriate mixes of land uses along the corridor, around designated nodes and at stop locations;
- Identification of sites for intensification and redevelopment
- Public realm and urban design components policies and guidelines
- Policies on corridor specific issues such as parking and loading, commercial uses, cultural heritage, etc.

In addition to a Corridor Plan/Secondary Plan and zoning by-law amendment adopted under the Planning Act, an Implementation Strategy will be prepared with recommendations for additional future actions that may be required to implement the vision and directions of the Plan. The strategy may include development of capital improvement plans, incentive programs, other city projects, programs and actions.

2.6 Land and Property Requirements

The general approach adopted in developing the B-Line LRT alignment has been to fit the route within the existing road right-of-way. This approach has minimized land and property requirements outside the existing road ROW. During the preliminary design process, it was identified that 80 properties will have impacts on access to their property or impacts to their frontages. The two properties that will have significant impacts are at the proposed terminal stops at McMaster University and Eastgate Square.

Elsewhere along the route, there are small areas of land to be acquired to accommodate road widening at some intersections and LRT stop platforms.

Land is also required for traction power substations.

2.7 Transit System Interface

Preliminary proposals for bus network changes to accompany the introduction of the B-Line LRT have been developed using the following key design principles:

- The objective of an integrated network wide solution;
- Maintenance of key links and accessibility;
- Through services retained wherever possible, although perhaps at reduced frequency and/or with an increased journey time;
- Does not force transit passengers to transfer unnecessarily, or for short distances;
- Where transfers are necessary, the facilities should be of a high quality;
- A network that:
    - links people to jobs, homes, leisure and key services;
    - meets current and future passenger needs;
    - adheres to HSR's service standards;
    - creates space for rapid transit;
    - ensures that feeder services to the LRT and bus network are provided where necessary; and
    - provides cost savings (when set against additional revenue generated).

A further principle adopted is that the changes should be limited to those associated with the LRT itself. At this stage, we are not proposing major changes to the structure of the bus network or its coverage, as this would involve funding and ridership issues that are not directly related to the introduction of LRT. However, a wider program of changes may be appropriate as land use and travel patterns evolve.

A key issue in the development of the strategy for LRT/bus integration is the different stop spacings of the two modes. The average distance between B-Line LRT stops is about 830 metres, whereas the average bus stop spacing along the corridor is about 230 metres, except on the express routes 10/10A where it averages 1.1 km.

If no bus services were provided in parallel to the LRT (i.e. running on King/Main and Queenston) then the average walk distance to the nearest stop would increase, even allowing for bus services on nearby corridors. However, this would be balanced by the shorter and more predictable waiting time for the LRT. For most riders this is a trade-off, but for some groups of people with reduced mobility it could be a significant barrier to travel. Given this, in developing the network proposals, a general principle has been adopted of retaining a bus service in parallel with the LRT to maximise accessibility, although generally at a reduced frequency.

2.8 Park and Ride

The B-Line between McMaster and Eastgate Square is primarily urban and does not present major opportunities for Park & Ride. Consequently no such formal facilities are currently envisaged. However, the scope for, need for and opportunities to provide Park & Ride will be kept under review throughout project development.

2.9 Bicycles

It is envisaged that provision will be made on LRT vehicles to enable a limited number of bicycles to be carried. Given this it is not envisaged that specific bicycle parking will be provided at either *Flagship* or *Downtown* stops but it may be provided at *out of downtown* stops subject to space availability and need or an identified opportunity. This approach will be kept under review throughout project development to make the most of opportunities that may arise.

2.10 Project Implementation

Following the Minister of the Environment's decision on this EPR, and preparation of the Statement of Completion by the City of Hamilton under the Transit Project Assessment Process, the project may proceed to subsequent phases of the implementation program. Following is summary of the preliminary approach to moving forward with the project.

The preliminary work program schedule for the overall project implementation incorporates the details of the Construction Planning Strategy and the results of deliberations by the City in relation to the outstanding activities prior to reaching the bidding stage.

Preliminary Project Implementation Approach

It has been assumed at this stage that, for project implementation, a design/build approach will be followed, where a single company takes responsibility and risks for completing the design, construction and commissioning of the system.

The project implementation approach includes a preliminary estimate of the time required for definition of the particular specifications of the vehicles, bid document, bid process, manufacturing and testing. Such time frames can be adjusted later if the vehicles are being procured under a program-wide agreement.

At the time of completion of this report, the site for the Maintenance and Storage Facility has not been fixed; therefore, it will be subject to further evaluation and the required environmental assessment and approval, as part of the project implementation process.

Preliminary Project Implementation Process

The process will have two phases:

- Phase A includes all the required actions to obtain outstanding information and finalization of the project procurement documents;
- Phase B will focus on the design, construction and commissioning processes. The construction phasing strategy and traffic management report document will elaborate on the different contracts required for the completion of the project and their envisaged staging.

Phase A of the project implementation includes all activities which will be finalized prior to calling for bids on a design/build implementation scheme. Following is a list of actions based on the status of the work at the completion of the preliminary engineering phase:

A Definition of MSF Location
- Environmental Assessment;
- Site investigations;
- Review of special trackwork (cross-overs)
- Cost estimate;
- Update of preliminary operations and maintenance plan, based on site location;
- Revision of project operating costs.

B Assessment and Confirmation of the Utility Conflicts
- Share utility conflict drawings with utility companies to ascertain the preliminary conflict identification;
- Identification by utility companies where Level A survey might be required (daylighting)
- Utility companies to provide their cost estimate

C Review of Construction Phasing Strategy

D Value for Money Assessment

E Project Funding Commitment

F Vehicles Procurement
- Vehicle definition and preparation of tender document;
- Bid preparation;
- Evaluation of bid;
- Contract negotiations;
- Contract award;

G Preparation and Approval of Bid Documents for Design/Build Contract (by Client's Engineer)
- Contract conditions;
- Technical requirements (performance requirements)

H Design/Build Bid Process
- Clarification period;
- Bid preparation;
- Bid submission;
- Bid evaluation;
  - Technical and financial evaluation of responsive bid documents
- Commercial closure;
  - Contract concurrence from funding agencies
- Notice to proceed

I Property Acquisition

J Additional Geotechnical Investigations

K Additional Survey Works and Establishment of Control Line for the Project

Table 2.6 presents preliminary timeframes for completion of each of the above activities in Phase A.

Table 2.7 presents a preliminary overall work program schedule incorporating Phases A and B.

Table 2.6: Phase A – Project Implementation Schedule

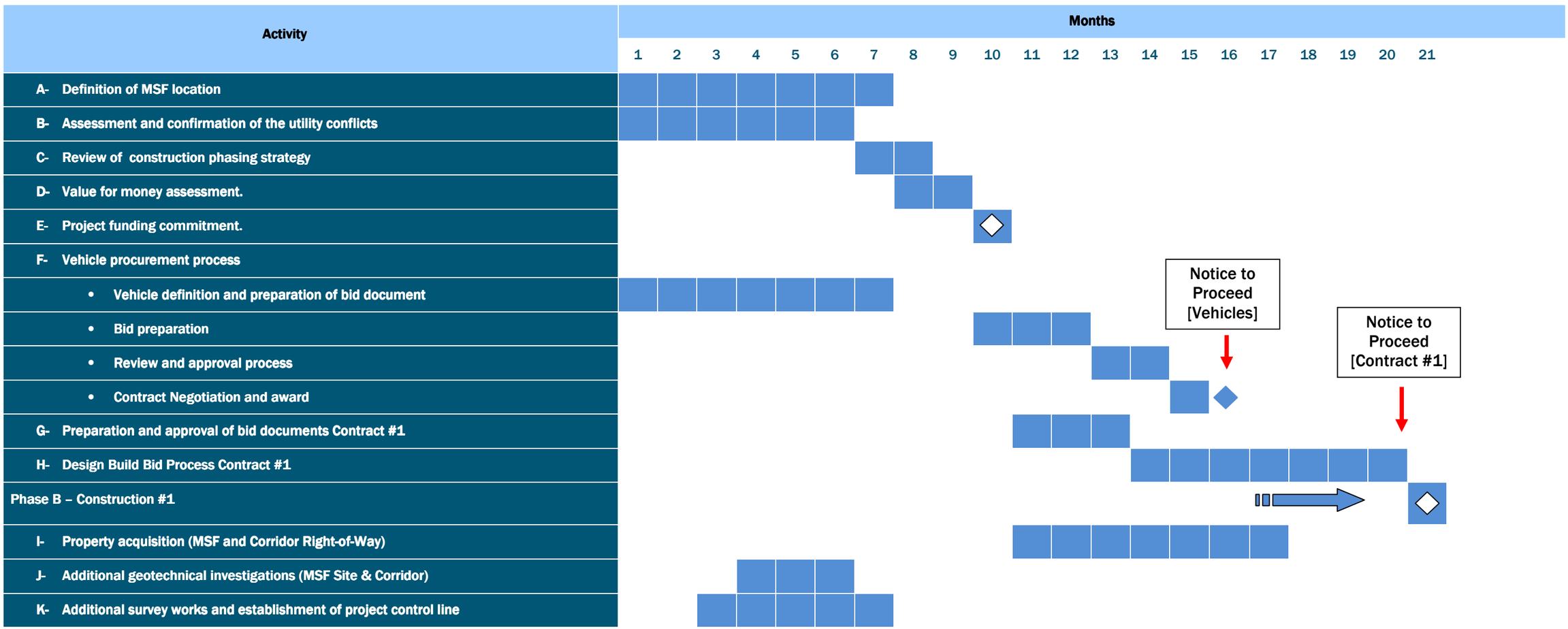
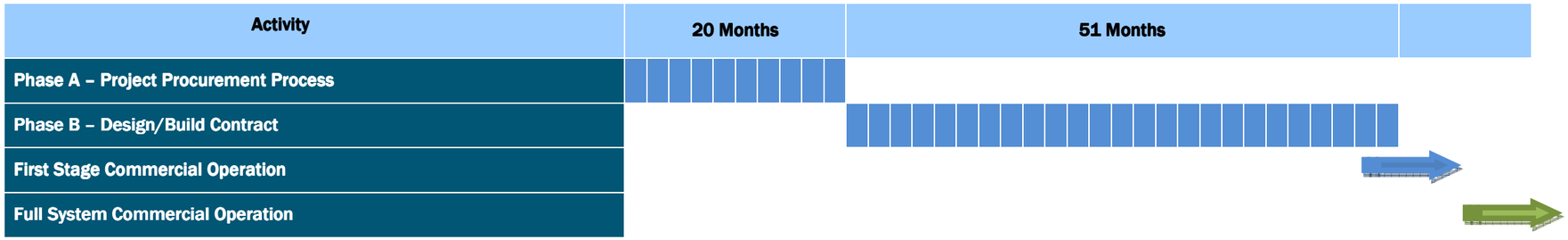


Table 2.7: Preliminary Overall Project Work Program Schedule (B-Line)



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3.0 EXISTING CONDITIONS

The B-Line LRT project will traverse a range of urban environmental conditions. This chapter of the EPR describes the project study area in the context of the transportation infrastructure and the natural, socio-economic and cultural environments and provides the baseline, including approved infrastructure and land use plans, against which the effects of the project have been measured.

Information on the following components is presented here and, for selected components, is supplemented with detailed technical reports appended to the EPR in Appendix B:

- Road Network
- Transit Network
- Active Transportation Initiatives and Infrastructure
- Surface and Subsurface Utilities
- Urban Structure and Land Use Policy
- Land Use and Community Features
- Surface Water and Aquatic Ecosystems;
- Terrestrial Ecosystems;
- Hydrogeology and Contaminated Soils;
- Noise and Vibration;
- Air Quality;
- Built Heritage and Cultural Landscapes; and
- Archaeology

3.1 Transportation and Utilities

3.1.1 Road Network

Much of the B-Line route is currently 4-lane two-way road. The main exception to this the King Street section, between The Delta in the east and Main Street West in the west, where both King Street East and King Street West generally operate as 4 lanes in a westbound only direction. Over this same length Main street carries the eastbound traffic flow. Alternative east-west routes exist via Cannon Street or Barton Street, both located to the north of the B-Line corridor.

The existing road network is show in Figure 3.1.

To reflect the proposals contained within the City of Hamilton's Transportation Master Plan, it was assumed the following transport projects, which result in changes to the road network, would be completed and operational by 2021:

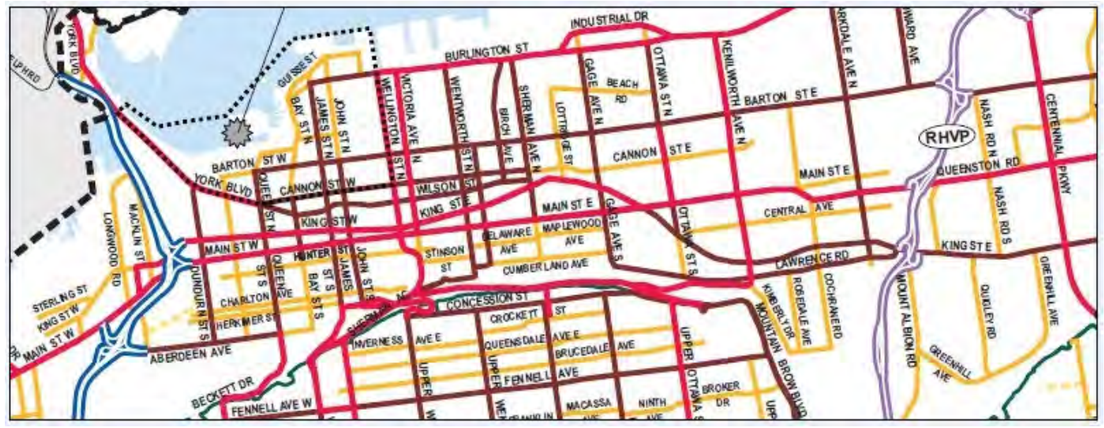
- Conversion of York Boulevard/Wilson Street to two-way operation. The road would comprise 3 traffic lanes and be subject to a posted speed of 50 km/h.
- Narrowing of Queen Street from Cannon Street to Stuart Street. The narrowed road would be 2 traffic lanes wide and be subject to a posted speed of 50 km/h.

The remainder of the road network would remain physically unchanged.

Along the B-Line corridor there are approximately 440 on-street parking spaces, with most spaces concentrated in the Downtown and Central sections. Overall weekday daily average occupancy along the corridor is approximately 150 cars. Within a 400-metre boundary areas of the B-Line, there are on average about 5,270 on-street daytime vacant parking spaces around the corridor. This value represents the average number of available parking spaces during a weekday where parking was permitted.

There are approximately 510 commercial properties requiring loading and delivery access in the corridor.

Figure 3. 1: City of Hamilton Existing Road Network



3.1.2 Transit Network

The B-Line is an east-west route following the major corridor of existing transit demand through Hamilton. The LRT is planned to run from McMaster University to Eastgate Square, with possible long term extensions westward towards Dundas, eastward into Stoney Creek and from Eastgate north to meet the proposed new GO station at Centennial Parkway.

Transit bus services on the B-line corridor are operated by Hamilton Street Railway (HSR). The corridor is currently served by an intensive transit service on a number of routes, which together provide 22 to 24 buses per direction per hour on the core sections. Two of these routes follow the whole length of the corridor, namely:

- 1A: McMaster University Medical Centre to Eastgate Square (4 buses per hour (bph) local; runs via Sterling Street).
- 10/10A: University Plaza/McMaster University Medical Centre to Eastgate Square (6 bph, B-Line Express).

Several other routes serve parts of the corridor, including:

- 1: GO Centre to Eastgate Square, supplementing the 1A (4 bph).
- The complex 5/5A/5C/5E/52 group from Dundas (2 termini), University Plaza, West Hamilton or Meadowlands to Greenhill/Cochrane, Quigley/Greenhill or Jones/King (8 bph in total).
- 51: West Hamilton to Hamilton GO Centre (4-6 bph, except summer and Christmas University vacations).

The existing pattern of these routes in peak periods is shown on a map base in Figure 3.2a, with the complete network of existing routes shown schematically for clarity in Figure 3.2b. The frequency of current services is illustrated on Figure 3.2.

Figure 3.2a: Existing Bus Routes in B-Line Corridor

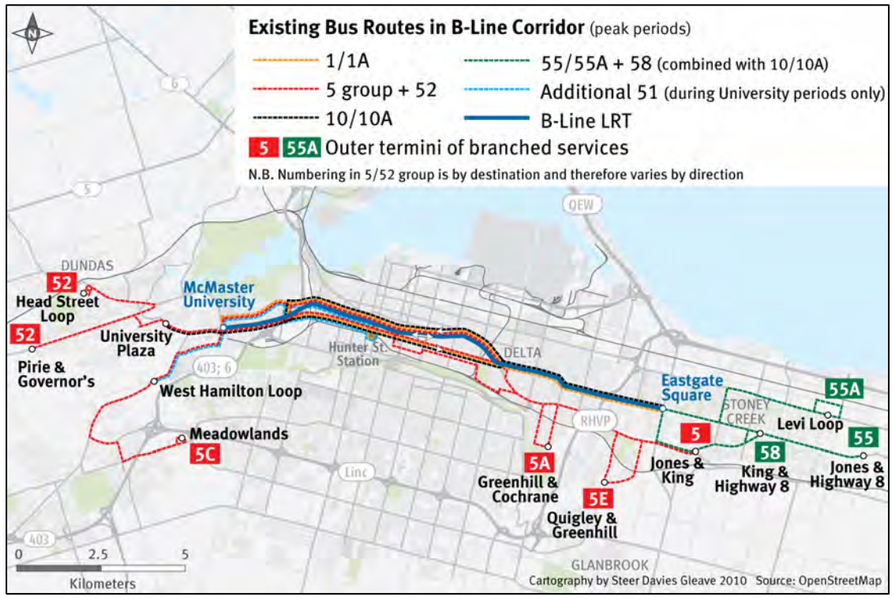


Figure 3.2b: Existing Network Schematic of Bus Routes in B-Line Corridor

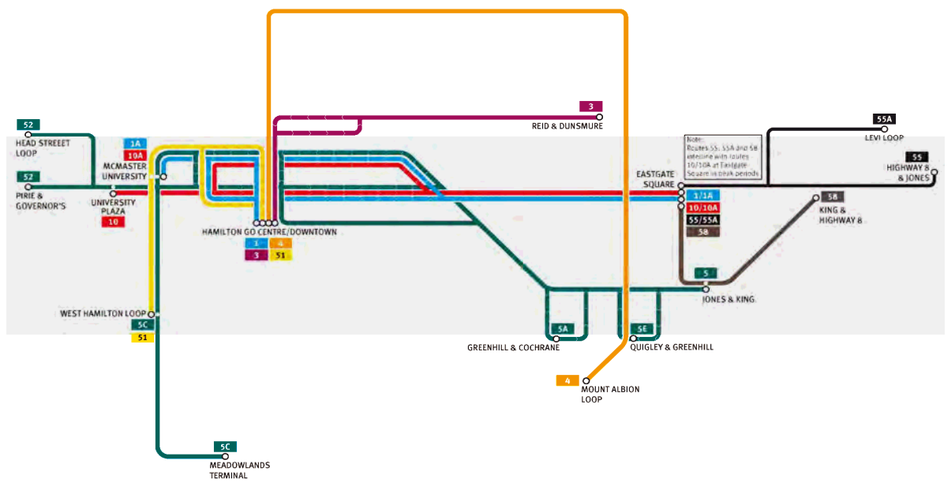
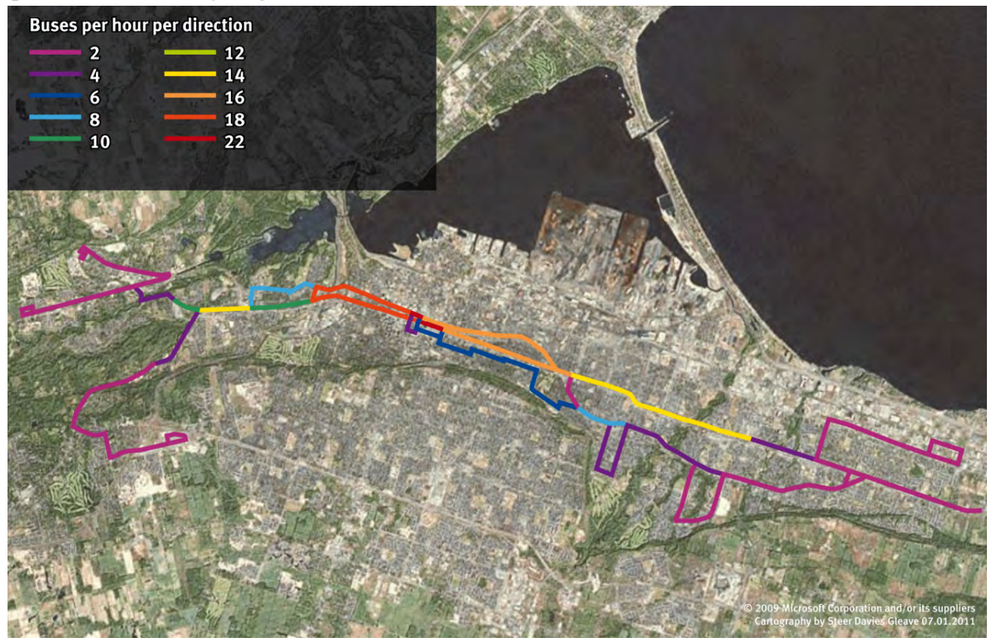


Figure 3. 2: Service Frequency in B-Line Corridor



Transfers between services occurs to the largest extent in the Downtown area along King Street and Main Street East and at the hubs of Eastgate Square, MacNab Transit Terminal, GO Centre and also at McMaster. Eastgate Square is a hub where local services intersect with the east-west services, and here all routes call in at the off-street terminal or at the adjacent stops on the near side of Queenston Road. Figure 3.3 illustrates transit network interfaces on the B-Line and shows the locations of the major transfer points, identified as those with a concentration of bus routes, based on the current network and smaller but nonetheless important locations (often at simple street intersections) where rapid transit lines intersect with bus routes and transfers will need to be facilitated.

In addition, a number GO bus services operate in the B-line corridor, including:

- Route 16: Hamilton QEW express GO bus
- Route 18(A): Lakeshore West Train-Meet GO Bus
- Route 47: Highway 407 West GO Bus
- Route 15: McMaster Train-meet Bus

The number of GO Buses operating in each direction on the corridor during the peak period is in the range of 6-8bph.

The Niagara GO Rail Service Extension identified a new station at Centennial Parkway. This would provide an opportunity to link the inter-regional rail service with the LRT. The City will continue to discuss this connection with Metrolinx and will seek to protect the ability for LRT to link to this proposed station in the future.

Figure 3. 3: Transit Network Interfaces: B-Line

3.1.3 Active Transportation Initiatives/Infrastructure

The City of Hamilton's transportation policies and infrastructure include general direction and provisions for active transportation (walking, cycling) in the context of improving mobility and quality of life, as well as connection to the proposed LRT system. The following section describes pertinent elements of this initiative.

Pedestrian

Current City policy on pedestrian mobility includes the Step Forward: Pedestrian Mobility Master Plan, anticipated to be completed by February 2012, and portions of the Hamilton Downtown Mobility Street Project, approved by Council in 2002, which focuses on urban design facilitating pedestrian usage. Also, on March 26, 2008, Council endorsed the "International Charter for Walking" developed at the October 2006 International Walk 21 conference, recognizing:

- The City of Hamilton has made the pedestrian mode of travel a key component of the Master Transportation Plan;
- Reducing vehicle trips by promoting a more walkable community cuts down on air pollution and greenhouse gas emissions;
- Making a community more walkable directly addresses the community's obesity problem and promotes better public health; and
- 16 Ontario communities (including Brantford, Niagara, Toronto and Sudbury) have already signed the International Charter for Walking.

The Step Forward: Pedestrian Mobility Master Plan is "To create pedestrian environments throughout the City that are safe, attractive, accessible to community institutions, recreation/leisure opportunities, employment, and retail services." To facilitate this, the plan includes the following goals:

- To increase the number of people walking in the City;
- To increase public health, active transportation and pedestrian linkages; and
- To create a walkable City to attract new residents and employers.

Rapid Transit is viewed as a means of fostering walkability and the number of pedestrians by calming vehicle traffic, creating land use intensification, enhancing the streetscape, and adhering to the city's Urban Design Guidelines for walkability, when possible.

The Downtown Mobility Street Project includes a section from Queen to Wellington on King Street that lies on the B-Line corridor. One of the four Master Plan Strategies identified as "Movement and Pedestrian Priority" that would include (but are not limited to) the following principles:

- Prioritize the Pedestrian Environment;
- Create an 'Urban' Streetscape Profile within the City Core;
- Expand the Pedestrian Realm through Targeted Lane Reduction and/or Sidewalk Widening;
- Create Safe Pedestrian Street Crossings; and
- Slow the Traffic Down.

As these principles are directly applicable to the implementation of the B-Line, they are to be addressed as part of the RT streetscape design along the entire corridor, in addition to the section of King Street mentioned above.

Cycling

The City's Cycling Master Plan "Shifting Gears 2009" commenced in the fall of 2008 and was finalized in early 2010. The focus of Shifting Gears is on commuter, utilitarian and recreational cycling, recognizing that recreational cycling is often the first step toward commuting or utilitarian use. The objectives of the cycling master plan are as follows:

- Develop a comprehensive cycling network for commuter, utilitarian and recreational cyclists through the expansion of on-street and off-street cycling facilities, including escarpment crossings;
- Provide a preferred cycling grid in the urban area based on a 2 km spacing design;
- Ensure consistency in design by providing separate facilities on streets with large motor vehicle traffic volumes and high speeds and shared facilities with low motor vehicle traffic volumes; and
- Provide convenient and all-season access to all residential and employment areas and transit nodes.

Light Rail Vehicles are able to accommodate cyclists and their bicycles on board. Cyclists will be able to start their trips on bicycle, travel longer cross-city distances on the LRV and then proceed to complete their trip on bicycle. This should contribute to multi-modal connectivity extending the usefulness of both the cycling infrastructure and RT system.

Recreational Trails

The City of Hamilton Recreational Trails Master Plan was adopted by Council in December 2007 and prescribes a comprehensive recreational trail system throughout the City of Hamilton. This system links both current and proposed future off-street and on-street systems into an integrated City-wide based system. The stated intent of the Master Plan is "to create a multi-purpose system that, to the extent practical, caters to the broadest range of users possible. The system is intended to embrace people of varied levels of health, mobility, skill, age and interests."

Trails in the vicinity of the B-Line LRT corridor include several on-street trails and the Desjardins Trail and the Red Hill Valley Trails.

3.1.4 Surface and Subsurface Utilities

The surface and subsurface utilities include both private and municipal services.

The underground utility infrastructure includes duct banks, sewer lines, water mains and gas mains. The surface infrastructure includes street lighting poles, hydrants and maintenance holes access covers.

Municipal

There is a dense network of water mains, combined sewers, sanitary sewers and storm sewers along the corridor, with some areas having up to 3 mains running along the corridor.

Lighting

The street lighting network is typically fed via an underground hydro cable with the certain aerial connections from pole to pole in locations where the underground cable might have failed.

Communications

Bell Canada has a discontinuous network of ducts that come in and out of the LRT corridor at different locations with the largest presence of duct banks at in the west end of the corridor. Impacts are expected to be minimal, given the limited number of locations where curbs are expected to be relocated. The detail design will ascertain the need for relocation as a 'Level A' utility survey will be required to provide existing vertical depth of the installed plant (duct banks and chambers).

A dense network of underground hydro duct banks serves the corridor, a possible reason for the corridor being virtually free of pole mounted hydro cables. Some areas exhibit up to 21 100 mm ducts in a duct bank, such as at the King Street and Bay Street intersection.

Communication company All-stream has a network that extends from Dundurn Street to James Street, with an additional crossing of the guideway at the Catherine and Wentworth intersection.

The area also has some existing aerial crossings of hydro wires such as the intersection of King St. and Dundurn Street. Canadian Pacific has a video cable network which extends from Dundurn Street to Catherine Street. The existence of this network remains to be confirmed as there has been no contact to ascertain their existence or locations.

The existing utility information shows an H.C.E. Pipeline west of Summers Lane, which coincides with the pedestrian bridge at this location. This utility owner will be further contacted to ascertain the existence and nature of their plant.

High tension electric power transmission line towers are present east of Strathearne Avenue. The clearance requirements from the medium voltage catenary of the LRT to the hydro towers will be developed in the detailed engineering phase.

Gas

Based on the utility information received, it is concluded that there are no high pressure gas mains along the corridor with the network generally made up of gas mains of diameters between 30 to 150 mm. Larger mains are found crossing the existing corridor with diameters ranging from 150 to 400 mm, with the largest main (400 mm) crossing at Hess Street.

The available information shows a Sun-Canadian pipeline which extends from Dundurn Street to Catherine Street. Through communications with Sun Canadian, it was confirmed that Sun Canadian has no active plant in this corridor.

There is a Natural Gas pipeline near the Queenston Traffic Circle. Based on current survey information, it is estimated that the pipeline has an approximate depth of 2.2 m which should not interfere with the construction of the guideway or the operation of the LRT.

3.2 Socio-Economic Environment

The description of the socio-economic environment is based on the City of Hamilton's *B-Line Land Use Opportunities and Challenges Study*[1], which provides existing land use and demographic profiles of the corridor, and on field investigations by the SDG/SLI team pertaining to both sectional and site-specific sensitivities and constraints.

3.2.1 Urban Structure and Land Use Policy Directions

Hamilton's Corridors have been recognized, described and identified prominently in various planning initiatives of the past and present. The directions that have shaped civic thinking on the Main-King-Queenston Corridor are synthesized in several key documents from the past 15 years.

Hamilton Wentworth Regional Official Plan (1995)

The Hamilton Wentworth Regional Official Plan presents the regional direction for growth and development in the City. The 1995 Regional Official Plan identifies the B-Line corridor as High Density Mixed Use Corridor anchored in the middle by the Regional Centre (Downtown Hamilton) and a Mixed Use Centre at the Eastgate Area. The Plan promotes the concentration of high density residential in the immediate proximity of major transit corridors and transit transfer points. This Plan calls for integrated land use and transportation planning, promoting the integration of transit plans into the design of neighbourhood and secondary plans to promote transit use and walkability. This Plan is currently in effect.

City of Hamilton Official Plan (1980 - Consolidated 2006)

City of Hamilton Official Plan identifies the B-Line corridor as the location for commercial land use and provides specific policy direction for the development of the Downtown as the primary node in the City, as well as the establishment of a sub-regional node at the Eastgate Area. Secondary planning for Downtown was completed in 2002 with the adoption of the Downtown Secondary Plan. No secondary planning was completed to give further direction to the corridor extending from Downtown or to the proposed Sub-Regional node at the Eastgate Area.

While secondary planning was not completed for parts of the corridor, neighbourhood plans were prepared for several areas, providing additional land use direction. In West Hamilton, the Ainslie Wood Westdale Secondary Plan (2005) recognized and reinforced Main Street as a major focus of mixed use commercial residential activity through that area. Secondary planning is currently underway to provide land use and transportation service/infrastructure direction for the Strathcona neighbourhood, which contains the section of the corridor between Downtown and Ainslie-Wood Westdale.

Growth Related Integrated Development Strategy (G.R.I.D.S.) (2006)

G.R.I.D.S. evaluated a series of growth options for the City based on nine directions that express the community's vision for future growth, namely:

- Mix of uses within neighbourhoods to provide opportunities to live, work and play.
- New development within existing built-up area.
- Protect rural areas for rural economy.
- Design neighbourhoods to improve access to community life.
- Retain and attract jobs in strength areas and new sectors.
- Encourage travel by foot, bike and transit and enhance regional connections.
- Maximize the use of existing buildings, infrastructure and vacant or abandoned land.
- Protect ecological systems.
- Maintain and create attractive public and private spaces and respect the unique character of existing buildings, neighbourhoods and settlements.

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1 B-Line Opportunities and Challenges Study. City of Hamilton, Spring 2010. This study will help to define and inform broader corridor planning activities that will include corridor design plans, secondary planning, transportation initiatives and implementation activities.

The evaluation of the growth options resulted in a choice of a node and corridor urban structure for the focus of future growth. G.R.I.D.S. identified the corridors as a key area for intensification in the chosen growth concept and described future development of the corridors as containing a broad mix of uses, including higher-density residential, retail, institutional and recreational uses. The study also identified corridors for the location of higher order bus transit services, linking the nodes and facilitating movement of people from place to place. The Main-King-Queenston Road Corridor is an identified corridor in G.R.I.D.S.

City of Hamilton Urban Official Plan (adopted 2009)

Further expanding on the description of the preferred future growth concept identified through G.R.I.D.S., the adopted Urban Official Plan presents the policy direction for future development of nodes and corridors.

The B-line corridor includes several high intensity nodes and activity areas identified in the Urban Hamilton Official Plan (Minister Approved. March 2011)including:

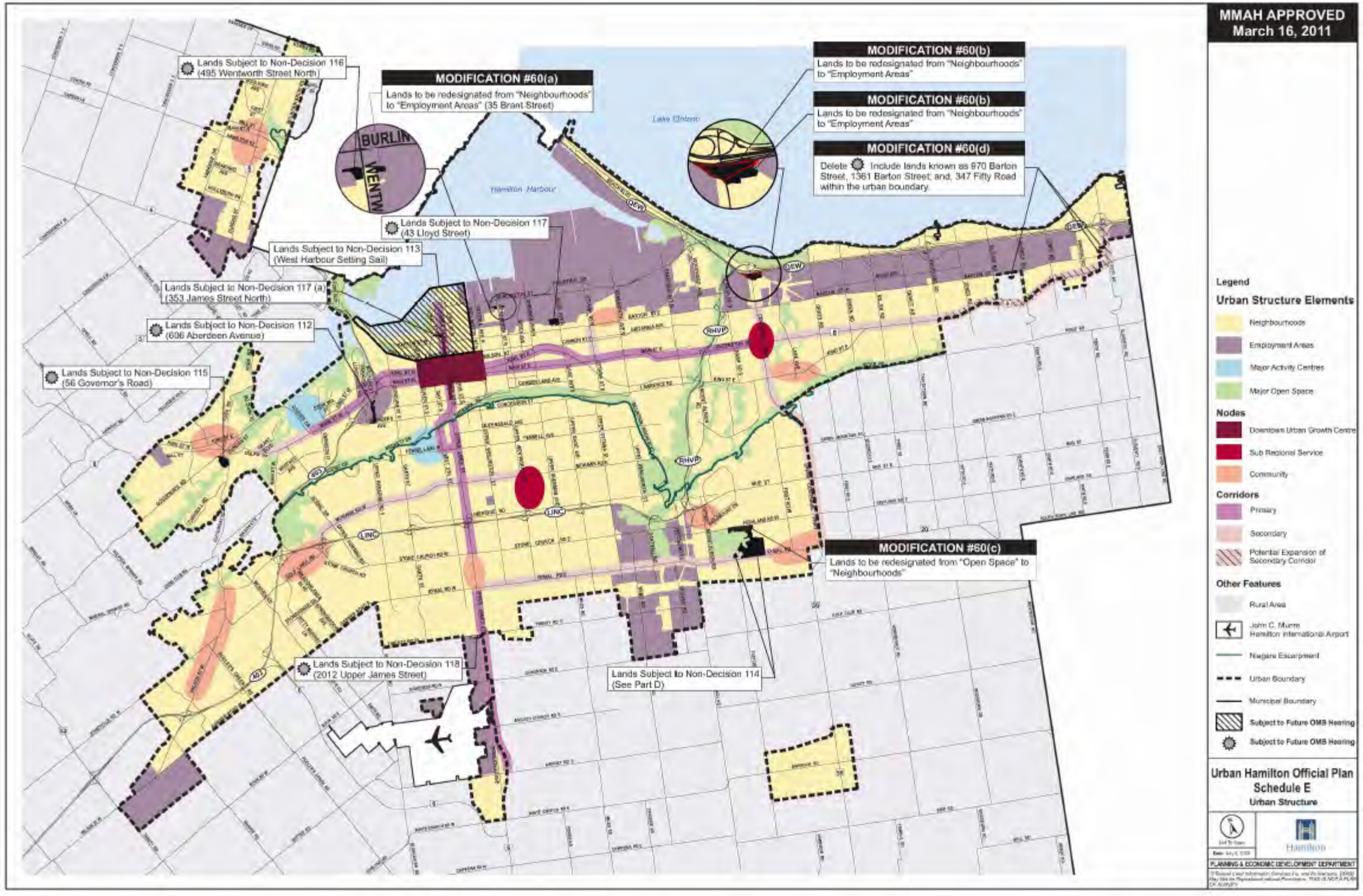
- the McMaster Major Activity Centre;
- the Downtown Urban Growth Centre; and
- the Eastgate Sub-Regional Service Node.

The Downtown and Eastgate stop areas are intended to be two of the highest intensity areas of the City.

The Main-King-Queenston Corridor is identified as an Urban Corridor in the Plan as part of the greater future Urban Structure (refer to Figure 3.4). The Plan describes and sets policy for developing an urban structure based on a system of urban nodes and corridors. Urban Corridors, along with Urban Nodes, are intended to be:

- the focus for re-urbanization activities (population growth, private and public redevelopment and infrastructure investment);
- focal points of activity for neighbourhoods and communities;
- vibrant pedestrian environments, facilitating active transportation; and
- interconnected and served by various transportation modes, including higher order transit.

Figure 3.4: Schedule E from Urban OP



The Urban Official Plan recognizes that urban corridors are integral parts of adjoining neighbourhoods, providing physical and social focal points for those adjacent neighbourhoods. The intent of the Plan is to maintain and enhance the mixed use nature of the corridors, while recognizing that segments of individual corridors will differ in character and function and will evolve over time.

The policies of the Plan set a future direction for development of the corridors by describing the function, scale and design for the corridors.

Function: - The corridors are to function as retail spines, with local commercial uses to serve adjacent neighbourhoods. Given the diversity of the corridors, the Plan recognizes that some retail areas along the corridors will have a broader community or regional draw. Corridors are also to be the focus for residential intensification through the neighbourhoods which they traverse.

Scale: - Built form along the corridor is to be low to mid-rise, with higher densities and built forms in some areas, where appropriate. Higher densities are more likely to be closer to the nodes along the corridor, with the scale for specific sections of the corridor to be determined through secondary planning and corridor studies.

Design: - The main design direction for corridors focuses on the pedestrian and the creation of a comfortable and attractive pedestrian environment. Connectivity of the corridor to the neighbourhood is essential to facilitate and promote active transportation and transit use. In addition, design along the corridor must respect the existing built form of the neighbourhood.

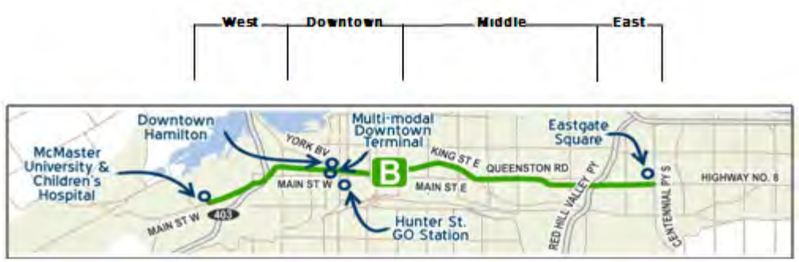
Building on the foregoing policy directions, the B-Line Opportunities and Challenges Study identified the following set of principles that summarize the vision for development of the Main-King-Queenston Corridor:

- The Corridor is a focus of community activity through the neighbourhoods.
- Development reflects the character of the adjoining neighbourhoods, creating unique places and spaces along the extent of the Corridor.
- Development of the Corridor creates and maintains a high quality pedestrian and public realm.
- Corridor development respects natural and cultural heritage resources.
- Multiple modes of transportation are accommodated within the corridor, and development along the corridor supports transit and active transportation through form and density.
- The Corridor is a location for a variety of housing forms and tenures. Development within the corridor protects existing rental housing stock and expands the supply of rental housing.
- The Corridor increases the connection between nodes and the Downtown according to the urban structure.

3.2.2 Existing Land Use/Community Features

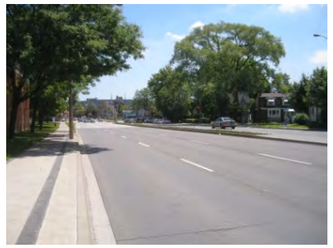
The B-line corridor traverses several distinct sections of the City exhibiting a wide diversity in urban form, land use, function, physical features, and community connectivity. For the purposes of this overall assessment, the corridor has been divided into four sub areas: West Section (McMaster University – Dundurn Street), Downtown (Dundurn Street – Wellington Street), Middle Section (Wellington Street – Red Hill Valley Parkway), and East Section (Red Hill Valley Parkway – Eastgate Square), as shown below in Figure 3.5.

Figure 3.5: B-Line Corridor Sections for Land Use Considerations



West Section

The western end of the proposed B-line corridor includes the western terminus of the proposed rapid transit line in the vicinity of McMaster University, the Longwood Road/Innovation Park stop and the Dundurn stop. These three stops are very distinct areas and there is variability in the function of these areas. McMaster University is a major activity centre, with institutional as the main use, surrounded by residential uses. The main function of this area is health care and education, having a regional draw to the University and the Medical Centre. As the endpoint of the rapid transit corridor, an anchor stop/station will be located in the vicinity of the McMaster University area. The exact location of the corridor terminus will be determined though more detailed review of the rapid transit corridor.



The Longwood Road area reflects the transition from the University focus to a broader mix of uses. This area has several high value residential neighbourhoods, as well as a greater mix of commercial uses than the area further west. The transition from major institutional uses and residential and mixed uses continues to the Dundurn Street area, where commercial uses occupy an increasing amount of the adjacent lands.

Overall, there is a mixture of larger lot commercial type uses directly adjacent to the corridor, with smaller residential lots further from the stop areas. The western area has many high profile features, including McMaster University and McMaster University Medical Centre, the West Hamilton Innovation District and the Westdale Business Improvement Area, which are significant trip attractors and generators.

Downtown Section

The Downtown section includes stop areas that are adjacent to, and directly situated within Downtown Hamilton. The stop areas include: Queen Street, Bay Street, Gore Park, and First Place. These stop areas exhibit the highest mix of land uses, and include the highest concentration of high density residential uses. In addition the east end of this section includes a range of specialized/boutique retail commercial outlets in the International Village (Mary Street to Wellington Street).

The Downtown is the intended cultural, civic and office centre of the City and contains several regionally significant features, such as City Hall, Copps Coliseum, The Art Gallery of Hamilton, Hamilton Convention Centre/Hamilton Place, Farmers' Market, and Gore Park. The Downtown area is also the main node for various modes of transit. The Hunter Street GO Transit terminal is located Downtown and an additional GO Transit stop is proposed for James Street North. A new transit terminal was built Downtown on MacNab Street. Furthermore, Metrolinx has identified Downtown Hamilton as a Mobility Hub, which means the area serves a critical function in the regional transportation system as the origin, destination, or transfer point for a significant number of trips. Metrolinx emphasizes their importance in being places of connectivity where different modes of transportation – from walking to riding transit – come together seamlessly and where there is an intensive concentration of working, living, shopping and/or playing." In addition, the Hamilton GO Centre is a major regional transit station within walking distance to the B-Line corridor.

Along most of the corridor, the stop areas may be spaced approximately 800 m – 1,000 m apart. The stop areas in the Downtown area (especially Bay Street to First Place) are more closely spaced and overlap, with distances of 500 m or less between stops. Thus, while each individual stop area does have distinct features, all the Downtown stop areas share significant land uses and potential ridership. In addition to having the most diversity in land use and highest densities of residential uses, the Downtown stop areas have the greatest concentration of office uses, which are a significant potential contributor to transit ridership.

Middle Section

This section includes the stop areas of Wentworth Street, Sherman Avenue, Scott Park, Ottawa Street, Kenilworth Street, Queenston Traffic Circle and Parkdale Avenue. The most dominant land use component of middle section is residential. In most stop areas, residential uses make up from 70% - 85% of all the stop areas. Unlike the Downtown area, most of the residential uses are single detached homes, with size and density varying by stop area. However, there are nodes where commercial is a dominant use, such as the Ottawa Street area, which contains a range of small community and neighbourhood retail and service outlets. In addition, there are a number of ethnic community centre facilities in this section of the corridor that serve as social gathering and interaction nodes.

The majority of the parcels in the middle section tend to be smaller in scale and more neighbourhood oriented. Moreover, the middle section has few regional attractions, except for Gage Park and the existing Ivor Wynne Stadium. There are few large commercial uses, galleries, or larger scale community facilities in the middle section of the corridor. Another trend in this section is the street pattern; some stop areas have very tight grid pattern streets, while other areas are more varied and irregular in the street pattern. Such differences can influence the ease of accessing transit and the walkability of the area. The smaller parcels also may make redevelopment more challenging.

The average residential and non-residential assessment values in this area are lower compared to the remaining areas along the corridor (see below). There has been no large scale development or redevelopment in this section of the corridor in the recent past.

East Section

In the eastern section of the corridor, residential uses dominate, but are well balanced by larger scale commercial uses. The larger commercial nodes in this section (e.g., Eastgate Square) draw from a large (regional) catchment area than those in other sections of the corridor. The stop areas that make up this section include Nash Road and Eastgate Square. In addition to being a regional commercial node, Eastgate Square is a bus transit terminal and will be the terminus of the rapid transit route in the short-medium term. A dominant feature in the east section of the corridor is the Red Hill Valley Parkway. The area of the on- and off-ramps at Queenston Road may represent a potential park-and-ride area to allow additional access to the rapid transit corridor.

The value of residential and non-residential property rises in the eastern section, especially compared to the middle section. The parcel sizes in the eastern section are much larger than that of the middle section and Downtown areas. These larger parcels increase the redevelopment and infill potential of this area of the corridor. The urban form in the east section is also generally newer than the areas of the Downtown and middle sections. The street pattern is less of a grid, making walkablilty more difficult.

Summary

In summary, land use along the corridor is quite varied both by section of the corridor, as well as by individual stop area. The incidence of commercial uses tends to be highest between Queen Street and Wentworth Street and in the east end at Nash Road and Eastgate. Residential uses are prevalent throughout the corridor, although it is the dominant land use in the middle section of the corridor. Institutional uses are spread fairly evenly through the corridor, with the largest concentration located near the McMaster stop area. Other major institutional uses include educational institutions; places of worship; retirement centres; and dental, medical and veterinary clinics.

There are few industrial uses along the corridor. 'Industrial' is a broad category which can include smaller warehouse-type uses and smaller workshops. Of the few industrial uses that exist, most are within an 800 m radius and not directly adjacent to the corridor. At 800 m, much of the corridor is in close proximity to the Bayfront Industrial area. The single largest concentration of 'industrial' uses is located at the West Hamilton Innovation District, one of the City's designated business parks.

Vacant land is more varied throughout the corridor than some of the other land uses. Vacant land varies from smaller single parcels to larger blocks being used as surface parking. The largest concentrations of vacant land, which are in the Downtown and eastern sections of the corridor, are currently used for surface parking lots.

Office uses are almost entirely concentrated in the Downtown section of the corridor (with some offices located in the western and eastern sections, as well). This is reflected in the high number of jobs within 400 m of the corridor between Bay Street and John Street.

Transportation and utility uses represent a small proportion of the corridor land uses and generally cross the corridor (e.g., Highway 403 in the West section; CP Rail spur lines in the West and Middle sections; the Red Hill Valley Parkway in the East section; and Hydro One and natural gas line in the Middle section).

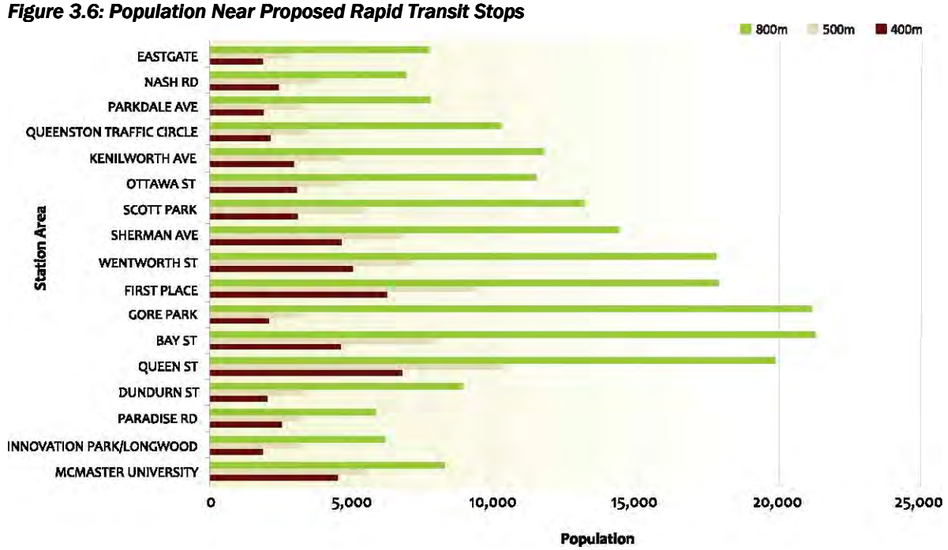
Finally, Open Space is located throughout the corridor and is generally located further from the stop areas, at 800 m rather than directly adjacent to the corridor at 400 m - 500 m. The exceptions are Cathedral Park (at Highway 403) Victoria Park (between Strathcona Avenue and Locke Street), Gore Park (between James Street and John Street), Wellington Park (between Wellington Street and West Avenue) and Scott Park (at Melrose Avenue), which directly abut the corridor. Gage Park (between Gage Avenue and Kensington Avenue) is situated immediately adjacent to the corridor at the Main Street/King Street junction in the Delta area.

The 2010 residential assessment values were highest at the end points of the B-Line corridor, where McMaster University and Medical Centre and West Hamilton Innovation District are located in the west (average $250,000+), and Eastgate Square and large scale commercial uses near Nash Road in the east (average $225,000+). Residential values are lowest in the middle section and eastern parts of the Downtown sections (average $130,000). Non-residential assessment shows a similar pattern, with the highest investment being located at the most westerly (average $7,000,000+) and easterly sections of the corridor (average $4,000,000+). The average assessment values very clearly show where the majority of investment and development interest has been in the recent past.

3.2.3 Corridor Wide Population and Employment

Figure 3.6 shows the population of the various stop areas at various distances from the proposed transit line. The Downtown and the middle section of the corridor have the highest concentration of population, while the end points of the corridor contain lower populations. The lower density residential areas in the eastern and western section of the corridor are in part due to the amount of non-residential land use, which has a greater focus on large format commercial or major institutional uses, and lower residential housing densities in the neighbourhoods in general.

Figure 3.6: Population Near Proposed Rapid Transit Stops

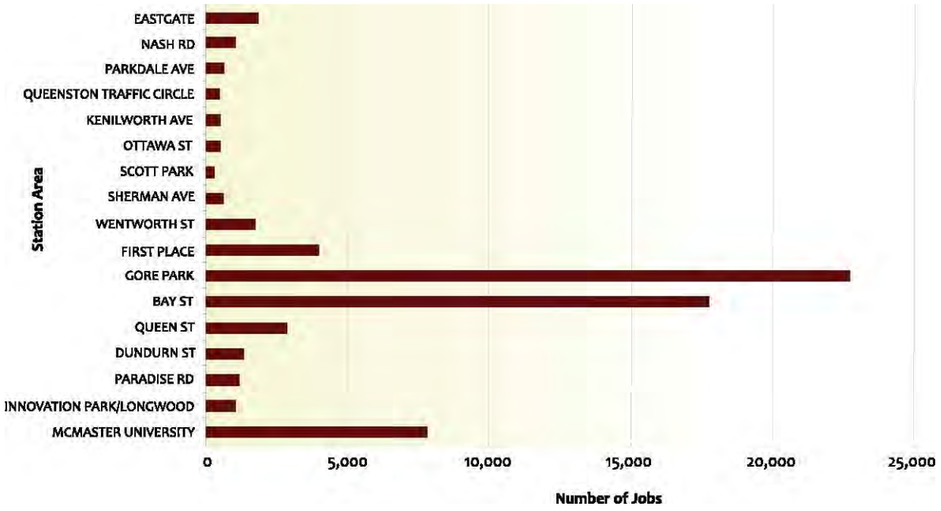


Source: B-Line Opportunities and Challenges Study. City of Hamilton, 2010.

While Queen Street has the highest population at 400 m and 500 m, Bay Street and Gore Park have the highest population when factoring in all population within 800 m. Overall, there are more than 54,900 people living within 400 m of proposed stop areas and 74,500 people living within 500 m of proposed stops areas along the corridor.

The number of jobs along the corridor also varies by stop area. Not surprisingly, the highest concentration of jobs located within 400 m is in the Downtown area, as shown in Figure 3.7. A high number of jobs are also located at the eastern end of the corridor, where several large scale commercial uses are located, and on the west end, where the McMaster University Medical Centre and other related commercial uses are located.

Figure 3.7: Number of Jobs within 400 m of Proposed Rapid Transit Stops



Source: B-Line Opportunities and Challenges Study. City of Hamilton, 2010.

3.3 Natural Environment

3.3.1 Surface Water and Aquatic Ecosystems

Introduction

The proposed LRT B-Line corridor crosses two watercourses, specifically Chedoke Creek and Red Hill Creek (refer to Figure 3.3). Chedoke Creek is located within the Spencer Creek watershed and Red Hill Creek is within the Red Hill Valley Creek watershed. Both watercourses are influenced by extensive surrounding urbanization, have reaches that have been altered, and are generally considered to have degraded habitat conditions for aquatic life. The purpose of this section of the report is to document the existing aquatic habitat conditions of the aforementioned watercourses.

Methodology

The description of the existing aquatic conditions involved the collection and review of secondary source information and primary collection of data during field investigations by SLI. The compilation of the background inventory was based on a review of all relevant background information available. The variety of background sources reviewed is listed below and the field approach is summarized briefly below.

Background Data Collection

Background data were obtained from various published and non-published sources. Sources of information include:

- City of Hamilton Rapid Transit Initiative Terrestrial and Avian Ecology Report, Dillon Consulting Limited, March 2009.
- Fisheries and the Red Hill Creek Realignment Study. C. Portt and Associates. 2003.
- Chedoke Channels Maintenance Study. City of Hamilton Municipal Class Environmental Assessment Study, McCormick Rankin Corporation (MRC). 2008.
- Guelph District Ontario Ministry of Natural Resources (MNR)
- Hamilton Conservation Authority (HRCA)
- Class EA Ecological Assessment Requirements for Baseline Conditions, S. Faulkenham, HRCA, March 26, 2009.
- Natural Heritage Information Center (NHIC) website 2010
- City of Hamilton
- Urban Hamilton Official Plan, Schedule B, Natural Heritage System, (Minister Approved, March 2011).
- COSEWIC. 2009. Canadian Wildlife Species at Risk. Committee on the Status of Endangered Wildlife in Canada. Web site: http://www.cosewic.gc.ca/eng/sct0/rpt/rpt_csar_e.cfm [accessed 25 Sept 2010].
- Species at Risk in Ontario (SARO) List. Updated September 11, 2009.

Field Surveys

To confirm background conditions and the sensitivity of fish and fish habitat reported by others, a field investigation was conducted on November 12, 2010 to fully characterize and assess habitat features present at the two (2) watercourse crossings in the study area for the B-Line corridor. Field data collection methods included:

- Documented information on stream type, substrate, morphology, bank stability,
- in-stream cover, near shore cover vegetation, migratory obstructions and presence of any critical habitat (i.e., spawning);
- Photographic Documentation of existing fish habitat conditions for the watercourses within the study area.

The field investigation study area for the watercourse crossings included the proposed B-Line corridor, plus 50 m upstream and 200 m downstream of the assumed right-of-way of the corridor.

Fish community sampling and inventory was not completed as background data was deemed sufficiently for the assessment of the fish community present at the watercourses in the study area. Information reported on fish species present is primarily from MNR historical fish collection records available and the Hamilton Harbour and Watershed Fisheries Management Plan (MNR/HRCA, 2009). The timing of the field investigations in November, 2010 (fall) was considered appropriate to confirm and assess existing physical (e.g., flow regime, temperature) and biotic (e.g., aquatic vegetation) habitat conditions, and specific fish use of interest.

The fish habitat assessment was conducted utilizing the methods outlined in the MNR Ontario Stream Assessment Protocol (2005). Information recorded includes:

- Watercourse size, flow (permanent/intermittent) and thermal regime (coldwater/warmwater);
- Physical channel dimensions and characteristics – width, depth (including bankfull and wetted widths and depths), substrate type, bank stability/erosion, channel morphology and evidence of any groundwater seepage or upwelling areas.
- In-stream/overhead cover opportunities (e.g., woody debris, undercut banks, vegetation);
- Riparian vegetation;
- Physical barriers to fish movement in the vicinity of the crossings;
- Identification of potential critical or specialized habitat areas or features (i.e., potential spawning or nursery areas); and,
- Observations of habitat alterations/land use (i.e., channel modification, potential pollutant sources).

Aquatic Species at Risk

The designation of species of national significance is given by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC). The designation of species of Provincial significance is made by the MNR and is based on recommendations made by the Committee on the Status of Species at Risk in Ontario (COSSARO).

From the review of the federal Department of Fisheries and Oceans Canada (DFO) "Distribution of Aquatic Species at Risk" mapping for the study area, there is one designated aquatic Species at Risk (Redside dace) that is known to occur in Chedoke Creek within the B-Line corridor. Redside dace (Clinostomus elongates) is designated nationally "Endangered" by the COSEWIC, and was recently (February 2009) up-listed provincially to "Endangered" by the COSSARO. Under the federal Species at Risk Act (SARA), Redside dace is considered to be of "Special Concern" (Schedule 3), and this species is listed as "Endangered" under the Ontario Endangered Species Act (2007).

Although Redside dace has historically present in Chedoke Creek, and is currently identified on DFO's Aquatic Species at Risk mapping for the creek, fish community surveys and current habitat conditions at the B-Line crossing indicate that Redside dace are no longer considered present in Chedoke Creek. The MNR has prepared a recovery strategy for Redside dace and is responsible for their protection under the Endangered Species Act. As part of this study, Hamilton Conservation Authority confirmed that Redside dace is not considered to be present in Chedoke Creek (pers. comm., Shari Faulkenham, HCA Ecologist).

There are no aquatic species at risk identified within the Red Hill Creek watershed.

Fish Habitat Evaluation Criteria

Watercourses located within the study area were evaluated based on DFO's delineation of fish habitat as direct or indirect fish habitat and MNR's classification of fish habitat as "Cold", "Cool" or "Warm" and also "Critical", "Important" or "Marginal".

These evaluations were based on a combination of the desktop and field information and were applied within the context of the habitats' productive capacity and potential contribution to the local fisheries. The following sections describe how the evaluations were applied to various types of habitats in the area.

Habitat Indicators

Criteria considered in the evaluation of fish habitat, or in the determination of whether or not a waterbody provided fish habitat, included:

- Physical habitat variables (depth, flow, cover, etc.). These variables were used primarily in the ranking of fish habitat quality and sensitivity; and
- Habitat connectivity, which is a major constraint to the ability of fish to utilize habitats, as some habitats are highly fragmented by urban infrastructure (e.g., roads, sewers).

Fish Habitat Evaluation Categories

Utilizing the MNR classification system, fish habitat falls into 1 of 3 categories: Type 1, Type 2 or Type 3, the definitions of which have been determined by MNR (2000). Habitat type is based on the sensitivity and significance of current or potential habitats in a waterbody.

- Type 1, or critical, habitat is the most sensitive and requires the highest level of protection. Examples of Type 1 habitat include critical spawning and rearing areas, migration routes, over-wintering areas, productive feeding areas and habitat occupied by sensitive species.
- Type 2, or important, habitat is less sensitive and requires a moderate level of protection. These areas include feeding areas for adult fish and unspecialized spawning habitat.
- Type 3, or marginal, habitat is considered to be highly degraded and does not contribute directly to fish productivity. Examples include channelized streams and artificially created watercourses.

Aquatic Habitat Resources

Fish Habitat Assessment - Chedoke Creek

Chedoke Creek is a warmwater permanent watercourse that originates south of the proposed B-Line corridor and is conveyed through a large culvert and concrete channel within the study area. Chedoke Creek continues to flow north into Cootes Paradise, which is in close proximity to the project study area.

The Hamilton Harbour and Watershed Fisheries Management Plan (2009) has classified Chedoke Creek as a small warmwater riverine system. The fisheries management objective for this system is to maintain the capacity for native coolwater and warmwater fish (e.g., minnows and darters). However, if it is possible to lower the stream temperatures, through stormwater management and habitat restoration initiatives, to convert a warmwater stream to a coldwater stream, then priority should be given to cool/cold water species, such as Brook trout (Salvelinus fontinalis), where the physical habitat determines.

Chedoke Creek is a highly urbanized and degraded watercourse with respect to habitat and water quality. Much of the creek in the project area has been straightened and channelized. The entire length at the proposed crossing point between Main Street and King Street is conveyed underground and is deemed by the Hamilton Conservation Authority to be an "enclosed watercourse". The reach upstream of Main Street is conveyed in a concrete-lined channel that is approximately 5-6 m wide, with water depths of approximately 0.2 m. There is no in-stream cover and the riparian vegetation is absent, as the concrete extends to the top-of-bank of the channel. Vegetation at the top-of-bank and through the valley consists of species typical of old fields and disturbed areas, such as Norway maple (Acer platanoides), white ash (Fraxinus americana), and white birch (Betula papyrifera), along with shrubs, such as staghorn sumac (Rhus typhina) and common buckthorn (Rhamnus cathartica).

Downstream of the Highway 403/Main Street Interchange, Chedoke Creek exhibits a more naturalized reach of stream, although it has been straightened and is characterized as more of a large drainage canal to Cootes Paradise.

Fish Community

Chedoke Creek is located within the Spencer Creek watershed. The fish community of the Spencer Creek watershed is very diverse, with 44 species of fish recorded (Table 3.1). However, the fish community of Chedoke Creek is very limited, due to the altered and degraded nature of the habitat conditions. According to the Hamilton Harbour and Watershed Fisheries Management Plan (2009) the fish community of Chedoke Creek is comprised of the following warmwater species: creek chub (Semotilus atromaculatus), brook stickleback (Culaea inconstans) and pumpkinseed (Lepomis gibbosus).

Within the proposed B-Line corridor, Chedoke Creek has been assessed as Type 3, or marginal, fish habitat due to the highly altered nature of the watercourse. The reaches upstream of Main Street do not contribute directly to the fish habitat potential of the system, but do provide indirect fish habitat in terms of allochthonous (food) matter inputs to downstream habitats. Downstream reaches are connected directly to Cootes Paradise and likely provide overall general habitat for feeding, rearing and over-wintering.

An overview of existing aquatic habitat conditions at Chedoke Creek is presented in Appendix B.1 Figure 2.0.

Table 3.1: Fish Community of the Spencer Creek Watershed[2]

Family	Scientific Name	Common Name
Petromyzontidae	*Lampetra appendix*	American brook lamprey
	Petromyzon marinus	Sea lamprey
Salmonidae	*Oncorhynchus mykiss*	Rainbow trout
	Salmo trutta	Brown trout
	Salvelinus fontinalis	Brook trout
Umbridae	*Umbra limi*	Central mudminnow
Esodidae	*Esox lucius*	Northern pike
Cyprinidae	*Chrosomus eos*	Northern redbelly dace
	C. neogaeus	Finescale dace
	Clinostomus elongates	Redside dace
	Carassius auratus	Goldfish
	Cyprinus carpio	Carp
	Notropis atherinoides	Emerald shiner
	Hybognathus hankinsoni	Brassy minnow
	Nocomis biguttatus	Hornyhead chub
	N. micropogon	River chub
	Luxilus cornutus	Common shiner
	Notemigonus crysoleucas	Golden shiner
	Notropis heterolepis	Blacknose shiner
	N. hudsonius	Spottail shiner
	N. rubellus	Rosyface shiner
	N. ludibundus	Sand shiner
	Cyprinella spiloptera	Spotfin shiner
	Notropis volucellus	Mimic shiner
	Pimephales notatus	Bluntnose minnow
	P. promelas	Fathead minnow
	Rhinichthys atratulus	Blacknose dace
	R. cataractae	Longnose dace
	Semotilus atromaculatus	Creek chub
	Luxilus chrysocephalus	Striped shiner
	Semotilus margarita	Pearl dace
Catostomidae	*Hypentelium nigricans*	Northern hog sucker
	Castostomus commersoni	Common white sucker
Ictaluridae	*Ameiurus nebulosus*	Brown bullhead
Gasterosteidae	*Culaea inconstans*	Brook stickleback
Centrarchidae	*Lepomis gibbosus*	Pumpkinseed
	Micropterus salmoides	Largemouth bass
	Ambloplites rupestris	Rock bass
	Lepomis cyanellus	Green sunfish
	L. macrochirus	Bluegill
	Pomoxis nigromaculatus	Black crappie
Percidae	*Perca flavescens*	Yellow perch
	Etheostoma caeruleum	Rainbow darter
	E. flabellare	Fantail darter

2 *Hamilton Harbour and Watershed Fisheries Management Plan,* 2009.

Fish Habitat Assessment - Red Hill Creek

Red Hill Creek is a coldwater permanent watercourse that originates south of the proposed B-Line corridor above the Niagara Escarpment near Upper James Street and Rymal Road in the City of Hamilton. The reach of Red Hill Creek through the proposed corridor has been significantly changed due to the construction of the Queenston Road Bridge, as well as the construction of the Red Hill Valley Parkway. The portion of the valley system throughout the study corridor has been altered to accommodate the construction of the Parkway, and approximately 7 km of Red Hill Creek was realigned from the QEW to Mount Albion Road. The realignment was designed utilizing natural channel design methodologies, which has resulted in improved hydraulic function, better habitat conditions and a riparian zone composed of native species.

The Hamilton Harbour and Watershed Fisheries Management Plan (2009) has classified Red Hill Creek as an intermediate coldwater riverine system. The objective for this system is to increase the habitat capacity for rainbow trout (Oncorhynchus mykiss) and brown trout (Salmo trutta). Atlantic salmon (Salmo salar) reintroduction is also being considered where successful brown trout reproduction proves that the spawning habitat is suitable.

Within the B-Line corridor, the realigned Red Hill Creek flows within a slightly meandering channel, with a series of rock vortex weirs spaced approximately 10 m apart for much of the length. The stream channel width through this reach varies from 1 - 2 m, with average water depths of 0.2 - 0.3 m. As is typical with many heavily urbanized watersheds, Red Hill Creek is a very flashy system and, based on the amount of debris caught in the riparian vegetation, it appears that water levels frequently overtop the banks during routine storm events. Due to the flashy nature of the stream and the resultant erosion forces, the stream banks have been lined with quarried limestone not only to ensure stream bank stabilization but also to provide in-stream cover for the resident fish community.

The valley restoration through this reach has been quite significant and there have been many native species planted in the riparian zone, including eastern white pine (Pinus strobus), white ash (Fraxinus americana), white birch (Betula papyrifera), balsam poplar (Populus balsamifera), along with shrubs such as staghorn sumac (Rhus typhina), downy serviceberry (Amelanchier arborea), common buckthorn (Rhamnus cathartica), grey dogwood (Cornus foemina), red osier dogwood (Cornus stolonifera), and slender willow (Salix petiolaris) found in the wetter areas.

Fish Community

The fish community of Red Hill Creek is healthy and diverse, with a total of 24 species dominated mainly by warmwater species, with a small assemblage of coldwater and coolwater species (Table 3-2).[3] Within the vicinity of the B-Line corridor, 14 species of fish have been sampled, including fathead minnow (Pimephales. promelas), common white sucker (Catostomus commersoni), blacknose dace (Rhinichthys atratulus), longnose dace (Rhinichthys cataractae), creek chub (Semotilus atromaculatus), brook stickleback, common shiner (Luxilus cornutus), Chinook salmon (Oncorhynchus tshawytscha), threespine stickleback (Gasterosteus aculeatus), common carp (Cyprinus carpio), spottail shiner (Notropis hudsonius), pumpkinseed, emerald shiner (Notropis atherinoides) and logperch (Percina caprodes).[4]

Fish community sampling conducted in 1997 resulted in a total of eight (8) species sampled from the reaches immediately upstream and downstream of Queenston Road, including fathead minnow, common white sucker, blacknose dace, longnose dace, creek chub, brook stickleback, white perch (Morone americana) and pumpkinseed.[5]

3 *Fisheries and the Red Hill Creek Realignment Study*, 2003. C. Portt and Associates.
4 Ibid, 2003.
5 Ibid, 2003.

Table 3.2: Fish Community of Red Hill Creek[6]

Family	Scientific Name	Common Name
Salmonidae	*Oncorhynchus tshawytscha*	Chinook salmon
	Salmo trutta	Brown trout
	Oncorhynchus mykiss	Rainbow trout
Cyprinidae	*Chrosomus eos*	Northern redbelly dace
	Carassius auratus	Goldfish
	Cyprinus carpio	Carp
	Notropis atherinoides	Emerald shiner
	Luxilus cornutus	Common shiner
	N. hudsonius	Spottail shiner
	P. promelas	Fathead minnow
	Rhinichthys atratulus	Blacknose dace
	R. cataractae	Longnose dace
	Semotilus atromaculatus	Creek chub
Catostomidae	*Castostomus commersoni*	Common white sucker
	Hypentelium nigricans	Northern hog sucker
Ictaluridae	*Ameiurus nebulosus*	Brown bullhead
Gasterosteidae	*Culaea inconstans*	Brook stickleback
	Gasterosteus aculeatus	Threespine stickleback
Centrarchidae	*Lepomis gibbosus*	Pumpkinseed
Percidae	*Percina caprodes*	Logperch
	Morone americana	White perch
Family	**Scientific Name**	**Common Name**
Salmonidae	*Oncorhynchus tshawytscha*	Chinook salmon
	Salmo trutta	Brown trout
	Oncorhynchus mykiss	Rainbow trout
Cyprinidae	*Chrosomus eos*	Northern redbelly dace
	Carassius auratus	Goldfish
	Cyprinus carpio	Carp
	Notropis atherinoides	Emerald shiner
	Luxilus cornutus	Common shiner
	N. hudsonius	Spottail shiner
	P. promelas	Fathead minnow
	Rhinichthys atratulus	Blacknose dace
	R. cataractae	Longnose dace
	Semotilus atromaculatus	Creek chub
Catostomidae	*Castostomus commersoni*	Common white sucker
	Hypentelium nigricans	Northern hog sucker
Ictaluridae	*Ameiurus nebulosus*	Brown bullhead
Gasterosteidae	*Culaea inconstans*	Brook stickleback
	Gasterosteus aculeatus	Threespine stickleback
Centrarchidae	*Lepomis gibbosus*	Pumpkinseed
Percidae	*Percina caprodes*	Logperch
	Morone americana	White perch

[6] *Hamilton Harbour and Watershed Fisheries Management Plan,* 2009.

The reach of Red Hill Creek within the study area provides direct fish habitat to the local fish community for feeding and rearing and also provides non-specialized spawning habitat. Red Hill Creek has been assessed as Type 2, or important, fish habitat, as the habitat is relatively common and widespread throughout the realignment and it does not provide any specialized spawning habitat or other habitat critical to a specific life stage of fish.

An overview of existing aquatic habitat conditions at Red Hill Creek is presented in Appendix B.1 Figure 3.0

3.3.2 Terrestrial Ecosystems

Introduction

As described by Dillon (2009), the majority of the corridor is an urban section of downtown Hamilton, which contains individual tree plantings spaced intermittently along Main Street, King Street and Queenston Road. Dillon identified four areas of natural/semi-natural vegetation that occur in distinct locations within the corridor. These were then designated as study areas for field investigation.

Initial review of the aerial photography available confirmed this initial assessment and designation of the general study areas, but the Coldwater Creek crossing was not included in these investigations due to a reassessment of the west terminus of the line and the decision to end the line at McMaster University (University Plaza). The vegetation study areas investigated by SLI were also reduced to those areas affected by the refined alignment, as identified in the vegetation study areas relevant to this section of the report are shown in Appendix B.1 Figure 4.0 and include:

- Chedoke Creek valley/Cathedral Park
- Gage Park; and
- Red Hill Creek Escarpment Valley.

For the wildlife component, the term 'study area' refers to the project area plus the surrounding area (approximately 1 km). Detailed biological surveys were undertaken by NRSI within the project area and background information on the biological communities and features in the study area were collected and reviewed.

Methods

Vegetation community site investigations for this study were carried out over two days, June 16 and 17, 2010. The purpose of the June 2010 investigations was to confirm the Dillon field assessment conducted in January of 2009 as part of the City of Hamilton Rapid Transit Initiative Terrestrial and Avian Ecology Report, March 2009.

Background

Background data were obtained from various published and non-published sources. Sources of information included:

- City of Hamilton Rapid Transit Initiative Terrestrial and Avian Ecology Report, Dillon Consulting Limited, March 2009;
- Guelph District Ontario Ministry of Natural Resources (MNR);
- Hamilton Conservation Authority (HRCA);
- Class EA Ecological Assessment Requirements for Baseline Conditions, S. Faulkenham, Hamilton Conservation Authority, March 26, 2009;
- Natural Heritage Information Center (NHIC) website 2010;
- City of Hamilton RT team;
- Urban Hamilton Official Plan, (Minister Approved, March 2011);
- COSEWIC. 2009. Canadian Wildlife Species at Risk. Committee on the Status of Endangered Wildlife in Canada. Web site: http://www.cosewic.gc.ca/eng/sct0/rpt/rpt_csar_e.cfm [accessed 25 Sept 2010];
- Species at Risk in Ontario (SARO) List, updated September 11, 2009.

For the wildlife component initial species lists were compiled to provide information on species known to be present in the local vicinity using various atlases, including the Ontario Mammal Atlas (Dobbyn 1994), Ontario Breeding Bird Atlas (OBBA) (Cadman et al. 2007), and the Ontario Herpetofaunal Summary Atlas (Oldham and Weller 2000). The NHIC Biodiversity

Explorer database (OMNR 2010) was searched for provincially rare species. All wildlife species identified as nationally significant (COSEWIC 2009) or provincially significant (OMNR 2009) were cross-referenced with species known to occur within the vicinity of the study area.

Data on breeding birds in the study area was extracted from the OBBA. Since the OBBA provides data based on 10 x 10 km survey squares, information on breeding birds from the squares that overlapped with the study area were compiled (squares 17NH88, 17NH89, 17NH98, 17NH99, 17PH08). Birds identified as nationally rare (COSEWIC 2009) or provincially rare (OMNR 2009; OMNR 2010) were cross-referenced with birds that were observed in the study area.

Field Surveys

Vegetation

Field surveys were conducted with the goal of confirming previous investigations, and for vegetation communities entailed the confirmation of the ELC classifications, as well as supplementing the botanical survey with spring field investigations to ensure that seasonal emergent species are included in the assessment.

Field surveys were conducted on June 16 and 17 using wandering transects in each significant vegetative assemblage regardless of size. Vegetation assemblages were identified using aerial photography and characterized using a modified Ecological Land Classification (ELC) protocol, due primarily to the limited extent (< 0.5 ha) of the majority of the vegetative units identified. All units were identified to the Vegetation Type (V-Type) level. Those units that did not fit into current V-Type designations were give codes with the appropriate Ecosite designation followed by the next logical vegetation number. Paved areas and trails were designated as disturbed, and groomed areas or parklands where designated as Manicured Grass/Trees (MGT).

Plant species were documented as they were encountered during the field surveys. A complete list of the vascular plant species found is presented in Appendix B.1. Nomenclature is based on the Ontario plant list (Newmaster et al. 2003).

Wildlife

Terrestrial biologists from Natural Resource Solutions Inc. conducted a total of five field visits to the study area in the spring and summer of 2010. A variety of field surveys were undertaken, which are described below in more detail.

Birds

The breeding bird season in southern Ontario is between May 1st and July 31st, with standard survey times being between May 24th and July 8th, as per the Ontario Breeding Bird Atlas protocols. Two breeding bird surveys were conducted by NRSI on June 25th and July 7th, 2010, using the OBBA methodology, which involved area searches throughout the entire property. In addition to breeding bird surveys, all birds observed within the study area during all field visits were documented.

Herpetofauna

Standard evening anuran (frogs and toads) call surveys were completed after sunset once monthly from April to June 2010 in accordance with the Marsh Monitoring Program (Bird Studies Canada 1994). Five anuran survey stations (ANR-001 to -005) were established within the study area, as shown in Appendix B.1. Figure 5.0. These visits occurred approximately half an hour after sunset on April 28th, May 20th, and June 21st, 2010. All frog and toad species heard calling within 100 m of the station were recorded, along with the intensity of their call, the approximate number of individuals, and the weather conditions. Suitable habitat for anurans is very limited in the project area; as a result, some of the survey point locations are outside of the project area within better habitat. This was done to determine what species could be found in the project area.

Habitat for reptiles is very limited within the subject lands; therefore, no specific surveys for these species were completed.

Additional Wildlife

All observations of mammals (as well as evidence such as tracks, scats, dens, etc.) were documented on all field visits.

Provincially and Locally Identified Natural Heritage Features

A number of significant or noteworthy natural areas within or proximal to the study areas have been identified. Brief descriptions of these areas can be found below, and are shown in Figure 3.8. The NHIC database feature reports and the City of Hamilton Site Summaries available for these features can be found in Appendix B.1.

Red Hill Creek Escarpment Valley

The Red Hill Creek Escarpment Valley is tracked by the MNR as a Life Science Site of local significance, and an Environmentally Significant Area (ESA), and significant Woodlot according to Schedule B-6, and B-2 of the of the Urban Hamilton Official Plan, (Minister Approved, March 2011)(UHOP). It is also defined as a Core Area under the cities Natural Heritage System (Schedule B).

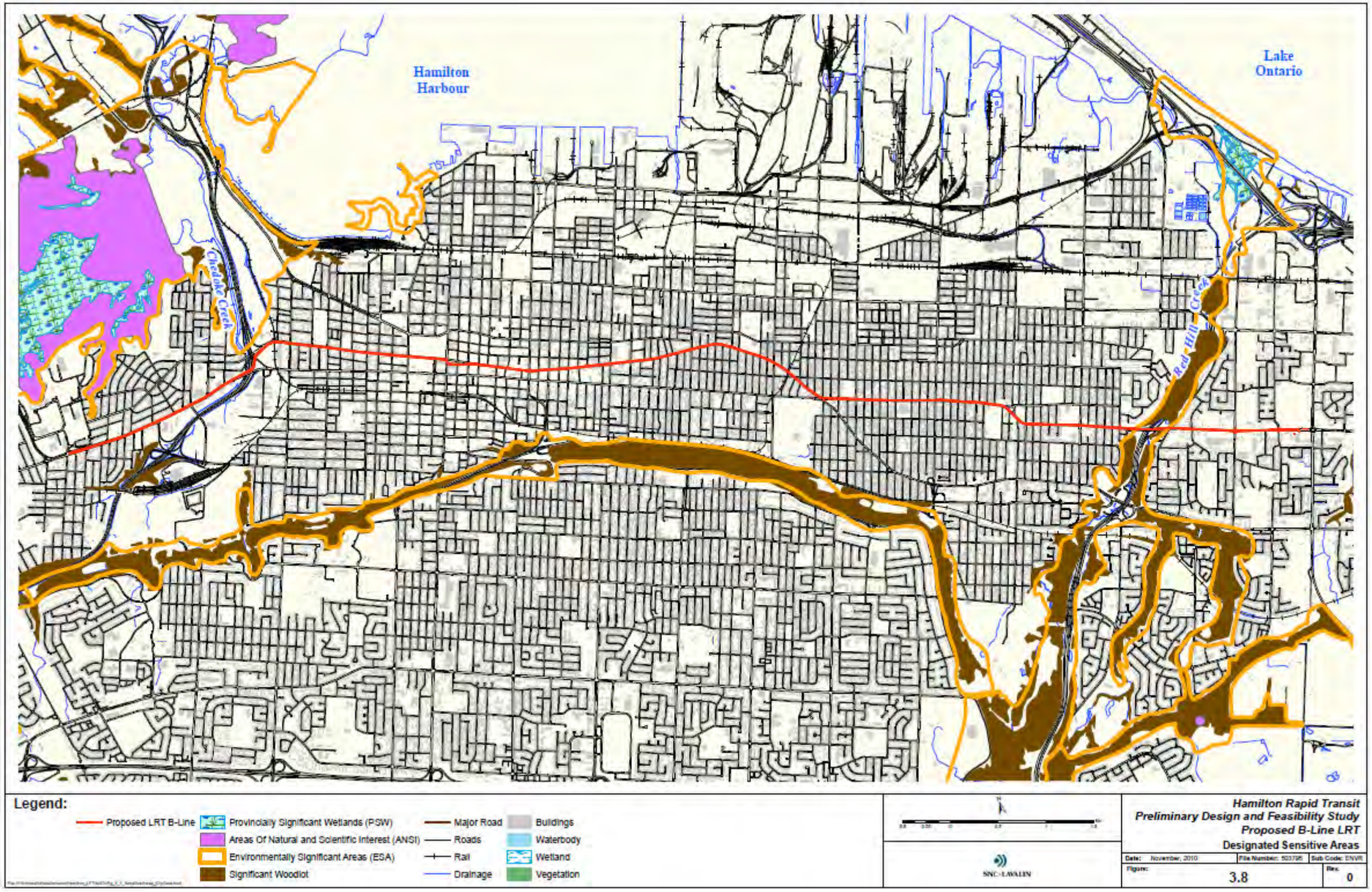
It is approximately 600 hectares in size and is part of a branching urban greenspace that includes floodplain lands, and active and passive recreational greenspace. The area is surrounded both east and west by urban development and is crossed by numerous roads, rail lines, transmission corridors and sewage mains. The Red Hill Creek Parkway also connects the QEW to areas to the south via the valley lands. Regardless of the significant disruption that has occurred within the area, it still maintains a diverse ecosystem due to the variety of topographical features, soils, moisture regimes, and micro-climates found in the valley system. In addition, the City has completed considerable restoration of the valleyland vegetation communities following construction of the Parkway. There are close to 600 plant species in the valley, of which about 20 are considered rare in Hamilton (Hamilton Naturalists Club, 2010). The NHIC database feature report and the City of Hamilton Site Summary for this feature can be found in Appendix B.1. The boundary of the Red Hill Creek Escarpment Valley ESA within the study area is shown in Appendix B.1 Figure 7.0. MNR does not maintain mapping for this feature.

The LRT B-Line crosses over the Red Hill Creek Escarpment Valley Life Science Site, and ESA between Pottruff Road and Reid Avenue South utilizing the Queenston Road Bridge. This portion of the valley is significantly degraded due to the construction of the Queenston Bridge and the more recent Red Hill Parkway construction. No construction activities related to the LRT B Line are expected within the valley system.

Gage Park

Gage Park is a large municipal multipurpose park with recreational facilities, large open areas, and historical significance. It is classified as, Park and General Open space in Schedule B (Natural Heritage System), and Schedule E-1 (Urban Land Use Designations) in the Urban Hamilton Official Plan (Minister Approved, March 2011) and is located along the south side of Main Street between Gage Avenue and King Street (see Appendix B.1 Figure 8.0). This park has large areas of manicured lawn, and numerous areas of planted trees, shrubs and gardens, some of which are exotic or rare to the area.

Figure 3.8: Designated Sensitive Areas



Chedoke Creek (Cootes Paradise)

Chedoke Creek flows through a large concrete box culvert within the study area. To the north it flows through Cootes Paradise, Cootes Paradise is wetland forest complex located in between the Dundas Valley and Hamilton Harbour, on the northwest fringe of the Hamilton-Ancaster-Dundas urban centre. It contains the Cootes Paradise Drowned Valley life science Area of Natural and Scientific Interest (ANSI), and a Provincially Significant Wetland (PSW), as defined by MNR. It is also designated as a Core Area under Schedule B, and an ESA in schedule B-6 of the Urban Hamilton Official Plan (Minister Approved, March 2011). A portion of the lands designated as ESA, and Core Area are found approximately 130 m to the north of the proposed LRT B-line.

The PSW wetland is the largest remaining Great Lakes shoreline marsh at the western end of Lake Ontario. This wetland is surrounded by significant terrestrial habitats of the Dundas Valley and the significant aquatic habitats of the Hamilton Harbour. Numerous nationally and provincially significant plant and animal species occur here. Many of the plant species present in this area have not been reported elsewhere in the City of Hamilton. Cootes Paradise is also an important staging ground for waterfowl and provides connectivity between the significant terrestrial habitats in the Dundas Valley and significant aquatic habitats in Hamilton Harbour (Hamilton Naturalists Club 1995a). The boundary of the Cootes Paradise ESA within the study area is shown on Figure 9.0 in Appendix B.1.

The LRT B-Line crosses within 130 m to the south of the Portion of the feature designated as ESA by the City, 1 km southeast of the ANSI, and 1.3 km southeast of the PSW.

Regulatory Protections

A few of these areas are subject to various protections under both the Provincial and Municipal regulatory process, depending on their current status.

The Red Hill Creek Valley is designated Life Science Site of Local importance. Life Science Sites are areas that are recognized a having ecological features of importance at a local level but are reasonably well represented in other parts of the Province. These areas are designated by Municipalities as being ecologically important, and are tracked by the province.

The ESA and Core areas are protected under Section 2.3 of the Urban Hamilton Official Plan (Minister Approved, March 2011): "natural features and ecological functions of Core Areas shall be protected and enhanced. To accomplish this protection and enhancement, vegetation removal and encroachment into Core Areas shall generally not be permitted, and appropriate vegetation protection zones shall be applied to all Core Areas." This applies to the Red Hill Creek Valley ESA and the Cootes Paradise ESA.

Gage Park is designated Park and General Open Space in Schedule B, and Schedule E-1 in the Urban Hamilton Official Plan (Minister Approved, March 2011), The OP states that if "land designated or used for Open Space and Parks purposes, as designated on Schedule E-1 – Urban Land Use Designations, the maps of the secondary plans, or identified on Appendices relating to Open Space and Parks, is acquired or used by a city department or other public agency for non-recreational public purposes, the City or public agency shall be required to compensate for the resulting loss of parkland by paying the full current market value of the parcel of land into the Parkland Reserve."

Vegetation Communities

The study areas identified in this report were selected based on the presence of reasonably large blocks of vegetation in the highly urbanized setting through which the proposed LRT B-Line will run. These areas have been subjected to significant anthropomorphic pressure, which has degraded the natural attributes of those vegetative assemblages that remain. A number of these landscapes have also been created to provide park settings and landscaped property holdings, which are subject to constant maintenance. All areas examined exhibit significant degradation of the historic natural systems and remnants still present. Cultural meadow or groomed open spaces dominate all sites, with some small remnant woodlots or pockets of planted wooded areas present in all areas. Appendix B.1 provides a photo record of each site.

Red Hill Creek Valley

The proposed LRT B-Line will cross the Red Hill Creek Valley using the existing Queenston Road Bridge. The lands surrounding the Red Hill Creek study area are largely urban in nature. There has also been significant road development in the form of the Queenston Road Bridge, and Red Hill Valley parkway and associated ramps, resulting in the degradation of the natural features remaining. Figure 7.0 in Appendix B.1 shows the ELC classifications assigned to the vegetative units found within the study area. A number of areas designated as Hedgerow in the 2009 report have been re-assigned as Cultural Woodlot to more accurately reflect the remnant nature of the features and provide a more descriptive code.

The majority of the habitat found within this study area is best described as manicured open space and cultural meadow, which is dominated by grasses, along with sun tolerant broad-leaf vegetation typical of old fields and disturbed areas. Herbaceous vegetation in the cultural meadow areas consists of old field type vegetation, such as introduced forage grasses (e.g., smooth brome (Bromus inermis), timothy (Phleum pretense), reed canary grass (Phalaris arundinacea), perennial ryegrass (Lolium perrenne), creeping red fescue (Festuca rubra) and Kentucky blue grass (Poa pratensis)). Broad-leaved ground cover includes common milkweed (Asclepias syriaca), common mullien (Verbascum thapsus), common burdock (Arctium minus), daisy fleabane (Erigeron annuus), wild carrot (Daucus carota), rough cinquefoil (Potentilla norvegica), garlic mustard (Alliaria petiolata), white sweet clover (Melilotus alba), bittersweet nightshade (Solanum dulcamara), crown vetch (Coronilla varia), common St. John's wort (Hypericum perforatum), common ragweed (Ambrosia artemisiifolia), yarrow (Achillea millefolium), bull thistle (Cirsium vulgare), teasel (Dipsacus fullonum), as well as perennial asters and goldenrods.

There are also a number of naturalized and planted isolated and clustered trees and shrubs of various ages within these areas. These include tree species such as Eastern white pine (Pinus strobus), Norway maple (Acer platanoides), white ash (Fraxinus Americana), white birch (Betula papyrifera), balsam poplar (Populus balsamifera), along with shrubs such as staghorn sumac (Rhus typhina), downy serviceberry (Amelanchier arborea), common buckthorn (Rhamnus cathartica), and grey dogwood (Cornus foemina), with red osier dogwood (Cornus stolonifera), and slender willow (Salix petiolaris) found in the wetter areas.

A few remnant wooded areas are found within the study area. On the eastern side of Red Hill Creek, these include one strip of valley slope vegetation designated as Fresh-Moist Black Walnut Lowland Deciduous Forest (FOD7-4) found to the north of Queenston Road, just west of the groomed verge of Potruff Road. This woodlot is dominated by black walnut (Juglans nigra), particularly within the lower slopes, with white ash, red ash (Fraxinus pennsylvanica), and Manitoba maple (Acer negundo) present in some numbers. Common buckthorn dominates the shrub layer, along with grey dogwood, riverbank grape (Vitis riparia), and Virginia creeper (Parthenocissus quinquefolia). The floodplain is open cultural meadow with a large stormwater pond extending to the north. There are some limited patches of broad-leaved cattail (Typha latifolia) and common reed (Phragmites australis), and red osier dogwood (Cornus stolonifera) associated with the pond.

Immediately to the south of Queenston Road, and west of the groomed verge of Potruff Road, a small Fresh-Moist Willow Lowland Deciduous Forest (FOD 7-3) follows a small drainage running parallel to Queenston Road into the valley, extending slightly to the south. It is bounded by residential development to the south and east. This woodlot is dominated by weeping willow (Salix alba), and white elm (Ulmus Americana), with some black cherry (Prunus serotina), and basswood (Tilia americana) present in the drier areas. Shrub composition was similar to that found to the north. The remaining areas are cultural meadow and another stormwater pod extends to the south. Also of note are a number of planted tulip (Liriodendron tulipifera), black gum (Nyssa sylvatica) and blue beech (Carpinus caroliniana) located within the groomed area at the corner of Queenston Road and Potruff Road.

To the west, major ramp construction related to the Red Hill Creek Parkway has removed the majority of the natural vegetation. In the southwest, a large block of Fresh-Moist Sugar Maple Hardwood Deciduous Forest (FOD 6-5) is found. This feature follows a meander in the creek and extends in a thin strip north to Queenston Road. It is dominated by sugar maple (Acer saccharum), with white ash and black walnut present in some numbers. The remainder is cultural meadow, with patches of Dry Fresh Staghorn Sumac Cultural Thicket (CUT1-1) adjacent to Queenston Road, the adjacent trail and along portions of the creek. Balsam poplar, slender willow and red osier dogwood were noted

along the creek, and evidence of restoration plantings of the above species, as well as white birch, were found in a number of open areas.

To the north, all that remains following ramp construction is a very small remnant of Fresh Moist Manitoba Maple Cultural Woodlot (CUW1-3). This feature is dominated by Manitoba maple, with some white ash, and bur oak (Quercus macrocarpa). The remaining areas are cultural meadow with some exposed soils, with a few small cultural thicket areas along Queenston Road and the east side to the creek. A small pond is also found within the southbound on-ramp loop.

Gage Park

The new alignment of the proposed LRT B-Line from the east will veer to the north to follow King Street East at the Delta (Main Street East/King Street West intersection) at the eastern edge of Gage Park.

Gage Park is a large municipal multipurpose park with recreational facilities, large open areas. The entire property is manicured and contains a large number of planted and managed mature native and non-native trees. Tree assemblages were found to be grouped in numbers significant enough to designate these areas as Cultural Plantation under the ELC. Figure 8.0 in Appendix B.1 shows the ELC classifications assigned to the vegetative units found within the study area. Two categories were deemed appropriate for this area. They are Dry Fresh Norway Maple Plantation (CUP1-11), and Dry Fresh Mixed Cultural Plantation (CUP2-2). Neither of these classifications are found within the existing ELC table, so the appropriate Ecosite designation followed by the next logical vegetation number was used. The remaining areas are manicured lawns and gardens. Of note are honey locust (Gleditsia triacanthos), and Kentucky coffee tree (Gymnocladus dioicus) found in the east and central portions of the park, and a number of very large European beech (Fagus sylvatica), one almost 2 m in diameter, found in the southwestern portion of the park. This beech species was not found in either the Newmaster or the NHIC listings.

The field survey confirmed the roadside tree counts provided in the Dillon 2009 Terrestrial conditions report:

> *"Trees found immediately adjacent to the road include northern catalpa (Catalpa speciosa) (2 individuals), horse chestnut (Aesculus hippocastanum) (3 individuals), white spruce (36 individuals), white ash (8 individuals), red ash (2 individuals), an introduced larch species (Larix sp.) (5 individuals), crab apple (Malus sp.) (4 individuals), eastern white cedar (29 individuals), non-native yew shrubs (Taxus sp) (5 individuals), an ornamental beech hedge (Fagus sp.), red pine (7 individuals), sycamore (3 individuals), scotch pine (Pinus sylvestris) (1 individual), eastern hemlock (Tsuga canadensis) (1 individual), and an introduced fir species (6 individuals)."*

Other tree species found here include Norway maple, sugar maple (Acer saccharum ssp. saccharum), Norway maple, and basswood (Tilia americana), sycamore (Platanus occidentalis), Austrian pine (Pinus nigra), and red pine (Pinus resinosa), eastern white cedar (Thuja occidentalis).

Chedoke Creek

The lands surrounding the Chedoke Creek study area are largely urban in nature. There has also been significant road development in the form of the King Street West and Main Street West Road Bridges over Highway 403, Highway 403, and its associated ramps, resulting in degradation of the natural features remaining in this area. Figure 9.0 in Appendix B.1 shows the ELC classifications assigned to the vegetative units found within the study area. A number of areas designated as Hedgerow in the 2009 report have been re-assigned as Cultural Woodlot to more accurately reflect the remnant nature of the features and provide a more descriptive code.

The LRT alignment from the east follows King Street West until it gets to Cathedral Park, which incorporates above and below ground infrastructure associated with the City's Main/King Combined Sewer Overflow facility. At this point the alignment runs southwest, on a dedicated elevated guideway, through the northern edge of the park, before bending sharply south to intersect with Main Street West and continuing westward.

The majority of the habitat found within this study area is best described as manicured open space and cultural meadow, which is dominated by grasses, along with sun tolerant broad-leaf vegetation typical of old fields and disturbed areas. Herbaceous vegetation in the cultural meadow areas is similar to that described above in the Red Hill Creek area.

A number of naturalized and planted isolated and clustered trees and shrubs of various ages are found within these areas. These include tree species such as Chinese elm (Ulmus parvifolia), Siberian elm (Ulmus pumila), Norway maple, white ash, white birch, balsam poplar, along with shrubs such as staghorn sumac, common buckthorn, and grey dogwood, with red osier dogwood found in the wetter areas. Planted Honey locust, sugar maple, silver maple (Acer saccharinum), Norway maple, red oak (Quercus rubra),and blue spruce (Picea pungens) were observed within the Cathedral Park grounds, and a number of larger planted Austrian pine, basswood, black walnut, and white birch were found along the northern side of Main Street West, just east of Highway 403.

Very few wooded areas remain in the area. One remnant Dry Fresh Silver Maple Deciduous Forest (FOD5-11) is found lining the rail line to the east of Cathedral Park. This is dominated by silver maple, and Manitoba maple with some black locust (Robinia pseudo-acacia), basswood, sugar maple, Chinese elm, Siberian elm, and red ash present. Shrub growth is vigorous and includes grey dogwood, tartarian honeysuckle (Lonicera tatarica), common buckthorn and riverbank grape.

Two small pockets of Fresh Moist Manitoba Maple Lowland Deciduous Forest (FODM7-7) are found to the north and west of Highway 403. These are remnants of the historic Chedoke Creek valley slope and floodplain forests, and have experienced significant degradation due to the proximity of the low and high density residential uses in the surrounding areas. Coote's Paradise ESA extends into the northern most of these units.

The remaining wooded areas have been designated as Dry Fresh Manitoba Maple Mineral Cultural Woodlot (CUW1-3). These areas line the northern, and western edges of Cathedral Park, the west and east sides of the Highway 403 to Main Street West ramp, and the southern edge of Main Street West just west of Highway 403. All these areas are dominated by Manitoba maple to some degree with Chinese elm and some Norway maple present. The majority of the trees are very small giving it the appearance of a thicket in many places and evidence of restoration planting is found throughout. Shrub growth is vigorous with tartarian honeysuckle, Virginia creeper, lilac (Syringa vulgaris), and staghorn sumac. Some small white mulberry (Morus alba) were noted along the western side of the Highway 403 to Main Street West ramp. Finally a small wet pocket of Reed Canary Grass Meadow Marsh (MAM2-2) was found adjacent to the highway east of the Highway 403 to Main Street West ramp.

Vascular Plants

A complete species list of vascular plants observed and noted within the study areas can be found in Appendix B.1. The list is organized by scientific family name, genus and species. A total of 129 vascular plant species were observed. Of these 71 (55%) are listed as native species, and 58 (45%) are listed as invasive. A number of the species observed (18, or 14%) have a Coefficient of Conservation value of 6 or greater, but these values can be somewhat misleading if given too much significance. The majority of these species have been planted as part of landscape/restoration initiatives, and as such provide no real indication of the true floristic quality of the sites. The disturbed and fragmented nature of the areas studied is apparent in the small size of the vegetative communities found and the even distribution of native and non-native species observed within the majority of these units.

It should be noted that the species list, though relatively comprehensive, is not a complete list of the plants of the area. This is particularly applicable to short-term seasonal plants, since the area was not observed throughout the growing season. Nomenclature is primarily in accordance with the Ontario Plant List (Newmaster, 1998), and secondarily with NHIC (2010).

Species At Risk

Within the study area, one species (the Kentucky Coffee-tree) is listed as Threatened under COSEWIC (Committee on the Status of Endangered Wildlife in Canada), the federal Species at Risk Act (SARA), and the Committee on the Status of Species at Risk in Ontario (COSSARO). This species is also listed as S2 (Imperiled) by the Ministry of Natural Resources within their NHIC (Natural Heritage Information Centre) website. One other species, the Honey locust, also has an NHIC S-Rank of S2. Both of these species were found within landscaped settings (e.g., Gage Park), and are present as a result of planting programs. Two other species, Black Gum and Pin Oak have an S-Rank of S3 (Vulnerable), and were observed in similar. The Pin oak was observed in Gage Park, and the Black Gum within a groomed are on the southeast side of Queenston Road in the Redhill Creek Valley study area. The remainder of the native vascular plant species observed were listed as S4 (Apparently Secure), or S5 (Secure).

The 2009 Dillon NHIC species occurrence database search listed 12 rare plants as being historically present the vicinity of their study area, which included Cold Creek. These include:

- Giant pinedrops (Pterospora andromedea) (S2)
- Red mulberry (Morus rubra) (S2)
- Bluebells (Mertensia virginica) (S3)
- American chestnut (Castanea dentata) (S2)
- Few flowered club rush (Trichophorum planifolium) (S1)
- White wood aster (Eurybia divaricata) (S2)
- Spotted wintergreen (Chimaphila maculata) (S1)
- Eastern yellow star-grass (Hypoxis hirsuta) (S3)
- Yellow pond-lily (Nuphar advena) (S3)
- Square stemmed rose pink (Sabatia angularis) (SX)
- Shaggy false gromwell (Onosmodium molle ssp. hispidissimum) (S2)
- Puttyroot (Aplectrum hyemale) (S2)

In early 2010, NHIC re-worked its website and developed a new 1 km block species occurrence database, which allows for a somewhat more refined location search. A number of species listed in the results were also found to be either extirpated or the last recorded observation occurred prior to 1980. These records are not included in these lists, but the full lists are provided in Appendix B.1 - Species Occurrence Data. A search of the new NHIC dataset yielded the following results.

Red Hill Creek

- Northern Hawthorn (Crataegus dissona) – S3, 1981
- Brainerd's Hawthorn (Crataegus brainerdii) – S2, 1981
- Fern-leaved Yellow False Foxglove (Aureolaria pedicularia) – S2?, 1989
- Soft-hairy False Gromwell (Onosmodium molle ssp. Hispidissimum) – S2, No Obs. Date
- Bowman's-root (Porteranthus trifoliatus) – Presumed Extirpated (SX), No Obs. Date
- Square-stemmed Rose Pink (Sabatia angularis) – Presumed Extirpated (SX), No Obs. Date

Gage Park

- White-tinged Sedge (Carex albicans var. albicans) - S3, 1980
- Northern Hawthorn (Crataegus dissona) – S3, 1981
- American Chestnut (Castanea dentate) – S2, 1993
- Brainerd's Hawthorn (Crataegus brainerdii) – S2, 1981
- Perfoliate Bellwort (Uvularia perfoliata) – S1, 2001
- Soft-hairy False Gromwell (Onosmodium molle ssp. Hispidissimum) – S2, No Obs. Date
- Bowman's-root (Porteranthus trifoliatus) – Presumed Extirpated (SX), No Obs. Date
- Square-stemmed Rose Pink (Sabatia angularis) – Presumed Extirpated (SX), No Obs. Date

Chedoke Creek

- White-tinged Sedge (Carex albicans var. albicans) - S3, 1980
- Northern Hawthorn (Crataegus dissona) – S3, 1981
- American Chestnut (Castanea dentate) – S2, 1993
- Brainerd's Hawthorn (Crataegus brainerdii) – S2, 1981
- Perfoliate Bellwort (Uvularia perfoliata) – S1, 2001
- Fern-leaved Yellow False Foxglove (Aureolaria pedicularia) – S2?, 1989
- Soft-hairy False Gromwell (Onosmodium molle ssp. Hispidissimum) – S2, No Obs. Date
- Bowman's-root (Porteranthus trifoliatus) – Presumed Extirpated (SX), No Obs. Date
- Square-stemmed Rose Pink (Sabatia angularis) – Presumed Extirpated (SX), No Obs. Date

None of the above species was observed during the field program. Due to the limited footprint of the project outside of established urban corridors, direct impacts to any rare vascular species that may occur in the vicinity of the study area are not expected.

Roadside Trees

In addition to the aforementioned large vegetated areas, the B-Line corridor is flanked by numerous street trees, and exhibits isolated centre medians planted with trees and ornamental shrubbery, which may be affected by the project.

Wildlife

Birds

A comprehensive bird species list, including field observations from NRSI and background information from the Ontario Breeding Bird Atlas (Cadman et al. 2007), can be found in Appendix B.1 A total of 154 bird species are known from the 10 x 10 km squares (17NH88, 17NH89, 17NH98, 17NH99, 17PH08) that overlap with the study area according to the OBBA. Most of these species lack suitable breeding habitat within the study area.

Background information from the OBBA indicates that 21 significant bird species are known to be within the vicinity (approximately 10 km) of the study area. These species, their habitat, and the likelihood of finding them in the study area are described in Table 3.3. Preferred breeding habitat for most of the significant species listed is not found within the study area, with the exception of peregrine falcon (Falco peregrinus anatum/tundrius), chimney swift (Chaetura pelagica), common nighthawk (Chordeiles minor), Louisiana waterthrush (Seiurus motacilla), and red-headed woodpecker (Melanerpes erythrocephalus).

Twenty-six species were observed by NRSI biologists during the area search surveys. Nine of these species showed probable breeding evidence; another ten species showed possible breeding evidence. Only one species showed confirmed breeding evidence because of fledged young, the European starling (Sturnus vulgaris). Six additional species were observed without any level of breeding evidence: common grackle (Quiscalus quiscula), barn swallow (Hirundo rustica), American crow (Corvus brachyrhynchos), chimney swift (Chaetura pelagica), ring-billed gull (Larus delawarensis), and herring gull (Larus argentatus). A complete list of all species observed is available in Appendix B.1. All of these species, with the exception of chimney swifts, are common or very common breeders in Ontario (OMNR 2010).

Chimney swifts were observed flying overhead on both of NRSI's breeding bird surveys on June 25 and July 7, 2010. Because they nest in chimneys in urban areas, they could be found breeding in the study area.

Peregrine falcons can nest on tall buildings in urban areas, and a pair has nested on the Hamilton Sheraton Hotel, located at the King Street and Bay Street intersection on the proposed B-Line route, since 1995 (Dillon Consulting Ltd. 2009). They were not observed by NRSI biologists during field surveys, but it is reasonable to assume that the nesting pair could return to this nest site or a nearby spot in the study area. According to the Dillon Consulting Ltd. report, these falcons "are accustomed to street level disturbance during the breeding season and should not be impacted by the development."

Common nighthawks can nest on flat, gravel roofs, which are present in the B-Line corridor. However, this species was not observed by NRSI biologists during field surveys.

Louisiana waterthrush and red-headed woodpecker could potentially breed in the forested creek valleys found within the study area, but outside the B-Line LRT corridor. These species were not observed by NRSI biologists during field surveys.

Herpetofauna

Twenty-six species of herpetofauna (reptiles and amphibians) are known to occur within the vicinity of the study area, according to the Ontario Herpetofaunal Atlas (Oldham and Weller 2000). Table 3-4 below identifies the eight significant species known from the study area, their preferred habitat, and the likelihood of finding them in the study area. Preferred habitat for any of the significant species listed is not found within the study area.

NRSI observed one amphibian species within the subject lands: the green frog (Rana clamitans melanota). A complete list of herpetofauna known from the study area, including their current status rankings, is shown in Appendix B.1.

Mammals

Thirty mammal species are known from the vicinity of the study area based on information from the Mammal Atlas of Ontario (Dobbyn 1994), all of which are common species in Ontario. NRSI biologists observed two of these species within the subject lands, including direct observations of gray squirrel (Sciurus carolinensis) and raccoon (Procyon lotor).

No species of mammal known to the area are considered Species at Risk (COSEWIC 2009; OMNR 2009). A complete list of mammal species known from the study area and their current status can be seen in Appendix B.1.

Significance and Sensitivity of Wildlife Habitat and Species

The majority of the study area is urban within the City of Hamilton, with a few small forested creek valleys.

A number of significant species are known from the vicinity of the study area including many species of birds and herpetofauna. Suitable habitat for some of the significant bird species is present within the subject lands. In particular, peregrine falcons, chimney swifts, common nighthawks, Louisiana waterthrushes, and red-headed woodpeckers all have the potential to breed in the study area. The only significant bird species observed during field surveys was chimney swifts.

However, as discussed in previously, none of these species should be impacted by the proposed development.

There is no suitable habitat for any significant herpetofauna species, and no significant herpetofauna species were observed by NRSI biologists during field surveys.

Table 3.3: Significant Bird Species in the Vicinity of the Study Area

Common Name	Scientific Name	S-Rank[1]	COSEWIC Status[2]	SARO Status[3]	Preferred Habitat[4]	Habitat Within Subject Property?
Redhead	Aythya americana	S2B, S4N			shallow cattail/bulrush marshes, lakes and ponds and fens; preferred nesting usually close to shallow water (most within 2 m), but can be found as far as 266 m from water's edge	No
Red-necked Grebe	Podiceps grisegena	S3B, S4N	NAR	NAR	permanent freshwater lakes with a fringe of aquatic emergent vegetation; marshes, impoundments or sewage lagoons with > 4 ha of open water; protected marshy areas or bays in larger lakes;	No
Least Bittern	Ixobrychus exilis	S4B	THR	THR	deep marshes, swamps, bogs; marshy borders of lakes, ponds, streams, ditches; dense emergent vegetation of cattail, bulrush, sedge; nests in cattails	No
Black-Crowned Night Heron	Nycticorax nycticorax	S3B,S3N			deciduous woodland swamps, cattail marshes, islands, wooded river and lake banks, coastal wetlands	No
Bald Eagle	Haliaeetus leucocephalus	S2N, S4B	NAR	SC	require large continuous area of deciduous or mixed woods around large lakes, rivers; require area of 255 ha for nesting, shelter, feeding, roosting; prefer open woods with 30 to 50% canopy cover; nest in tall	No

Common Name	Scientific Name	S-Rank[1]	COSEWIC Status[2]	SARO Status[3]	Preferred Habitat[4]	Habitat Within Subject Property?
					trees 50 to 200 m from shore; require tall, dead, partially dead trees within 400 m of nest for perching	
Peregrine Falcon	Falco peregrinus anatum/tundrius	S3B	SC	THR	rock cliffs, crags, especially situated near water; tall buildings in urban centres;	Yes
Great Black-backed Gull	Larus marinus	S2B			flat rocky coastal islands, moorlands, rocky beaches, cliffs; nest is solitary or in small (rarely large) colonies	No
Forster's Tern	Sterna forsteri	S2B	DD	DD	large open and fresh or saltwater marshes, deep cattail marshes; must be near open water; marsh nesting restricts breeding distribution	No
Caspian Tern	Hydroprogne caspia	S3B	NAR	NAR	open habitat near large lakes or rivers, beaches, shorelines, rocky or sandy beaches, offshore islands; negatively affected by elevated water levels during nesting season	No
Barn Owl	Tyto alba	S1	E	END	open areas such as fields, agricultural lands with scattered woodlots, buildings and/or orchards; grasslands, sedge meadows, marshes; nests in hollow trees and live trees >46 cm dbh; also nests in barns, abandoned buildings	No
Short-eared Owl	Asio flammeus	S2N, S4B	SC	SC	grasslands, open areas or meadows that are grassy or bushy; marshes, bogs or tundra; both diurnal and nocturnal habits; ground nester	No
Common Nighthawk	Chordeiles minor	S4B	T	SC	open ground; clearings in dense forests; ploughed fields; gravel beaches or barren areas with rocky soils; open woodlands; flat gravel roofs	Yes
Whip-poor-will	Caprimulgus vociferus	S4B	T	THR	dry, open, deciduous woodlands of small to medium trees; oak or beech with lots of clearings and shaded leaf litter; wooded edges, forest clearings with little herbaceous growth; pine plantations; associated with >100 ha forests	No
Chimney Swift	Chaetura pelagica	S4B, S4N	T	THR	commonly found in urban areas near buildings; nests in hollow trees, crevices of rock cliffs, chimneys	Yes
Red-headed Woodpecker	Melanerpes erythrocephalus	S4B	T	SC	open, deciduous forest with little understory; fields or pasture lands with scattered large trees; wooded swamps; orchards, small woodlots or forest edges; groves of dead or dying trees	Possible in forested creek valleys
Golden-winged Warbler	Vermivora chrysoptera	S4B	T	SC	early successional habitat; shrubby, grassy abandoned fields with small deciduous trees bordered by low woodland and wooded swamps; alder bogs; deciduous, damp woods; shrubbery clearings in deciduous woods with saplings and grasses; brier-woodland edges; requires >10 ha of habitat	No
Prothonotary Warbler	Protonotaria citrea	S1B	E	END	area sensitive species preferring 100 ha of flooded or swampy woodlands with standing or flowing water and more than 25% canopy cover with numerous stumps and snags; stream borders or flooded bottomlands; soft, dead trees with dbh >10 cm; Carolinian species	No
Louisiana Waterthrush	Seiurus motacilla	S3B	SC	SC	prefers wooded ravines with running streams; also woodlands swamps; large tracts of mature deciduous or mixed forests; canopy	Possible in forested creek valleys

Common Name	Scientific Name	S-Rank[1]	COSEWIC Status[2]	SARO Status[3]	Preferred Habitat[4]	Habitat Within Subject Property?
					cover is essential; has strong affinity to nest sites; nests on ground	
Hooded Warbler	Wilsonia citrina	S3B	T	SC	favours mature, deciduous forest (Carolinian), particularly along stream bottoms, ravine edges and where saplings and shrubbery grow; nests above ground in small shrubs; feeds on or near ground	No
Canada Warbler	Wilsonia canadensis	S4B	T	SC	an interior forest species; dense, mixed coniferous, deciduous forests with closed canopy, wet bottomlands of cedar or alder; shrubby undergrowth in cool moist mature woodlands; riparian habitat; usually requires at least 30 ha	No
Yellow-breasted Chat	Icteria virens	S2B	SC (ssp. virens)	SC	thickets, tall tangles of shrubbery beside streams, ponds; overgrown bushy clearings with deciduous thickets; nests above ground in bush, vines etc.	No
Bobolink	Dolichonyx oryzivorus	S4B	THR		large, open expansive grasslands with dense ground cover; hayfields, meadows or fallow fields; marshes; requires tracts of grassland >50 ha	No

[1]OMNR 2010

[2]COSEWIC 2009; [3]OMNR 2009; [4]OMNR 2000.

Table 3.4: Significant Reptile and Amphibian Species Known From the Vicinity of the Study Area

Common Name	Scientific Name	S-Rank[1]	COSEWIC status[2]	SARO status[3]	Preferred Habitat[4]	Habitat Within Subject Property?
Eastern Spiny Softshell	Apalone spinifera spinifera	S3	THR	THR	large river systems, shallow lakes and ponds with muddy bottoms and aquatic vegetation; basks on sandbars, mud flats, grassy beaches, logs or rocks; eggs are laid near water on sandy beaches or gravel banks in areas with sun	No
Common Snapping Turtle	Chelydra serpentina serpentina	S5	SC	SC	permanent, semi-permanent fresh water; marshes, swamps or bogs; rivers and streams with soft muddy banks or bottoms; often uses soft soil or clean dry sand on south-facing slopes for nest sites	No
Blanding's Turtle (Great Lakes/St Lawrence population)	Emydoidea blandingii	S3	THR	THR	shallow water marshes, bogs, ponds or swamps, or coves in larger lakes with soft muddy bottoms and aquatic vegetation	No
Northern Map Turtle	Graptemys geographica	S3	SC	SC	large bodies of water with soft bottoms, and aquatic vegetation; basks on logs or rocks or on beaches and grassy edges, will bask in groups; uses soft soil or clean dry sand for nest sites; may nest at some distance from water	No
Eastern Musk Turtle (Stinkpot)	Sternotherus odoratus	S3	THR	THR	aquatic, except when laying eggs; shallow slow moving water of lakes, streams, marshes and ponds; hibernate in underwater mud, in banks or in muskrat lodges	No
Eastern Milksnake	Lampropeltis t. triangulum	S3	SC	SC	farmlands, meadows, hardwood or aspen stands; pine forest with brushy or woody cover; river bottoms or bog woods	No
Jefferson Salamander and	Ambystoma jeffersonianum	S2	THR	THR	damp shady deciduous forest, swamps, moist pasture, lakeshores; temporary woodland pools for breeding	No
Jefferson/Blue-spotted Salamander Polyploids	Ambystoma jeffersonianum-laterale polyploids	S2			damp shady deciduous forest, swamps, moist pasture, lakeshores; temporary woodland pools for breeding	No

3.3.3 Hydrogeology and Contaminated Soil

Introduction

The purposes of this hydrogeological report are to:

- Provide a detailed hydrogeological description for the proposed B-Line route;
- Identify areas of potential concern;
- Evaluate the potential impact of the construction activities along the B-line Route on the groundwater regime; and,
- Recommend mitigation measures to address the potential impacts.

For these purposes, available information pertaining to the local geology, hydrogeology and infrastructure were reviewed, in conjunction with the proposed construction methods.

Physical Setting

The majority of the study area is heavily urbanized with significant building structures along the central corridor (Dillon, 2009). Generally, few natural areas occur along the proposed B-Line route. The two main areas of natural features are Chedoke Creek, and Red Hill Creek. Chedoke Creek drains from north and south into Cootes Paradise. To the east, Red Hill Creek drains from the high lands above the Niagara Escarpment directly to Lake Ontario.

Topography

The topography of the study area is typically flat (Dillon, 2009), sloping gently down towards Lake Ontario with the exception of Coldwater Creek (at the west end of the proposed B-Line route); Chedoke Creek (near the Highway 403 corridor); and Red Hill Creek (at the east end of the proposed B-Line route). The valleys generally run south to north through the study area. The lower portion of the Red Hill Valley watershed slopes gently down to Lake Ontario from the base of the Escarpment with a change in grade of approximately 30 m. The Red Hill Creek Valley is relatively steep and the creek is cut 5 m to 15 m below ground surface (mbgs).

Physiography

The study area is located in the Iroquois Plain, as described by Chapman and Putnam (1966). The Iroquois Plain resulted from the inundation of the area in late Pleistocene times by glacial Lake Iroquois. The Iroquois Plain consists of lacustrine deposits and lake-bottom sediments that have been smoothed by wave action and which extend around the western end of Lake Ontario and as far east as the Trent River. The width of this plain varies from a few hundred metres to 13 kilometres, but is usually about 3 kilometres wide within the City of Hamilton. This is the youngest, large lake plain within the City of Hamilton and also occurs at the lowest elevation. Between Lake Ontario and the Niagara Escarpment, the plain is cut by a number of creeks, with lagoons or marshes at their outlet to the Lake.

Geology

Quaternary Geology

As interpreted from SNC, 2006 (Figure 2.2C), the proposed B-Line traverses through, from west to east, the glaciolacustrine deposits of the Iroquois Plain (glaciolacustrine sand and silt, and beach gravel), Paleozoic bedrock (shale and dolomite), Halton Till (silty to clayey till), and a narrow tract of modern alluvial deposits.

The overburden varies in thickness along the proposed B-Line route ranging from a few meters to approximately 30 m.

Paleozoic Geology

As interpreted from SNC, 2006 (Figure 2.3C), bedrock along the proposed B-Line route consists of the Queenston Formation (from Upper Ordovician age), which is predominantly red shale with green siltstone bands. The formation thickness is estimated as being a minimum of 300 m, with the upper surface of the formation described as weathered in various geotechnical reports (Teleford, Bond, and Liberty, 1976; Liberty, B.A., 1976). The bedrock elevation along the B-Line route is relatively flat, between approximately 76 m above mean sea level (amsl) and 91 m amsl, except in the Coldwater Creek (at the west end of the proposed B-Line route); Chedoke Creek (near the Highway 403 corridor); and Red Hill Creek (at the east end of the B-Line route).

The Georgian Bay Formation, also from the Ordovician age, underlies the Queenston Formation. The Ordovician formations have a low westward dip and show little sign of disturbance other than some stress-relief features. The Georgian Bay Formation does not outcrop within the RMHW.

Hydrogeology

Regional Hydrogeology

As interpreted from SNC, 2006 (Figure 2.7), there are two types of regional aquifers within the RMHW: overburden aquifer and bedrock aquifer. The overburden aquifers consist of granular deposits within the shallow overburden, and those present in thicker overburden found along bedrock valleys such as the Dundas Valley. A sand and gravel aquifer is located at the west end of the B-Line. No regional aquifers are identified in the rest of the study area.

Local Hydrogeology

As interpreted from SNC, 2006 (Figure 3.12C), the general direction of groundwater flow is from the southern highlands toward Hamilton Harbour and Lake Ontario. The presence of deep infrastructure, sewers, tunnels and other linear corridors will affect local groundwater flow within local areas, but the general trend will continue to be toward the lake.

Shallow Groundwater Conditions

As interpreted from SNC, 2006 (Figure 3.12C) and Dillon, 2006 (borehole logs), the near surface water table along the proposed B-Line route occurs in wells installed at a depth less than 15 m bgs and ranges from approximately 80 m amsl to 90 m amsl (or about 2 m bgs to 16 m bgs). The water table is relatively deeper to the west of the Highway 403 corridor, ranging from approximately 2 m bgs to 16 m bgs. The water table to the east of the Highway 403 corridor ranges from approximately 2 m bgs to 9 m bgs. A perched water table at approximately 1 m bgs may be present at various locations along the central west portion of the proposed B-Line route.

Deeper Groundwater Conditions

As interpreted from SNC, 2006 (Figure 3.13C), groundwater elevations (or potentiometric surface) in wells installed 15 m or more bgs range from approximately 80 m amsl to 110 m amsl along the proposed B-Line route. The general trend of the potentiometric surface is similar to the water table described in Section 3.2.1.

Recharge and Discharge Areas

As interpreted from SNC, 2006 (Fig 3.14C), the west and middle sections of the proposed B-Line route are groundwater discharge areas where groundwater flow is upwards towards the ground surface. The east section of the route, mainly in the Red Hill Valley, is a recharge area where groundwater flow is downwards from the ground surface. A small part of the west section is also a discharge area.

Groundwater recharge and discharge areas are associated with the potential for groundwater contamination. For instance, in a recharge area, contaminants that infiltrate to the water table will be transported with downward flowing groundwater and may impact an underlying aquifer. In contrast, in discharge areas, groundwater contamination of the water table may still occur but downward migration is minimal, and hence potential impacts on an underlying aquifer will be less pronounced, if any.

Areas Vulnerable to Groundwater Contamination

As interpreted from SNC, 2006 (Figure 3.24), groundwater along the proposed B-Line route has medium to high contaminant vulnerability, except in the west end in the Dundas Valley which has low vulnerability.

Groundwater vulnerability is related to several factors: (1) the water table is shallow, (2) the overburden is either very thin or absent in much of this area and (3) the predominant aquifer is fractured bedrock. The combination of these conditions results in the groundwater being considered as having medium to highly vulnerability to contamination.

In the vicinity of the Dundas Valley, the groundwater vulnerability is low because the water table is greater than 10 m bgs and the predominantly clayey surficial deposits limit downward infiltration of potential contaminants.

Potential for Soil and Groundwater Contamination

As discussed in Dillon, 2009 (Figure 2), there are several contaminated sites situated along the proposed B-Line route. As a result, it is likely that contaminated soil and groundwater will be encountered during construction of the proposed B-Line route. The site locations with actual or potential contamination, where environmental investigation reports were identified by Dillon, 2009, via a review of a variety of geotechnical and environmental reports are summarized in Table 3.5. It was

anticipated that there were potentially other contaminated sites along the proposed B-Line route that were not identified in Table 3.5

Table 3.5: Potential Contaminated Sites Identified in Dillon Report

Nearest Major Intersection	Geotechnical Report Number	Report Reference Information	Actual/Potential Contamination Investigation and/or Type
King Street & Gage Avenue	517[1]	Sitest Engineering, 1989. Geotechnical Investigation. Proposed Sanitary Sewers, King Street (Gage and Glendale), Hamilton, Ontario. File No. 8903	Gasoline
King Street & Ottawa Street	646[1]	Mountainview Geotecnical Ltd. 1992. Geotechnical Investigations. Proposed Sewer Investigations. City of Hamilton, Ontario. Project No. S0220.	Petroleum Hydrocarbons
Main Street West & Cootes Drive	684[1]	Trow Consulting Engineers Ltd. 1993. Phase I Geo-Environmental Assessment, Cootes Drive Rail Lands. Hamilton, Ontario. Project: H02917-E.	Phase I Investigation
Main Street West & Cootes Drive	693[1]	Trow Consulting Engineers Ltd. 1993. Follow-up Environmental Testing. CP Rail Right-of-Way Adjacent to Cootes Drive. Project: H02917-E.	Follow-up to Phase I (684[1]), to investigate potential PAH impacts on soil and groundwater.
Main Street, King Street & Highway 403	695[1]	Peto MacCallum Ltd. 1993. Geotechnical Investigation King/Main Street Storage Tank. Hamilton, Ontario. Job No. 93HF100.	Refuse fill (historical landfill).
Main Street East & Sherman Avenue	ESA1_29[1]	Jacques Whitford. 2008. Soil Analytical Results – Northern and Western Property Lines, Former Sunoco Retail Outlet No. 5995. 790 Main Street East, Hamilton, Ontario. Project No. 102865	Petroleum hydrocarbons.
Main Street West & Cootes Drive	ESA1_33[1]	WESA. 2008. Phase I Environmental Site Assessment of City of Hamilton Rail Trail Corridor. Hamilton, Ontario. File: W-B5247-00.	Phase I Investigation
Main Street East & Gage Avenue	ESA1_34[1]	AMEC Earth & Environmental. 2007. Phase I Environmental Site Assessment, Commercial Property, 979 Main Street East & 56 East Bend Avenue South. Hamilton, Ontario. TB71002.	Phase I Investigation.
Main Street East & Gage Avenue	ESA2_13[1]	Peto MacCallum Ltd. Phase II Environmental Site Assessment, 979 Main Street East & 56 East Bend Avenue South. Hamilton, Ontario. PMI Ref.: 08HX011.	Phase II Investigation – including petroleum hydrocarbons.

The information in the reports was not verified or assessed for accuracy by Dillon. In addition, since that time there has been additional information made available for review by the City. As part of the data gap assessment since the Dillon report was released, SLI staff reviewed changes to the anticipated routing, available City of Hamilton databases, and completed a field visit to complete additional information gathering.

As a result, sixteen (16) additional potentially contaminated sites have been identified. The investigation focussed on the area where a route change was noted. The sites include gas stations, automotive service, repair and sales outlets, and dry cleaning/laundry shops,

As suggested by Dillon, prior to initiating field works in these areas, contingency plans to handle potentially impacted soil and/or contaminated water generated during potential dewatering activities should be developed. The City of Hamilton's Contaminated Sites Management Program manual should be followed.

Existing Groundwater Usage and Source Water Protection

Halton-Hamilton Source Protection Committee (2010) summarized groundwater usage, wellhead protection area and recommended groundwater protection action plan. This chapter summarizes those parts which directly relates to the proposed B-Line route project.

Source Water Protection

Halton-Hamilton Source Protection Committee (2010) proposes Sources Water Protection Areas for the current surface and groundwater usages within the greater Hamilton region. Based on this report, Source Water Protection Area does not exist along the proposed B-Line route.

Well Head Protection Areas

Wellhead Protection Areas (WHPA) are the total area of land which contributes water to a municipal well to the capacity of the municipal drinking-water supply systems, as well as the length of time groundwater within the WHSA will take to reach the municipal drinking-water supply well. The closest Wellhead Protection Area (Greensville well field) is located approximately 5 km northwest of the western portion of the proposed B-Line route (see Halton-Hamilton Source Protection Committee (2010) Figure 4.4).

GUDI Wells

Groundwater under the direct influence of surface water (GUDI) wells draw groundwater that is directly connected to, and dependent upon, surface water. The closest GUDI well (Greensville) which is located approximately 5 km northwest of the western portion of the proposed B-Line route.

Existing Groundwater Usage

Halton-Hamilton Source Protection Committee (2010) summarized the existing groundwater usage using the MOE Permit to Take Water (PTTW) database. The closest PTTW for the purpose of groundwater remediation is located at a site near the western inner Hamilton Harbour (see Halton-Hamilton Source Protection Committee (2010) Figure 5.4). This PTTW is located approximately 1 km north of the proposed B-Line route in the vicinity of the intersection of King and Queen Streets.

3.3.4 Noise and Vibration

The noise and vibration analysis identified the key noise and vibration sensitive locations within the study area and quantified the typical ambient noise conditions based on the estimated current traffic conditions. This section describes the existing noise conditions within the study area, and identifies the vibration sensitive locations.

Noise Sensitive Areas/Receptors

The Model Municipal Noise Control By-Law defines a receptor of noise as:

> "any point on the premises of a person where sound or vibration originating from other than those premises is received" (MOE, 1978).

Noise sensitive areas (NSA)/receptors may include any of the following existing or zoned for future use sites:

- Permanent or seasonal residences;
- Hotels;
- Hospital / Nursing or Retirement homes;
- Campground;
- Schools; and

- Places of Worship.

The initial study investigations identified receptors along Main Street/Queenston Road and King Street that were generally considered representative of existing noise conditions in the project corridor. These locations were refined as the design progressed, to provide the most conservative noise impact assessment (i.e., predictable worst case) for the 10-year after construction period in accordance with the approved MOE/MTO Joint Noise Protocol (refer to Section 4.3.6 in this regard).

Main Street – King Street Corridor

As highlighted in Figures 3.9 to 3.22, the noise sensitive receptors identified are located adjacent to the main traffic corridors. Based on SLI's evaluation of the study area, most of the receptors are 2-level residences in close proximity to the road traffic, typically within 25 m of the proposed transit route. There are very small outdoor living areas between the residence and the roadway. Unless otherwise indicated, the worst case location is considered to be a 2nd storey window (i.e., 4.5 m above grade).

Figure 3.9: Receptor-1 - Main Street W. and Emerson Street

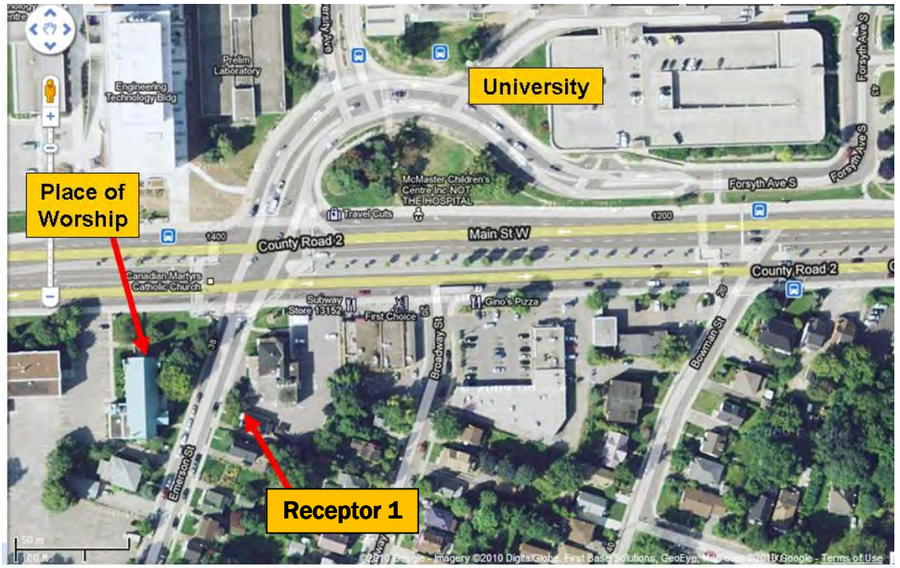


Figure 3.10: Receptor-2 - Main Street W. and Longwood Road S.

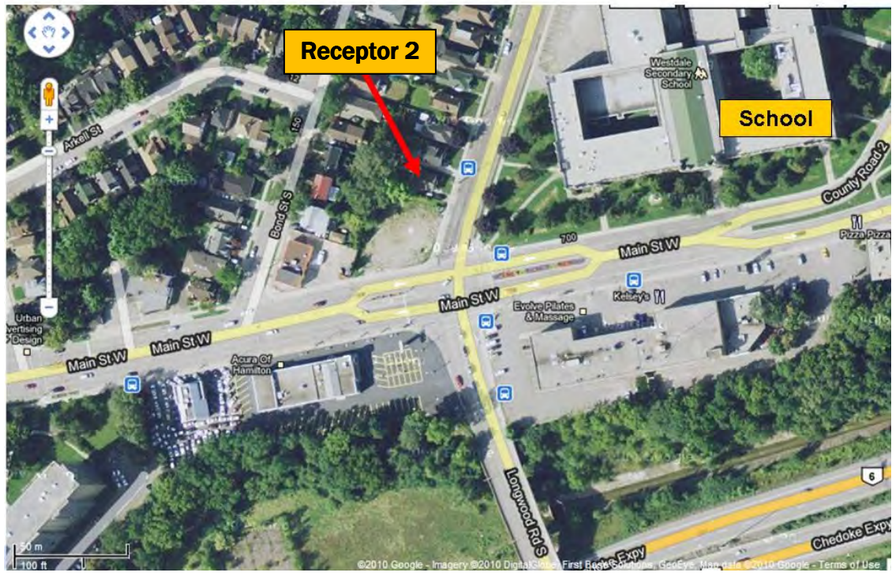


Figure 3.11: Receptor-3 - King Street W. and Highway 403

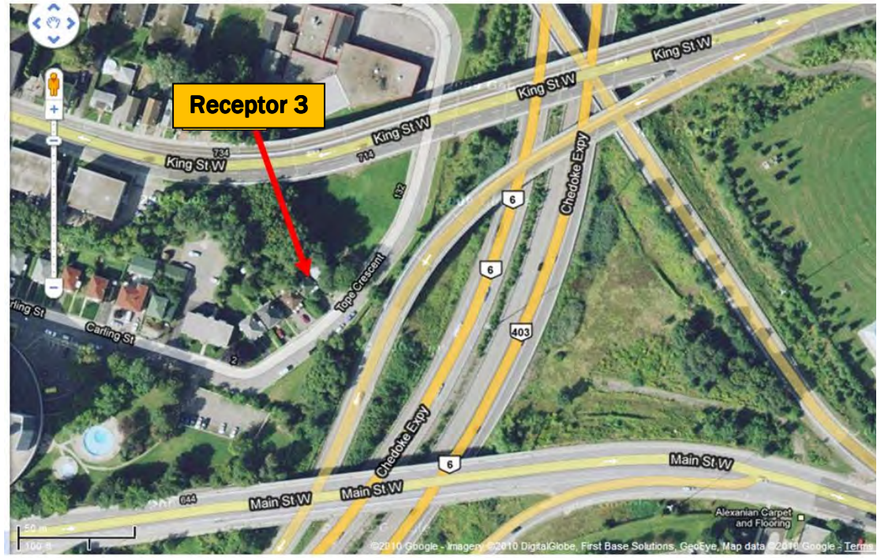


Figure 3.12: Receptor-4 - King Street W. and Dundurn Street S.

Figure 3.13: Receptor-5 - King Street W. and Queen Street N.

Figure 3.14: Receptor-6 - King Street W. and Wellington Street N.

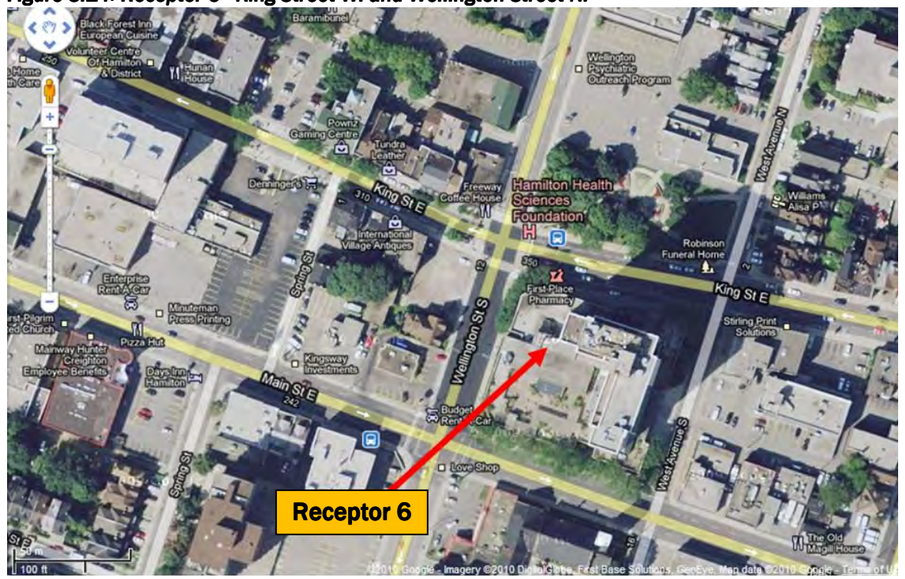


Figure 3.15: Receptor-7 - King Street E. and Wentworth Street S.

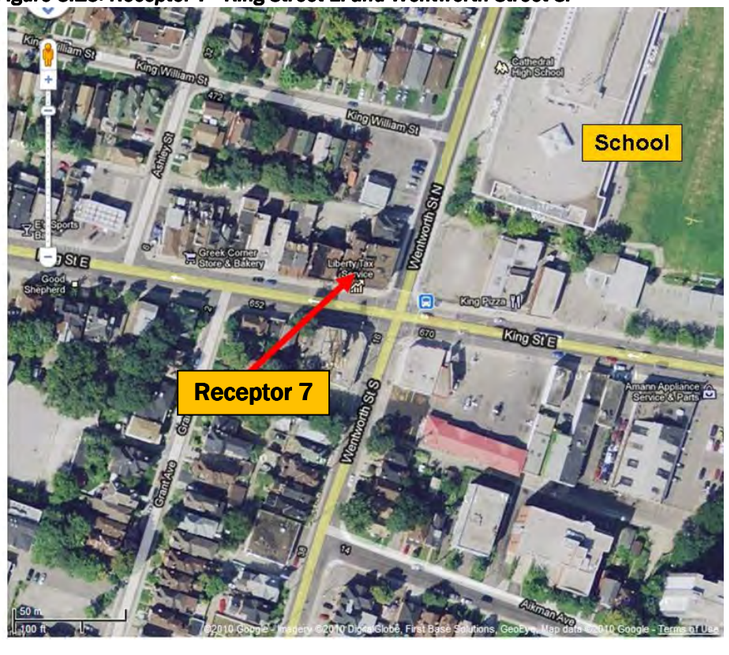


Figure 3.16: Receptor-8 - King Street E. and Main Street E.

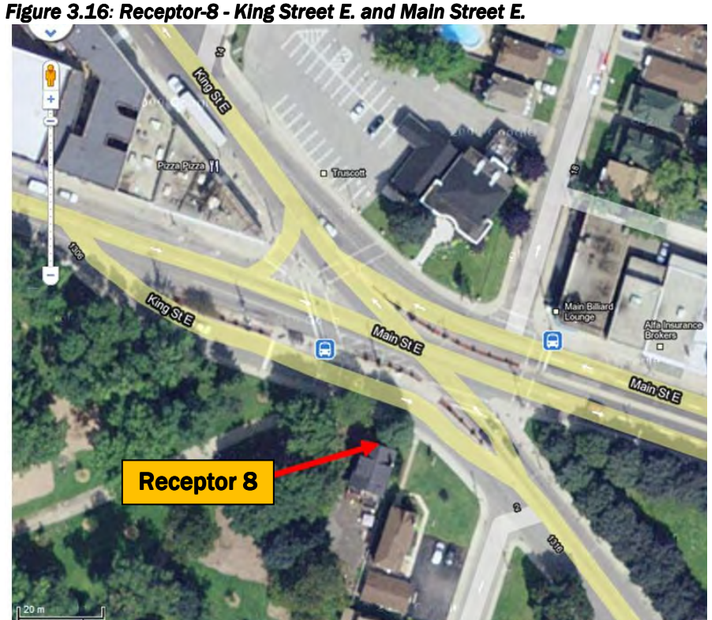


Figure 3.17: Receptor-9 - Main Street E. and Kenilworth Avenue N.

Figure 3.18: Receptor-10 - Main Street E. and Strathearne Avenue

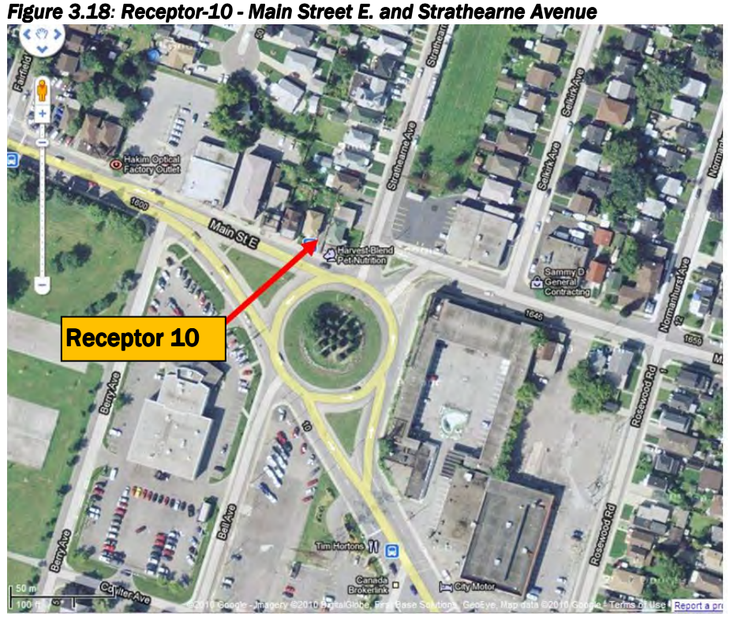


Figure 3.19: Receptor-11 - Queenston Road and Parkdale Avenue S.

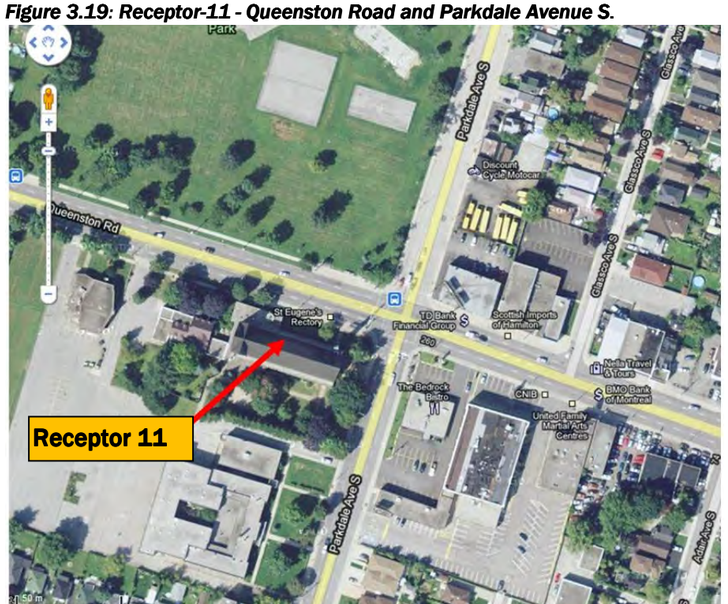


Figure 3.20: Receptor-12 - Queenston Road and Red Hill Valley Parkway

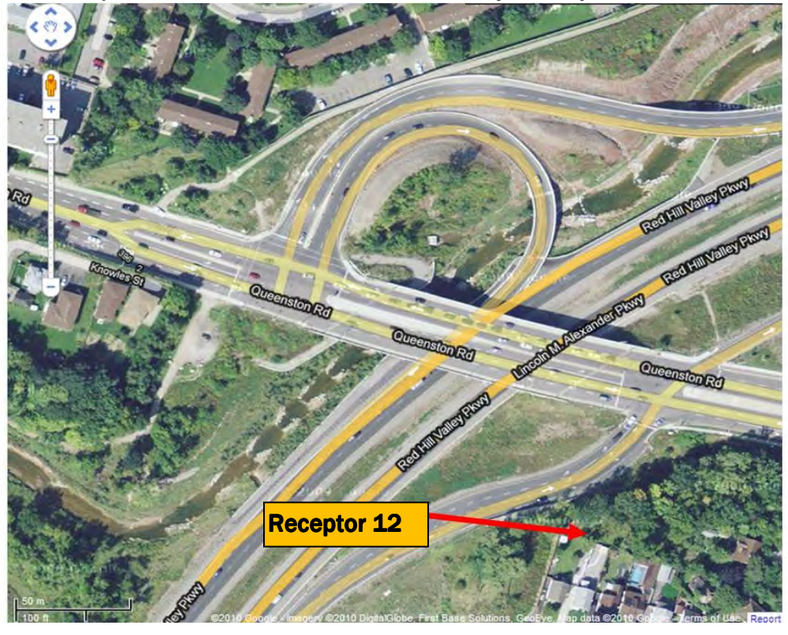


Figure 3.21: Receptor-13 - Queenston Road (West of Nash Road)

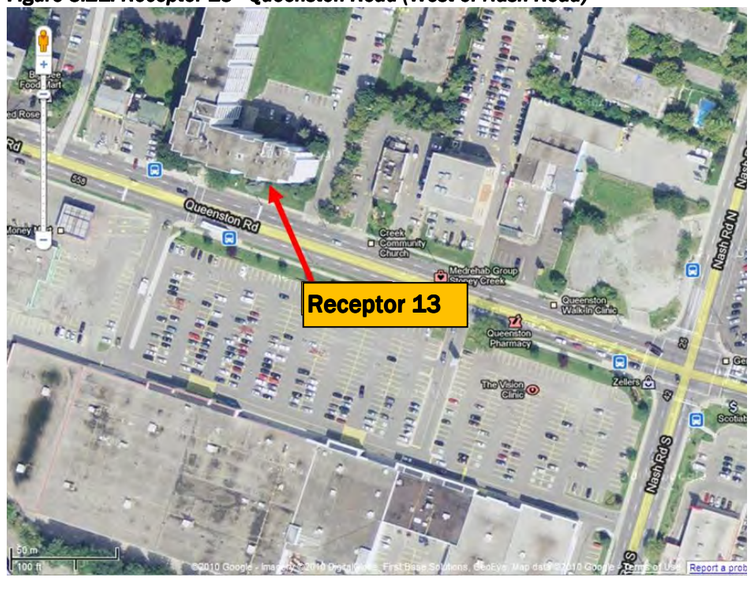
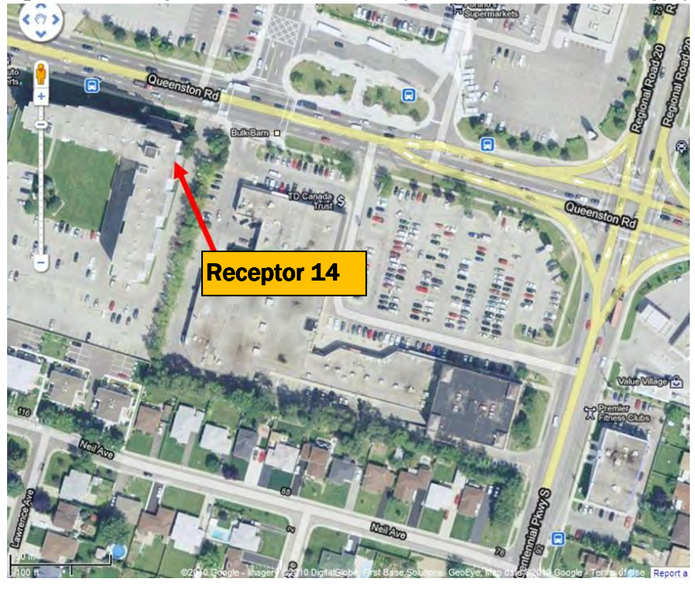


Figure 3.22: Receptor-14 - Queenston Road (West of Centennial Parkway S.)



Noise Receptor Summary

As highlighted previously, SLI has identified fourteen (14) receptors within the study area that were used to characterize the existing noise conditions for both transportation and stationary noise sources. Table 3-6 provides a list of the receptors, including a description of the structure and its location relative to a nearby main intersection.

Table 3.6: Noise Receptor Summary

Receptor	Receptor Description	Receptor Location (set-back distance referenced to the road centreline)
Receptor-1	1-storey residence on Emerson St.	Approximately 40 m south of Emerson St. and Main St. W.
Receptor-2	1 ½-storey residence on Longwood Rd. S.	Approximately 25 m north of Longwood Rd. S. and Main St. W.
Receptor-3	2-storey residence on Tape Crescent	Just west of Hwy 403, Approximately 25 m south of Tape Cres. and Main St. W.
Receptor-4	5-storey apartment building on King St. W.	Adjacent to King St. W., Approximately 75 m east of Dundum St. S.
Receptor-5	2-storey residence on Queen St. N.	Approximately 35 m south of Queen St. N. and King St. W.
Receptor-6	High rise apartment building at King St. E. and Wellington St. S.	Adjacent to the intersection
Receptor-7	2nd level apartment on King St. E.	Adjacent to King St. E., approximately 10 m west of Wentworth St. S.
Receptor-8	2-storey residence at King St. E. and Main St. E.	Adjacent to the King St. E. ramp, Approximately 25 m south of Main St. E.
Receptor-9	2 ½-storey residence on Main St. E.	Approximately 50 m west of Kenilworth Ave. N
Receptor-10	1-storey residence on Main St. E. and Strathearne Ave.	Approximately 25 m west of Strathearne Ave., just north of the traffic circle
Receptor-11	Place of Worship at Queenston Rd. and Parkdale Ave. S.	Adjacent to the intersection
Receptor-12	2-storey residence at Queenston Rd. and Red Hill Valley Parkway	Approximately 50 m west of Red Hill Valley Parkway (adjacent to east ramp)
Receptor-13	10-storey apartment building on Queenston Rd.	Adjacent to Queenston, approximately 200 m west of Nash Rd.
Receptor-14	7-storey apartment building on Queenston Rd.	Adjacent to Queenston, approximately 200 m west of Centennial Parkway S.

Regulatory Requirements

Transportation Source - MOE Protocols

In the absence of specific noise assessment requirements in the City of Hamilton, the noise assessment methods and criteria set out in the MOE/MTO Joint Protocol (MTO, 2006) may be applied for new capital projects. The evaluation of noise impact according to the Joint Protocol is chiefly based on the change in the equivalent 24-hour noise level, expressed as the Leq(24) (dBA), from the future "no-build" to the future "build" condition. Low impact is defined as an increase of less than 5 dB above existing sound levels. Moderate impact is defined as an increase of 5 to 10 dB, and high impact is defined as an increase of more than 10 dB. The protocol states that the primary objective is to achieve sound exposures not exceeding 55 dBA or the pre-construction ambient sound exposure, whichever is higher.

It should be noted that the MOE/MTO Joint Protocol is the applicable guideline when determining noise impact as part of the Municipal Class Environmental Assessment Process.

Transportation Source - City of Hamilton Noise Policy Paper

The City has a Transportation and Noise Policy Paper which provides a guideline in assessing noise impacts for capital projects. The Policy Paper has recommended adoption of the MOE/MTO Joint Protocol for such assessments, as outlined above.

Stationary Noise Criteria – MOE NPC-205

In Ontario, the Noise Pollution Control (NPC) Publication 205 (MOE, 1995) establishes sound level limits for stationary sources, such as industrial and commercial establishments, or ancillary transportation facilities, affecting receptors in Class 1 and 2 Areas (Urban). NPC-205 states that the sound level limit must be established based on the principle of "predictable worst case" noise impact. Generally, the limit is based on the background sound level at the receptors and must represent the minimum background sound level that occurs or is likely to occur during the operation of the stationary source under assessment.

Sound levels from steady stationary noise sources are quantified using the energy equivalent sound level, Leq, (in A-weighted decibels - dBA). For urban areas, the daytime limit at a critical receptor for steady noise from a stationary source is the higher of either the one-hour Leq (Table 3.7) resulting from existing volumes of road traffic and any industry that is not under investigation for noise excess, or 50 dBA. The night-time limit is the higher of either the ambient (road traffic plus industry) one-hour Leq noise level, or 45 dBA. If the stationary source contains any noticeable features, such as tonal components or buzzing, a 5 dB tonal penalty must be added to the noise level of the source as per NPC-104 (MOE, 1978c).

Table 3.7: Minimum Values of One-Hour Leq by Time of Day

Time of Day	One Hour Leq (dBA)	
	Class 1 Area	Class 2 Area
07:00 - 19:00	50	50
19:00 - 23:00	47	45
23:00 - 07:00	45	45

Existing Noise Environment

The existing ambient noise within the study area is dominated by road traffic, light industrial and commercial activities. For the purpose of this study, the existing noise conditions were established using MOE's STAMSON noise model, which is based on the Ontario Road Noise Analysis Method for Environment and Transportation (ORNAMENT).

Traffic Noise Modelling Methodology

STAMSON calculates receptor sound levels for a variety of source types, such as road and various rail type vehicles. Sound levels due to road noise include the contribution from three vehicle categories:

- Automobiles
  - All vehicles having two axles and four wheels designed primarily for the transportation of nine or fewer passengers or the transportation of cargo (e.g., vans and light trucks). Generally, the gross vehicle weight is less than 4,500 kg.
- Medium Trucks
  - All vehicles having two axles and six wheels designed for the transportation of cargo. Generally, the gross vehicle weight is greater than 4,500 but less than 12,000 kg. City buses are also included in this category.

- Heavy Trucks
    - All vehicles having three or more axles designed for the transportation of cargo. Generally, the gross vehicle weight is greater than 12,000 kg. Inter-city buses are included in this category.

Key parameters utilized by STAMSON in the calculation of road noise include vehicle speed, road surface, topography gradient, ground surface conditions (absorptive or reflective), angle of exposure, and the presence or absence of sound barriers. In order to predict sound levels for road traffic, the STAMSON model requires an hourly traffic flow of at least 40 vehicles/hour; travelling at least 40 km/h; and receptors must be located between 15 m and 500 m from the traffic source.

The sound levels at the receptors for both the vehicle traffic and LRT operations are estimated in STAMSON. The parameters used in calculating the sound level impact from these vehicles are similar to those listed above; however, there is a limitation on the travel speed at which the LRT may be modelled (i.e., between 30 and 50 km/h). The sound level calculations presented in this study are primarily based on the following parameters and assumptions:

(i) AADT estimated from afternoon peak traffic volumes for all municipal roads (based on measurements);

(ii) SADT traffic volume estimates for Highway 403 (based on MTO's 2006 traffic database);

(iii) Percentage of trucks for all municipal roads based on measurements (varies);

(iv) Percentage of trucks for Highway 403 estimated as 10% medium trucks and 5% heavy trucks;

(v) Posted speed limits;

(vi) Surface type of pavement;

(vii) Type of topography between the subject roadway/highway and the PORs;

(viii) Type of ground cover over the intervening lands (i.e., assumed to be acoustically 'hard' surfaces);

(ix) Receiver heights – 1.5 or 4.5 m above grade for single-storey and multi-storey receptors;

(x) Setback distance between the receptor and the centerline of the subject transportation facility.

As indicated in Table 3.8, the 2010 traffic data is based on the most recent 2009 traffic count data. Within the context of the modelling, the receptors were assumed to be an upper level bedroom window, as all PORs selected in this study did not provide a closer Outdoor Living Area (OLA) during daytime hours (i.e., 3 m from the façade of the building). Therefore, the bedroom window represents a worst case noise impact scenario for all PORs in this study. All receptor locations were assumed to be on the same side of the building as the road traffic and the future LRT operations.

Traffic Volumes

The Average Annual Daily Traffic (AADT) volumes for the main road segments used in this study are primarily derived through traffic counts. The traffic volumes are summarized in Table 3.8, including a listing of the key road segments that may impact each receptor, the traffic flow direction, the PM Peak traffic counts (vehicles per hour), and the calculated AADT. As noted in Table 3.8, in order to provide a comprehensive traffic noise model for the study area, additional data were referenced from a 2008 report by McCormick Rankin Corporation (MRC) and the most recent highway traffic data from MTO. This includes the Summer Average Daily Traffic (SADT) volumes for Highway 403 (MTO 2006 Provincial Highways Traffic Volume Publication).

The percentage of vehicle types were derived through the 2009 traffic study, including a breakdown for trucks found to be within 1.3 to 2.8% of the overall traffic volume. There were no data available that differentiated between medium and large sized trucks. The actual percentage of cars, medium trucks and heavy trucks used was based on the available measured data at the nearest intersection to the NSA.

Table 3.8: Traffic Volumes for Key Road Segments (Vehicles/Hour)

Receptor	Road Segment Impacting Receptor	Road Segment Description	2009 PM Peak (Vehicles Per Hour)		2010 AADT (Estimated for Existing Conditions)	
Receptor-1	Main St. W.	Eastbound and Westbound Traffic	1,566 (EB)	2,096 (WB)	19,553 (EB)	25,319 (WB)
	Emerson St.	Northbound and Southbound traffic	145 (NB)	538 (SB)	1,755 (NB)	7,082 (SB)
Receptor-2	Main St. W.	Eastbound and Westbound Traffic	1,628 (EB)	716 (WB)	20,406 (EB)	8,975 (WB)
	Longwood Rd. S.	Northbound and Southbound traffic	741 (NB)	435 (SB)	9,288 (NB)	5,452 (SB)
Receptor-3	Main St. W.	Eastbound Traffic	2,800[1] (EB)	n/a (WB)	35,096 (EB)	n/a (WB)
	King St. W.	Westbound Traffic	n/a (EB)	3600[1] (WB)	n/a (EB)	45,123 (WB)
	Highway 403	Northbound and Southbound traffic	n/a (WB)	n/a (EB)	54,000[2] (WB)	54,000[2] (EB)
Receptor-4	King St. W.	Westbound Traffic	n/a (EB)	3178 (WB)	n/a (EB)	39,834 (WB)
	Dundum St. S.	Northbound and Southbound traffic	576 (NB)	635 (SB)	7,220 (NB)	7,959 (SB)
Receptor-5	King St. W.	Westbound Traffic	n/a (EB)	2,206 (WB)	n/a (EB)	27,651 (WB)
	Queen St. N.	Southbound traffic	n/a (NB)	1,014 (SB)	n/a (NB)	12,710 (SB)
Receptor-6	King St. E.	Westbound Traffic	n/a (EB)	1,315 (WB)	n/a (EB)	16,483 (WB)
	Wellington St. S.	Southbound traffic	n/a (NB)	1,023 (SB)	n/a (NB)	12,823 (SB)
Receptor-7	King St. E.	Westbound Traffic	n/a (EB)	1,167 (WB)	n/a (EB)	14,627 (WB)
	Wentworth St. S.	Southbound traffic	n/a (NB)	538 (SB)	n/a (NB)	6,743 (SB)
Receptor-8	Main St. E.	Eastbound and Westbound Traffic	2,098 (EB)	675 (WB)	26,297 (EB)	8,461 (WB)
	King St. E.	Westbound Traffic	n/a (EB)	405 (WB)	n/a (EB)	5,076 (WB)
Receptor-9	Main St. E.	Eastbound and Westbound Traffic	966 (EB)	764 (WB)	12,108 (EB)	9,576 (WB)
	Kenilworth Ave.	Northbound and Southbound traffic	523 (NB)	1,091 (SB)	6,555 (NB)	13,675 (SB)

Receptor	Road Segment Impacting Receptor	Road Segment Description	2009 PM Peak (Vehicles Per Hour)		2010 AADT (Estimated for Existing Conditions)	
Receptor-10	Main St. E.	Eastbound and Westbound Traffic	1200[1] (EB)	900[1] (WB)	15,041 (EB)	11,281 (WB)
Receptor-11	Queenston Rd.	Eastbound and Westbound Traffic	893 (EB)	834 (WB)	11,193 (EB)	10,454 (WB)
	Parkdale Ave. S.	Northbound and Southbound traffic	391 (NB)	263 (SB)	4,901 (NB)	3,297 (SB)
Receptor-12	Queenston Rd.	Eastbound and Westbound Traffic	1,271 (EB)	1,196 (WB)	15,931 (EB)	14,991 (WB)
	Red Hill Valley Parkway (ramp)	Northbound and Southbound traffic	472 (NB)	n/a (SB)	5,916 (NB)	n/a (SB)
Receptor-13	Queenston Rd.	Eastbound and Westbound Traffic	1,175 (EB)	1,757 (WB)	14,728 (EB)	22,023 (WB)
	Nash Rd.	Northbound and Southbound traffic	640 (NB)	638 (SB)	8,022 (NB)	7,997 (SB)
Receptor-14	Queenston Rd.	Eastbound and Westbound Traffic	1,035 (EB)	601 (WB)	12,973 (EB)	7,533 (WB)
	Centennial Parkway S.	Northbound and Southbound traffic	1,124 (NB)	983 (SB)	14,088 (NB)	12321 (SB)

Notes:

1. Traffic data obtained from the "Rapid Transit Feasibility Study Supplemental Investigations, Phase 2" report (MRC, 2008).
2. Traffic data obtained from the MTO 2006 Provincial Highways Traffic Volume Publication – Summer Average Daily Traffic (SADT) with annual growth based on SADT trends.

Traffic Modelling Results

Existing traffic noise levels were determined for all 14 receptors within the study area. A summary of the existing noise levels at each receptor is provided in Table 3.9.

Table 3.9: Predicted Sound Levels (dBA) for the Existing Conditions

Receptor	Sound Pressure Level (Leq(24); dBA)
Receptor-1	67.6
Receptor-2	68.0
Receptor-3	77.1
Receptor-4	69.7
Receptor-5	68.2
Receptor-6	66.4
Receptor-7	64.5
Receptor-8	66.3
Receptor-9	66.8
Receptor-10	66.0
Receptor-11	65.6
Receptor-12	65.4
Receptor-13	66.9
Receptor-14	67.1

As noted in the aerial views in Figures 3.9 to 3.22, most of the receptors are in close proximity to the main roads. Therefore, the existing noise level calculations are well above the target 55 dBA noise level for urban areas, as highlighted in Table 3.9. However, the predicted noise levels are considered typical for a busy urban environment.

In order to confirm the modelled sound levels throughout the corridor, short term sound level measurements were taken during daytime hours at various locations. Generally, because of the old sound data used in the models, areas with relatively higher truck traffic show higher modelled sound levels than measured sound levels. Because of the relatively low heavy and medium truck traffic along the proposed B-Line LRT route, the measured sound levels tended to be within 1 dB of the modelled sound levels in most cases. In areas with densely packed buildings on either side of a road, the measured sound levels were actually about 2 dB higher than the modelled sound levels. This is a result of the reflection of roadway noise off adjacent buildings, which is not incorporated into the model. All absolute sound levels reported within this report take into consideration the difference between modelled sound levels and measured sound levels. Measured sound levels are likely to be lower than modelled sound levels in areas with higher truck percentages, which likely occur along streets parallel to the LRT route.

Vibration Sensitive Uses Adjacent to B-Line LRT Corridor

Experience suggests that an LRT system in an urban environment, such as that through which the B-Line corridor runs, has the potential to create both ground-borne vibration (perceptible vibration normally experienced in building rooms with windows facing the corridor) and vibration-induced noise (the "rumble" normally heard in building rooms that are further removed from the corridor and without a window).

The B-Line corridor has been inventoried for uses that may be susceptible to vibration impacts. In the order of 280 such uses have been identified, including residences, religious institutions (churches, mosques), long term care facilities, retirement homes, educational institutions (schools, colleges, academies, training centres), medical facilities (individual medical and dental offices and clinics, veterinary hospitals and clinics, laboratories, multi-use medical buildings), cultural/commercial operations (art galleries, theatres, entertainment clubs, theatres, radio station), and utilities buildings. A full list is included in Appendix B.3 of this report.

3.3.5 Air Quality

Introduction

The purpose of this section is to describe existing air quality conditions in the study area of the Hamilton LRT project in terms of climatic conditions, as well as current background levels for airborne contaminants of concern.

Climatic Conditions

Hamilton is located on the Western shore of Lake Ontario. The city of Hamilton extends up onto Hamilton Mountain (the Niagara Escarpment), varying from an elevation of approximately 70-80 meters above sea level near the waterfront to 220-230 meters above sea level at the airport. Environment Canada provides climate normals for 4 stations within the Hamilton area. These stations consist of the Hamilton Airport, Hamilton Municipal Lab, Hamilton Psychiatric Hospital, and Hamilton Royal Botanical Gardens (RBG). The locations of these stations are presented on Figure 3..

Figure 3.23: Location of Environment Canada Meteorological Stations

Climate normals based on data from each of these four stations are presented in order to bracket the range of climate conditions throughout the Hamilton area. The Hamilton Psych Hospital station is the most representative for conditions along the B-Line, which runs in a generally east-west direction. The Hamilton Royal Botanical Gardens, Hamilton Psychiatric Hospital, and Hamilton Airport stations are all representative for portions of the A-Line, which runs in a north-south direction from the waterfront to the airport. Data from each of these four stations are summarized in Table 3.10. The information presented in this Table and the following discussion were obtained from Environment Canada's Canadian Climate Normals, 1971-2000 for Hamilton Airport, Hamilton Municipal Lab, Hamilton Psych Hospital, and Hamilton RBG stations.

Table 3.10: Hamilton Climate Normals

Parameter	Hamilton Royal Botanical Gardens	Hamilton Psychiatric Hospital	Hamilton Airport	Hamilton Municipal Lab
General Location	Near Waterfront	Mid-town Hamilton	On top of Mountain	Near Waterfront
Station Elevation	102 m	198 m	238 m	76 m
Most frequent wind direction	SW	n/a	SW	n/a
Mean wind speed - January	13.8 km/hr	n/a	21.2 km/hr	n/a
Mean wind speed - July	9.6 km/hr	n/a	13.1 km/hr	n/a
Extreme gust speed	n/a	n/a	133 km/hr	n/a
Daily max/min temperature - January	-1.1 / -8.8 °C	-1.7 / -8.9 °C	-2.2 / -9.7 °C	-0.4 / -6.8 °C
Daily max/min temperature - July	27.3 / 16.6 °C	26.8 / 16.5 °C	26.3 / 15.1 °C	27 / 17.9 °C
Extreme minimum temperature	-28.3 °C	-27 °C	-28 °C	-25 °C
Extreme maximum temperature	38.8 °C	38 °C	37.4 °C	38.5 °C
Average afternoon relative humidity	n/a	n/a	65.2%	n/a
Annual snowfall	126.1 cm	119 cm	161.8 cm	113.2 cm
Annual rainfall	768.5 mm	821.7 mm	764.8 mm	750.8 mm
Average snow depth - February	8 cm	n/a	9 cm	n/a
Rainfall greater than 0.2 mm	117.7 days/year	113.4 days/year	117.7 days/year	120.3 days/year
Snowfall greater than 0.2 cm	38.1 days/year	27.1 days/year	55.7 days/year	28.8 days/year

Note: n/a = "not applicable", data for this parameter were not available at a given station.

The Hamilton region generally has warm, humid summers and cold winters. Due to the moderating effect of the Great Lakes, the climate is relatively temperate, compared to mid-continental locations that are away from the lakes. During the summer months, the daytime temperatures are usually below 30 °C and the nighttime temperatures are typically around 17 °C, based on the Hamilton Municipal Lab and RBG stations, which are located near the waterfront. Temperatures from the Airport Station, located at a higher elevation, are typically 1-2 °C lower than temperatures from the other stations. Daytime humidity during the summer is moderate, usually averaging between 50 and 60% at the airport station, which is the only station in the area that records this statistic. Winter weather conditions are also moderate, with high temperatures usually above -10 °C, and low temperatures seldom below -20 °C.

The area receives between 113 and 162 cm of snowfall in an average winter, with the depth of snow on the ground averaging at less than 10 cm. Snowfall occurs often through the winter, with appreciable amounts (greater than 0.2 cm) occurring on an average of 27 to 56 days/year, depending on location.

Annual rainfall varies from 751 to 822 mm. Like snowfall, rain also occurs fairly often during the warmer months, with appreciable rainfall (greater than 0.2 mm) occurring on 113 to 120 days/year, on average. The driest month of the year is February, with an average precipitation of 55 to 59 mm; the wettest month tends to be September, with an average of 82 to 92 mm of rainfall. The months with the fewest number of days of precipitation are June through August, which average approximately 10 to 11 days precipitation above 0.2 mm.

Table 3.11 presents data on hazardous weather conditions in the vicinity of Hamilton, Ontario. The information presented in this table was obtained from the Canadian Climate Normals for the 4 Hamilton-area stations, as well as from Environment Canada's Ontario.Hazards.ca website. Records from Hamilton were used, where available. Where records from the Hamilton area were not available, data from Toronto Pearson Airport were used, as this was the nearest station recording the desired parameters.

Table 3.11: Data on Atmospheric Hazards

Parameter	Value	Location
Freezing Rain	17 hours / year over 9 days/year	Toronto, Pearson Airport
Snowfall greater than 10 cm	3 days/year	Hamilton – 4 Stations
Extreme snowfall	31 – 43 cm	Hamilton – 4 Stations
Fog with 0 km visibility	15 hours/year	Toronto, Pearson Airport
Fog with visibility less than 1 km	30 days/year	Hamilton
Rainfall greater than 25 mm	4 – 5 days/year	Hamilton – 4 Stations
Tornadoes	2.0 Tornadoes/yr/10,000 km^2	Hamilton

Freezing rain is infrequent, typically occurring less than 17 hours/year, which is similar to most other parts of Southern Ontario, but lower than Eastern Ontario (Ottawa Valley) and some highland areas south of Georgian Bay (e.g., Shelburne, Ontario). The freezing rain is typically spread out over about 9 days/year.

Heavy snowfall events are also infrequent, with daily snowfalls greater than 10 cm generally occurring only about 3 days/year. Very heavy snowfall events occur from time to time, with the extreme being in the range of 31 to 43 cm. Similarly, heavy rainfall events (greater than 25 mm) are infrequent, occurring 4 to 5 days/year on average.

Fog with visibility less than 1 km occurs about 30 days/year, on average, and fog with zero visibility occurs occasionally, but very infrequently (only about 15 hours/year).

The area is susceptible to tornadoes, with the annual average frequency being in the range of 2.0 tornadoes/ 10,000 km^2. This is similar to much of Southwestern Ontario, where the frequency is between 1.6 and 2 tornadoes/10,000 km^2.

Airborne Contaminants of Interest

Airborne contaminants are produced from a variety of sources, including industrial activities and vehicular traffic. Hamilton is known for its many heavy industries, including large steel production facilities. Some of the main emission sources in Hamilton; according to 2009 NPRI data, include the U.S. Steel and Arcelormittar Dofasco Steel Plants, Columbian Chemicals Canada Plant, the Hamilton Specialty Bar Plant and the Hamilton Community Energy Centre. Table 3.12 lists the most common of the air contaminants of potential concern

Table 3.12: Contaminants of Interest

Contaminant	Symbol or Chemical Formula
Carbon Monoxide	CO
Nitrogen Oxides	NO_x
Respirable Particulate Matter	$PM_{2.5}$
Inhalable Particulate Matter	PM_{10}
Sulphur Dioxide	SO_2
Benzene	C_6H_6
1-3 Butadiene	C_4H_6
Formaldehyde	CH_2O
Acetaldehyde	CH_3CHO
Acrolein	C_3H_4O
Benzo(a)pyrene	$C_{20}H_{12}$

Relevant Guidelines

The Province of Ontario has established both criteria and standards for concentrations of airborne contaminants. The Ambient Air Quality Criteria (AAQC's) are effects-based levels in air, based on health and/or other effects. They are used in environmental assessments, special air monitoring studies, and assessments of general air quality to determine the potential for adverse effects. The standards, on the other hand, are established by Ontario Regulation 419/05, and are legal requirements which emitters in Ontario must meet. Most of the standards are based on the AAQC's but, in some cases, the standard and AAQC for a contaminant differ from each other.

In addition to the provincial AAQC's, the Federal Government and the Canadian Council of Ministers of the Environment have established National Ambient Air Quality Objectives and Canada-Wide Standards (CWS) for some of the contaminants. Of particular relevance is the CWS for $PM_{2.5}$ (respirable particulate matter), since $PM_{2.5}$ currently does not have a provincial AAQC in Ontario.

The AAQC and CWS are summarized in Table 3.13. These AAQC and CWS were used as benchmarks for assessing the existing conditions in the Hamilton area.

Table 3.13: Summary of Relevant Air Quality Thresholds for Ontario

Pollutant	Criterion (µg/m³)	Averaging Period	Source
$PM_{2.5}$	30	24-hour	CWS
	30	24-hour	AAQC
PM_{10}	50	24-hour	AAQC
CO	36,200	1-hour	AAQC
	15,700	8-hour	AAQC
NO_2	400	1-hour	AAQC
	200	24-hour	AAQC
SO_2	690	1-hour	AAQC
	275	24-hour	AAQC
	55	Annual	AAQC
Benzene	2.3	24-hour	AAQC (proposed)
	0.45	Annual	AAQC (proposed)
1,3-Butadiene	10	24-hour	AAQC (proposed)
	2	Annual	AAQC (proposed)
Acrolein	4.5	1-hour	AAQC
	0.4	24-hour	AAQC
Acetaldehyde	500	30-minute	AAQC
	500	24-hour	AAQC
Formaldehyde	65	24-hour	AAQC
Benzo(a)Pyrene	0.00005	24-hour	AAQC (proposed)
	0.00001	Annual	AAQC (proposed)

The World Health Organization (WHO) published new air quality guidelines for several contaminants in the year 2000, with updates in 2005 for $PM_{2.5}$, PM_{10}, NO_2 and SO_2. These are shown in Table 3.14. Some jurisdictions have adopted these globally applicable guidelines as their own and, as such, it was considered prudent to include them for reference purposes, even though they have not been officially adopted in Ontario at this time.

Table 3.14: Summary of Relevant Air Quality Thresholds from the World Health Organization

Pollutant	Criterion (µg/m³)	Averaging Period	Source
$PM_{2.5}$	25	24-hour	WHO
	10	Annual	WHO
PM_{10}	50	24-hour	WHO
	20	Annual	WHO
CO	30,000	1-hour	WHO
	10,000	8-hour	WHO
NO_2	200	1-hour	WHO
	40	Annual	WHO
SO_2	500	10-minute	WHO
	20	24-hour	WHO
Formaldehyde	100	30-minute	WHO

Background Air Quality Conditions

Current air quality conditions were determined by looking at historical air pollutant monitoring data from stations throughout the Hamilton area. These data are available from a variety of sources, including:

- Ontario Ministry of the Environment (MOE) stations;
- Hamilton Air Monitoring Network (HAMN) stations; and,
- National Air Pollutant Surveillance Network (NAPS) stations.

Where monitoring results for a specific contaminant were not available from the Hamilton area monitoring stations, data from the most representative available stations in Southern Ontario were used as surrogates. The air pollutant monitoring data were used as a representation of present-day outdoor concentrations of the contaminants of concern (CACs, VOCs, and PAHs) in the Hamilton area. These are referred to as background concentrations. Background concentrations can vary widely from day-to-day, depending on the weather conditions, and also vary from place-to-place.

B-Line Background Air Quality Conditions

The proposed B-Line generally runs in an east-west direction, from Eastgate Square to McMaster University. The Table 3.15 summarizes the air quality monitoring stations used to develop the background concentrations for the B-Line study. Based on their location, the MOE Hamilton Downtown, the MOE Hamilton West, NAPS Hamilton Downtown and the HAMN stations are the most representative in terms of background concentrations for the B-Line. Formaldehyde, acetaldehyde, and acrolein are not monitored at any of the Hamilton-area stations; therefore, ambient concentrations of these contaminants were obtained from the nearest available station, NAPS Toronto Ruskin & Perth.

Table 3.15: Summary of Ambient Monitoring Stations – B-Line Study

Pollutant	Stations / Years with Data Available
Nitrogen Dioxide (NO_2)	MOE Hamilton Downtown: 2003-2008 MOE Hamilton West: 2003 HAMN - Station 29567: 2009 HAMN - Station 29102: 2006-2009 HAMN - Station 29547: 2009
Carbon Monoxide (CO)	MOE Hamilton Downtown: 2003-2008
Respirable Particulate Matter ($PM_{2.5}$)	MOE Hamilton Downtown: 2003-2008 MOE Hamilton West: 2003-2008
Inhalable Particulate Matter (PM_{10})	HAMN - Station 29567: 2006-2009 HAMN - Station 29113: 2009 HAMN - Station 29102: 2006-2009 HAMN - Station 29547: 2009
Sulphur Dioxide (SO_2)	MOE Hamilton Downtown: 2003, 2006-2008 HAMN - Station 29567: 2008-2009 HAMN - Station 29102: 2006-2009 HAMN - Station 29547: 2009
Formaldehyde	NAPS Toronto Ruskin & Perth: 1999-2003
Acetaldehyde	NAPS Toronto Ruskin & Perth: 1999-2003
Benzene	MOE Hamilton Downtown: 2003-2004 HAMN - Station 29567: 2006-2009 HAMN - Station 29113: 2006-2009 HAMN - Station 29102: 2006-2009
1,3-Butadiene	NAPS Elgin & Kelly, Hamilton Downtown: 1999-2003
Acrolein	NAPS Toronto Ruskin & Perth: 1999-2003
Benzo(a)Pyrene	HAMN - Station 29567: 2006-2009 HAMN - Station 29113: 2006-2009 HAMN - Station 29547: 2006-2009

The locations of these stations, with the exception of the NAPS Toronto Station, are shown in Figure 3.24.

Figure 3.24: Location of Hamilton-Area Ambient Monitoring Stations

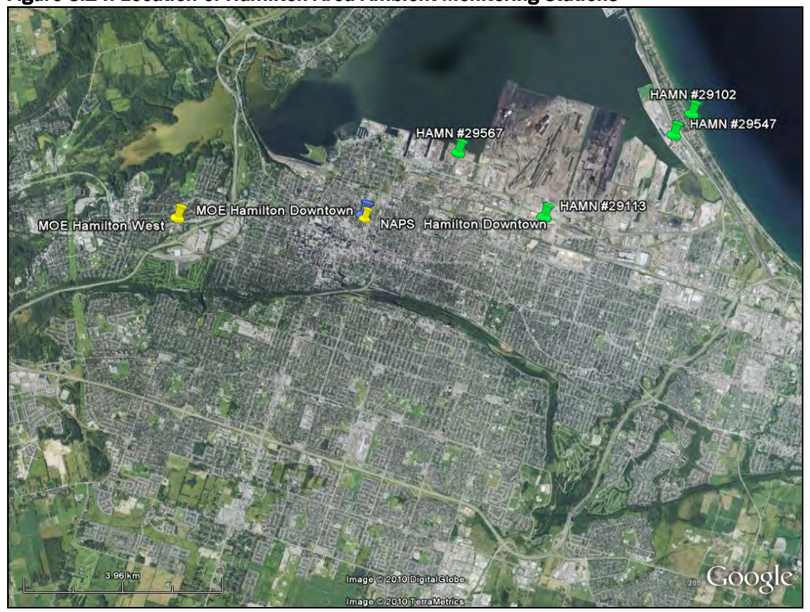


Table 3.16, presented on the next page, shows representative high-end values, averaged over multiple years of data and multiple monitoring sites throughout the Hamilton area. These background concentrations are applicable to the B-Line.

Table 3.16: Ambient Monitoring Results for the MOE Hamilton Downtown, the MOE Hamilton West, NAPS and HAMN Stations

Pollutant	Statistic	Result (Over all Years and Stations)		AAQC or CWS
		Maximum	Average	(µg/m³)
NO_2 (µg/m³)	1-hr Maximum	101	85	400
	24-hr Maximum	76	55	200
	Annual Mean	26	20	--
	1hr-90th Percentile	45	40	--
	Times > 1-hr AAQC (400)	0	0	--
	Times > 24-hr AAQC (200)	0	0	--
CO (µg/m³)	1-hr Maximum	7,195	4,375	36,200
	8-hr Maximum	2,109	1,782	15,700
	Annual Mean	530	354	--
	1hr-90th Percentile	1,302	747	--
	Times > 1-hr AAQC (36,200)	0	0	--
	Times > 24-hr AAQC (15,700)	0	0	--
$PM_{2.5}$ TEOM (µg/m³)	1-hr Maximum	108	80	--
	24-hr Maximum	46	41	30
	Annual Mean	11	8.9	--
	1hr-90th Percentile	24	20.4	--
	24hr-90th Percentile	21	18.1	--
	Times > CWS (30)	15	7.8	--
PM_{10} TEOM (µg/m³)	1-hr Maximum	1,000	558	--
	24-hr Maximum	338	141	50
	Annual Mean	41	31	--
	1hr-90th Percentile	n/a	n/a	--
	24hr-90th Percentile	n/a	n/a	--
	Times > 24-hr AAQC (50) *	83	45	--
SO_2 (µg/m³)	1-hr Maximum	221	150	690
	24-hr Maximum	60	46	275
	Annual Mean	11	7	55
	1hr-90th Percentile	16	14	--
	Times > 1-hr AAQC (690)	0	0	--
	Times > 24-hr AAQC (275)	0	0	--
Formaldehyde (µg/m³)	24-hr Maximum	11.1	7.1	65
	Annual Mean	2.8	2.7	--
	1hr-90th Percentile	5.8	4.6	--
Acetaldehyde (µg/m³)	24-hr Maximum	5.1	4.4	500
	Annual Mean	1.8	1.7	--
	1hr-90th Percentile	3.2	2.7	--
Benzene (µg/m³)	24-hr Maximum	193	19	2.3
	Annual Mean	2.4	1.4	0.45
	24hr-90th Percentile	3.8	3.6	--
1,3-Butadiene (µg/m³)	24-hr Maximum	0.72	0.54	10
	Annual Mean	0.15	0.13	2
	1hr-90th Percentile	0.43	0.29	--
Acrolein (µg/m³)	24-hr Maximum	0.90	0.44	4.5
	Annual Mean	0.10	0.10	0.4
	1hr-90th Percentile	0.30	0.22	--
Benzo(a)Pyrene (ng/m³)	24-hr Maximum	8.0	4.4	0.05
	Annual Mean	1.6	0.9	0.01
	Times > 24-hr AAQC (1.10 ng/m³) [1]	13	7	--

Note: [1] – The HAMN monitoring network compared benzo(a)pyrene concentrations to the current 24-hour AAQC of 1.1 ng/m³; however, benzo(a)pyrene has proposed AAQCs of 0.05 ng/m³ and 0.01 ng/m³ for the 24-hour and annual averaging periods respectively.

Table 3.16 provides the maximum concentrations for the 1-hour and 24-hour averaging periods, as applicable. This table also includes the annual mean and 90th percentile concentrations, where available. The annual mean values are representative of typical conditions, the 90th percentile values (values of concentration which are exceeded only 10% of the time) are representative of typical high-concentration periods, and maximum values are representative of rare, extreme events.

The majority of the contaminants are less than their relevant AAQC, even when considering the maximum concentrations over multiple stations and multiple years. However, PM_{10}, $PM_{2.5}$, benzene, and Benzo(a)pyrene do exceed their criteria at least some of the time.

PM_{10} and $PM_{2.5}$ have maximum concentrations that are above their 24-hour AAQC and CWS. These elevated maximums result from high particulate matter events that occur in Hamilton from time-to-time. However, for both of these contaminants, the annual means are well below the AAQC, indicating that on an average day, the ambient concentrations of PM_{10} and $PM_{2.5}$ are below the criterion. In the case of $PM_{2.5}$, the concentrations remain below the CWS at the 90th percentile level and, at the average monitoring station in an average year, meet it at approximately the 98th percentile level (i.e., the CWS is exceeded less than 8 days/year). In the case of PM_{10}, the AAQC is exceeded at approximately the 88th percentile level at the average monitoring station, in an average year (i.e., exceeded on 45 days/year).

For benzene and benzo(a)pyrene, the overall maximum concentrations are quite high, and represent rare, outlying events. The 90th percentile values and annual means are much lower than the overall maxima, although still above the proposed AAQC. In the case of benzo(a)pyrene, the HAMN monitoring network measured a maximum of 15 days per year above the current 24-hour AAQC (1.1 ng/m³), which is a significantly higher threshold than the proposed new AAQC (0.05 ng/m³). The annual average concentrations measured by the HAMN network exceed the proposed 24-hour AAQC, which means that this AAQC is exceeded most of the time. However, this is not unique to Hamilton. It is the case throughout urbanized areas of Southern Ontario.

Conclusions

This report has presented a summary of the climate and air quality conditions in the vicinity of the proposed Hamilton LRT B-Line. Existing air contaminant levels in the study area are within acceptable thresholds set out in MOE Ambient Air Quality Criteria (AAQCs), with the exception of particulate matter, benzene and benzo(a)pyrene. With respect to inhalable and respirable particulate matter, 24-hour concentrations are within the thresholds most of the time, but do exceed them from time to time. In the case of benzene and benzo(a)pyrene, their annual average concentrations exceed proposed new annual average AAQC's, and their daily concentrations exceed proposed new 24-hour AAQC's relatively frequently. Sulphur dioxide levels easily meet the applicable Ontario AAQC's, but occasionally exceed the more stringent 24-hour guideline for SO_2 set out by the World Health Organization.

3.4 Cultural Environment

3.4.1 Built Heritage and Cultural Landscapes

Introduction

A cultural heritage assessment for the current B-Line Rapid Transit proposal was conducted as a follow-up to the 2009 investigations conducted for the Rapid Transit Feasibility Study. The purpose of the cultural heritage resource inventory study was to provide an existing conditions inventory of above ground cultural heritage resources at the site of the proposed transit project; a description of data reviewed; and summary of results and conclusions to guide further deliberations on development of the B-Line design.

Built Heritage Resource and Cultural Heritage Landscape Assessment Context

Provincial Policy Context

The B-Line Rapid Transit corridor has the potential to affect cultural heritage resources in a variety of ways. Impacts can include: direct impacts that result in the loss of resources through demolition, or the displacement of resources through relocation; and indirect impacts that result in the disruption of resources by introducing physical, visual, audible or atmospheric elements that are not in keeping with the resources and/or their setting.

For the purposes of this assessment, the term cultural heritage resources was used to describe both cultural landscapes and built heritage features. A cultural landscape is perceived as a collection of individual built heritage features and other related features that together form farm complexes, roadscapes and nucleated settlements. Built heritage features are typically individual buildings or structures that may be associated with a variety of human activities, such as historical settlement and patterns of architectural development.

The analysis throughout the study process addresses cultural heritage resources under various pieces of legislation and their supporting guidelines. Under the Environmental Assessment Act (1990) environment is defined in Subsection 1(c) to include:

- cultural conditions that influence the life of man or a community, and;
- any building, structure, machine, or other device or thing made by man.

The Ministry of Tourism and Culture is charged under Section 2 of the Ontario Heritage Act with the responsibility to determine policies, priorities and programs for the conservation, protection and preservation of the heritage of Ontario and has published two guidelines to assist in assessing cultural heritage resources as part of an environmental assessment: Guideline for Preparing the Cultural Heritage Resource Component of Environmental Assessments (1992), and Guidelines on the Man-Made Heritage Component of Environmental Assessments (1981). Accordingly, both guidelines have been utilized in this assessment process.

The Guidelines on the Man-Made Heritage Component of Environmental Assessments (Section 1.0) states the following:

> When speaking of man-made heritage we are concerned with the works of man and the effects of his activities in the environment rather than with movable human artifacts or those environments that are natural and completely undisturbed by man.

In addition, environment may be interpreted to include the combination and interrelationships of human artifacts with all other aspects of the physical environment, as well as with the social, economic and cultural conditions that influence the life of the people and communities in Ontario. The Guidelines on the Man-Made Heritage Component of Environmental Assessments distinguish between two basic ways of visually experiencing this heritage in the environment, namely as cultural landscapes and as cultural features.

Within this document, cultural landscapes are defined as the following (Section 1.0):

> The use and physical appearance of the land as we see it now is a result of man's activities over time in modifying pristine landscapes for his own purposes. A cultural landscape is perceived as a collection of individual man-made features into a whole. Urban cultural landscapes are sometimes given special names such as townscapes or streetscapes that describe various scales of perception from the general scene to the particular view. Cultural landscapes in the countryside are viewed in or adjacent to natural undisturbed landscapes, or waterscapes, and include such land uses as agriculture, mining, forestry, recreation, and transportation. Like urban cultural landscapes, they too may be perceived at various scales: as a large area of homogeneous character; or as an intermediate sized area of homogeneous character or a collection of settings such as a group of farms; or as a discrete example of specific landscape character, such as a single farm, or an individual village or hamlet.

A cultural feature is defined as the following (Section 1.0):

> ...an individual part of a cultural landscape that may be focused upon as part of a broader scene, or viewed independently. The term refers to any man-made or modified object in or on the land or underwater, such as buildings of various types, street furniture, engineering works, plantings and landscaping, archaeological sites, or a collection of such objects seen as a group because of close physical or social relationships.

The Transit Project Assessment Process and the Municipal Class Environmental Assessment process for Municipal Transit Projects also provide a series of relevant provisions and definitions. The Transit Project Assessment Process Guide (March 2009) includes provisions to consider whether the proposed project may have a negative impact on a matter of provincial importance, which is defined as follows:

> A matter of provincial importance that relates to the natural environment or has cultural heritage value or interest.

The Transit Project Assessment Process Guide further notes that identification and assessment of potentially impacted built heritage resources, cultural heritage landscapes, and protected properties are relevant in determining if a matter is of 'provincial importance' (March 2009:8). It should be noted that the Transit Project Assessment Process Guide acknowledges that a built heritage resource, cultural heritage landscape, or protected property does not necessarily need to meet criteria set out under Regulation 10/06 of the Ontario Heritage Act to be considered to be of 'provincial importance'.

The Municipal Class Environmental Assessment process for Municipal Transit Projects provides the following relevant definitions and provisions:

> Built heritage resource means one or more significant buildings, structures, monuments, installations or remains associated with architectural, cultural, social, political, economic, or military history and identified as being important to a community. These resources may be identified through designation or heritage conservation easement under the Ontario Heritage Act, or listed by local, provincial, or federal jurisdictions.
>
> Cultural heritage landscape means a defined geographical area of heritage significance that has been modified by human activities. Such an area is valued by a community, and is of significance to the understanding of the history of a people or place. Examples include farmscapes, historic settlements, parks, gardens, battlefields, mainstreets and neighbourhoods, cemeteries, trailways, and industrial complexes of cultural heritage value.
>
> Cultural heritage resources include built heritage, cultural heritage landscapes, and marine and other archaeological sites. The Ministry of Cultural is responsible for the administration of the Ontario Heritage Act and is responsible for determining policies, priorities and programs for the conservation, protection and preservation of Ontario's heritage, which includes cultural heritage landscapes, built heritage and archaeological resources.
>
> Significant cultural heritage and archaeological features should be avoided where possible and where they cannot be avoided, effects should be minimized where possible and every effort made to mitigate adverse impacts, in accordance with provincial and municipal policies and procedures.

Finally, the Planning Act (1990) and related Provincial Policy Statement (PPS) make a number of provisions relating to heritage conservation. One of the general purposes of the Planning Act is to integrate matters of provincial interest in provincial and municipal planning decisions. In order to inform all those involved in planning activities of the scope of these matters of provincial interest, Section 2 of the Planning Act provides an extensive listing. These matters of provincial interest shall be regarded when certain authorities, including the council of a municipality, carry out their responsibilities under the Act. One of these provincial interests is directly concerned with:

> 2.0 ...protecting cultural heritage and archaeological resources for their economic, environmental, and social benefits.

Part 4.5 of the PPS states that:

> Comprehensive, integrated and long-term planning is best achieved through municipal official plans. Municipal official plans shall identify provincial interests and set out appropriate land use designations and policies. Municipal official plans should also coordinate cross-boundary matters to complement the actions of other planning authorities and promote mutually beneficial solutions.
>
> Municipal official plans shall provide clear, reasonable and attainable policies to protect provincial interests and direct development to suitable areas.

In order to protect provincial interests, planning authorities shall keep their official plans up-to-date with this Provincial Policy Statement. The policies of this Provincial Policy Statement continue to apply after adoption and approval of a municipal official plan.

Those policies of particular relevance for the conservation of heritage features are contained in Section 2- Wise Use and Management of Resources, wherein Subsection 2.6 - Cultural Heritage and Archaeological Resources, makes the following provisions:

2.6.1 Significant built heritage resources and cultural heritage landscapes shall be conserved.

Significance is generally defined. It is assigned a specific meaning according to the subject matter or policy context, such as wetlands or ecologically important areas. With regard to cultural heritage and archaeology resources, resources of significance are those that are valued for the important contribution they make to our understanding of the history of a place, an event, or a people (PPS 2005).

Criteria for determining significance for the resources are recommended by the Province, but municipal approaches that achieve or exceed the same objective may also be used. While some significant resources may already be identified and inventoried by official sources, the significance of others can only be determined after evaluation (PPS 2005).

Accordingly, the foregoing guidelines and relevant policy statement were used to guide the scope and methodology of the cultural heritage assessment.

Municipal Policy Context

The City of Hamilton's Official Plan (2009) makes a number of provisions relevant to the preparation of cultural heritage assessments conducted within the Environmental Assessment framework. The following policy provisions were considered in the course of this assessment.

3.4.2.1 The City of Hamilton shall, in partnership with others where appropriate:

a) Protect and conserve the tangible cultural heritage resources of the City, including archaeological resources, built heritage resources, and cultural heritage landscapes for present and future generations.

b) Identify cultural heritage resources through a continuing process of inventory, survey, and evaluation, as a basis for the wise management of these resources.

c) Promote awareness and appreciation of the City's cultural heritage and encourage public and private stewardship of and custodial responsibility for the City's cultural heritage resources.

d) Avoid harmful disruption or disturbance of known archaeological sites or areas of archaeological potential.

e) Encourage the ongoing care of individual cultural heritage resources and the properties on which they are situated together with associated features and structures by property owners, and provide guidance on sound conservation practices.

f) Support the continuing use, reuse, care, and conservation of cultural heritage resources and properties by encouraging property owners to seek out and apply for funding sources available for conservation and restoration work.

g) Ensure the conservation and protection of cultural heritage resources in planning and development matters subject to the Planning Act either through appropriate planning and design measures or as conditions of development approvals.

h) Conserve the character of areas of cultural heritage significance, including designated heritage conservation districts and cultural heritage landscapes, by encouraging those land uses, development and site alteration activities that protect, maintain and enhance these areas within the City.

i) Use all relevant provincial legislation, particularly the provisions of the Ontario Heritage Act, the Planning Act, the Environmental Assessment Act, the Municipal Act, the Niagara Escarpment Planning and Development Act, the Cemeteries Act, the Greenbelt Act, the Places to Grow Act, and all related plans and strategies in order to appropriately manage, conserve and protect Hamilton's cultural heritage resources.

3.4.2.5 In addition to the provisions of the Ontario Heritage Act respecting demolition of cultural heritage properties contained in the Register, the City shall ensure that such properties shall be protected from harm in the carrying out of any undertaking subject to the Environmental Assessment Act or the Planning Act.

3.4.2.6 The City recognizes there may be cultural heritage properties that are not yet identified or included in the Register of Property of Cultural Heritage Value or Interest nor designated under the Ontario Heritage Act, but still may be of cultural heritage interest. These may be properties that have yet to be surveyed, or otherwise identified, or their significance and cultural heritage value has not been comprehensively evaluated but are still worthy of conservation.

3.4.2.7 The City shall ensure these non-designated and non-registered cultural heritage properties are identified, evaluated, and appropriately conserved through various legislated planning and assessment processes, including the Planning Act, the Environmental Assessment Act and the Cemeteries Act.

3.4.2.8 To ensure consistency in the identification and evaluation of these non-designated and non-registered cultural heritage properties, the City shall use the criteria for determining cultural heritage value or interest established by provincial regulation under the Ontario Heritage Act and set out in Policy B.3.4.2.9.

3.4.2.9 For consistency in all heritage conservation activity, the City shall use, and require the use by others, of the following criteria to assess and identify cultural heritage resources that may reside below or on real property:

a) prehistoric and historical associations with a theme of human history that is representative of cultural processes in the settlement, development, and use of land in the City;

b) prehistoric and historical associations with the life or activities of a person, group, institution, or organization that has made a significant contribution to the City;

c) architectural, engineering, landscape design, physical, craft, or artistic value;

d) scenic amenity with associated views and vistas that provide a recognizable sense of position or place;

e) contextual value in defining the historical, visual, scenic, physical, and functional character of an area; and,

f) landmark value.

3.4.2.10 Any property that fulfils one or more of the foregoing criteria listed in Policy B.3.4.2.9 shall be considered to possess cultural heritage value. The City may further refine these criteria and provide guidelines for their use as appropriate.

Data Collection

In order to provide an existing conditions inventory of above ground cultural heritage resources located within the B-Line LRT study corridor, the *Cultural Heritage Assessment Report: Rapid Transit Initiative, City of Hamilton* (ASI 2009) was reviewed to assess the results of data collection and to identify any potential gaps. As part of cultural heritage inventory compilation undertaken during the 2009 study, the following data sources were consulted: the City of Hamilton's *Inventory of Buildings of Architectural and/or Historical Interest, List of Designated Properties and Heritage Conservation Easements under the Ontario Heritage Act,* and the *City of Hamilton Register of Property of Cultural Heritage Value or Interest*. Subsequently, a field review was undertaken in January 2009 to compile an inventory of cultural heritage resources located 10 m on either side of the proposed alignments. The field review of the proposed corridor was scoped to identify heritage sensitive areas adjacent to the proposed transit corridor based on analysis of desk-top and field data.

This approach was developed and adopted based on the following information:

- Hundreds of properties had been previously identified on the City of Hamilton's heritage inventory, predominantly concentrated in the downtown core. Identification of such a high number of properties suggests that particular, potentially-continuous portions of road rights-of-way retain previously identified cultural heritage resources;
- A review of historic mapping revealed that a large portion of the area under assessment was densely subdivided for residential and commercial purposes during the nineteenth century and early twentieth century, and therefore it was determined that there would be a high potential for portions of the study corridor to retain many resources associated with this land use development; and
- The City of Hamilton provided ASI with a preliminary identification of cultural heritage landscapes within the B-Line study corridor. This document revealed that a preliminary assessment of cultural heritage resources within the study corridor determined that a wide and sizeable number of cultural heritage landscape are extant within the City of Hamilton. This document was used as a guide during the 2009 study, rather than as an official identification of cultural heritage landscapes in the city. This approach was adopted given that the document provided had not been officially adopted and given that it was predominantly generated based upon a review of historic mapping and did not incorporate the results of a field review. As such, the 2009 study's analysis of cultural heritage landscapes in the study corridor reflects the results of the city's preliminary analysis to some extent. In some cases, the 2009 study identified new cultural heritage landscapes or determined different boundaries for previously identified cultural heritage landscapes.

Several investigative criteria were utilized during the 2009 field review to appropriately identify cultural heritage resources. These investigative criteria were derived from provincial guidelines, definitions, and past experience. During the course of the assessment, a built structure or landscape is identified as a cultural heritage resource if it satisfies at least one criterion in one of the following three categories, or if it meets any of the criteria contained in Section 3.4.2.9 of the *City of Hamilton's Urban Official Plan* 2009; (described above):

Design/Physical Value:

- It is a rare, unique, representative or early example of a style, type, expression, material or construction method
- It displays a high degree of craftsmanship or artistic merit
- It demonstrates a high degree of technical or scientific achievement
- The site and/or structure retains original stylistic features and has not been irreversibly altered so as to destroy its integrity

Historical/Associative Value:

- It has a direct association with a theme, event, belief, person, activity, organization, or institution that is significant to: the City of Hamilton; the Province of Ontario; Canada; or the world heritage list
- It yields, or has the potential to yield, information that contributes to an understanding of: the City of Hamilton; the Province of Ontario, Canada; or the world heritage list
- It demonstrates or reflects the work or ideas of an architect, artist builder, designer, or theorist who is significant to: the City of Hamilton; the Province of Ontario; Canada; or the world heritage list

Contextual Value:

- It is important in defining, maintaining, or supporting the character of an area
- It is physically, functionally, visually, or historically linked to its surroundings
- It is a landmark
- It illustrates a significant phase in the development of the community or a major change or turning point in the community's history
- The landscape contains a structure other than a building (fencing, culvert, public art, statue, etc.) that is associated with the history or daily life of that area or region
- There is evidence of previous historic and/or existing agricultural practices (e.g., terracing, deforestation, complex water canalization, apple orchards, vineyards, etc.)

The 2009 field review resulted in the identification of numerous built heritage resources and cultural heritage landscapes containing hundreds of individual parcels. Identified features included the following:

- Properties designated under the Ontario Heritage Act;
- Individual properties that retain potential cultural heritage significance, based on architectural, historical or contextual associations, but are physically situated in a setting that lacks architectural, historical, and/or contextual fluidity. This category of resource generally consists of properties that contain cultural heritage value, but are no longer contextually associated with the surrounding built environment. This category consists of properties listed on the City of Hamilton's heritage inventory, listed on the City of Hamilton Register of Property of Cultural Heritage Value, and sites newly identified during the field review; and
- Cultural heritage landscapes that retain cultural heritage value. These features were identified based on an analysis of historic mapping and observations made during the field review, which included consideration of the extent to which groups of structures retained architectural and stylistic fluidity, scenic amenity, and contributed to the character of the area. This category of resources consists of properties listed on the City of Hamilton's heritage inventory, properties listed on the City of Hamilton Register of Property of Cultural Heritage Value, and sites newly identified during the field review. It should be further noted that the 2009 study analyzed identified cultural heritage landscapes to identify parcels within these landscapes that had been altered by recent modern infill development, such as gas stations, fast food operations, convenience stores, and/or parking lots. Identification of altered parcels within cultural heritage landscapes does not suggest that the landscape is fractured and does not necessarily serve as an indicator of the integrity of the cultural landscape. This analysis was conducted for the purposes of identifying parcels adjacent to the proposed alignment that would be more suitable for property acquisitions and/or encroachment activities associated with the development of the B-Line LRT corridor.

Built Heritage Resource and Cultural Heritage Landscape Assessment

This section provides the results of historical research and a description of above ground cultural heritage resources that may be affected by the proposed B-Line LRT corridor along portions of Main Street and King Street in the City of Hamilton. Historically, the study corridors traverse the Townships of Ancaster, Barton and Saltfleet. The B-Line LRT alignment along Main Street and King Street follows original historic thoroughfares that connected the Hamilton settlement with surrounding communities.

Township Survey and Settlement

Wentworth County was once part of the Gore District that covered an area of over a half a million acres in western Ontario. When the district was broken up into counties in 1850, Wentworth and Halton were united as a single municipality. This continued until 1854 when they were separated. Prior to the formation of the Regional Municipality of Hamilton-Wentworth in 1974, Wentworth County was composed of the seven townships: Ancaster, Barton, Beverly, Binbrook, Flamborough East and Flamborough West, Glanford and Saltfleet. The City of Hamilton was the administrative centre for the County.

Township of Barton

The Township of Barton was first surveyed by Augustus Jones in 1791. The first settlers in the township were United Empire Loyalists and disbanded troops, mainly men who had served in Butler's Rangers during the American Revolutionary War. The earliest families to settle within the township included those of Land, Ryckman, Horning, Rymal, Terryberry and Markle (Smith 1846:8; Mika 1977:143).

One writer described the Head of the Lake and Burlington Bay in a geographical account of Upper Canada published in the early nineteenth century, but made no particular mention of Barton Township. Settlement was slow up until the time of the War of 1812, perhaps due to the early importance of the nearby town of Dundas. By 1815, it is said that the township contained just 102 families. By 1823, however, the township contained three sawmills and a gristmill. By 1841, the township population had increased to 1434, and it contained five sawmills and one grist mill. In 1846, the township was described as "well settled" and under cultivation (Boulton 1805:48-49; Smith 1846:8; Mika 1977:143).

Township of Ancaster

The land within the Township of Ancaster was acquired by the British from the Mississaugas in 1784. The first township survey was undertaken in 1793, and the first legal settlers occupied their land holdings two years later. Ancaster was initially settled by disbanded soldiers, mainly Butler's Rangers, and other Loyalists following the end of the American Revolutionary War. In 1805, Boulton noted that this township contained both excellent and indifferent soils. By the 1840s, the township was noted for its fine farms (Boulton 1805:79; Smith 1846:6; Armstrong 1985:141; Rayburn 1997:11).

Township of Saltfleet

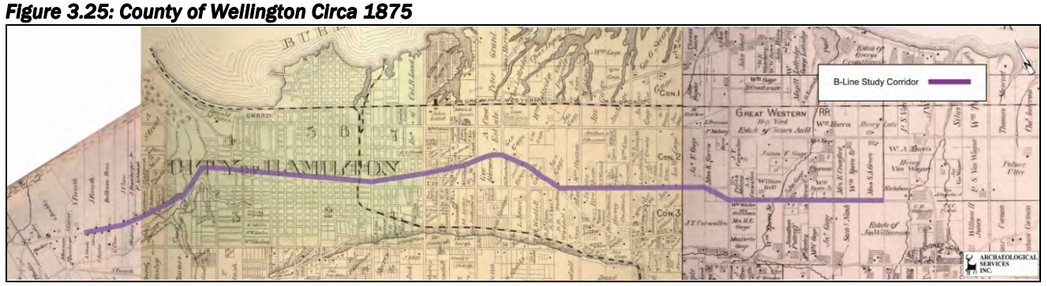
The land within the Township of Saltfleet was acquired by the British from the Mississaugas in 1784. The first township survey was undertaken in 1791, and the first legal settlers occupied their land holdings in the same year. The township is said to have been named after a place in Lincolnshire, England. Saltfleet was initially settled by disbanded soldiers, mainly Butler's Rangers, and other Loyalists following the end of the American Revolutionary War. In 1805, Boulton described Saltfleet as "a township claiming no particular observation." By the 1840s, the township was noted for its excellent land and well-cultivated farms (Boulton 1805:87; Smith 1846:163; Armstrong 1985:147; Rayburn 1997:305).

City of Hamilton

Hamilton was surveyed and established by 1820 through the combined efforts of George Hamilton, James Durand and Nathaniel Hughson. The first court house and jail, a log-and-frame building, was constructed in 1817, and was replaced with a stone building in 1827/28.

Figure 3.25 shows the B-Line corridor in relation to the 1875 definition of the County of Wellington and its constituent townships.

Figure 3.25: County of Wellington Circa 1875



The settlement became a port in 1827, at which point Hamilton became the commercial centre of the District of Gore, in addition to serving as its administrative centre (Gentilcore 1987: 101-3). Hamilton was incorporated as a City in 1846.

Historical Land Use Summary

The following summary is based on research conducted at the Local History and Archives at the Hamilton Public Library and the Lloyd Reed Map Library at McMaster University.

Main Street and King Street have been important thoroughfares through the City of Hamilton from the nineteenth century through to the present. In particular, King Street has played an important role in the historical development of the City of Hamilton.

King Street is among the older thoroughfares through Hamilton, given that it was an established trail prior to the survey and settlement of Hamilton in the early nineteenth century. King Street is the site of the first store in Hamilton, a general store that was opened in 1814 by William Shelton. By the time that Hamilton became a City in 1846, a large number of commercial buildings along King Street were under construction. A streetcar line was established in the latter half of the nineteenth century along King Street, which was replaced in 1922 by a double set of streetcar tracks, and the street was widened and repaved from James Street to Bay Street. The rest of King Street, from Bay Street to Dundurn Street, was widened a year later. In 1949, it was proposed that the streetcar tracks along King Street West should be removed; and in 1951, the streetcar tracks from King Street East were removed and the road was widened and repaved (Hamilton Public Library, King Street Scrapbook V.1).

For the purposes of this study, a selection of historic mapping capturing the growth and development of Hamilton's built environment in the nineteenth and twentieth centuries was reviewed and analyzed. This selection includes:

- The 1875 Illustrated *Historical Atlas of the County of Wentworth, Ontario* (Page and Smith) provides detailed maps of the seven wards that compose the City of Hamilton, as well as maps for each of the three townships that the City occupies (Figure 3.25);
- The 1876 Bird's *Eye View of the City of Hamilton* (H. Brosius) and the 1893 *Bird's Eye View of the City of Hamilton* (Toronto Lithographing Company) each illustrate the buildings and streets in the City of Hamilton (Appendix B.5) and,
- The 1898 *Fire Insurance Plan of the City of Hamilton* (C. Goad) and the 1911/1914 *Fire Insurance Plan of the City of Hamilton* (C. Goad) provide a detailed record of the buildings located in the City of Hamilton in the late nineteenth and early twentieth century. The plans contain information such as building heights, building types or uses, construction materials and municipal addresses (reviewed at the Lloyd Reed Map Library).

Existing Conditions

The results of previously conducted above ground cultural heritage data presented in the Cultural Heritage Assessment Report: Rapid Transit Initiative, City of Hamilton (ASI 2009) were reviewed in the context of the preferred route for the B-Line LRT corridor to identify and address any gaps in data collection. The preferred route for the B-Line LRT corridor is proposed along Main Street West, between McMaster University and Highway 403, with a crossing at Highway 403 to carry the alignment to King Street West. The preferred route travels easterly from Highway 403 along King Street West to the Delta and subsequently along Main Street East and Queenston Road to Centennial Parkway. To conduct a gap analysis of previously compiled cultural heritage resource inventory data, the following tasks were undertaken:

- Consultation with Heritage Planning staff at the City of Hamilton to confirm if data contained in the following documents underwent any changes or revisions since completion of the Cultural Heritage Assessment Report: Rapid Transit Initiative, City of Hamilton (ASI 2009): City of Hamilton's *Inventory of Buildings of Architectural and/or Historical Interest*, *List of Designated Properties and Heritage Conservation Easements under the Ontario Heritage Act*, and *City of Hamilton Register of Property of Cultural Heritage Value or Interest.*
- Review of available *Ontario Heritage Act* designation by-laws contained in the City of Hamilton document entitled *Reasons for Designation under Part IV of the Ontario Heritage Act*, to determine if any protected properties retain potential provincial heritage significance;
- Review and analysis of the preferred route for the B-Line LRT corridor to identify and address any gaps in field review assessment activities undertaken as part of the 2009 study.
- Updating of inventory data presented in the 2009 study to reflect the preferred route for the B-Line LRT corridor and to incorporate results of additional field review and data collection activities as appropriate and where needed.
- Review and analysis of the preferred route for the B-Line LRT in the context of updated inventory data to identify general constraints and opportunities of the undertaking on identified cultural heritage resources. This assessment was undertaken through the identification of potential direct and indirect impacts to identified cultural heritage resources.

Sections *Main Street and Queenston Road* and *King Street* (below) present an updated description of the built heritage resources and cultural heritage landscapes located adjacent to the preferred route for the B-Line LRT corridor, including a tabular summary of all features identified. Main Street and Queenston Road below, first presents an existing conditions description of cultural heritage resources located adjacent to Main Street, between McMaster University and Highway 403 and adjacent to Main Street/Queenston Road between the Delta and Centennial Parkway, while the section titled *King Street* provides an existing conditions description of cultural heritage resources located adjacent to King Street, between Highway 403 and the Delta. The section titled *Constraints Assessment* (below) presents general constraints of the undertaking on inventoried cultural heritage resources.

Main Street and Queenston Road

McMaster University to Highway 403

Historic mapping from 1875 illustrates that this portion of Main Street was largely agricultural land and located outside of the boundaries of the City of Hamilton (Figure 3.25). Historic mapping from 1876, 1893, 1898 and 1911 did not extend far enough to the west to include this part of Main Street West.

A review of the Ainslie Wood Westdale Background Report (City of Hamilton, 2002) indicates that this area is divided into eight neighbourhoods (Appendix B.5), of which the study corridor traverses through three, which are described as follows:

- Cootes Paradise "A" – contains McMaster University, which was relocated from Toronto to land north of Main Street in the 1930s. The portion of the university campus that is located along Main Street is of more recent development and well set back from the road right-of-way;
- Ainslie Wood East – this area features a combination of commercial and residential structures fronting on to the south side of Main Street, and generally well set back from the road right-of-way. The commercial buildings are concentrated between Kingsmount Street and Leland Street and across from the McMaster University campus, and range in construction dates from the 1940s to the present. A school and church are located between Leland Street and Emerson Street, both of which are well set back from the right-of-way. Residential buildings, ranging from early 1930s and 1940s detached housing to more recent apartment buildings, are concentrated between Bowman Street and Dow Avenue (Plate 1); and
- Westdale South – the built environment located south of Main Street towards Highway 403 is comprised of recent commercial and light industrial development. The north side of Main Street contains a combination of commercial and residential development, much of which is associated with the early twentieth century planned suburb of Westdale (Plates 2 and 3). Westdale is identified as a cultural heritage landscape in the secondary plan and features a radial road pattern, with Main Street located along the southern part of the development. The late twentieth century commercial buildings located between just west of Cline Avenue South to Newton Avenue, and the predominantly residential construction located east of Cline Avenue to Longwood Road are of interest given their association with Westdale. This section contains portions that are set closer to the current Main Street road right-of-way. Continuing eastward beyond Westdale Secondary School towards Highway 403, the north side of Main Street features more recent developments that are set back from the road right-of-way.

The results of the 2009 field review confirm that this portion of the study corridor contains a combination of commercial and residential developments that range from early twentieth century construction to the present. Much of the corridor is fractured by modern infill that is typically set back from the road right-of-way, while some of the remaining early twentieth century commercial and residential buildings are in closer proximity to the current Main Street alignment.

A total of six cultural heritage landscapes were identified, three of which are associated with the Westdale subdivision development (CHL 7 - 8 and CHL 9).

Plate 1: Southeast corner of Main Street and Gary Avenue, showing example of residential commercial developments.

Plate 2: East along Main Street towards Paisley Avenue, showing proximity of dwellings to Main Street right-of-way.

Plate 3: Northwest corner of Main Street and Paradise Road, showing Westdale Secondary School.

Plate 4: View of circa 1930s commercial streetscape along Main Street East from Kensington Avenue to Edgemont Street showing Delta High School in the foreground.

Delta to Centennial Parkway

Historic mapping collected between 1876 and 1914 did not provide coverage of this portion of the study corridor. However, the results of the field review confirmed that the western portion of this area, from Kensington Avenue to Edgemont Street, retains a commercial landscape that dates to the 1920s-1930s, which includes predominantly two storey brick structures. A circa 1930s school and church are also included within this commercial landscape (Plate 4). This landscape is only intact on the north side of Main Street, and therefore has been confined to this portion of the road right-of-way. A separate cultural heritage landscape was also identified within this larger, commercial landscape, which includes a former water line that dates to the mid nineteenth century. East of Edgemont Street, circa 1950s commercial structures and a small number of post-war residences line the Main Street East of right-of-way. Although of interest from an age point of view, the structures in this area were not assessed as a residential landscape because there was neither a high degree of congruency among the built forms nor a significant level of scenic amenity in this area. One individual resource was identified between Edgemont Street and Queenston Road: a circa 1930's school at Graham Avenue. This property has been previously identified by the City of Hamilton. An additional brick structure was identified at the Main Street and Queenston Road intersection given that it appears to have served an industrial-based function and is located prominently along and in close proximity to the road right-of-way (Plate 5). East of the Queenston Road and Main Street intersection, the built form along Queenston Road largely consists of modern infill, retail strip development. No features of potential heritage interest were identified in this area, with the exception of the Red Hill Valley and Creek (Plate 6).

In total, five cultural heritage resources were identified within this portion of the Main Street East corridor (CHL 1 – CHL 3, BHR 1 and BHR 18).

Plate 5: View of likely mid twentieth century industrial/factory-related, brick building located in close proximity to the road right-of-way.

Plate 6: View of Red Hill Valley, looking west along Queenston Road.

Plate 7: View of the nineteenth century commercial streetscape on the north side of King Street West, west of Bay Street.

Plate 8: View of mixed nineteenth century residential and commercial streetscape at the southeast corner of the Locke Street and King Street West.

King Street

Highway 403 to James Street

Historic mapping indicates that in the late nineteenth century, King Street between James Street and Caroline Street was comprised of two, three and four storey, densely packed buildings that held a range of commercial shops and industrial operations. The properties along King Street between Caroline Street and Dundurn Street were mostly smaller scale residences that were situated on larger, more spacious lots. Many of the buildings were located in close proximity to the King Street road right-of-way. A number of small scale commercial buildings were located at the Locke Street and King Street intersection, across from Victoria Park.

According to the 1875 Atlas, King Street West originally curved south after Dundurn Street to intersect with Main Street West where Highway 403 is currently located. During the construction of the highway through this area in the mid twentieth century, King Street was realigned and now travels across to Paradise Road, then south to Main Street West. Historic mapping indicates that this area was already surveyed; however, it was not likely settled until the early twentieth century in conjunction with the Westdale subdivision development. In 1875, Paradise Road marked the western boundary of the City of Hamilton.

The results of the 2009 field review confirmed that there are portions of King Street West that have retained their nineteenth century and early twentieth century streetscapes, and are consequently also set in close proximity to the road right-of-way. Fine examples of late nineteenth century commercial/residential structures are located on the north side of King Street just west of Bay Street, between Caroline Street and Hess Street, and on either side of King Street between Locke Street and Ray Street. There are a number of early twentieth century commercial buildings and apartments identified between Hess Street and Queen Street, and along King Street and Paradise Road west of Highway 403. However, the late twentieth century construction of Jackson Square and other modern buildings along King Street between Bay Street and James Street has completely altered the nineteenth streetscape (Plate 7).

In total, nineteen cultural heritage resources were identified along King Street West, between Highway 403 and James Street (BHR 4 – 17 and CHL 10 – 14), of which one has been designated under the Ontario Heritage Act (BHR 17). Examples include: Victoria Park, site of the Crystal Palace in the nineteenth century (Plate 8); a number of remnant nineteenth century split commercial/residential streetscapes (Plates 9 and 10); twentieth century residential and commercial streetscapes; a number of early twentieth century landmarks, including the Scottish Rite Castle/Masonic Centre and Mount St. Joseph (Plate 11); and nineteenth and twentieth century churches, including the All Saints Anglican Church and Cathedral of Christ the King (Plate 12).

Plate 9: Looking east along King Street West from Bay Street at twentieth century development.

Plate 10: View of southeast corner of Victoria Park, site of the former Crystal Palace.

Plate 11: View of Mount St. Joseph at the northwest corner of King Street West and Queen Street.

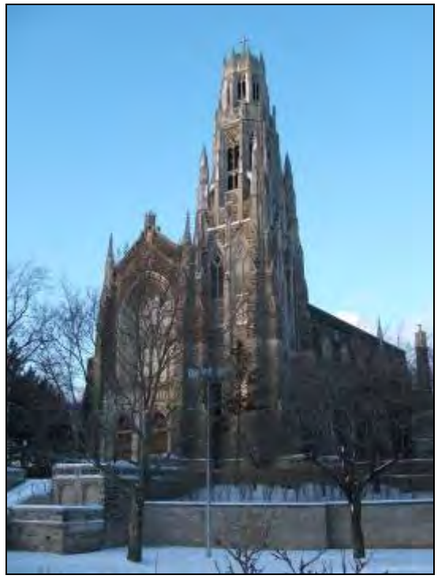


Plate 12: View of Cathedral of Christ the King located on the promontory overlooking King Street West at Highway 403.

James Street to Wellington Street

Bird's eye view historic mapping from 1876 and 1893 (Appendix B.5) revealed that by the mid to late nineteenth century, properties along King Street, in the downtown core, had been densely subdivided and a wide array of commercial buildings had been constructed. A review of fire insurance plans from 1898 further confirmed that King Street, between James Street and Wellington Street, served as a major hub of business and service-related activity at this time. These plans confirm that by the turn of the twentieth century King Street was lined with densely packed two and three storey brick buildings that housed commercial enterprises combined with residential space. The 1898 plan indicates that nearly every structure between James and Wellington was used as a store. Some specific businesses are illustrated, including: drug stores, merchant space, department and clothing stores, bicycle shops, and office space. The 1914 fire insurance plans provide increased detail regarding the types and variety of businesses that lined the King Street corridor between James Street and Wellington Street. Densely packed two and three storey brick buildings continue to be shown in the 1914 plan.

The results of the 2009 field review confirmed that this portion of King Street East is highly intact, retaining a fluid, late nineteenth century commercial streetscape consisting of two and three storey brick buildings (Plate 14). Extant buildings in this area, referred to as the International Village, continue to be used for commercial activities and undoubtedly correspond to the built form that emerged in this area at the end of the nineteenth century (Plate 13). Nearly every property parcel located in this area has been previously identified on the City of Hamilton's heritage inventory. Within this late nineteenth century, commercial cultural landscape, two additional cultural landscapes were identified, including Gore Park (plate 15), which is indicated on 1876 mapping, and the former Ferguson Rail Line. Both of these features have been previously identified by the City of Hamilton.

In total, six cultural heritage resources have been identified in this portion of the study corridor (BHR 2, BHR 19, BHR 21, CHL 15, CHL 16, and CHL 19), of which three have been designated under the Ontario Heritage Act (BHR 2, BHR 19 and BHR 21).

Plate 13: View of northwest corner of Hughson and King Street, showing one of four designated properties in this portion of the corridor. This structure corresponds to the Thomas C. Watkins Department Store illustrated on an 1898 fire insurance plan.

Plate 14: View of typical three storey brick buildings that form the late nineteenth century commercial streetscape between James Street and Wellington.

Plate 15: View of Gore Park, located in the centre of the King Street East right-of-way, between James Street and Hughson Street. This park dates back to at least 1867.

Wellington Street to the Delta

A review of bird's eye view mapping from 1876 (Appendix B.5) reveals that portions of King Street East, east of Wellington Street, had not yet undergone dense subdivision during the 1870s. A handful of residences were concentrated between Wellington Street and East Avenue at this time and, as such, residential development did not substantially emerge east of Wellington Street until the 1890s and into the early twentieth century. Mapping from 1893 and 1914 confirms that during this time, lands between Wellington and Wentworth Streets underwent substantial residential subdivision. These plans illustrate that two and a half and three storey brick buildings lined the King Street road right-of-way. A review of 1914 fire insurance plans confirms that further eastward, from Sanford Avenue to Barnsdale Road, a relatively small amount of two and a half storey brick buildings were spaced out along this portion of King Street during this time period. From Barnsdale Road eastward to the Delta, 1914 fire insurance plans revealed that very few buildings were extant during this time period. Generally, the results of a review of historic mapping suggest that land use development along King Street East, between Wellington Street and the Delta, emerged in three broad phases. Between the 1890s and 1910s, Wellington to Wentworth Streets underwent residential subdivision. Portions of King Street, between Sandford Avenue and Barnsdale Avenue, generally underwent residential subdivision between 1910 and 1920. Portions of King Street, east of Barnsdale Avenue to the Delta, likely experienced residential subdivision during the 1920s.

The results of the 2009 field review confirmed that a large portion of the King Street East corridor, between Wellington Street and the Delta, retains a wide number of cultural heritage resources set in close proximity to the road right-of-way. This portion of the study corridor was determined to retain three large cultural heritage landscapes that frame the King Street East right-of-way. A late nineteenth century mixed residential and commercial streetscape was identified between Wellington and Wentworth Streets (Plates 16-17) (CHL 18). This cultural landscape is mostly intact along the north side of the road, between West Avenue and Emerald Street and on the south side of the road, from Tisdale Street to Wentworth Street. Plate 18 illustrates a representative example of the features located in this streetscape.

A transitional urban streetscape was identified between Sanford Avenue and Barnsdale Avenue (Plate 19) (CHL 20). This cultural landscape was identified as a transitional residential feature because it retains numerous residential buildings and some commercial structures that date from the early twentieth century up to the 1950s. This portion of the King Street East corridor represents layers of twentieth century development and provides a nuanced and tangible illustration of the architectural trends and modern demands that influenced urban city planning (Plates 20-21).

A third residential urban streetscape was identified from Barnsdale Avenue to Belview Avenue (CHL 21). This landscape consists of predominantly circa 1920s – 1930s residential structures set in close proximity to the current road right-of-way (Plate 22). This cultural landscape is most intact along the south side of King Street East. Plate 23 illustrates a representative example of the features located in this streetscape. Two additional cultural heritage landscapes were also identified within these larger landscape features (Plates 24-25). Wellington Park, located at Wellington and King Street and the former Toronto Hamilton & Buffalo Railway line, which cuts across King Street East at East Bend Avenue, have both been previously identified by the City of Hamilton as cultural heritage landscapes of interest (CHL 17 and CHL 5). Table 3.17 presents a listing of the built heritage (BHR) and cultural heritage landscapes located adjacent to the preferred route for the B-Line LRT

Plate 16: North side of King Street East, westward from Wentworth showing late nineteenth century streetscape.

Plate 17: View of south side of King Street East, at Grant Street, showing late nineteenth century/early twentieth century residential streetscape.

Plate 18: Example of cluster of properties located within late nineteenth century residential-commercial streetscape. View of north side of King Street East, between Tisdale Street and Steven Street.

Plate 19: View of circa 1920-1940s residential structures located within the transitional urban streetscape. View of south side of King Street East, east of Sherman Avenue.

Plate 20: Good example of transitional streetscape, showing circa 1950s structures built around an earlier twentieth century residence. View of north side of King Street East, east of Sherman Avenue.

Plate 21: View of circa 1920s three storey commercial buildings located within the transitional streetscape. North side of King Street East, west at Holton Street.

Plate 24: View of King Street East, looking west towards Wellington Street. Wellington Park is featured on the right.

Plate 25: View of former Toronto-Hamilton & Buffalo Railway Line (current CP Rail spur line), bisecting the King Street right-of-way in the distance. Looking west from Dunsmure Road.

Plate 22: View of typical circa 1920s-1940s residential streetscape identified between Barnesdale Avenue and Belview Avenue. Looking west along King Street East from just west of the Delta.

Plate 23: Property located within the 1920s residential landscape. View of north side of King Street East, west at Balsam Avenue.

Table 3.17: Identified Built Heritage Resources (BHR) and Cultural Heritage Landscapes (CHL) Adjacent to the Preferred Route for the B-Line Light Rail Transit Corridor

New Feature #	Previous Feature # (ASI 2009)	Location	Feature Type/Name	Age	Description/Comments
BHR 1	BHR 1	1284 Main Street East	School	1930s	Identified in the City of Hamilton's Inventory of Buildings of Architectural and/or Historical Interest.
BHR 2	BHR 29	35-41 King Street East	The Right House	1890	Designated under the Part IV of the Ontario Heritage Act.
BHR 3	BHR 32	100 Main Street West	Hamilton Wentworth District School Board Building	Mid twentieth century	Identified in the City of Hamilton's Inventory of Buildings of Architectural and/or Historical Interest.
BHR 4	BHR 36	621 King Street West	Residence	Nineteenth century	Identified during field review.
BHR 5	BHR 37	619 King Street West	Residence	Nineteenth century	Identified during field review.
BHR 6	BHR 38	581 King Street West	Residence	Nineteenth century	Identified in the City of Hamilton's Inventory of Buildings of Architectural and/or Historical Interest.
BHR 7	BHR 39	577-579 King Street West	Residence	Nineteenth century	Identified in the City of Hamilton's Inventory of Buildings of Architectural and/or Historical Interest.
BHR 8	BHR 40	393 King Street West	Residence	Nineteenth century	Identified in the City of Hamilton's Inventory of Buildings of Architectural and/or Historical Interest.
BHR 9	BHR 41	2 Ray Street	Residence	Nineteenth century	Identified during field review.
BHR 10	BHR 42	374 King Street West	Commercial	Nineteenth century	Identified during field review.
BHR 11	BHR 43	378 King Street West	Commercial	Early twentieth century	Identified in the City of Hamilton's Inventory of Buildings of Architectural and/or Historical Interest.
BHR 12	BHR 44	366/368 King Street West	Residence	Nineteenth century	Identified in the City of Hamilton's Inventory of Buildings of Architectural and/or Historical Interest.
BHR 13	BHR 45	363 King Street West	The Grand Lodge A.E. and A.M. of Canada.	1960	Identified during field review.
BHR 14	BHR 46	354 King Street West	Mount St. Joseph	Early twentieth century	Identified during field review.
BHR 15	BHR 47	4 Queen Street South	The Scottish Rite of Freemasonry: Castle (house) and Cathedral	1895/ 1923	Identified in the City of Hamilton's Inventory of Buildings of Architectural and/or Historical Interest.
BHR 16	BHR 48	15 Queen Street South	All Saints Anglican Church	1872	Identified in the City of Hamilton's Inventory of Buildings of Architectural and/or Historical Interest and Listed on the City of Hamilton Register of Property of Cultural Heritage Value
BHR 17	BHR 49	276-278 King Street West	Commercial	1905	Designated under the Part IV of the Ontario Heritage Act.
BHR 18	BHR 51	1620 Main Street East	Industrial/Factory	Twentieth century	Identified during field review.
BHR 19	BHR 59	66-70 King Street East	Victoria Hall	1887	Designated under the Part IV of the Ontario Heritage Act.
BHR 20	BHR 60	45 Main Street East	John Sopinka Courthouse	1935	Designated under the Part IV of the Ontario Heritage Act; A review of the property's designation by-law suggests that it likely retains provincial significance.
BHR 21	BHR 61	320 King Street East	Commercial	1892	Designated under the Part IV of the Ontario Heritage Act.
BHR 22	N/A	Strathearne Avenue and Main Street East	Traffic Circle	Ca. 1950	Identified during the field review and based on review of twwntieth century topographic mapping.
CHL 1	CHL 1	Red Hill Valley	Waterscape	N/a	Identified in the City of Hamilton's Inventory of Cultural Heritage Landscapes.
CHL 2	CHL 2	Water Line	Public infrastructure element	1857-1860	Identified by the City of Hamilton.
CHL 3	CHL 3	Main Street East; Kensington Avenue to Edgemont Street; North side of Main Street	Commercial streetscape	Ca. 1920 - 1930	Identified by the City of Hamilton/field review.

New Feature #	Previous Feature # (ASI 2009)	Location	Feature Type/Name	Age	Description/Comments
CHL 4	CHL 5	Gage Park	Designed landscape/public park	1922	Identified in the City of Hamilton's Inventory of Cultural Heritage Landscapes and Listed on the City of Hamilton Register of Property of Cultural Heritage Value
CHL 5	CHL 6	Toronto, Hamilton, and Buffalo Railway	Railscape	1890s	Identified by the City of Hamilton/field review.
CHL 6	CHL 11	Toronto, Hamilton and Brantford Railway	Railscape	c.1890s	Identified by the City of Hamilton/field review.
CHL 7	CHL 12	North side of Main Street West, west of Cline Avenue to east of Paisley Avenue South	Part of Westdale Original Subdivision	1920s-1950s	Identified by the City of Hamilton as a Cultural Heritage Landscape in the Ainslie Wood Westdale Secondary Plan.
CHL 8	CHL 13	South side of Main Street West, Bowman Street to east of Cline Avenue South	Part of Ainslie Wood East Neighbourhood	1930s-1950s	Identified during field review and on the Ainslie Wood Westdale Secondary Plan.
CHL 9	CHL 17	King Street West and Main Street West Streetscape, Longwood Road South north along Paradise Road South, and east to Highway 403	Part of Westdale South Neighbourhood.	Early twentieth century	Identified during field review and on the Ainslie Wood Westdale Secondary Plan.
CHL 10	CHL 18	174 King Street West	Cathedral of Christ the King	1931	Identified in the City of Hamilton's Inventory of Buildings of Architectural and/or Historical Interest.
CHL 11	CHL 19	King Street West between Strathcona Avenue to Locke Street	Victoria Park - site of the Crystal Palace	Nineteenth century	Identified in the City of Hamilton's Inventory of Cultural Heritage Landscapes.
CHL 12	CHL 20	King Street West Streetscape, Locke to just past Pearl.	Split residential/commercial streetscape	Nineteenth and early twentieth century	Identified during field review.
CHL 13	CHL 21	King Street West Streetscape, Queen Street to Caroline Street	Split residential/commercial streetscape	Nineteenth and early twentieth century	Identified during field review.
CHL 14	CHL 22	King Street West Streetscape at Bay Street	Commercial streetscape	Nineteenth century	Identified during field review.
CHL 15	CHL 23	King Street East, James to Wellington	Commercial streetscape	Ca. 187os-1900	Identified during field review/Identified by the City of Hamilton; One property located within this landscape (82 King Street East) and is listed on the City of Hamilton Register of Property of Cultural Heritage Value
CHL 16	CHL 24	Gore Park	Designed landscape/Public Park	Ca. 1870s	Identified in the City of Hamilton's Inventory of Cultural Heritage Landscapes.
CHL 17	CHL 25	Wellington Park	Designed Landscape/Public Park	Late nineteenth century	Identified in the City of Hamilton's Inventory of Cultural Heritage Landscapes and Listed on the City of Hamilton Register of Property of Cultural Heritage Value
CHL 18	CHL 26	King Street East Streetscape, Wellington to Wentworth	Split residential/commercial streetscape	Late nineteenth century	Identified by the City of Hamilton/field review.
CHL 19	CHL 27	Ferguson Rail Line	Railscape	Ca.1920s	Identified by the City of Hamilton/field review.
CHL 20	CHL 28	King Street East; Sanford Avenue to Barnesdale	Transitional residential and commercial landscape	Ca. 1900 - 1950	Identified by the City of Hamilton/field review.
CHL 21	CHL 29	King Street East Street, Barnesdale Avenue to Belview Avenue	Residential	Ca. 1920-1930	Identified by the City of Hamilton/field review.
CHL 22	CHL 35	Main Street East Streetscape, Burris Street to the Delta	Split commercial and residential, transitional streetscape	Ca. 1890 – 1930	Identified by the City of Hamilton/field review

Constraints Assessment

The preferred route for the B-Line LRT corridor was analyzed to identify preliminary constraints of the undertaking on inventoried cultural heritage resources for the purposes of identifying high risk areas requiring careful consideration during subsequent design phases for the proposed undertaking. To identify preliminary constraints of the preferred route for the B-Line LRT corridor on cultural heritage resources, data contained in the Hamilton Rapid Transit Preliminary Design and Feasibility Study: B-Line Design Workbook 1 (2010, Steer Davies Gleave; Proposed alignment maps dated July 30, 2010 and October 20, 2010) was reviewed against updated cultural heritage resource feature mapping. As part of this analysis, data collected during the 2009 study that identified vacant and/or altered lots located within cultural heritage landscapes was considered (See Appendix B.5). Specifically, the proposed right-of-way and station locations were analyzed to identify potential impacts of the undertaking on known cultural heritage resources for the purposes of identifying high level constraints and opportunities. Two types of impacts were considered during this analysis:

- Indirect impacts on cultural heritage resources through the introduction of visual, audible, or atmospheric elements. Indirect impacts were identified in areas where track and platform infrastructure is proposed adjacent to identified cultural heritage resources.
- Direct impacts through potential encroachment onto properties resulting in potential isolation, premature deterioration through adverse vibration effects, and/or other construction-related operations, and/or removal of cultural heritage resources. Direct impacts were identified in cases where the proposed track alignment is illustrated to encroach upon properties containing cultural heritage resources.

The results of this analysis are provided in Tables 3.18 to 3.20. It should also be noted that specific direct impacts, including destruction and/or encroachment, were not identified between Wellington Street and the Queenston Traffic Circle, given that this portion of the alignment was not fully defined at that time. Table 3.21 lists all known cultural heritage resources located in this area.

Table 3.18: Visual and Audible Impacts Due to Introduction of Rail Infrastructure: McMaster University to Centennial Parkway

Designated Under the Ontario Heritage Act		Identified by the City of Hamilton[7]/Identified During the Field Review (2009)	
CHL	BHR	CHL	BHR
N/A	BHR 2	CHL 1	BHR 1
	BHR 17	CHL 2	BHR 3
	BHR 21	CHL 3	BHR 4
		CHL 5	BHR 5
		CHL 6	BHR 6
		CHL 7	BHR 7
		CHL 8	BHR 8
		CHL 9	BHR 9
		CHL 10	BHR 10
		CHL 11	BHR 11
		CHL 12	BHR 12
		CHL 13	BHR 13
		CHL 14	BHR 14
		CHL 15	BHR 15
		CHL 16	BHR 16
		CHL 17	BHR 18
		CHL 18	
		CHL 19	
		CHL 20	
		CHL 21	

Table 3.19: Visual and Audible Impacts Due to Introduction of Stops and Platforms: McMaster University to Centennial Parkway

Designated under the Ontario Heritage Act		Identified by the City of Hamilton[8]/Identified during field review (2009)	
CHL	BHR	CHL	BHR
N/A	BHR 17	CHL 2 (North side of King, east of Ottawa Street; Ottawa Stop)	BHR 16 (Queen Street Stop)
		CHL 3 (North side of King, East and west of Ottawa Street; Ottawa Stop)	
		CHL 9 (Between Longwood and Paradise;Longwood Stop)	
		CHL 13 (Between Queen and Hess; Queen Street Stop)	
		CHL 15 (North and south sides of King between Mary Street and Walnut Street; Walnut Stop)	
		CHL 17 (First Place Stop)	
		CHL 18 (North and south sides of King Street between Ashley Street and Wentworth Street; Wentworth Stop)	
		CHL 20 (North and south sides of King between Sherman and Garfield; Sherman Stop)	
		CHL 21 (North and south sides of King between Balsam and Connaught; Scott Park Stop)	
		CHL 21 (south side of King, between 1266 King and the Delta; Delta Stop)	BHR 18 (Queenston Circle Stop)

[7] Includes data contained in the City of Hamilton Register of Property of Cultural Heritage Value, Inventory of Cultural Heritage Landscapes, Inventory of Buildings of Architectural/Historical Interest, and collected as part of a preliminary analysis of cultural heritage landscapes located within the City of Hamilton, prepared by the City of Hamilton and provided to ASI in 2009

[8] Includes data contained in the City of Hamilton Register of Property of Cultural Heritage Value, Inventory of Cultural Heritage Landscapes, Inventory of Buildings of Architectural/Historical Interest, and collected as part of a preliminary analysis of cultural heritage landscapes located within the City of Hamilton, prepared by the City of Hamilton and provided to ASI in 2009.

Table 3.20: Destruction and/or Encroachment Impacts:
McMaster University to Wellington Street; Queenston Traffic Circle to Centennial Parkway

Designated Under the Ontario Heritage Act		Identified by the City Of Hamilton[9]/Identified During Field Review (2009)	
CHL	**BHR**	**CHL**	**BHR**
N/A	N/A	CHL 9 (Between Longwood and Paradise)	BHR 16 (Queen Street Stop)
		CHL 15 (Walnut Stop – North and south sides of King Street between Mary and Walnut)	
		CHL 16 (Proposed alignment along south side of King shows tree removals along the north side of Gore Park)	

Table 3.21 Known Cultural Heritage Resources Located Along King Street Between Wellington Street and the Queenston Traffic Circle

Designated under the Ontario Heritage Act		Identified by the City of Hamilton[10]/Identified during Field Review (2009)	
CHL	**BHR**	**CHL**	**BHR**
N/A	N/A	CHL 2	BHR 1
		CHL 3	
		CHL 5	
		CHL 17	
		CHL 18	
		CHL 20	
		CHL 21	

Preferred alignment data for the B-Line LRT corridor, as illustrated in Design Workbook 1, indicated that the proposed undertaking will result in the introduction of visual, audible, and atmospheric elements adjacent to identified cultural heritage resources. Introduction of rail infrastructure along some portions of the Main Street and King Street corridors represents a new intervention that has the potential to alter the setting of cultural heritage resources, particularly when proposed adjacent to cultural heritage landscapes and in cases where stop platforms are proposed adjacent to cultural heritage resources, including:

- Longwood platform/stop
- Queen platform/stop
- Walnut Street platform/stop
- First Place platform/stop
- Wentworth Street platform/stop

9 Includes data contained in the City of Hamilton Register of Property of Cultural Heritage Value, Inventory of Cultural Heritage Landscapes, Inventory of Buildings of Architectural/Historical Interest, and collected as part of a preliminary analysis of cultural heritage landscapes located within the City of Hamilton, prepared by the City of Hamilton and provided to ASI in 2009.

10 Includes data contained in the City of Hamilton Register of Property of Cultural Heritage Value, Inventory of Cultural Heritage Landscapes, Inventory of Buildings of Architectural/Historical Interest, and collected as part of a preliminary analysis of cultural heritage landscapes located within the City of Hamilton, prepared by the City of Hamilton and provided to ASI in 2009.

- Sherman Avenue platform/stop
- Scott Park platform/stop
- Delta platform/stop
- Ottawa platform/stop
- Queenston Circle platform/stop

Alignment data also suggested that the proposed undertaking has the potential to encroach onto properties associated with identified cultural heritage resources in a small number of cases between McMaster University and Wellington Street (See Table 3.20.)

Conclusions

A review of historic mapping from 1876, 1893, 1898, and 1914, combined with the updated results of data collection and a field review conducted in 2009, confirmed that wide portions of the study corridor retain numerous cultural heritage resources. Generally, resources are concentrated in the downtown core, from east of the Highway 403 through to the Delta. In the eastern and western extremities of the study corridor under assessment, fewer cultural heritage resources were identified. The following provides a summary of inventory findings:

In summary, the Main Street portion of the B-Line LRT study corridor contains:

- One cultural heritage landscape listed on the City of Hamilton Register of Property of Cultural Heritage Value, which includes one park (CHL 4);
- Two cultural heritage landscapes that are identified on the City of Hamilton's Inventory of Cultural Heritage Landscapes, which include one waterscape (CHL 1) and one park (CHL 4);
- One cultural heritage landscape identified in the Ainslie Wood Westdale Secondary Plan (CHL 7);
- One built heritage resource, identified as a school (BHR 1), which was previously identified in the City of Hamilton's Inventory of Buildings of Architectural and/or Historical Interest;
- One built heritage resource that consists of an industrial structure (BHR 18), which was identified during the field review;
- Four cultural heritage landscapes that were either identified during the 2009 field review or during preliminary cultural heritage landscape analysis conducted by the City of Hamilton, which include one water line (CHL 2), one commercial streetscape (CHL 3), and two residential neighbourhoods (CHL 8 and CHL 9).

In summary, the King Street portion of the B-Line study corridor contains:

- Five properties designated under Part IV of the Ontario Heritage Act, which consist of residential (BHR 2), commercial (BHR 17, BHR 19, and BHR 21) and institutional (BHR 20) structures. A review of the designation by-law for BHR 20, also known as the John Sopinka Courthouse, suggests that this property may retain provincial significance;
- Three resources that are listed on the City of Hamilton Register of Properties of Cultural Heritage Value, which include one park (CHL 16), one former hotel (82 King Street East located within CHL 15), and one church (BHR 16);
- Three cultural heritage landscapes that are identified on the City of Hamilton's Inventory of Cultural Heritage Landscapes, which include parks (CHL 11, CHL 16, and CHL 17);
- Eight built heritage resources that were previously identified in the City of Hamilton's Inventory of Buildings of Architectural and/or Historical Interest, which consist of educational (BHR 3), residential (BHR 6, BHR 7, BHR 8, and BHR 12), commercial (BHR 11), and religious (BHR 15 and BHR 16) structures;
- One cultural heritage landscape that was previously identified in the City of Hamilton's Inventory of Buildings of Architectural and/or Historical Interest, which consists of a church complex (CHL 10).
- Six built heritage resources that were identified during the 2009 field review, which consist of residential (BHR 4, BHR 5, BHR 9), commercial (BHR 10), and miscellaneous structures (BHR 13 and BHR 14); and
- Eleven cultural heritage landscapes that were either identified during the 2009 field review or during preliminary cultural heritage landscape analysis conducted by the City of Hamilton, which include five commercial/residential

streetscapes (CHL 12, CHL 13, CHL 18, CHL 20, and CHL 22), four commercial streetscapes (CHL 14 and CHL 15), one residential streetscape (CHL 21), and three railscapes (CHL 5, CHL 6 and CHL 19).

Analysis of the preferred route for the B-Line LRT corridor confirmed that the undertaking presents the following general constraints and opportunities that should be considered and addressed during subsequent refinement and development of detailed functional planning and route analysis:

- Constraint # 1: Large numbers of individual built heritage resources and cultural heritage landscapes are set in close proximity to existing road rights-of-way. Conceptual designs should be developed to avoid direct impacts to all known identified cultural heritage resources through encroachment, which has the potential to result in isolation of the resource, premature deterioration of the resource due to vibration and/or construction related impacts, and/or removal of the resource.

- Opportunity #1: Property acquisitions in relation to identified cultural heritage resources should be minimized and planned in a manner that conserves the heritage significance of the subject resource and maintains the viability of the resource as a useable structure or landscape (i.e. vehicular and pedestrian access is maintained and noise is minimized). It should also be noted that in cases where property acquisitions are not proposed, but resources are located in close proximity to proposed road rights-of-way, vibration studies should be undertaken to confirm that adjacent cultural heritage resources will not be subject to premature deterioration during construction and operation of the proposed rapid transit infrastructure.

  It should be further noted that in cases where property acquisitions in relation to cultural heritage resources are proposed and this impact is expected to result in destruction and/or adverse alteration of the resource, this constraint has the potential to be mitigated by planning property acquisitions in areas where no cultural heritage resources have been identified. If property requirements are proposed within cultural heritage landscape areas, it is recommended that directly impacted areas be confined to parcels that have been identified as altered (See Appendix B.5).

- Constraint #2: The introduction of rail infrastructure along portions of Main Street and King Street and adjacent to cultural heritage resources has the potential to alter the setting of cultural heritage resources and modify the existing urban realm.

Opportunity #2: The wide and diverse number of cultural heritage resources located along the Main Street and King Street corridors provide opportunities to capitalize on and celebrate these assets in the design of stop infrastructure, minimizing the extent to which introduction of rail infrastructure will adversely alter the setting of cultural heritage resources. Given that numerous stop platforms are proposed adjacent to cultural heritage resources, design principles and branding strategies should be developed in consideration of their scenic amenity, contextual values, and character. In this sense, there are opportunities to sympathetically integrate the proposed rail infrastructure into the existing fabric of heritage resources through the design and branding of stop infrastructure, platforms, signage, shelters, and seating, resulting in a transit undertaking that compliments existing cultural heritage resources. The proposed infrastructure also has the potential to present new opportunities for conserving and interpreting cultural heritage resources located within the corridor. The proposed B-Line, and its removal of major traffic movements from Main Street and King Street, has the potential to improve the urban realm of the area. Increasing numbers of cyclists and pedestrians within the corridor has the potential to help foster an awareness and appreciation of the various cultural heritage resources and cultural heritage landscapes located throughout the corridor. Some measures that may be considered as part of the proposed undertaking include introduction of improved sidewalk lighting and sightlines and introduction of public art. These strategies have the potential to present new opportunities for conserving, interpreting and integrating existing cultural heritage resources into the urban realm.

3.4.2 Archaeological Resources

Introduction

An update of the Stage 1 Archaeological Assessment for the Rapid Transit Feasibility Study prepared in February 2009 was conducted as part of this environmental assessment. This segment of the report presents the results of the Stage 1 background research and field review, and makes several recommendations. In summary, having reviewed the results of the 2009 work in 2010, it was concluded that no significant information gaps exist. Since the assessment included areas within 2 km of the segments of Main Street and King Street within which the B-Line corridors were previously proposed and, since the King Street and Main Street corridors are relatively close together relative to that 2 km study area, the 2008 findings have not been significantly modified to suit the refined (current) B-Line alignment.

Background Research

The Stage 1 archaeological assessment of the study corridor was conducted in accordance with the Ontario Heritage Act (2005) and the Ontario Ministry of Culture's (MCL) draft Standards and Guidelines for Consultant Archaeologists (MCL 2006). A Stage 1 archaeological assessment involves research to describe the known and potential archaeological resources within the vicinity of a study corridor. Such an assessment incorporates a review of previous archaeological research, physiography, and land use history. Background research was completed to identify any archaeological sites in the study corridor and to assess their archaeological potential.

Definitions

For the purposes of this EA, the Ontario Heritage Act (OHA) and the Provincial Policy Statement (PPS) provide a number of useful definitions that will be applied throughout this report:

- Archaeological resource…[i]ncludes artifacts, archaeological sites, and marine archaeological sites. The identification and evaluation of such resources are based upon archaeological fieldwork undertaken in accordance with the OHA (MMAH 2005: 28);
- Area of archaeological potential…means areas with the likelihood to contain archaeological resources. Criteria for determining archaeological potential are established by the Province, but municipal approaches with the same objectives may also be used. Archaeological potential is confirmed through archaeological fieldwork undertaken in accordance with the OHA (MMAH 2005: 28);
- Archaeological sites…means any property that contains an artifact or any physical evidence of past human use or activity that is of cultural heritage value or interest…(OHA, O.Reg. 170/04, s.1); and
- Significant…means in regard to cultural heritage and archaeology, resources that are valued for the important contribution they make to our understanding of the history of a place, an event, or a people. Criteria for determining significance…are recommended by the Province, but municipal approaches that achieve or exceed the same objective may also be used. While some significant resources may already be identified and inventoried by official sources, the significance of others can only be determined after evaluation (MMAH 2005: 36).

Previous Archaeological Research

In order that an inventory of archaeological resources could be compiled for the study corridor, three sources of information were consulted: the site record forms for registered sites housed at the MCL; published and unpublished documentary sources; and the files of ASI.

In Ontario, information concerning archaeological sites is stored in the Ontario Archaeological Sites Database (OASD) maintained by the MCL. This database contains archaeological sites registered within the Borden system. Under the Borden system, Canada has been divided into grid blocks based on latitude and longitude. A Borden block is approximately 13 km east to west, and approximately 18.5 km north to south. Each Borden block is referenced by a four-letter designator, and sites within a block are numbered sequentially as they are found. The study corridor under review is located in Borden blocks AhGw and AhGx.

According to the OASD (email communication, Robert von Bitter, MCL Data Coordinator, January 5, 2009), twenty (20) archaeological sites have been registered within 2 km of the study corridor (Table 3.22). Three of these sites are located within 100 m of the B-Line study corridor.

Table 3. 22: List of Registered Sites Within a 2 Km Radius of the Study Corridor

Borden #	Site Name	Cultural Affiliation	Site Type	Researcher
AhGw-1	King's Forest Park	Aboriginal – Woodland	Campsite	W. Fox 1961 ASI 2007
AhGw-2	Pergentile	Aboriginal – Woodland	Village	W. Fox 1962
AhGw-31	Spera	Aboriginal – Archaic	Campsite	W. Fox 1977
AhGw-66	Nash Farm East	Aboriginal – Archaic	Undetermined	R. Michael 1986
AhGw-67	Nash Farm West	Aboriginal – Archaic	Undetermined	R. Michael 1986
AhGw-98	Battlefield Creek	Aboriginal	Lithic Scatter	ASI 1992, 1993
AhGw-101	Stoney Creek Monument	Aboriginal – Woodland Euro-Canadian	Lithic Scatter Undetermined	L. Gibbs 1990
AhGw-117	Thomas Kennady 1	Aboriginal	Campsite	MHCI 1996
AhGw-118	Thomas Kennady 2	Aboriginal	Campsite	MHCI 1996
AhGw-119	Thomas Kennady 3	Euro-Canadian	Undetermined	MHCI 1996
AhGw-120	Bertie Gage	Aboriginal	Campsite	MHCI 1996
AhGw-124	Creekbend	Aboriginal	Campsite	ASI 1996
AhGw-130	Spera 2	Aboriginal	Lithic Scatter	ASI 1998, 2001
AhGx-2	Campus	Aboriginal – Archaic	Undetermined	D. Stothers 1968
AhGx-28	**Frederick Ashbaugh Redware Pot**	**Euro-Canadian**	**Kiln**	**R Michael 1983**
AhGx-224	Whitehern	Aboriginal Euro-Canadian	Undetermined Homestead	ASI 1994
AhGx-278	Ofield Road 1	Aboriginal – Woodland	Campsite	MPA 1991
AhGx-279	Ofield Road 2	Aboriginal	Isolated Find	MPA 1991
AhGx-280	**Coldwater Creek**	**Aboriginal – Woodland Euro-Canadian**	**Campsite Undetermined**	**MPA 1991**
AhGx-286	Whitney Avenue	Aboriginal	Campsite	MPA 1991
Unknown	Unknown	Unknown	Unknown	Historic Horizon n.d. Archeoworks n.d.

*** Sites in bold** are within 100 m of the study corridor

The Frederick Ashbaugh Redware Pot site, AhGx-28, is located on the southeast corner of Newtown Avenue/Arkell Street, just north of Main Street. The site was discovered when a hole for a pool was dug and consisted of a large scatter of redware ceramics. The site provided new evidence for Ontario redware technology in the form of kiln furniture, different from any other thus far recovered. No structural evidence of a kiln or other buildings pre-dating the present structure were found, however, the 1816 tax assessment roll indicted the owner as a potter (Michael 1985).

The City of Hamilton (personal communication, Joseph Muller, Cultural Heritage Planner, March 4, 2009) has confirmed the presence of an unregistered site located at 398 King Street West. Historic Horizon Inc. conducted the initial Stage 1 assessment of the property, and Archeoworks Inc. conducted the Stage 2-4 assessment. The site encompasses the western half of the property, and the northern half of the site has been mitigated through excavation. Further work is being conducted on the southern half of the site.

The presence of Aboriginal artifacts in almost every Euro-Canadian site that has been investigated in the City of Hamilton indicates that these urban areas, although developed in the 19th and early 20th century, often retain remnants of the former intense Aboriginal occupation of this region.

Physiography and Assessment of Aboriginal Archaeological Potential

The study corridor is situated within the Iroquois Plain physiographic region of southern Ontario (Chapman and Putnam 1984). The Iroquois Plain region is characteristically flat and was formed by lacustrine deposits laid down by the inundation of Lake Iroquois, a body of water that existed during the late Pleistocene. This region extends from the Trent River, around the western part of Lake Ontario, to the Niagara River, spanning a distance of 305 km (Chapman and Putnam, 1984:190). The old shorelines of Lake Iroquois include cliffs, bars, beaches and boulder pavements. The old sandbars in this region are good aquifers that supply water to farms and villages. The gravel bars are quarried for road and building material, while the clays of the old lake bed have been used for the manufacture of bricks (Chapman and Putnam, 1984:196).

A portion of the study corridor along King Street (between Queen Street and Dundurn Street) and Main Street (between Locke Street and Bay Street) transgresses a portion of the Iroquois Beach Ridge. This significant rise of land is a remnant glacial feature of Lake Iroquois. The ridge marks the location of the former Lake Iroquois shoreline and was formed approximately 12,000 years ago and constitutes a prominent physiographic feature within the City of Hamilton.

This narrow strip is the most densely inhabited area because of its proximity to Lake Ontario and its climatic influences, as well as its favourable soil conditions.

Potable water is the single most important resource necessary for any extended human occupation or settlement. Since water sources have remained relatively stable in south central Ontario after the Pleistocene era, proximity to water can be regarded as a useful index for the evaluation of archaeological site potential. Indeed, distance from water has been one of the most commonly used variables for predictive modeling of site location.

The MCL's draft Standards and Guidelines for Consultant Archaeologists (2006: Unit 1e 5–7, 10) stipulates that undisturbed land within 300 m of a primary water source (lakeshore, river, large creek, etc.), undisturbed land within 200 m of a secondary water source (stream, spring, marsh, swamp, etc.), as well as undisturbed land within 300 m of an ancient water source (as indicated by remnant beaches, shore cliffs, terraces, abandoned river channel features, etc.), are considered to have archaeological potential. Coldwater Creek, Chedoke Creek, and Red Hill Creek all bisect the B-Line study corridor.

Therefore, depending on the degree of previous land disturbance, it may be concluded that there is potential for the recovery of Aboriginal remains within the study corridor.

Euro-Canadian Land Use History

Historically, the study corridors traverse across the Townships of Ancaster, Barton and Saltfleet. Each of the current road ROWs follows original historic thoroughfares that connected the Hamilton settlement with the communities to the west and east.

Wentworth County was once part of the Gore District that covered an area of over a half a million acres in western Ontario. When the district was broken up into counties in 1850, Wentworth and Halton were united as a single municipality. This continued until 1854 when they were separated. Prior to the formation of the Regional Municipality of Hamilton-Wentworth in 1974, Wentworth County was composed of the seven townships: Ancaster, Barton, Beverly, Binbrook, Flamborough East and Flamborough West, Glanford and Saltfleet. The City of Hamilton was the county seat.

The Township of Barton was first surveyed by Augustus Jones in 1791. The first settlers in the township were United Empire Loyalists and disbanded troops, mainly men who had served in Butler's Rangers during the American Revolutionary War. The earliest families to settle within the township included those of Land, Ryckman, Horning, Rymal, Terryberry and Markle (Smith 1846:8; Mika 1977:143).

One writer described the Head of the Lake and Burlington Bay in a geographical account of Upper Canada published in the early nineteenth century, but made no particular mention of Barton Township. Settlement was slow up until the time of the War of 1812, perhaps due to the early importance of the nearby town of Dundas. By 1815, it is said that the Township contained just 102 families. By 1823, however, the township contained three sawmills and a gristmill. By 1841, the

township population had increased to 1,434, and it contained five saw mills and one grist mill. In 1846, the township was described as "well settled" and under cultivation (Boulton 1805:48-49; Smith 1846:8; Mika 1977:143).

The land within the Township of Ancaster was acquired by the British from the Mississaugas in 1784. The first township survey was undertaken in 1793, and the first legal settlers occupied their land holdings two years later. The township is said to have been named after a town in Lincolnshire, England. Ancaster was initially settled by disbanded soldiers, mainly Butler's Rangers, and other Loyalists following the end of the American Revolutionary War. In 1805, Boulton noted that this township contained both excellent and indifferent soils. By the 1840s, the township was noted for its fine farms (Boulton 1805:79; Smith 1846:6; Armstrong 1985:141; Rayburn 1997:11).

The land within the Township of Saltfleet was acquired by the British from the Mississaugas in 1784. The first township survey was undertaken in 1791, and the first legal settlers occupied their land holdings in the same year. The township is said to have been named after a place in Lincolnshire, England. Saltfleet was initially settled by disbanded soldiers, mainly Butler's Rangers, and other Loyalists following the end of the American Revolutionary War. In 1805, Boulton described Saltfleet as "a township claiming no particular observation." By the 1840s, the township was noted for its excellent land and well-cultivated farms (Boulton 1805:87; Smith 1846:163; Armstrong 1985:147; Rayburn 1997:305).

The City of Hamilton was surveyed and established by 1820 through the combined efforts of George Hamilton, James Durand and Nathaniel Hughson. The first court house and jail, a log-and-frame building, was constructed in 1817, which was replaced with a stone building in 1827/28. The settlement became a port in 1827, at which point Hamilton became the commercial centre of the District of Gore, in addition to serving as its administrative centre (Gentilcore 1987: 101-3). Hamilton was incorporated as a City in 1846.

Assessment of Euro-Canadian Archaeological Potential

The 1875 Illustrated Historical Atlas of the County of Wentworth, Ontario was reviewed to determine the potential for the presence of historical archaeological remains within the study corridor during the nineteenth and early twentieth centuries (Figure 3.25).

As mentioned above, the study corridors traverse across the Townships of Ancaster, Barton and Saltfleet.

From west to east, the Main Street corridor travels through Lots 54 to 61, Concession I, in the Township of Ancaster; then into the Township of Barton (and the City of Hamilton) through Lot 21 in Concession III, and Lots 20 to 1 along the road allowance between Concession II and III. Finally, the Main Street corridor continues into the Township of Saltfleet along the road allowance between Concessions II and III across Lots 32 to 23.

From west to east, the King Street corridor extends northerly along the road allowance between Lots 20 and 21 in Concession 3, Township of Barton, from Main Street, then easterly through Lots 20 to Lot 5 in Concession 2, at which point it intersects Main Street and continues southeasterly and out of the study corridor.

From south to north, the James Street study corridor begins at the intersection of James Street and Main Street in the City of Hamilton and travels along the road allowance between Lots 14 and 15 towards Burlington Bay, through Concessions 1 and 2.

The atlas depicts several property owners/residents within the study corridor. Details of property owners/residents and historic features within or adjacent to the study corridor are listed, where possible, in Appendix B.6. It should be noted, however, that not all features of interest were mapped systematically in the Ontario series of historical atlases, given that they were financed by subscription, and subscribers were given preference with regard to the level of detail provided on the maps. Moreover, not every feature of interest would have been within the scope of the atlas.

The Cultural Heritage Assessment Report for the Rapid Transit Initiative further documents the land use development patterns along the study corridor using historic mapping from 1875, 1876, 1893, 1898 and 1911 (ASI 2009).

For the Euro-Canadian period, the majority of early nineteenth century homesteads (i.e., those which are arguably the most potentially significant resources and whose locations are rarely recorded on nineteenth century maps) are likely to be captured by the basic proximity to the water model outlined above, since these occupations were subject to similar environmental constraints. An added factor, however, is the development of the network of concession roads and railroads through the course of the nineteenth century. These transportation routes frequently influenced the siting of homesteads and businesses. Accordingly, undisturbed lands within 100 m of an early settlement road, Main, King, and James Streets, are also considered to have potential for the presence of Euro-Canadian archaeological sites.

Therefore, depending on the degree of previous land disturbance, it may be concluded that there is potential for the recovery of Euro-Canadian cultural material within the study corridor.

Determination of Archaeological Potential

The MCL's draft Standards and Guidelines for Consultant Archaeologists cites eleven criteria that indicate where archaeological resources are most likely to be found (2006: Unit 1C 10). Archaeological potential is confirmed when one or more features of archaeological potential are present.

Based on ASI's background research and consultation with the City of Hamilton's Archaeology Management Plan (provided by Joseph Muller, City of Hamilton, Cultural Heritage Planner, February 4, 2009), the study corridor meets nine of the eleven criteria used for determining archaeological potential:

- Known archaeological sites within 250 m;
- Primary water source within 300 m, or secondary water source within 200 m;
- Pockets of sandy soil in a clay or rocky area;
- Distinctive land formations;
- Associated with food or scarce resource harvest areas;
- Indications of early Euro-Canadian settlement;
- Associated with historic transportation routes;
- Contains property designated under the Ontario Heritage Act; and
- Local knowledge/documentary evidence.

These criteria characterize the study corridor as having both Aboriginal and Euro-Canadian archaeological potential.

Field Review

A field review of the study corridor was conducted by Peter Carruthers (P163), ASI, on January 14 and January 21, 2009, in order to confirm the assessment of archaeological site potential and to determine the degree to which development and landscape alterations may have affected that potential. Weather conditions during the January 14 field assessment were sunny and -14°C, and during the January 21 field assessment were overcast and -1°C. Field observations have been compiled onto maps of the study corridor (Appendix B.6).

ROWs can be divided into two areas: the disturbed ROW, and ROW lands beyond the disturbed ROW. The typically disturbed ROW extends outwards from either side of the centerline of the traveled lanes. The disturbed ROW includes the traveled lanes and shoulders, and extends to the toe of the fill slope, the top of the cut slope, or the outside edge of the drainage ditch, whichever is furthest from the centerline. Subsurface disturbance within these lands may be considered extreme and pervasive, negating any archaeological potential for such lands.

ROW construction disturbance may be found to extend beyond the typical disturbed ROW area. Such ROW disturbances generally include additional grading, cutting and filling, additional drainage ditching, watercourse alteration or channelization, servicing, removals, intensive landscaping, and heavy construction traffic. Areas beyond the typically disturbed ROW generally require archaeological assessment in order to determine archaeological potential relative to the type or scale of disturbances that may have occurred in these zones.

Within the study corridor, the Main Street segment of the project starts at Cootes Drive as a two-way street and switches over to a one-way street (Eastbound) at Paradise Road up to the Delta where it once again switches over to a two-way street into Stoney Creek. King Street starts at McMaster Medical Centre as a two-way street and passes through Westdale and then at Paradise Road South, King Street switches over to a one-way street (Westbound) right through the city's core up to the Delta, where King and Main Streets intersect. Main Street switches over to a two-way street at the Queenston Road traffic circle and continues as such to the B-Line eastern terminus at Eastgate Square;

The field review of the study corridor proceeded from west to east, starting at University Plaza.

Main Street Corridor

Along Main Street, the ROW has been heavily disturbed by typical road construction, exhibiting grading, utility installation, and landscaping, and by residential and commercial developments (Appendix B.6 Plates 2, 4-5, 9, 11-12, 14-15, 17, 19, 22-25, 30, 32, 34, 36). Due to the extent of previous disturbance, the Main Street ROW does not exhibit archaeological site potential, and no further archaeological assessment is required within the disturbed ROW (Appendix B.6 Figures 4-1 to 4-25: non-highlighted areas).

Beyond the Main Street disturbed ROW, a few areas have exhibited minimal disturbances. Areas with archaeological potential are summarized in Table 3.23.

Table 3.23: Areas Containing Archaeological Potential Along Main Street

Location	Plate Reference	Figure Reference	Rationale
South side of Main Street, east of Leland Street (Canadian Martyrs Catholic Elementary School grounds)	10	4-5	Within 100 m of an early settlement road (Main Street)
North side of Main Street, west of Dalewood Avenue	N/A	4-6	Within 100 m of an early settlement road (Main Street)
North side of Main Street, west of Haddon	N/A	4-6	Within 100 m of an early settlement road (Main Street)
South side of Main Street, between Cline Avenue South and Dow Avenue	N/A	4-6	Within 300 m of a primary water source (Chedoke Creek) and 100 m of an early settlement road (Main Street)
Northwest corner of Main Street and Paradise Road south	13	4-8	Within 300 m of a primary water source (Chedoke Creek) and 100 m of an early settlement road (Main Street/Paradise Road)
Southeast corner of Main Street and King Street	N/A	4-19	Within 100 m of an early settlement road (Main/King Streets)
North side of Main Street, between Balmoral Avenue and Ottawa Street (Memorial High School)	29	4-19	Within 100 m of an early settlement road (Main Street/Balmoral Avenue)
Southeast corner of Main Street and Ottawa Street (Vacant Lot)	31	4-19	Within 100 m of an early settlement road (Main Street)
Northwest corner of Main Street and Edgemont (Vacant Lot)	N/A	4-19	Within 100 m of an early settlement road (Main Street)
South side of Main Street, between Graham Avenue and Wexford Avenue (Delta Collegiate)	33	4-20	Within 100 m of an early settlement road (Main Street)
South side of Main Street, west of Berry Avenue (Montgomery Park)	35	4-21, 4-22	Within 100 m of an early settlement road (Main Street)
Southeast corner of Queenston Road and Craigroyston Road	N/A	4-21, 4-22	Within 100 m of an early settlement road (Main Street)
Both sides of Queenston Road, between Isabel Avenue and Parkdale Avenue	37, 38	4-22	Within 100 m of an early settlement road (Queenston Road)
Both sides of Queenston Road, within the Red Hill Creek valley	39, 40	4-22	Within 300 m of a primary water source (Red Hill Creek) and 100 m of an early settlement road (Queenston Road)

The areas listed in Table 3.22 have remained relatively undisturbed, and they exhibit archaeological site potential. Should the proposed project encroach upon undisturbed land with archaeological potential beyond the disturbed ROW, a Stage 2 assessment should be conducted (Appendix B.6 Figures 4-1 to 4-25: areas marked in green that are adjacent to the current B-Line corridor).

In addition to the 14 areas listed in Table 3.23, one area of additional archaeological interest should be noted (personal communication, Peter Topalovic, City of Hamilton, February 27, 2009). A pipeline, dating to ca. 1858-1859, extends from the pump house at Woodward Avenue to the Main Street and Ottawa Street intersection (Appendix B.6 Plate 30, Figure 4-19). As an archaeological feature, it comprises an 18-inch diameter cast-iron water pipe at a depth of approximately 8 feet below the surface that passes through the ROW at Ottawa Street. The pipeline has also been captured as a cultural heritage landscape feature (ASI 2009). Should the proposed project impact the location of this archaeological resource by deep trenching, further archaeological investigations will be required.

King Street Corridor

The King Street ROW has been heavily disturbed by typical road construction, exhibiting grading, utility installation, and landscaping, and by residential and commercial developments (Appendix B.6 Plates 42-45, 53, 56, 67). Due to the extent of previous disturbance, the King Street ROW does not exhibit archaeological site potential, and no further archaeological assessment is required within the disturbed ROW (Appendix B.6 Figures 4-1 to 4-25: non-highlighted areas).

Beyond the King Street disturbed ROW, a few areas have exhibited minimal disturbances. Areas with archaeological potential are summarized in Table 3.24.

Table 3.24: Areas Containing Archaeological Potential Along King Street

Location	Plate Reference	Figure Reference	Rationale
West side of Paradise Road, between Main Street and King Street	41	4-8	Within 300 m of a primary water source (Chedoke Creek) and 100 m of an early settlement road (Main Street/Paradise Rd)
Victoria Park	46	4-10	Within 100 m of an early settlement road (King/Locke Streets)
North and south side of King Street, between Locke Street and Pearl Street (Vacant Lots)	N/A	4-10	Within 100 m of an early settlement road (King/Locke Streets)
North side of King Street, between Pearl Street and Ray Street	47	4-10	Within 100 m of an early settlement road (King/Pearl/Ray Streets)
South side of King, between Pearl Street and Ray Street	48	4-10	Within 100 m of an early settlement road (King Street)
Northeast corner of King Street and Ray Street	N/A	4-10	Within 100 m of an early settlement road (King/Ray Streets)
Scottish Rite Club	49	4-11	Early Euro-Canadian building and within 100 m of an early settlement road (King/Ray Streets)
Northwest corner of King Street and Queen Street	N/A	4-11	Within 100 m of an early settlement road (King/Queen Streets)
All Saints Anglican church	50	4-11	Early Euro-Canadian building and within 100 m of an early settlement road (King/Queen Streets).
Southeast corner of King Street and Hess Street (Vacant Lot)	51	4-11	Within 100 m of an early settlement road (King/Hess Streets)
North side of King Street, between Caroline Street and Bay Street (Vacant Lot)	52	4-11	Within 100 m of an early settlement road (King Street)
South side of King Street, between Caroline Street and Bay Street (2 Vacant Lots)	52	4-11	Within 100 m of an early settlement road (King Street)
Southeast corner of King Street and Bay Street (Vacant Lot)	N/A	4-11	Within 100 m of an early settlement road (King/Bay Streets)
Gore Park	54	4-12	Within 100 m of an early settlement road (King/Bay Streets)
Southwest corner of King Street and Catharine Street (Vacant Lot)	54	4-13	Within 100 m of an early settlement road (King/ Catharine Streets)
South side of King Street, between Mary Street and Walnut Street (Vacant Lot)	55	4-13	Within 100 m of an early settlement road (King Street)
Southwest corner of King Street and Wellington Street (Vacant Lot)	N/A	4-13	Within 100 m of an early settlement road (King/ Wellington Streets)
North side of King Street between Wellington Street and West Ave	57	4-14	Within 100 m of an early settlement road (King/ Wellington Streets)
St. Patrick's Church	58	4-14	Within 100 m of an early settlement road (King Street/ Victoria/East Avenue)
Southeast corner of King Street and Emerald Street (Vacant Lot)	59	4-14	Within 100 m of an early settlement road (King/Emerald Streets)
North side of King Street, between Tisdale Street and Steven Street (Vacant Lot)	60	4-14	Within 100 m of an early settlement road (King Street)
Northeast corner of King Street and Wentworth Street (Vacant Lot)	61	4-15	Within 100 m of an early settlement road (King Street)
North side of King Street between Wentworth Street and Sanford Avenue	62	4-15	Within 100 m of an early settlement road (King/ Wentworth Streets)
Southwest corner of King Street and Sanford Avenue (Vacant Lot)	63	4-15	Within 100 m of an early settlement road (King/ Wentworth Streets)
Southeast corner of King Street and Sanford Avenue (Vacant Lot)	63	4-15	Within 100 m of an early settlement road (King Street)
South side of King Street, between Fairleigh Avenue and Holton Avenue (Vacant Lot)	64	4-16	Within 100 m of an early settlement road (King Street)
Northeast corner of King Street and Sherman Avenue (Vacant Lot)	N/A	4-16	Within 100 m of an early settlement road (King Street)
Northeast corner of King Street and Garfield Avenue (Vacant Lot)	65	4-16, 4-17	Within 100 m of an early settlement road (King Street)
Northeast corner of King Street and Melrose Avenue, within the recreational complex	66	4-17	Within 100 m of an early settlement road (King Street)
Southwest corner of King Street and Dunsmure Road	68	4-18	Within 100 m of an early settlement road (King Street)
Southeast corner of King Street and Hilda Avenue	N/A	4-18	Within 100 m of an early settlement road (King Street)
Northwest corner of King Street and Belmont Avenue (Vacant Lot)	N/A	4-19	Within 100 m of an early settlement road (King Street)
Northeast corner of King Street and Belmont Avenue (Vacant Lot)	69	4-19	Within 100 m of an early settlement road (King Street)

The 33 areas listed in Table 3.23 total 33,533 m^2 in size and have remained relatively undisturbed, and they exhibit archaeological site potential. Should the proposed project encroach upon undisturbed land with archaeological potential beyond the disturbed ROW, a Stage 2 assessment should be conducted (Appendix B.6 Figures 4-1 to 4-25: areas marked in green that are adjacent to the current B-Line corridor).

Conclusions

The Stage 1 Archaeological Assessment has been conducted as part the City of Hamilton's Rapid Transit Initiative for the B-Line. The assessment determined that 20 archaeological sites have been registered within 2 km of the study corridor, two of which are located within 100 m of it. Additionally, a review of the general physiography and local nineteenth century land use of the study corridor suggested that it has potential for the identification of Aboriginal and Euro-Canadian archaeological sites.

The field review of the study corridor determined that the Main Street and King Street ROWs have been previously disturbed by typical road construction and modern development. However, there are several areas adjacent to the disturbed ROW that remain undisturbed and contain archaeological potential.

In addition to lands that have remained undisturbed, within the urban context in general, and on land that has been intensively developed and redeveloped between the mid- to late nineteenth century and the present, such as is the case with the study corridor, any archaeological resources that may have survived are likely to take the form of subsurface structural features (e.g., foundations, privies, cisterns, etc.). These areas have been noted in Tables 3.23 and 3.24 as "Vacant Lots".

Given the essentially continuous use of the majority of the individual properties that make up the study corridor, most archaeological resources of the nineteenth century occupations are likely to have been severely compromised and/or highly mixed, consisting of an accumulation of items that could not be conclusively associated with any particular occupation or activity among the myriad of uses that the corridor has witnessed. The continuous occupation of the individual properties for a variety of purposes likely involved repeated episodes of utility upgrades, renovation, structural alteration, landscaping, etc. that would have resulted in further destruction or mixing of earlier deposits that may have formed on any surviving original ground surface or occupation level.

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4.0 PROJECT ENVIRONMENTAL EFFECTS, MITIGATION AND MONITORING

Implementation of the B-Line LRT project has the potential to create environmental condition changes that may result in both positive and negative effects. These potential condition changes have been considered through the Pre-planning and TPAP phases of the study.

The Transit Projects Regulation requires the proponent to prepare an Environmental Project Report that contains the following information:

- An assessment and evaluation of the impacts that the preferred method of carrying out the transit project and other methods might have on the environment;
- A description of any measures proposed by the proponent for mitigating any negative impacts that the preferred method of carrying out the transit project might have on the environment; and
- A description of the means the proponent proposes to use to monitor or verify their effectiveness.

The purpose of this chapter is to document these requirements for the B-Line LRT project. Note that alternative (other) methods of carrying out the project were considered during the Pre-planning phase and are not addressed here.

Generally, for each component, the features and sensitivities identified in Chapter 3 are summarized; the studies and criteria against which the project changes/impacts have been assessed are identified; and construction/operations impacts, proposed mitigation measures and resultant net effects, and proposed monitoring are described. The exception to this is Transportation and Utilities (Section 4.1), where, due to commonalities, some mitigation/net effects and monitoring for impacts to transit, traffic and utilities are discussed jointly at the end of Section 4.1.

4.1 Transportation and Utilities

4.1.1 Transit Operations

The B-Line LRT will be integrated into the wider transit network. A full and formal analysis of bus routing changes, including public consultation, will be undertaken between 12 months and 24 months prior to opening of the B-Line LRT. For planning purposes, a set of preliminary transit network changes have been developed to help guide discussion about LRT facilities, potential bus connections and remaining bus service requirements, and to provide the basis for estimating future operating costs of the combined LRT and bus network.

Preliminary proposals for bus network changes to accompany the introduction of the LRT have been developed using the following key design principles:

The objective of an integrated network wide solution;

- Maintain key links and accessibility;
- Through services retained wherever possible, although perhaps at reduced frequency and/or with an increased journey time;
- Where transfers are necessary, the facilities are of a high quality;
- Does not force transit passengers to transfer unnecessarily, or for short distances;
- Provide a network that links people to jobs, homes, leisure and key services;
- Meets current and future passenger needs;
- Adheres to HSR's service standards;
- Creates space for rapid transit;
- Ensures that feeder services to the LRT and bus network are provided where necessary; and
- Provides cost savings (when set against additional revenue generated).

Construction/Operations Impacts

The project was assessed against the following criteria with respect to transit operations:

- Changes to existing local bus service routing and frequency in the B-Line corridor;
- Changes to existing local/feeder bus service routing and frequency on routes parallel and perpendicular to the B-Line corridor;
- Changes to broader, sub-regional and regional (GO Transit) service (i.e., service to destinations beyond the McMaster University and Eastgate terminus stops; and integration with GO Bus and Rail hubs at McMaster and Downtown);
- Changes in overall transit journey times.

Applying the foregoing principles, the main focus of the proposed alterations to transit system operations is the east-west pattern of bus routes on King Street and Main Street. As well, as the B-Line Express 10/10A, which would be directly replaced by the B-Line LRT, these include a number of local routes that parallel all or part of the LRT route. Together, the express and local routes provide a total peak period corridor flow of 22 to 24 buses per hour (bph) in each direction west of Downtown and 22 bph east of Downtown. The route groups are:

- 1/1A: McMaster Medical Centre or Hamilton GO Centre to Eastgate Square (4 bph McMaster, 4 bph GO Centre);
- 10/10A: McMaster Medical Centre or University Plaza to Eastgate Square (6 bph);
- 5/5A/5C/5E/52: Dundas (two termini), University Plaza, West Hamilton Loop or Meadowlands to Greenhill/Cochrane, Quigley/Greenhill or Jones/King (8 bph in total, of which 6 bph run via Delaware and 2 bph via King/Main);
- 51: West Hamilton Loop to Hamilton GO Centre (4-6 bph, except summer and Christmas vacations).

Of these, routes 1A and 10/10A follow the whole length of the B-Line LRT corridor currently under development between McMaster and Eastgate Square; the others follow part of the corridor only, terminating or diverging part-way. Several routes also extend beyond the ends of the LRT route.

The proposed changes also include some changes to existing routes that do not parallel the LRT directly, to improve frequencies on routes that could act as feeders. There are clearly other routes that could perform this role, but many connections already exist and at present we have concentrated on those where a change in route pattern appears beneficial.

The following assumptions have been made in defining the proposed bus network changes:

- Traffic circulation on the B-Line corridor is amended as proposed, with westbound traffic including buses retained on King Street East between the Delta and Downtown;
- A reduced level of bus services within the LRT corridor between McMaster and Eastgate, but frequencies maintained to outer destinations;
- Through services beyond the ends of the corridors (e.g. Stoney Creek) retained wherever possible, though sometimes with an increased journey time to Downtown as a result of being interlined with local bus services rather than B-Line expresses as now;
- Bus services on Main Street East and Queenston Road east of the Delta diverted via King Street East and Parkdale Avenue;
- Bus services that run on King Street East into the downtown diverted around the International Village section via Victoria Avenue, King William Street and Catherine Street North to get back on King Street through the Downtown.

Table 4.1 and Figure 4.1 detail the proposed changes. The frequencies in the table refer to the weekday AM peak; base service levels could be slightly lower but the same pattern would apply. Where a specific change to the base service is proposed, separately from the peaks, this is highlighted.

Table 4.1: B-Line: Proposed Alterations to the Bus Network

Existing Route	Change	
B-Line Corridor Routes		
10/10A	B-Line Express	Removed (replaced by LRT) Interlining to Stoney Creek on 55/55A transferred to local route 1/1A Interlining to Stoney Creek on 58 replaced by extended route 5
1/1A 5/52 group	King Delaware	Cross-city services reduced from 18 to 12 buses per hour in total, all running west of McMaster University At western end, existing frequencies retained on each branch, with option to extend 2 bph from West Hamilton Loop to Ancaster. Services would run via King Street East and Parkdale Avenue At eastern end of route 1/1A to Eastgate Square reduced from 8 bph to 4 bph, interlining with 55 or 55A to Stoney Creek. Eastern end of Route 5/52 unchanged except that Jones & King journeys extended via route 58 to King & Highway #8
51	University	Unchanged (seasonal service). However, depending on demand patterns, this could be considered for a reduced frequency as a result of the increased capacity provided by the LRT on the McMaster-Downtown section
58	Stoney Creek Local	Route 58 retained to provide local link to Eastgate Square but no longer interlines there with services to Downtown
Other Routes		
3	Cannon	Half of service diverted at Parkdale to run via route 11 to Valley Park Base service increased to 4 bph and to operate as peaks
4	Bayfront	Divert at Barton/Nash to run via Centennial Parkway, Eastgate Square and Queenston Road to Nash Road then via existing route

Figure 4.1: B-Line LRT Plus Proposed Supporting Bus Network

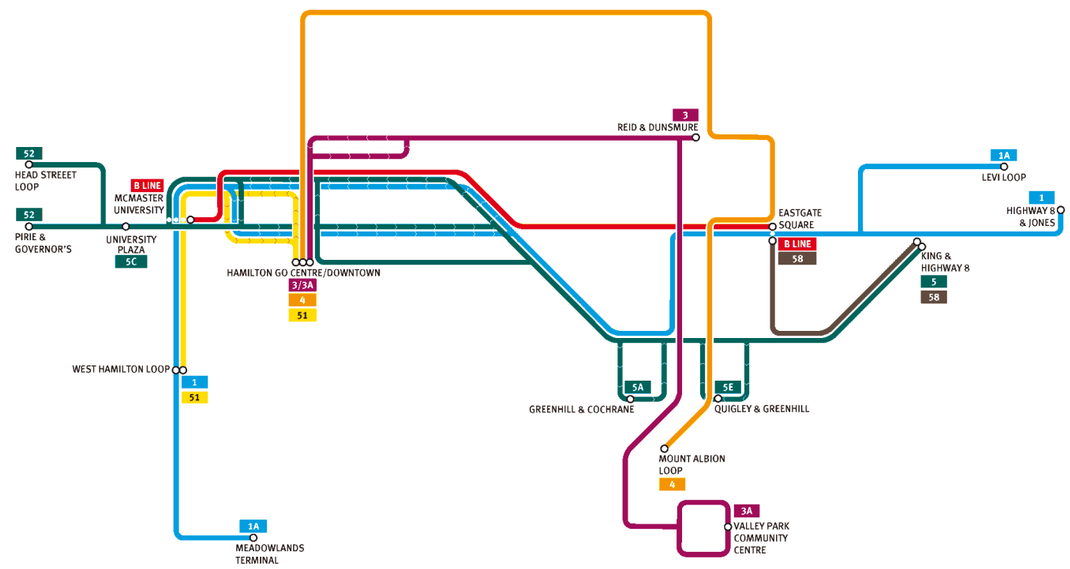


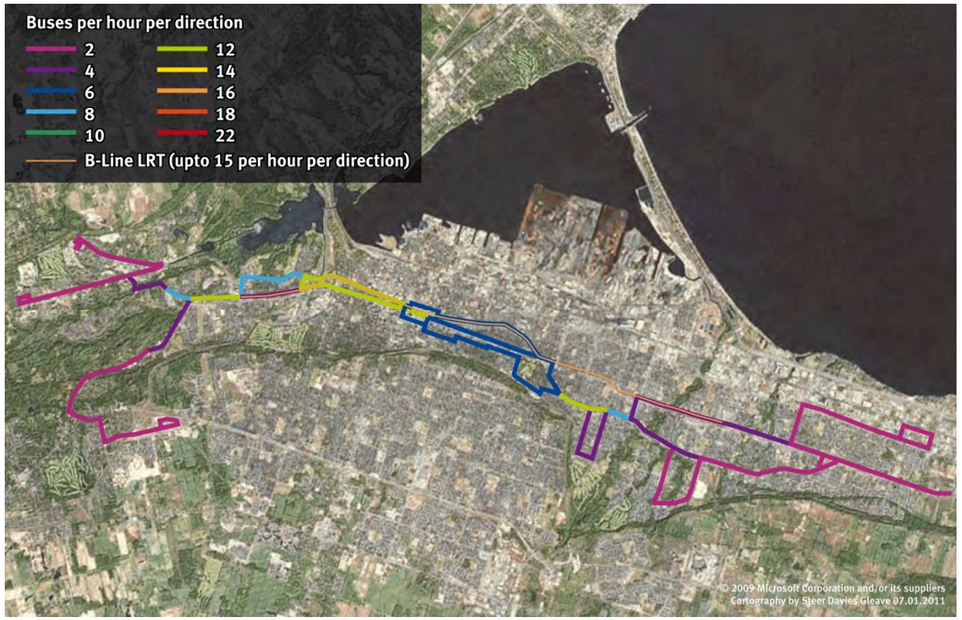
Figure 4.2 shows the proposed AM peak buses per hour following the introduction of LRT. These figures illustrate the reductions in bus service in the core section, where the LRT will provide a substantial increase in capacity, while retaining service levels on the outer branches. The frequency shown is the total for the routes that partly or wholly parallel the LRT alignment, namely:

- 1/1A
- 10/10A (existing only)
- 5/52 group
- 55/55A and 58

The University service 51 is not included as it is not proposed for change. If included it would add 4-6 buses per hour between West Hamilton Loop and Downtown in both figures.

Similarly, it is not anticipated that any routing changes to the GO bus services operating in the corridor, noted in section 3.1.2, will be required. Existing GO Transit bus stops for these routes are in close proximity to the following proposed LRT stops: Longwood Road; Dundurn Street; Queen Street; MacNab Street. Whilst falling outside of the scope of the B-Line LRT project EPR opportunities for high quality service integration with these stops, Downtown Hamilton, which is designated a Mobility Hub, and the GO Rail stations at Hunter Street and the proposed GO station at James Street North, will be explored at the detailed design stage. This is expected to include consideration of issues such as good pedestrian connectivity and wayfinding between the GO bus stops and the proposed LRT stops, as well as shared branding opportunities.

Figure 4.2: Buses Per Hour In B-Line Corridor – Proposed



4.1.2 Traffic Operations

Most of the B-Line route between Highway 403 and Queenston Traffic Circle is currently a 4-lane single roadway, carrying westbound traffic only (King Street West and King Street East) and two-way traffic (Main Street East). In designing the LRT layout along such sections, two key requirements are:

- Provision of a segregated LRT alignment; and
- Provision of roadway that is ideally at least 2 lanes wide, but otherwise provides for one through traffic lane, together with space for frontage parking, loading, bus stops, and other traffic service features over the majority of the length.

Taken together, these requirements suggested that the optimum layout should comprise two LRT lanes on one side of the road, with two traffic lanes on the other side. If the two traffic lanes operate in the same direction, and are arranged such that vehicular traffic travels in the same direction as in the adjacent LRT lane, then no separating median is required between the LRT and the traffic lanes. This minimizes the overall width required. Also, provision of two traffic lanes in the same direction allows the offside lane to be available for through traffic at all times, while the nearside lane may be occupied by stationary vehicles. This layout also provides more flexibility for dealing with utility works, road repairs and similar obstructions. Where two full traffic lanes cannot be provided, then the offside lane is designated for through traffic, with the curbside lane marked for parking and loading.

Over parts of the route, the existing road, while marked as four traffic lanes at present, is not wide enough to allow for two segregated LRT lanes and two traffic lanes. In these sections, only one full traffic lane, plus a curbside parking and loading area is provided.

Similarly at stops, one platform can be located on the existing sidewalk, but the other is in the middle of the existing roadway, and, therefore, occupies a further traffic lane.

The conversion of two existing traffic lanes to segregated LRT removes two (or three) traffic lanes from the existing road network, and reduces the vehicular capacity (although not the person-capacity) of the roads concerned.

Construction/Operations Impacts

The project was assessed against the following criteria with respect to traffic operations:

- Changes to traffic circulation in the B-Line corridor, on adjacent local and arterial roads and across the wider Hamilton downtown highway network;
- Changes in permitted and prohibited turning movements;
- Changes in property access;
- Changes in parking and loading provisions.

Traffic Changes

The key changes to traffic circulation in the B-Line LRT corridor are set out below.

At the western end, between McMaster University and the Highway 403 crossing, traffic will continue to use Main Street West as it does currently. Over this section, the LRT will be in the median and at existing non-signalized intersections and driveways or private accesses there will be a right-in/right-out arrangement to ensure safe LRT operation by not permitting crossing of the alignment by other motor vehicles. The design has considered each location to ensure that either an existing or new signalized intersection is nearby to provide a convenient u-turn opportunity. There will be some impacts on the capacity for motorized vehicle movements because of the re-assignment of some left-turn traffic to U-turn manoeuvres at intersections. LRT operation will also be given priority through signalized intersections along the length of the B-Line route.

In the vicinity of the Highway 403 crossing, the existing one-way circulation (westbound on King Street West and Paradise Road South; eastbound on Main Street West) is retained. This avoids the need for any changes to the ramps at the intersection, and also avoids any reductions in traffic capacity of the local road network downstream of the exit ramps. Thus, the changes in road layout should not result in additional traffic queuing back onto Highway 403.

King Street West, from west of Dundurn Street to James Street, and King Street East, from James Street to Catharine Street, remain one way westbound, with the traffic lanes on the north side and the LRT on the south side.

Between Catharine Street and Mary Street, the direction of traffic flow on King Street East is reversed from westbound to eastbound, to allow traffic to access the Crowne Plaza Hotel and Effort Square parking.

The Walnut LRT stop is located between Mary Street and Walnut Street. This section is closed to all traffic except Light Rail Vehicles (LRVs). The introduction of this non-trafficked section breaks King Street as a through route, and causes through westbound traffic to divert to other routes, principally Cannon Street and, to a slightly lesser extent, Barton Street. Within the International Village (between Walnut Street and Wellington Street) there is two-way shared running of local traffic and the LRT to allow for essential frontage access, but so as to prevent use of this as a through traffic route.

From Wellington Street to the Delta, King Street East remains one way westbound, but with 1-2 traffic lanes in place of the existing 4 lanes.

From the Delta to Queenston Traffic Circle, Main Street East is converted to one way westbound, with one lane for local traffic, with curb bumpouts introduced to provide bays for parking and loading. Westbound through traffic uses a combination of King Street East, Britannia Avenue/Cannon Street East and Barton Street East. Eastbound traffic will use King Street East from the Delta onwards, either accessing Queenston Road via Parkdale Avenue, or continuing on King Street East.

The movements of through traffic are as shown on Figure 4.3a, 4.3b and 4.3c.

Figure 4.3a: Traffic Circulation

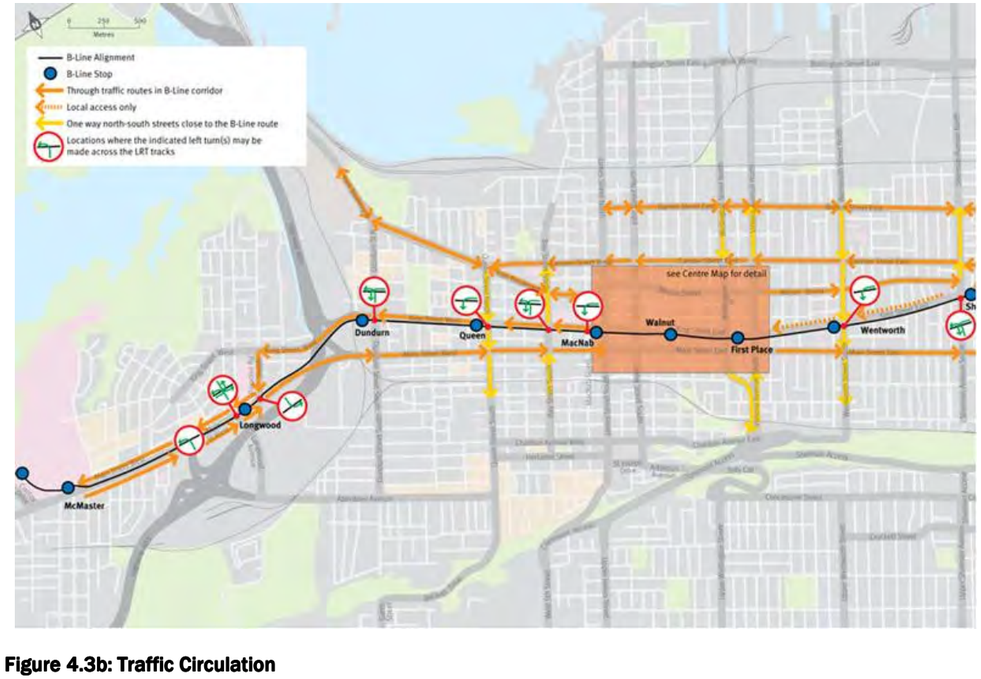


Figure 4.3b: Traffic Circulation

Figure 4.3c: Traffic Circulation

Permitted and Prohibited Turning Movements

With the introduction of LRT and the associated changes to traffic circulation, there will be changes to the turning movements which are permitted along the B-Line route, particularly where these movements cross the LRT tracks. These changes are required both to facilitate the smooth reliable running of the LRT system, with the appropriate level of priority at signalized intersections, and on safety grounds.

Where the LRT tracks run adjacent to traffic lanes (whether on the side of road or a central alignment) the layout is such that the direction of travel on the LRT lane is the same as in the adjacent traffic lane. This arrangement minimizes the total road width required, and avoids the situation where drivers can be presented with an oncoming LRV approaching on the 'wrong' side. Similarly, pedestrians crossing the road are presented with vehicles in the closest lane(s) approaching from the left, and in the far lane(s) approaching from the right, in the conventional manner.

With this layout, drivers wishing to turn left (or U-turn) across the LRT tracks will have a clear view of an oncoming LRV (on the track further to their left). However, they may not be aware of a LRV approaching from behind on their left-hand side. In order to minimize the risk of accidents, it is necessary to prohibit uncontrolled left turns and U-turns across the LRT tracks. This applies both to the central running LRT tracks on two-way roads, and on streets where the LRT tracks are on the left-hand side of the one-way traffic lanes.

Right turns into and out of side roads (which do not cross the LRT tracks) are not affected and will continue to operate as at present. Thus, many side streets along the centre-running sections of the route and on the non-LRT side of the side-running sections will, in future, operate as right-in/right-out only.

Left turns and U-turns will be permitted at signalized intersections. However, over much of the B-Line route there is insufficient space for dedicated lanes for left-turning vehicles (turning across the LRT tracks), in addition to the lanes for ahead and right-turning traffic. Hence, the left turners will use a lane marked for ahead and left-turning traffic. This in turn means that left turns can take place at any time in the traffic stage, so a separate LRT-only stage is needed for LRV movements. Accordingly, existing two stage intersections will operate with three stages in those cycles when an LRV

movement occurs. This will reduce the intersection capacity, in addition to the capacity reduction arising from the reduction in the number of traffic lanes. In response to this, some drivers of motorized vehicles are expected to either change their routing to alternative routes or, if convenient, change their travel to LRT instead of private car. It is important to note that while the traffic capacity of the corridor will be reduced, the people carrying capacity of the corridor will be increased by introducing the LRT service.

Left turns out from a side road, across the LRT tracks and onto the main street, will be permitted. In this case, the driver will stop at the intersection and is able to see LRVs approaching from either direction. This movement is essentially the same as a left turn into a two-way road.

Crossing movements can be made at signalized and un-signalized intersections. As with left turns from a side road, these are essentially the same as crossing a two-way road.

Access to Properties

The same arrangements as outlined above for road intersections apply to vehicular accesses to individual properties.

Entrances on the centre-running sections of the route and on the non-LRT side of side-running sections will operate on a right-in/right-out only basis. Drivers wishing to make the left turn will in have to either make a U turn at a suitable point or use the local road network to approach or leave in the appropriate direction.

There are a number of properties with vehicular accesses on the LRT side of the route on the one-way sections. As with side street intersections, left turns out of such accesses (in a forward direction) are straightforward. However, left turns into the property are less desirable, but, given the road layout and the need for some form of access to be maintained, are unavoidable. However, the number and frequency of such movements each day will be small and they will tend to be undertaken by the same people on a daily basis. These individuals will thus be accustomed to ensuring no LRV's are approaching before they make their turn.

That said, during the ongoing design, where the opportunity exists, accesses will be reconfigured to avoid entry to the property across the LRT tracks. It is expected that at some of the corner properties this can be achieved by moving the access to the side street. At other locations, there are commercial properties that have frontage parking areas accessed individually. Interconnecting these could reduce the number of access points across the tracks.

The changes in road layout, traffic circulation and access routing have been comprehensively assessed using accepted practice traffic modelling tools. In summary, these have demonstrated that the preferred scheme results in a general fall in the operational performance of the municipal road network, due to the reduction in capacity on the corridor for other motorized road users. However, alternative corridors, such as Barton Street, King Street East and Cannon Street and Wilson Street, generally have sufficient capacity to accommodate the level of re-assigned traffic.

Parking and Loading

The B-Line LRT will enhance accessibility in the corridor with improved transit service, bringing more people to and along the corridor. By stimulating transit oriented development along the corridor, the LRT should attract more business activity, resulting in positive economic benefits.

Experience from other projects has suggested that an important business issue is the possible reduced vehicle access to the area and potential loss of on-street parking and loading areas. The design of the project has been developed to try to minimize these impacts and this work will continue throughout the further development and detail design of the project. The City of Hamilton is committed to minimizing the construction period, in as far as is reasonably practicable, in order to minimize such construction related impacts to residents and businesses.

It is anticipated that of the 440 on street parking spaces available in the B-Line corridor up to 80 could be displaced. Key impact areas for displaced parking are downtown between Queen Street and James Street, and between Wentworth Avenue to Gage Street This is a conservative estimate of short-term impacts based on future loss of on-street parking spaces and existing block peak demand observed from surveys. The short-term reflects a scenario where LRT becomes operational but future development and intensification have not yet been fully realized. However, as reported in Chapter 3 there are on average some 5,240 vacant on street parking spaces within 400m of the B-Line corridor and given this the surrounding side-streets could easily handle displaced demand for on-street parking during the day along the corridor.

An evaluation of potential impacts to loading and delivery access to approximately 510 commercial properties along the B-Line corridor revealed:

- The majority of parcels along the B-Line corridor will have minimal impacts to their loading access, with the main impact identified as having to use a back alleyway where properties could have previously used front-door on-street loading.
- 126 commercial parcels were assessed to have moderate impacts, such as changes in entry point to on-site parking and having to use loading facilities via side or back street where parcels had access via King Street or Main Street
- Over 50 commercial parcels were identified to require mitigation measures to address the loss or impact to loading capacity. Impacts include loss of on-street loading in front or near front of property (with no alternate access point) and loss of access to on-site loading spaces. The majority of impacted properties are on the south side of the corridor where on-street loading is proposed to be removed due to the rail tracks or stations.

A number of properties will also be affected due to changes in loading access points or delivery routes arising from changes in traffic patterns (e.g. conversion to one-way, no left turn, etc.) that are proposed as part of the B-Line design. Whilst delivery access will be maintained there will be impacts on existing delivery routes in the following areas:

- Strathcona area - due to changes of side streets to one-way direction into King Street;
- Downtown area - especially between John Street and Ferguson Street, due to no through traffic being allowed on King Street through International Village;
- Wentworth Street to East Bend Avenue - due to changes of side streets to one-way traffic;
- East Bend Avenue to Queenston Circle - due to loss of eastbound direction on Main Street; and,
- Parkdale area - due to changes in through movements along side streets and left turns.

<u>Mitigation Measures and Net Effects</u>

The greatest impact on traffic operations is on the west side of the network, due to the reduction of capacity on the westbound section of King Street, Downtown to Dundurn Street. This results in a reassignment of traffic onto the York Boulevard westbound link, and the subsequent southbound route along Dundurn Street North, to reach the King Street/Dundurn Street intersection. The destination zones for this traffic are the University area and the residential areas to the west, such as Dundas and Greensville, for which alternative routes to and from Hamilton are onerous. To facilitate traffic movements to and over the King Street flyover (over Highway403) a number of improvements are proposed in the following locations:

- Dundurn/King - Additional free-flow right-turn lane provided on southbound approach. Third party land take required on northwest corner of intersection;
- Dundurn/York - Additional left-turn lane required on westbound approach. Extra flared approach can be accommodated within existing road boundaries; and
- Southbound exit on Dundurn has been revised to allow two southbound lanes as far as Tom Street. Therefore, the northbound section of Dundurn has been assumed to merge to a single lane at Florence Street, with a single lane in each direction between Tom Street and Florence Street.

Other improvements included to mitigate adverse effects of the operational changes to the road network are:

- Banning of left-turn movements at Queenston Road/Reid Avenue – U-turn movements available at Parkdale to the west, and Red Hill Valley Parkway (RHVP) to the east; and
- Increasing traffic signal cycle time to 110 seconds (from 90 seconds) at King Street/Parkdale Avenue, King Street/RHVP West and King Street/RHVP East, with resultant increase in capacity (but removal of co-ordination with adjacent intersections).

In addition, as a result of the re-assignment of traffic between the Highway 403 ramps (due to the reduction in capacity on the approach to the King Street on-ramps), additional traffic is predicted to use Aberdeen Avenue as a route to join Highway 403. To accommodate this, the following modest improvement works are included:

- Aberdeen Avenue/Longwood Road – provide additional third lane as dedicated right-turn bay (approximately 140 m long) on the Aberdeen Avenue to Longwood Road right turn movement; and
- Aberdeen Avenue/Dundurn Street – provide dedicated left-turn bays on both Aberdeen Avenue approaches, and modify existing signal timing operation.

In terms of overall net effects, the implementation of the B-Line LRT can be accommodated by the existing road network, albeit with a general reduction in performance for other motorized road users. This is offset by the increase in people carrying capacity on the corridor and the introduction of some offline intersection and link improvements.

Recommended mitigation measures to address loss of loading facilities include: designate new on-street loading space on closest side-street to properties losing access to on-street loading on Main Street or King St; designate on-street loading space where feasible and where on-street parking on corridor is to be provided; and, improve public alleyways and ongoing maintenance (e.g. snow removal) to ensure abutting commercial parcels have access.

Every attempt will be made to minimize or replace any short-term parking loss for individual homes and businesses both in the short term during the construction stages and in the longer term, once the project is constructed and operational. As part of the detail design of the project, delivery and loading arrangements and potential parking replacement solutions will be formulated and discussed with the affected property owners.

4.1.3 Surface and Subsurface Utilities

The surface and subsurface utilities along the length of the alignment are typical of the type of utilities found along major arterials and consist of a mix of overhead hydro, cable, telephone wires on each or one side of the roadway along which the LRT will be travelling, or the utilities will be crossing over or under the roadway at various intersections along the route. The preliminary design has identified the utility relocation requirements for the alignment, which are generally as follows:

- The underground utilities that cross the LRT guideway will be protected to minimize long term vertical impact to these (by use of sleeves, where necessary).
- Any underground utility line that currently runs under and parallel to the proposed LRT guideway may be relocated, where space permits, to avoid being directly beneath the guideway, in order to prevent any shutdown of the LRT when such utility needs maintenance or repair. Some of the utilities under the future LRT guideway/track include older combined sanitary and storm sewers that, based on recommendations made in the AECOM Utilities Life Cycle Review Report (May 20110, should be retained and protected in their existing locations, rather than moved. The review of these locations to determine if the move is warranted or not will be completed at the next phase of design.

The various utility agencies and the affected City of Hamilton departments have been consulted to the degree necessary to ensure the existence of key utilities is confirmed along the proposed corridor. The preliminary design, as shown in Appendix A, provides details on the location, size and depth of the utilities. Further information on specific utility types is provided below.

Municipal

Potential relocation or lining (less disruptive than relocation) of existing municipal services has been discussed in the 'Underground Life Cycle Assessment Report' (AECOM, May 2011). The possibility of relocating the existing services outside the influence zone of the LRT, without requiring the introduction of utility tunnels, is highly dependent on the available right-of-way and the presence of other large diameter services in the same zone.

Lighting

It is not expected that many of the street lighting poles will be affected, as the introduction of the LRT guideway will not greatly impact the existing horizontal corridor. The underground cables and related existing poles that will be relocated will be in areas where the curb needs to be relocated, and will be assessed on a case-by-case basis.

Communications

In the case of existing aerial wires, they will be relocated to an underground duct bank crossing the future LRT guideway. The impact of the LRT construction on the existing network of duct banks and hydro chambers is highly dependent on the existing depth of cover over the duct banks and opportunities to adjust the length of the collars of the chambers. A slim track bed design normally helps in avoiding disruptions to existing underground networks.

Hydro

The LRT passes under a major high voltage Hydro One power transmission corridor in the vicinity of the Queenston Traffic Circle. Early discussions with Hydro One took place to determine potential impacts to their corridor and any restrictions that might be in place concerning the passage of a LRT alignment under the high voltage north-south hydro corridor at this location.

Hydro One requires that the City ensure that the minimum distance from the lowest point of the high voltage hydro lines and the overhead catenary system OCS) cables be respected. This design of the OCS respects that minimum distance. The other requirement was to not locate any LRT stop beneath the hydro line and this has also been achieved.

Construction/Operations Impacts

The project was assessed against the following criteria with respect to surface and subsurface utilities:

- Need for relocation of existing services;
- Potential for service interruptions to residents and businesses.

The City has, in addition to developing the cross-sectional details provided in the preliminary design drawings, undertaken two site-specific detailed reviews of segments of approximately 200 m of alignment at key locations, in order to confirm the potential impacts of relocations during construction and downstream operation of the LRT and the maintenance of utilities along the corridor. In general, the standard construction sequence for completing utility relocations will be used during construction and minimal impacts to existing services, or service interruptions to residents and businesses along the corridor, are expected.

Street closures and interruptions during construction will generally be limited to closing two out of four lanes at a time, or if a total street closure is required for a short period of time, alternative access to businesses and residences will be provided. In those cases, a strategic site-specific traffic management protocol and plan will be developed and implemented. The plan will be designed to cause minimal disruption to traffic along the corridor. However, it is expected that some inconvenience to car users will occur along the corridor. Bus services along the corridor will also be affected, with temporary re-routing of the B-Line and other bus services during the construction period.

Mitigation Measures and Net Effects

A detailed traffic management plan, comprising a construction staging and street closure or lane reduction plan will be prepared as part of the detailed design stage of the project. It is anticipated that only short segments of the alignment will be closed or will experience limited access during construction. To ensure that there will not be undue traffic flow and access restrictions, in the corridor, the construction sequence is intended to be undertaken in manageable segments, with manageable lengths of the corridor being subjected to lane closures or restricted access at any one time during construction.

Where restricted access to existing residential, commercial and business properties is to occur as a result of utility relocations, the owners will be notified in advance of the alternative access arrangements to be provide to the owner to ensure continuous access during the construction period. Adequate protection will be in place to ensure site safety at all times to protect the public and the owners from the construction sites. Please also refer to Section 4.2.1 for proposals to establish a Construction Liaison Committee to address potential impacts to residents and business operations.

Monitoring

As part of the traffic management plan and construction contract(s), a monitoring and complaint process will be in place to ensure:

- Traffic and transit operations are not unduly compromised by construction in the LRT;
- Traffic and transit modifications are operating efficiently during the operational phase of the project;
- Safety is a priority on site for all construction employees and member of the public who have to access the corridor;
- There are no undue service interruptions during the construction phase;
- Environmental protection requirements are being met with regard containment of effluent from utilities relocation/replacement construction sites; and
- Minimal risk from potential for exposure of contaminated soils as a result of uncovering abandoned utilities.

4.2 Socio-Economic Environment

This section of the report summarizes the assessment of the potential condition changes to the socio-economic environment associated with implementation of the B-Line LRT project. Most of this potential has been identified in the

City's B-Line Land Use Opportunities and Challenges study report and that document has been used as the basis for this assessment.

4.2.1 Land Use Structure and Economic Impacts

Land Use

The project was assessed against the following criteria with respect to land use impacts:

- Potential to achieve the City's overall land use objectives with respect to intensification, diversity, neighbourhood enhancement and renewal, and redevelopment to higher and better uses;
- Potential to support economic viability of existing land uses and regional destinations in and adjacent to the B-Line corridor;
- Impacts to individual properties and business operations.

From a general land use perspective, the benefits of LRT are numerous. LRT supports intensification, helping to achieve overall City intensification objectives. Establishment of LRT can stimulate opportunities for the development of a wider variety of housing choices for a wide range of residents and people from outside of the City who are attracted to urban living. The investment in LRT also represents an opportunity for re-urbanization by increasing population and overall investment, promoting job growth, and improving neighbourhood vitality and image.

The introduction of light rail transit along the B-line Corridor will be a key driver in realizing land use objectives that emphasize the important connections between land use and transportation by promoting future transit-supportive land uses along rapid transit corridors.

The City's B-Line Land Use Opportunities and Challenges investigations included the identification areas where the B-Line LRT service would provide impetus for redevelopment to higher and better uses, comprising transit supportive/transit oriented development. In addition, the influence of the new/replacement transit service on fostering general corridor improvements and neighbourhood enhancement was assessed. This information was used reciprocally, to inform corridor land use planning initiatives, including secondary planning and site-specific development initiatives, as well as the planning and design of a rapid transit line itself.

On a corridor-wide basis, overall the Downtown areas and the western and eastern ends of the corridor appear to have more opportunities for new development as a result of rapid transit. As indicated in Section 3.2 of this report, these areas exhibit the highest assessed values, as well as the most recent redevelopment interest and activity. Having said that, the City has cited lower assessment values in general throughout the corridor as a major challenge to redevelopment, even with the introduction of the transit line. In the past, there has not been much interest in developing large portions of the corridor. This, combined with the flight of commercial retail uses to the suburban areas, has led to uncoordinated investments in the corridor, resulting in the introduction of uses that do not contribute to an attractive public realm and fail to create cohesive neighbourhood commercial areas.

Along the middle sections of the corridor, community scale shopping opportunities may not return but rapid transit is viewed as a possible catalyst to attract additional smaller neighbourhood scale amenities and retail uses to improve these areas and develop a local identity and neighbourhood amenity. With interesting retail and neighbourhood environments come interests in residential development. Therefore, the City's land use vision identifies the B-Line corridor as an important location for residential intensification rather than substantial new retail.

Opportunities for larger scale redevelopment projects are found in the vacant or underutilized areas of the Downtown, just outside the Downtown and in the Eastgate/Nash Road areas. These sections have the land values and developable land available to make them attractive development sites. The introduction of the B-Line LRT service is also viewed as a catalyst to this type of redevelopment. Further, uses with large parking areas present along the corridor and in immediate stop area (e.g., west and east end commercial uses) present transit oriented development opportunities that will be complemented by the B-Line service.

In addition to key land use nodes along the corridors, the B-Line has regionally significant destinations and attractions within walking distances of the corridor, including:

- McMaster University
- West Hamilton Innovation District
- Art Gallery of Hamilton
- Copps Coliseum
- Canadian Football Hall of Fame
- Convention Centre/Hamilton Place
- Hamilton City Hall
- Downtown Business District
- Gore and Gage Parks
- Ivor Wynne Stadium
- Eastgate Square

The B-Line LRT project has the potential to both support the economic viability of these destinations by providing improved mobility and accessibility, and to in turn be supported by these destinations as their attractiveness is enhanced.

Economic Benefits

The anticipated economic impacts of the B-Line LRT were considered in two studies, with the findings outlined in two reports: The Impact on Property Values[1] and the Economic Potential[2] for the City of Hamilton.

The project was assessed against the following criteria with respect to economic impacts:

- Changes in mobility and access levels, and associated socio-economic benefits to the people of Hamilton in general, and those with high social needs in particular;
- Changes in employment opportunities;
- Changes in property values.

The studies conclude that LRT investment in the B-Line should be able to address the transportation capacity needs for at least 50 years. With 80% of HSR's current routes connecting to the B-Line corridor, and significant population and employment within 800 m of the route, the probability of Hamilton residents benefiting from rapid transit is high. These benefits include travel time savings, increased travel time predictability, reduced auto ownership and operating costs, and reduced accident costs.

Compared to regional, provincial and national averages, the B-Line corridor has a high number of people with high social needs, namely unemployed, lone-parent families, low educational attainment, low income or high rates of government assistance. In this regard, it is expected that implementation of the B-Line LRT will be positive, providing these individuals with greater mobility and access to employment opportunities and health and wellness activities.

It is anticipated that some 6,000 jobs would be created during the B-Line LRT construction phase, with up to 1,000 ongoing jobs due to operations and maintenance. In terms of the economic benefits of net improvements air quality (refer to Section 4.3.7), there will be an associated cost reduction of $2 million annually (7.5%), based on reductions in a number of pollutant levels by weight.

LRT is generally accepted to have a significant influence on investment decisions and economic growth. In support of the conclusions in the foregoing section on land use impacts, the economic studies identify vacant land parcels and other low density parcels, such as parking lots, that could be developed into more transit supportive uses. LRT along the B-Line corridor could create a property market uplift ranging from $50.0 Million to $143.5 Million, representing a 1.5% to 4.3% impact.

4.2.2 Community Cohesion

The project was assessed against the following criterion with respect to community cohesion:

1 Hamilton Rapid Transit Benefits Case: Impact on Property Values Draft Report. MKI. July 28, 2009
2 Hamilton Rapid Transit Initiative: Economic Potential Study Final Report. IBI in association with HDR. March 2009

- Potential to strengthen community cohesion through improved walkability and accessibility to active transportation corridors.

With respect to community cohesion, the introduction of light rail transit assists the City towards achieving numerous objectives contained within City policy documents that ultimately all strive to achieve the vision for the City to be the best city in Canada to raise a child, promote innovation, engage citizens and provide diverse economic opportunities (City of Hamilton Strategic Plan, 2008). In this respect, the introduction of LRT has the potential to enhance the quality of life for residents within the corridor influence area, and the City of Hamilton as a whole by:

- Increasing mobility for residents;
- Creating more walkable environments, particularly along the rapid transit corridor;
- Supporting complete communities where people can live, work play and learn within the same community, and be supported by a range of services and community facilities to serve the needs of all residents;
- Supporting aging in place where residents can choose from a range of housing choices to meet their changing needs over time;
- Improved air quality as a result of reduced automobile dependency; and
- Promoting sustainable forms of development.

Community cohesion will be enhanced through increased mobility and access provided by the B-Line LRT. Section 3.1.3 outlined the City of Hamilton's principal active transportation initiatives (pedestrian, cycling, recreation trails). Mobility and walkability principles are directly applicable to the implementation of the B-Line LRT, as they are to be addressed as part of the RT streetscape design along the entire corridor, in addition to the section of King Street cited in the Downtown Mobility Street Project.

The B-Line LRT will foster walkability and the number of pedestrians by calming vehicle traffic, facilitating land use intensification, enhancing the streetscape, and adhering to the city's Urban Design Guidelines for walkability, when possible.

The B-Line alignment will work in parallel with the existing and proposed cycling routes to improve community connectivity to and from the corridor. Cycling facilities that travel in east-west direction are generally on separate roads running parallel to the B-Line corridor. These parallel east-west routes connect to the B-Line corridor at key locations by way of north-south cycle routes that lead to some of the key proposed station locations, including Dundurn Street, Wellington Street North, Sherman Avenue South, Gage Avenue North and Nash Road.

The B-Line corridor will provide improved community access to adjacent recreation trails and assist in achieving higher levels of health, mobility, skill, and age ranges in using them. In addition to the several on-street trails the B-Line corridor will also provide direct access to the Desjardins Trail and the Red Hill Valley Trails.

Construction/Operations Impacts

During the preliminary design process it was identified that 80 properties will have impacts on access to their site, or impacts to their frontages. The two properties that will experience significant impacts are at the proposed terminal stations at McMaster University and Eastgate Square (refer to Design Plates in Appendix A.1. Some of the impacts may require full acquisition of the parcels affected. Temporary property needs may include working easements to facilitate construction; these will be identified during the detail design stage of the project.

Property acquisition required for this project will be undertaken by the City of Hamilton, with the objective being to ensure that individual rights are respected and protected, and to provide fair compensation within the framework of the City's policy and associated legislative instruments governing the acquisition of property for City projects. The acquisition process emphasizes negotiation on a willing seller, willing buyer basis and the achievement of a mutually satisfactory agreement between the City and the owner. If necessary, expropriation may be required to acquire the necessary property in a timely and efficient manner.

There may also be adverse permanent and temporary impacts to individual business operations in the B-Line corridor. Consultation to date has suggested that an important business issue is the possible reduction in the level of customer and supplier vehicle access to the area (e.g., and potential loss of passing traffic, on-street parking, and loading/unloading areas). The design of the project has been developed to minimize these impacts. The City is committed to staging and scheduling construction in a manner that reduces temporary impacts during the construction period.

Mitigation Measures and Net Effects

The City will establish a construction liaison committee during construction to provide quick access to construction related information, specifically schedule and timing information for business owners and residents. The committee will be made up of City and Contractor staff who will meet on site periodically. Business owners and residents directly affected by the current/future construction activity will be invited and encouraged to attend these meetings where the day-to-day issues affecting their home/business will be discussed and resolved. Issues such as business deliveries, local parking, and garbage pick-up will often be topics of concern. In addition to the construction liaison committee initiative, prior to each phase of construction, the City will conduct a broader public awareness campaign. It is expected that such ongoing strategic consultation and information dissemination will increase certainty about project impacts, create an acceptable contingency planning regime, and dramatically reduce the potential disruption to business activities and community cohesion.

While recognizing the influence of rapid transit as a positive catalyst for redevelopment, the City has also recognized the potential adverse impacts of the new service. These include pressure for intensification or redevelopment that would displace important components of the existing housing stock in the City, such as affordable rental units.

Intensification and infill should be implemented with care and consideration of surrounding neighbourhoods. Intensification, in and of itself, is not appropriate unless developments respect neighbourhood character, are of appropriate scale, and include high quality design. Further direction regarding intensification is detailed the Urban Hamilton Official Plan and other planning guidelines and documents.

Monitoring

In addition to monitoring that will occur through the construction liaison committee forum during construction, the City will establish storefront locations dedicated to receiving public comments and concerns about construction activities and impacts.

With respect to long-term monitoring, planning within the Places to Grow policy environment requires comprehensive programs to monitor the various targets contained within the Growth Plan. Beyond monitoring for Growth Plan purposes, the Urban Hamilton Official Plan identifies monitoring and measuring performance of the Official Plan as critical to determine if:

- the assumptions of this Plan remain valid;
- the implementation of the policies fulfill the overall goals and objectives of this Plan;
- growth targets listed in Sections A.2.3 - Growth Management – Provincial and B.2.4.1 - General Residential Intensification Policies, are being met; and
- the priorities identified in this Plan remain constant or require change.

Official Plan monitoring is carried out through statutory 5-year official plan reviews to evaluate whether the goals and objectives of the plan are being met and remain relevant. The more detailed policy direction is also monitored through secondary plan reviews. The City also actively monitors housing starts to track new development, and monitors intensification to track whether City objectives and Provincial targets are being met. Monitoring of economic activity and investment is done where city programs are in effect. Such monitoring can be established to track economic impacts in the LRT corridor over time.

4.3 Natural Environment

4.3.1 Surface Water and Aquatic Ecosystems

Fish habitat was identified at the two (2) watercourses within the project limits for the proposed B-Line LRT, namely Red Hill Creek and Chedoke Creek. The fish community of Red Hill Creek is healthy and diverse, supporting a total of 24 species dominated mainly by warmwater species, with a small assemblage of coldwater and coolwater species. However, the fish community of Chedoke Creek is very limited, due to the highly urbanized nature of its watershed, and primarily supports warmwater species that are tolerant of degraded habitat and water quality conditions. Further, the creek is an "enclosed" watercourse through the B-Line LRT project area.

Background information (DFO Aquatic Species at Risk mapping) suggested that the provincially and nationally endangered Redside dace (*Clinostomus elongatus*) is present in Chedoke Creek. However, typical habitat requirements to support Redside dace were not present in the study area. As part of this study, Hamilton Conservation Authority (pers. comm., Shari Faulkenham, HCA Ecologist) confirmed that Redside dace is not considered to be present in Chedoke Creek.

Construction/Operations Impacts

The project was assessed against the following criteria with respect to aquatic resource impacts:

- Impacts to watercourses providing fish habitat (number of watercourse crossings, sensitivity of fish and fish habitat, extent and function of riparian habitat, extent and type of fish habitat altered/displaced at the crossings and the importance to aquatic ecosystems);
- Potential impacts to designated aquatic species at risk;
- Impacts to the water quality, thermal regime and baseflow of the two watercourse crossings.

Work in and around water features containing fish and fish habitat typically has the potential to result in the harmful alteration, disruption or destruction (HADD) of fish habitat as defined in the Fisheries Act. HADD includes any changes that prevent the physical, biological or chemical attributes of fish habitat from providing food, reproduction, cover and movement corridors, or any change in fish habitat that reduces its capacity to support one or more of life processes of fish (DFO 1998). The proposed B-Line LRT does not involve any in-water work or work near the banks of the Chedoke Creek and, therefore, does not have the potential to directly impact fish habitat by altering/removing their physical habitat (i.e., channel bed, substrates, riparian vegetation, instream cover, etc.). At the Red Hill Creek crossing, due to the manner in which the LRT will make use of both structures that comprise the Queenston Road bridge (there is a gap between the structures that must be filled in and crossed), it is likely that the bridge substructure (piers and abutments) will require reinforcement, resulting in the need to work on the valley floor and the potential for impacts from near-water construction. At both sites, various construction and operation activities associated with the project, such as excavation, bridge/culvert structural work, excess material storage, equipment maintenance activities and wastewater management, may have the potential to adversely affect the aquatic environment and surface water quality within the study area. Potential impacts include impairment of water quality, and direct fish kills or destruction of habitat due to spills (e.g., chemical or sediment) resulting in short term population decline. No impacts to aquatic species at risk are anticipated since none are present in the watercourses crossed by the project.

Mitigation Measures and Net Effects

Environmental design and construction mitigation measures to avoid and/or minimize potential impacts to the aquatic environment and surface water within the study area will include:

- Design and implement erosion and sediment controls measures, such as straw bale flow checks, silt fence, and temporary rock flow checks to prevent or reduce sediment discharges to the existing sewer system and natural watercourses, including application of best management practices (e.g., *Erosion & Sediment Control Guideline for Urban Construction (2006)*).
    - Stabilize and re-vegetate exposed soils immediately following construction.
    - Conduct work in a continuous fashion to minimize the duration of potential impacts and limit the area of disturbance to a minimum.
- Design drainage and stormwater management systems to mimic overland drainage patterns and control runoff quality/quantity contribution to watercourse features.
- Store, handle and dispose of all excess materials by storing, handling and disposing of all materials generated during site preparation, construction and operations to prevent their entry into watercourses.
    - Place temporary stockpiles of material a minimum of 30 m away from the watercourse and ensure material is stabilized to prevent sediment-laden runoff from entering watercourses.
    - Prepare a spills/emergency response plan for construction and operations.
- Manage dewatering and concrete effluent, where applicable, from excavations and structural works to prevent release of contaminated water to receiving watercourses.
    - Direct dewatering effluent to temporary settling basins, filter bags and energy discharge diffusers, as required.
    - Capture and transport concrete effluent off-site for disposal.
- Operate, maintain and store all equipment and materials (e.g., fuel, lubricants) in a manner that prevents the entry of any deleterious substances to watercourses.
- Implement a containment system over the Red Hill Creek channel to prevent construction debris from entering the watercourse.
- Equipment re-fuelling will take place no closer than 30 m from any watercourse to prevent water contamination due to accidental fuel spills.
- Prohibit/limit construction access to watercourses/watercourse banks.

Hamilton Conservation Authority (HCA), the local conservation authority, has a Level 3 agreement in place with the Department of Fisheries and Oceans (DFO). In accordance with the agreement and DFO's Risk Management Framework, HCA will complete an aquatic effects assessment to determine potential impacts of the proposed work on fish and fish habitat. This process includes an assessment to determine the level of risk (high, medium or low) that any residual effects after the application of mitigation pose to fish/fish habitat, and thus the likelihood of a HADD or No HADD occurring as a result of the work.

From the assessment completed as part of this study, it is expected the proposed work associated with the B-Line LRT will be characterized as "Low Risk" by HCA and, as such, will not result in a HADD of fish/fish habitat, provided that the appropriate mitigation measures are applied.

No significant residual effects to surface water resources are anticipated from the project with implementation of the identified mitigation.

Monitoring

An environmental monitoring plan to assess the mitigation measures for protection of aquatic and surface water resources will be prepared, if needed.

Monitoring during construction is anticipated to focus on:

- Routine inspections of temporary erosion and sediment control measures to ensure they are operating effectively to prevent any release of sediment- laden runoff to watercourses.
- Monitoring of treatment systems for any dewatering and/or concrete effluent to avoid any release of contaminated water to receiving watercourses.
- The effectiveness of debris containment system over Red Hill Creek.
- Compliance monitoring of best management practices related to refuelling and excess materials storage and handling.

Monitoring during operations is anticipated to be limited to sediment accumulation and functioning of stormwater management facilities, and stability of drainage systems and slopes near the watercourses in the study area.

4.3.2 Terrestrial Ecosystems

Vegetation Communities

Three principal areas were identified for detailed examination of impacts to vegetation communities. They were selected based on the presence of reasonably large blocks of natural/semi-natural vegetation in the highly urbanized setting through which the proposed B-Line LRT will run. These were identified as Red Hill Creek Valley; Gage Park and Chedoke Creek Valley. These areas have been subjected to significant anthropomorphic pressure, which has degraded the natural attributes of those vegetative assemblages that remain. A number of these landscapes have also been created to provide park settings and landscaped property holdings, which are subject to constant maintenance. All areas examined exhibit significant degradation of the historic natural systems and remnants still present. Cultural meadow or groomed open spaces dominate all sites, with some small remnant woodlots or pockets of planted wooded areas present in all areas.

Construction/Operations Impacts

The project was assessed against the following criteria with respect to terrestrial resource impacts:

- Impacts to existing vegetation communities (area, type, quality, composition, and relative extent);
- Potential impacts to designated Environmentally Sensitive Areas / Areas of Natural and Scientific Interest/Provincially Significant Wetlands; and
- Potential impacts to designated vegetation species at risk.

Impacts of proposed Hamilton B-line LRT construction will be limited to the existing road bed or ROW of the associated roadways over the majority of the line.

The proposed B-Line LRT will cross the Red Hill Creek Valley using the existing Queenston Road Bridge. Generally, all works will take place within the existing bridge structure footprint and road bed or ROW of Queenston Road; consequently, no significant impacts to vegetation are expected. However, given the likelihood that the bridge substructure (piers and abutments) will require reinforcement, resulting in the need to work on the valley floor, there may be a need for vegetation clearing associated with creating construction access to the valley area under the bridge. There is similar potential for vegetation impacts at the Chedoke Creek valley crossing for guideway pier construction.

The new alignment of the proposed B-Line LRT will veer to the north to follow King Street East at the Main Street East/King Street West intersection at the eastern edge of Gage Park. All works will take place within the existing road bed or ROW of the Main Street East and King Street West; consequently, no impacts to vegetation are expected.

The LRT alignment follows King Street West until it gets to Cathedral Park. At this point, the alignment runs southwest, through the northern edge of the park, before bending sharply south to intersect with Main Street West and continuing westward. Assuming a working room requirement of 15 m to either side of the preferred line, this will result in the loss of approximately:

- 0.70 ha Dry Fresh Silver Maple Deciduous Forest;
- 0.22 ha Dry Fresh Manitoba Maple Mineral Cultural Woodlot;
- 0.90 ha Dry Moist Old Field Cultural Meadow;
- 2.54 ha Manicured Grass/Trees; and
- 0.06 ha Reed Canary Grass Meadow Marsh.

These areas are significantly degraded by urban development pressures in the surrounding lands and, with the exception of the small portion of Dry Fresh Silver Maple Deciduous Forest associated with the rail line CP Rail spur crossing under King Street, these areas are manicured or have been partially restored due to previous works in the area. No direct impacts to designated vegetation species at risk have been identified.

Mitigation Measures and Net Effects

A few of the potentially affected areas are subject to various protections under both the Provincial and Municipal regulatory process, depending on their current status.

The Red Hill Creek Valley is designated a Life Science Site of Local importance. Life Science Sites are areas that are recognized as having ecological features of importance at a local level, but are reasonably well represented in other parts of the Province. These areas are designated by municipalities as being ecologically important, and are tracked by the Province.

The ESA and Core areas are protected under Section 2.3 of the Urban Hamilton Official Plan: "*natural features and ecological functions of Core Areas shall be protected and enhanced. To accomplish this protection and enhancement, vegetation removal and encroachment into Core Areas shall generally not be permitted, and appropriate vegetation protection zones shall be applied to all Core Areas*". This applies to the Red Hill Creek Valley ESA and the Cootes Paradise ESA.

Gage Park is designated Park and General Open Space in Schedule B, and Schedule E-1 in the Urban Hamilton Official Plan (2009). The OP states that if "*land designated or used for Open Space and Parks purposes, as designated on Schedule E-1 – Urban Land Use Designations, the maps of the secondary plans, or identified on Appendices relating to Open Space and Parks, is acquired or used by a city department or other public agency for non-recreational public purposes, the City or public agency shall be required to compensate for the resulting loss of parkland by paying the full current market value of the parcel of land into the Parkland Reserve.*" No areas in Gage Park will be directly affected by the project.

In addition to the limited potential for impacts on the aforementioned major natural areas in or adjacent to the B-Line LRT corridor, the project will require displacement of a number of roadside trees. The preliminary design investigations identified that 43 small trees and 64 mature trees will be directly affected. However, it should be noted that with the addition of bumpouts at some intersections, the bumpouts are large enough to accommodate the planting of one tree on each. The principal areas affected are:

- Centre median plantings on Main Street West from McMaster University to Haddon Avenue;
- North side of Main Street West, immediately west of Highway 403;
- South side of King Street at Gore Park;
- North side of King Street at Scott Park;
- South side of Main Street at Delta Secondary School; and
- North side of Queenston Road at Eastgate Square.

The following mitigation measures should be implemented to minimize the effects of construction of the B-Line LRT on those natural and/or semi-natural vegetative assemblies found within the project area.

- Minimize encroachment on, or avoid remnant woodlots and large healthy trees where possible. Individual specimens to be saved will be marked on the ground before construction takes place;
- Trees and areas to be preserved within and adjacent to the ROW will be identified in a Tree Protection Plan and protected with snow fence defining Tree Protection Zone(s);
- Inclusion of hard and soft landscaping in the corridor, including planting of additional street trees, where opportunities present themselves;
- Approval will be obtained, and compensation/reimbursement will be provided, as required, for displacement of publicly owned roadside trees on public property, in compliance with City of Hamilton's Public Tree Removal Policy, the Forest Management Plan (Reforestation Policy) and By-Law 06-151 (Public Trees By-Law), as amended.
- For design and implementation of works in the Red Hill Valley, the City will work collaboratively with the Red Hill Valley Stewardship Board to develop Environmental and Ecological Principles, which will initially be prepared and provided to the RT Team by the Board.
- Designated staging and construction vehicle maintenance/refuelling areas will be identified and enforced;
- Siltation control in areas where sedimentation could potentially affect vegetation not scheduled for removal;
- Stormwater management to maximize runoff water quality, and provide some peak flow controls, which will benefit nearby natural features;
- The movement of construction machinery will be limited to within the boundaries of the ROW and operated in a manner that minimizes damage to adjacent vegetation;
- Roots and branches, if damaged, will be treated using approved horticultural methods;
- Tree management, as needed, to remove any potentially hazardous trees along new wooded edges, and maintain forest health and balance;
- Trees felled will be dropped to fall within the ROW to avoid damage to the remaining vegetation, where practicable;
- Retain dead standing trees where possible as long as there is no safety hazard;
- Wherever possible, construction activities will be restricted within the dripline of all trees not scheduled for removal;
- No rare or endangered species have been identified within the study area. Specimens of rare or otherwise significant species, if observed, would be transplanted in nearby compatible habitat, where practical. The survival rate of any relocated rare and endangered species would also be monitored periodically.
- Where practicable, use only native species for landscaping efforts along the LRT ROW;
- Provide dense edge plantings in areas of fresh forest edge exposure to protect from drying winds, sun exposure (desiccation and spread of invasive sun-tolerant plant species), and salt spray. These plantings may constitute an

exception to the native species mandate, since non-native conifers may provide better screening/protection than native options.

- Return ROW to pre-construction or better condition, where possible.

Monitoring

Environmental site inspections will be required during key construction periods and at key locations to ensure environmental protection/re-vegetation measures are implemented and working and any required remedial action is undertaken. If species at risk are identified within the influence zone of construction activities, MNR will be contacted to determine how specimens of such species should be treated.

Plantings of woody and herbaceous vegetation will be checked periodically for a period of one year to ensure an acceptable survival rate.

Wildlife

The entire project is situated within the urban limits of the City of Hamilton and provides limited wildlife habitat, which is generally restricted to small parks and the Chedoke Creek and Red Hill Creek valleys. Generally, the effects of the proposed B-Line LRT on wildlife species are anticipated to be minimal, as extensive vegetation clearing is not required. Some minor vegetation clearing adjacent to the right-of-way may result in the loss of bird nesting habitat. However, bird species that would nest along the right-of-way corridor can be assumed to be tolerant of high noise levels and disturbances, since the habitat exists within a highly urbanized environment. If vegetation clearing and building removal does not directly remove or destroy active nests, these species are likely to adapt to the increased activity in the study area.

Potential adverse effects on wildlife in the project area were assessed in terms of impacts to birds, herptetofauna and mammals, including species at risk and species of special conservation concern.

Birds – although 21 significant bird species are known to be within the vicinity (approximately 10 km) of the project area, preferred breeding habitat for most of these species is not found within the project area, with the exception of peregrine falcon (*Falco peregrinus anatum/tundrius*), chimney swift (*Chaetura pelagica*), common nighthawk (*Chordeiles minor*), Louisiana waterthrush (*Seiurus motacilla*), and red-headed woodpecker (*Melanerpes erythrocephalus*). Chimney swifts were observed but common nighthawks were not observed during breeding bird surveys. These species can nest in chimneys and flat gravel roofs, respectively.

Peregrine falcons, historically observed on the Hamilton Sheraton Hotel located at the King and Bay intersection on the proposed B-Line route, are accustomed to street level disturbance during the breeding season and should not be adversely affected by the RT line construction or operation.

The project has been designed to avoid displacement of adjacent buildings; therefore, this type of habitat for chimney swift and common nighthawk should not be directly affected.

Louisiana waterthrush and red-headed woodpecker could potentially breed in the larger forested blocks within creek valleys found within the study area. These species were not observed by NRSI biologists during field surveys. Since the B-Line LRT construction will not impact such areas outside of the existing infrastructure footprint, these species should not be adversely affected.

Herpetofauna - Twenty-six species of reptiles and amphibians are known to occur within the vicinity of the project area. NRSI observed only the green frog (*Rana clamitans melanota*) within the project area and the project will not affect the area of the sighting. No preferred habitat for any of the eight significant species listed is found within the project area; therefore, no impacts to these species are anticipated.

Mammals – All of the thirty mammal species known to be within the vicinity of the project area are common in Ontario. NRSI biologists observed only two of these species within the project area - gray squirrel (*Sciurus carolinensis*) and raccoon (*Procyon lotor*). The B-Line LRT project may require removal of street trees that provide habitat for these species.

Construction/Operations Impacts

The project was assessed against the following criteria with respect to wldlife resource impacts:

- Impacts to existing wildlife (Birds, Mammals, and Herpetofauna) and wildlife habitat (type, and quality);
- Potential impacts to wildlife movement, breeding, and increases in animal vehicle conflicts; and,
- Potential impacts to designated wildlife species at risk.

There may be direct impacts to migratory birds during construction of the B-Line, including one significant species (common nighthawk, if nesting in trees) as a result of work on the Queenston Road bridge over Red Hill Creek, and the displacement of trees that serve as nesting habitat. As indicated above, construction activities may also displace trees that are habitat for common urban mammals (gray squirrel, raccoon).

Other potential impacts of the new RT service on wildlife species include barrier effects, vehicle conflicts (road kill), and light and noise disturbance. Since the proposed B-Line LRT infrastructure and operation will be within the existing Main Street-King Street-Queenston Road corridor, the barrier and light/noise effects already exist and will not increase during operation of the proposed LRT service. Similarly, the new guideway crossing Highway 403 and the existing Queenston Road structure are elevated over the Chedoke Creek and Red Hill Creek valleys, respectively, thereby eliminating potential wildlife/LRT vehicle conflicts in the principal wildlife corridors within the project area.

Mitigation Measures and Net Effects

During construction, the Contractor must adhere to the requirements of Migratory Birds Regulations (MBR) under the Migratory Birds Convention Act (MBCA), 1994. The MBR prohibit the "incidental take" of migratory birds and the disturbance or taking of the nests of migratory bird species, which could occur during the construction of infrastructure projects such as the B-Line LRT. Incidental take is defined as the inadvertent harming of migratory birds and the disturbance or destruction of their nests and eggs due to economic activities. In Canada, the MBCA is administered by the Canadian Wildlife Service (CWS) of Environment Canada in cooperation with provincial and territorial governments. Since 2007, Environment Canada has considered the development of a new approach to the management of incidental take of migratory birds in Canada, but in October 2010 announced that the department had decided not to pursue regulatory amendments to the MCBA at that time. Instead, the department has since decided in favour of an approach supported by best management practices and avoidance guidelines. This is a risk-based approach that will address the highest threats to the conservation of migratory birds.

Additionally, the Ontario Fish and Wildlife Conservation Act prohibits the destruction or taking of nests or eggs of wild birds, except for rock pigeons *(Columba livia)*, American crows *(Corvus brachyrhynchos),* brown-headed cowbirds *(Molothrus ater),* common grackles *(Quiscalus quiscula),* house sparrows (Passer domesticus), red-winged blackbirds *(Agelaius phoeniceus)* and starling species. The Act also prohibits the capturing, killing or harassment of endangered species.

To protect bird species that may nest in the right-of-way, the following measures are proposed:

- Implement timing constraints so that no vegetation or buildings deemed to be suitable for migratory bird habitat will be removed during the bird breeding season (April 1 to July 15);
- If construction is scheduled to occur during the aforementioned restricted period, conduct a nest search of vegetation or buildings deemed to be suitable for migratory bird habitat; and
- Conduct a general site visit prior to April 1 in the first year of construction, if required, to inspect the structures (buildings/bridges) scheduled for alteration or removal. If nesting is likely, the Contractor must install bird nesting preventative measures before April 1. The measures must remain in place until July 15. The Contractor will be responsible for installing and maintaining these measures during the bird breeding season.

It should be noted that trees planted as part of urban realm enhancement program proposed by the City in the B-Line corridor will serve as mitigation for some of the trees removed for construction of the B-Line, and may eventually serve as replacement habitat for migratory bird and mammal species.

Since the alignment traverses the federal quarantine area for the Asian Long-horned Beetle, all regulations regarding this quarantine area will be observed.

Monitoring

Monitoring of the migratory bird prevention measures, if required, will occur during the critical breeding/nesting period (April 1 – July 15) to ensure that the measures are effective in restricting nesting on structures scheduled for removal or alteration; thus, eliminating the potential for incidental take.

If any wildlife species, particularly nesting birds, are encountered during construction, a qualified biologist will be contacted immediately to identify the species encountered and ensure that the appropriate agencies are notified and arrangements are made with respect to the appropriate action to be taken to minimize impacts to the species.

4.3.3 Hydrogeology and Groundwater

The proposed B-Line LRT line runs through various soil types, including Iroquois Plan glaciolacustrine deposits (sand and silt, and beach gravel), Paleozoic bedrock (shale and dolomite), Halton Till (silty to clayey till), and modern alluvial deposits. These soils range from a few meters thick to approximately 30 m thick.

The water table generally occurs about 2 m below ground grade to about 16 m below grade. A perched water table about 1 m below grade may be present along central west portions of the route.

Groundwater generally has medium to high contaminant vulnerability. This results from relatively shallow water tables, frequently thin or absent soils, and the presence of fractured bedrock.

For the most part, the LRT construction will involve widening of the existing roadway with minor cut and fill site grading operations. Some portions of the LRT route will be constructed above grade. Excavation for guideway support foundations will be required at the Highway 403 interchange and possibly for structural enhancement of the Queenston Road bridge over Red Hill Creek. No extensive soil or groundwater impacts are anticipated.

Construction/Operations Impacts

The project was assessed against the following criteria with respect to hydrogeology and groundwater:

- Potential contamination of or interference with shallow groundwater resources;
- Potential need for construction dewatering;
- Potential groundwater impacts on surface water where there is interaction in proximity to Chedoke Creek and Red Hill Creek.

The following localized impacts may occur during construction:

- Shallow groundwater levels may be temporarily affected if dewatering is required for excavation. If required, a Permit to Take Water application will be prepared and submitted to the MOE for approval in accordance with Ontario Regulation 387/04, as amended. The application document will include detailed and appropriate evaluation of geological and hydrogeological conditions of the subject area;
- Some contaminated soil and groundwater may be encountered and will require proper storage and handling in accordance with applicable environmental regulations in order to maintain public and worker safety and avoid potential runoff/interaction with surface water; and
- Groundwater contamination may occur from excavation (leaching of contaminants into groundwater), construction equipment and/or associated spills.

Mitigation Measures and Net Effects

Mitigation plans to address the aforementioned construction impacts will be developed during the detail design phase, based on completion of geotechnical testing along the route, an update of potential and actual sources of contaminated sites along the route, and the development of construction methods. Construction methods will reduce the potential for excessive groundwater taking at excavation sites (e.g., use of sheet pile enclosures). Construction contract provisions will ensure that equipment will be maintained in good working order with appropriate safety and emergency measures in place. Contingency plans will be developed to minimize potential groundwater contamination, including a spills response plan. Potential impacts to groundwater will be managed in accordance with O.Reg. 153/04, as amended, and the City of Hamilton's Contaminated Sites Management Program for Municipal Works manual. A copy of the manual is available from the City of Hamilton and will be provided to reviewing agencies on request.

Monitoring

An overall monitoring plan is not required. Temporary or localized plans can be prepared on an as needed basis (e.g., in proximity to Chedoke Creek and Red Hill Creek).

4.3.4 Contaminated Property

The project was assessed against the following criteria with respect to contaminated property:

- The potential to encounter contaminated material during construction activities, and related effects to human health and adjacent sensitive environmental features.

The 2009 inventories of the B-Line corridor and a windshield survey conducted by SNC-Lavalin in October 2010 have identified properties within the study area that have the potential to contribute to environmental contamination. There is the potential for encountering contaminated soil and/or groundwater during construction, which may result in temporary impacts. No impacts are anticipated during future LRT operations.

Potential temporary impacts associated with disturbance of contaminated properties include runoff of contaminated materials into watercourses, the airborne transmission of fine contaminated particulates, and leaching of contaminants into groundwater. Phase 1 Environmental Site Assessments and, potentially, Phase 2 Environmental Site Assessments will be undertaken during detail design, if required.

Mitigation Measures and Net Effects

If contaminated sites are positively identified in or adjacent to the construction area, the MOE District Office will be contacted. Where removal of potentially contaminated soil must take place, soils will be tested for those chemicals that may have been used or deposited within the area, and will be handled in accordance with Part XV.I of the Environmental Protection Act (EPA) and Ontario Regulation 153/04 (as amended). In addition, the City of Hamilton's Contaminated Sites Management Program manual will be applied to the project, including health and safety special provisions (hazard assessment, training, air monitoring, use of personal protective equipment, site control and decontamination). Application of the aforementioned management measures is expected to minimize potential impacts associated with contaminated properties to the point where they are acceptable.

Monitoring

Regular and frequent air monitoring will be performed in areas where contamination has been identified. The City's Contaminated Sites Management Program manual includes procedures for standard general on-site and perimeter air monitoring, as well as non-routine monitoring, which will be applied to this project.

4.3.5 Drainage and Stormwater Management

The majority of the proposed B-Line LRT alignment will have surface runoff collected and fed into the City of Hamilton's storm sewer system. The study area is urbanized and the LRT alignment will generally remain within existing roadway allowances where the road sections are already built to urban standard. Consequently, the amount of impervious area will not increase substantially and the impacts on stormwater drainage are not expected to be significant.

Construction/Operations Impacts

On a segmental basis, the alignment of the B-Line LRT will affect the existing stormwater management system as follows:

From Sta 0+000 (McMaster University) to Sta 0+550, the LRT facilities are located within the McMaster University grounds. Most of the area required for the LRT is currently landscaped and covered with grass. The LRT guideway and station platforms will be concrete surface. Consequently, this is one area where the extent of impervious surface and associated runoff will increase. At present, due to the ongoing development of details as to how the LRT will interface with the University grounds and infrastructure, there are no drainage configuration plans for the affected area of the University upon which to base an assessment of the ability to accommodate the additional runoff, or the need for additional storm sewers to drain the LRT area independently from the University drainage system. If the existing storm drainage system of the University parking area does not have capacity to accommodate the increased runoff from the LRT guideway and stop area, a separate stormwater drain will be required. This will most likely be the case, as the parking lot drainage system may be designed for a 10-year storm event and the LRT ROW will require a 25-year design storm capacity. Accommodation of stormwater detention facilities will also be considered.

From Sta 0+550 to 0+750 and from Sta 0+750/0+310 to Sta 1+800, the LRT occupies the existing median on Main Street West. A marginal increase in runoff will occur in this segment. The existing storm sewer system will need to be checked for capacity to accept this extra runoff.

From Sta 1+800 to Sta 2+400, the alignment covers the approaches to and the bridge over Highway 403. This is a new component of the infrastructure and it also represents an increase in impervious area contributing to the existing surface drainage system. The western part of the bridge deck and approach will have a drainage outlet to the Chedoke Creek corridor running along the west side of Highway 403. In the next design phase the need for enhanced stormwater measures will be examined. The central segment of the bridge (the crest curve) will drain into the Highway 403 storm sewer system managed by the Ministry of Transportation. It is expected that this sewer will have the capacity to handle this additional runoff. Initial discussions with MTO confirm this to be likely. The Eastern part of the new bridge and the approach will drain into the municipal storm sewer along King Street West.

From Sta 2+400 to Sta 10+600, the LRT guideway runs along existing sections of King Street West/East, Main Street East and Queenston Road. It replaces existing impervious surfaces (pavement/sidewalks) and, therefore, will not increase the existing runoff or require additional treatment or drainage facilities.

From Sta 10+600 to Sta 13+600, the LRT guideway replaces a hard surface median on Queenston Road and will not increase existing runoff.

On a permanent basis, the project represents an absolute increase in impervious surface of approximately 1.62 ha (0.23 ha at the University; 0.27 on the new structure over Highway 403; 1.12 along the remainder of the existing road system). In terms of water quantity impacts this is not expected to result in a significant increase in erosion or flooding potential due to the capacity of the municipal and MTO drainage systems to handle the majority of the runoff), but will require treatment to address potential water quality concerns.

Mitigation Measures and Net Effects

Where the B-Line LRT guideway represents an increase in impervious surface and will result in increased stormwater runoff, alternative best management practices will be assessed in accordance with MOE's *Stormwater Management Planning and Design Manual* (2003). Consideration will also be given to enhancing runoff conditions in existing road segments, where practical. Alternative mitigation measures that may be considered during detail design may include:

- Incorporation of vegetated drainage swales in the Highway 403 crossing area immediately adjacent to the guideway to act as filters and provide quality treatment to the water prior to entering the Chedoke Creek system;
- Incorporation of roadway conveyance control measures (oil/grit separators), where practical;
- Consideration of alternative end-of-pipe approaches to serve as a form of water quality treatment at the outflow end of the existing stormwater system. This approach will only be considered when conveyance control measures are unable to improve the quality of stormwater runoff to objective levels. Every effort will be made to address quality and quantity concerns within the constraints of the right-of-way.

Improvements to the existing stormwater drainage system and any other alternative mitigation measures that may be evaluated during the detail design phase of the LRT should be able to address the project impacts relative to both water quality and quantity concerns.

Monitoring

A detailed surface water management plan will be prepared and used for monitoring throughout construction.

4.3.6 Noise and Vibration

The potential noise and vibration impacts of the proposed City of Hamilton B-Line LRT have been evaluated using approved protocols and project-specific criteria, as agreed upon with the Ministry of the Environment's Senior Noise Engineer. The focus of the noise and vibration assessment is the effect the LRT would have at sensitive receptors during normal operations. The noise and vibration from construction activities are also considered. Following is a summary of noise and vibration impacts, mitigation and monitoring during the construction and operations phases of the project. More detailed information is presented in the Noise and Vibration Impact Assessment Report in Appendix B.3 of this EPR.

Construction/Operations Impacts

The project was assessed against the following criteria with respect to noise and vibration:

- Potential for operational noise and vibration impacts at sensitive receptors, such as residential developments, nursing homes, group homes, hospitals, and other such institutional land uses where people reside. Additional criteria were developed based on the FTA guidelines to consider the effects of vibration-induced noise.
- A generic guideline for construction noise and vibration based on provincial emission standards and municipal timing restrictions.

The impact of construction noise and vibration on nearby sensitive receptors has been reviewed. As the project has not reached the detailed design level, neither the specifics of the equipment to be used in the construction process, nor the construction process itself have been determined. The focus of the construction noise and vibration impact assessment is to develop a generic guideline to be further refined and expanded when more information becomes available during the detailed design phase.

Provincial and municipal guidelines provide basic restrictions and recommendations with regard to construction noise and vibration. The City of Hamilton enforces a noise by-law which prescribes appropriate hours of operation for construction activities. The applicable guidelines can be found in the following documents:

- MOE's Model Municipal Noise Control By-law
- The City of Hamilton By-Law No. 03-020, Enacted January 22, 2003
- NPC-115 'Construction Equipment'
- NPC-205 'Sound Level Limits for Stationary Sources in Class 1&2 (Urban) Areas'

For the operations phase, the noise impact assessment is based in principle on the MOE/TTC Draft Noise Protocols prepared for several transit projects in Toronto in the last 20 years. The noise assessment considers the effects of the LRT on roadway noise as heard by adjacent sensitive receptors. It compares the sound levels that would be present along the corridor without the project to the sound levels that would be present along the corridor with the project in place. The difference between the two scenarios (the "with" project and "no" project sound levels) indicates the effect that the project would have along the corridor. Wherever the project results in an increase in sound levels of 5 dBA or more, noise control needs to be implemented, wherever feasible.

The MOE/TTC Protocols also indicate that stationary sources such as bus terminals, traction power substations, and maintenance facilities will need to meet the MOE's NPC 205 guidelines for stationary sources in urban areas. As there will be no new bus terminals, and the details of the traction power substations and Maintenance and Storage Facility are as yet undeveloped, the evaluation of these facilities has been deferred to later design stages.

In most areas in the Downtown core along the LRT route, the project will actually result in a noticeable and sometimes significant reduction in road noise. Along other segments of the proposed LRT route, the sound levels in limited areas will increase slightly, mostly as a result of offsetting the LRT tracks to one side of the road or another. Table 4.2 summarizes the "No Project" and "With Project" sound levels as well as the expected daytime and nighttime changes in sound levels.

Table 4.2: Expected B-Line LRT Sound Levels and Impacts

POR[4]	No Project Sound Levels (dB)		With Project Sound Levels (dB)						Impact (dB)	
	Daytime (16hr L_{eq})	Nighttime (8hr L_{eq})	Daytime (16hr Leq)			Nighttime (8hr Leq)			Daytime	Nighttime
			Traffic Only	LRT Only	TOTAL[1]	Traffic Only	LRT Only	TOTAL[1]		
1	69	62	68	61	69	62	57	63	0	1
2	68	61	67	61	68	60	57	62	0	1
3	65	58	64	60	65	57	56	60	0	2
3[2]	71	71	71	60	71	71	56	71	0	0
4	70	63	65	63	67	59	59	62	-3	-1
5	70	63	64	63	67	57	59	61	-3	-2
5[3]	68	62	67	61	68	60	57	62	0	0

POR[4]	No Project Sound Levels (dB)		With Project Sound Levels (dB)						Impact (dB)	
	Daytime (16hr L_{eq})	Nighttime (8hr L_{eq})	Daytime (16hr Leq)			Nighttime (8hr Leq)			Daytime	Nighttime
			Traffic Only	LRT Only	TOTAL[1]	Traffic Only	LRT Only	TOTAL[1]		
6	69	62	0	61	61	0	57	57	-8	-5
7	67	60	58	63	64	52	58	59	-3	-1
8	68	61	60	63	65	54	59	60	-3	-1
9	69	62	61	63	65	55	59	60	-4	-2
10	68	61	58	62	63	52	58	59	-5	-2
11	66	60	61	60	64	54	56	58	-2	-2
12	66	59	63	61	65	56	57	60	-1	1
12[2]	68	64	67	61	68	63	57	64	0	0
13	66	60	66	62	67	59	58	62	1	2
14	65	58	63	61	65	57	57	60	0	2

Notes

1. The 'With Project Sound Levels" have been divided into "Traffic Only" and "LRT Only" sound levels to show the relative significance of each. They are then added together to obtain the total sound level, which is used to determine the potential impact.
2. Upper floors are evaluated in these cases to demonstrate the relative impacts on upper floors compared to lower floors.
3. Opposite to POR5 are also sensitive receptors, which are evaluated to show the effect of a shift in the alignment of the roadway in the sections where the LRT is offset.
4. PORs may differ slightly from those cited in Chapter 3 based on refinements to the design between the inventory and impact assessment stages, and due to the need to adopt the most conservative approach for assessing noise impacts (i.e., mid-block receptors are used to avoid the influence of noise on major crossing roads. Refer to figures in Appendix B.3).

Part of the reduction in road noise in the B-Line corridor is a result of diversion of traffic onto other parallel streets. Sound levels can be expected to increase by 1-2 dBA along the major parallel streets. In a couple of isolated cases, such as along Cannon Street near Gage Avenue, the traffic increases two-fold, resulting in a 3 dBA increase in road noise; this increase may be perceptible at some receptors. Table 4.3 summarizes the sound levels and impacts on parallel arterial roads.

Table 4.3: Parallel Street Noise Impacts

Street Name	Intersection Description	Impact (dB)	
		Daytime	Nighttime
Cannon Street	Cannon and Bay	2	2
Cannon Street	Cannon and John	2	2
Cannon Street	Cannon and Catharine	1	1
Cannon Street	Cannon and Ferguson	1	1
Cannon Street	Cannon and Wellington	1	1
Cannon Street	Cannon and Victoria	2	2
Cannon Street	Cannon and Wentworth	2	2
Cannon Street	Cannon and Gage	3	3
Cannon Street	Cannon and Ottawa	2	2
King Street	King and Macklin	-1	-1
Main Street	Main and Queen	-1	-1
Main Street	Main and Bay	-1	-1
Main Street	Main and Wellington	-2	-2
Main Street	Main and Wentworth	-2	-2
Main Street	Main and Parkdale	1	1
York Boulevard	York and Hess	1	1
York Boulevard	York and Bay	0	0
Wilson Street	Wilson and John	1	1
Wilson Street	Wilson and Catharine	2	2
Wilson Street	Wilson and Wellington	2	2
Wilson Street	Wilson and Wentworth	1	1
Barton Street	Baron and James	0	0
Barton Street	Barton and Wellington	1	1
Barton Street	Barton and Victoria	2	2
Barton Street	Barton and Wentworth	1	1
Barton Street	Barton and Sanford	2	2
Barton Street	Barton and Strathearne	2	2
Barton Street	Barton and Centennial	1	1

With respect to vibration, the impact assessment has considered the effects of vibration in two forms. First, the ground-borne vibration (perceptible vibration) levels have been evaluated based on the MOE/TTC Protocol limit of 0.10 mm/s rms. Second, the vibration-induced sound (vibration that is heard, not felt) is evaluated based on the US Federal Transit Administration guideline level of 35 dBA. Residential receptors are the primary consideration, as they are usually the most sensitive to vibration. At distances of more than 20 m from the nearest track, the vibration levels from the proposed B-Line LRT system will meet these guidelines. For residential receptors located closer than 20 m, the vibration level criteria will be exceeded if no special track isolation measures are incorporated in the design. Specifically, sections where there are residences less than 10 m from the nearest track centerline will need special vibration isolation measures. Notable areas in this regard include the following sections along King Street:

- Between Dundurn Street and Margaret Street;
- Between Locke Street and Ray Street;
- Between Hess Street and Caroline Street;
- Between Tisdale Street and Wentworth Street;
- Between Farleigh Avenue and Holton Avenue; and
- Between Proctor Boulevard and Belmond Avenue.

Mitigation Measures and Net Effects

Noise

With regard to mitigation of noise impacts during construction, provincial guidelines place specific restrictions on source equipment sound levels. The guidelines are written to restrict maximum allowable sound levels for equipment used in certain construction activities. The applicable guidelines can be found in NPC-115. NPC-205 excludes noise sources related to construction activities.

City of Hamilton By-Law No. 03-020 places restrictions on the hours of operation for all construction activities; contractors will generally be required to adhere to these restrictions. In particular, construction is limited to between 7:00 a.m. and 7:00 p.m. on weekdays and Saturdays, with more stringent hours on Sundays and holidays. Construction activities beyond these periods will require exemption from the by-law (e.g., to avoid traffic operations impacts, or move/install large guideway beams at the Highway 403 crossing). Because of the potential impact on receptors during the nighttime periods, it is recommended that the residents in the corridor be notified several weeks in advance of pending nighttime construction activities.

As indicated above, sound level increases during the operations phase may be perceptible in a couple of locations on arterial roads parallel to the B-Line corridor. However, since the increases in sound levels are well below the guideline level for consideration of mitigation measures (5 dB), noise mitigation is not warranted for any part of the LRT route.

Vibration

It is assumed that there will be a basic level of vibration isolation installed throughout the system. This will include encapsulated rail (rail embedded in a rubber casing to dampen vibration). At distances of more than 20 m from the nearest track, the vibration levels from the LRT system will meet the applicable guidelines. For residential receptors located closer than 20 m, various levels of upgraded vibration isolation will be required (e.g., improved encapsulated rail systems or floating slab track), as listed above. The upgraded vibration isolation will primarily serve to control the vibration-induced noise, but will also reduce the perceptible vibration levels to below the guideline limit of 0.10 mm/s rms. The segments of the B-Line corridor where upgraded vibration isolation is recommended are shown overlain on an aerial photograph in Appendix A of the Noise and Vibration Impact Assessment report in Appendix B.3 of this EPR.

It must be emphasized that these mitigation proposals, particularly the locations and the level of upgraded vibration isolation to be considered, are preliminary. A more detailed noise and vibration assessment will be conducted during the detail design phase of the project, when vehicle and LRT infrastructure design parameters have been refined and more site-specific information will be available (i.e., LRT vehicle and suspension type; track structure; soil conditions and receptor structure setback, type, condition and use).

Monitoring

Noise and vibration monitoring of the construction activities may be warranted. The equipment used in LRT construction should not be substantially different than the equipment used in highway construction projects. Vibration sources, such as pile drivers are not expected for the at-grade segment of the route. Further, the new elevated guideway structure over Highway 403 will be remote from noise sensitive areas. However, a construction phase protocol will also be developed for addressing noise and vibration complaints in keeping with the City's standard practice.

The City of Hamilton does not currently have a post-construction transit noise monitoring policy. Though not required, noise monitoring can be conducted once the project is completed to provide an indication of the actual sound levels along the LRT route.

For the operations phase, a noise and vibration monitoring plan will be considered, along with a complaints protocol.

4.3.7 Air Quality

The project was assessed against the following criteria with respect to air quality:

- Potential for project-related changes in traffic to impact air quality at nearby sensitive land uses. The impact of a traffic change was considered negative if it increased the potential for an air pollutant to exceed its acceptable threshold, and positive if it decreased this potential.
- Potential for construction activities to cause temporary impacts at nearby sensitive land uses.

Appendix B.4 describes the Air Quality studies conducted and provides detailed information on the air quality modeling, including:

- Vehicle emissions modeling to predict emission rates of the Contaminants of Concern (CoC's) from local traffic;
- Dispersion modeling, to predict how the emitted pollutants disperse into the surrounding area and to determine the resulting airborne concentrations of CoC's contributed by the local traffic; and
- Review of historical monitoring data to determine background concentrations of CoC's onto which the contribution from local traffic is added.

Introduction of the B-Line LRT system will result in a number of air quality benefits. Since the LRT is an electrified rail system, it does not produce any significant local air emissions. On the contrary, it displaces emissions that otherwise would be generated by alternative methods of carrying its passengers, either automobile or bus. However, the existing traffic conditions and routes are expected to be altered to accommodate the B-Line LRT. Certain streets will be made one-way; the direction of flow of traffic will be reversed on others and the number of lanes on some roads will change. With the proposed LRT line in place, traffic is expected to increase on certain sections of roads and decrease on others when compared to a "without LRT" scenario for the year 2021.

Both King Street and Main Street are expected to have significantly reduced traffic throughout the Downtown area with the LRT in place. For example, approximately 50% fewer vehicles (about 2,000 fewer vehicles/hour) will arrive at the King and Main intersection during peak hours. King Street and Main Street will also experience a decrease in bus transit activity, with the peak hour bus volume dropping from 16-22 buses/hour to 6-12 buses/hour.

On the other hand, both Cannon Street and Barton Street are expected to experience increased traffic with the LRT in place. Traffic arriving at the intersection of Barton Street and Strathearne Avenue, for example, is expected to increase by about 50% during the morning peak (i.e., about 1,000 vehicles/hour) and by 20% during the afternoon peak (about 500 vehicles/hour). York Boulevard, between Dundurn Street and Hess Street, is also expected to experience increased traffic, by about 25% during the morning peak (about 900 vehicles/hour) and about 35% during the afternoon peak (about 1,300 vehicles/hour). The potential air quality impacts resulting from these increases in traffic are discussed below.

There is also a small stretch of King Street, in the vicinity of Kenilworth Avenue where bus transit activity is expected to increase with the LRT, with the peak hour volume increasing from 8 buses/hour to about 12 buses/hour. However, this increase in bus traffic has only a minor impact on traffic emissions, which will be more than off-set by the anticipated decrease in other traffic along this section of King Street.

Given these changes in traffic service attributes, the following three areas were selected for the air quality impact assessment based on their potential to provide sufficient information about the most extreme air quality impacts, both positive and negative:

1. King Street and Main Street intersection;
2. Barton Street from Kenilworth Avenue to Strathearne Avenue; and
3. York Boulevard from Locke Street to Hess Street.

Following is a summary of air quality impacts, mitigation and monitoring during the construction and operations phases of the project. More detailed information is presented in the Air Quality Impact Assessment Report in Appendix B.4 of this EPR.

Construction/Operations Impacts

Construction activities will involve heavy equipment that can generate air pollutants and dust. These impacts are temporary in nature. The emissions are highly variable and difficult to predict, depending on the specific activities that are taking place and the effectiveness of the mitigation measures. However, it is known that these emissions have the potential to cause undesirable air quality impacts unless effective mitigation measures are in place. Air quality concerns are related primarily to total suspended particulate (TSP) and dustfall impacts caused by these activities. Dust emissions may result from the movements of construction vehicles, pavement cutting, and wind erosion of stockpiles and exposed graded areas.

For the operations phase, computer modeling, in combination with historical monitoring data, was used to predict the impact of projected traffic changes on local air quality. The computer model predicted the maximum contribution of the traffic changes, and the historical monitoring data provided an estimate of the maximum contribution from background

emission sources in the surrounding area (occasional events of elevated background concentration were excluded from the analysis).

The analysis indicated that, for most of the pollutants assessed, the maximum cumulative concentrations remain within acceptable thresholds at residences and other sensitive receptors adjacent to the roadways (i.e., concentrations remain within applicable ambient air quality criteria, or AAQC's). This is true even in the areas where traffic volumes are projected to increase with the LRT in place. The exceptions are as follows:

- The increased traffic on York Boulevard is predicted to cause the maximum cumulative concentration of PM_{10} (inhalable particulate matter) to exceed its AAQC slightly at one of the modeled receptors (an adjacent residence). This result is associated with worst-case weather conditions, which would be infrequent. Without the LRT, the predicted maximum cumulative concentration of PM_{10} would be slightly below its AAQC.
- The maximum cumulative concentration for benzene (a key species of exhaust hydrocarbon) is expected to exceed its acceptable threshold at all modeled receptors, since the maximum background concentration exceeds the threshold. In most cases, however, the contribution of the modeled road traffic is very small in relation to the background concentration (generally less than 10%, even at locations adjacent to the roadways). This indicates that the traffic changes associated with implementation of the LRT will have only a very small impact on the cumulative concentrations.

Along King Street and Main Street, the maximum cumulative benzene concentrations are expected to improve slightly due to the projected decrease in traffic volume on these roads, with the LRT in place. The largest predicted cumulative concentrations for benzene are expected to occur along York Boulevard. This roadway's predicted contribution to benzene levels is about 25% of background at the most-impacted receptors, with the LRT in place. Without the LRT in place, this contribution would be only about 15% of background, indicating that the effect of the traffic change on maximum cumulative benzene levels is only about 10% at the most-impacted receptors.

Another exception is benzo(a)pyrene (BaP), a key species of so-called polycyclic aromatic hydrocarbons (PAH). Like benzene, background levels of BaP in Hamilton and elsewhere are currently well above the applicable AAQC's for this substance. BaP was not explicitly modeled with the computer simulation (due to greater uncertainty in both emissions and background levels), but was represented by benzene as a surrogate, as benzene has a similar ratio of emission to AAQC. Like benzene, therefore, the contribution of the modeled road traffic to BaP levels is very small in relation to background concentrations and has only a small impact on cumulative BaP concentrations.

Mitigation Measures and Net Effects

The construction tendering process will include requirements for implementation of an emissions management plan. This would include measures such as application of dust suppressants; reduced travel speeds for heavy construction vehicles; efficient staging of activities; minimization of haul distances; cleaning of paved areas (sweeping and water flushing); appropriate management (e.g., covering) of material stockpiles susceptible to wind erosion; and proper loading and transport procedures (avoiding overloading and spillage, minimizing free-fall distance, enclosure, wind guards). Use of temporary solid barriers will also be considered, since they may also be provide some reduction in air quality impacts at sensitive receptors that are in close proximity to construction activities.

Where construction involves excavation of potentially contaminated soils, the tendering process will include requirements for testing of the soils prior to excavation and ongoing monitoring during the excavation, if the initial testing indicates that monitoring is warranted (refer also to Section 4.3.4 Contaminated Property and the City of Hamilton's Contaminated Sites Management Program for Municipal Works manual (available from the City of Hamilton)).

Recently published studies indicate that tall vegetation is very effective at reducing pollutant concentrations downwind of roadways, and that barriers can also reduce pollutant levels in areas immediately behind the barrier (within 80 m). The potential for additional tree plantings on public land adjacent to York Boulevard between Inchbury Street and Hess Street should be investigated, and additional plantings on private land adjacent to the road, where practical, should be encouraged. This could potentially include additional tree plantings in the median, and in any open green spaces adjacent to the roadway, such as the open area south of York Boulevard, between Pearl Street and Ray Street. The City will consider these measures in areas where there is an impact.

With respect to net effects, for most air pollutants of concern, predicted cumulative concentrations will remain within acceptable air quality thresholds in areas where road traffic volumes are expected to be affected by the operation of the LRT (with the exception of occasional events of elevated background concentration for some pollutants). Thus, there is no significant net effect for these pollutants.

In the case of benzene and BaP, background concentrations in Hamilton currently exceed the applicable ambient air quality criteria (even when occasional elevated events are excluded). The anticipated changes in road traffic will improve benzene and BaP levels slightly in some areas (along King Street and Main Street) and add slightly to the benzene and BaP levels in other areas (most notably along York Boulevard). Overall, the anticipated net effect for benzene is very small.

In the case of inhalable particulate matter (PM_{10}), along King Street and Main Street, PM_{10} levels will be reduced somewhat compared to existing levels, due to a reduction in traffic volumes with the LRT in place. The anticipated increase in traffic along York Boulevard may result in some exceedances of the applicable criterion at adjacent residences, but only under worst-case weather conditions, which would be infrequent. Overall, the net effect for PM_{10} is anticipated to be small.

Monitoring

Ontario Regulation 419/05 under the Environmental Protection Act requires that every measure be taken to minimize emissions and prohibit visible emissions from escaping beyond the contract limits of a construction site. The City of Hamilton will consider the development and implementation of an air quality monitoring plan during the construction period. As a minimum, during construction, observation of visible emissions will be treated as a case where immediate action must be taken. A number of monitoring approaches and mitigation measures are available for measuring and reducing dust emissions. Dust generation will be visually monitored to proactively achieve the goal of reducing the impacts to local air quality. This minimizes the exposure of the general public and workers on-site to fine particles, which can contribute to certain human health effects and traffic safety concerns.

Since the anticipated effects on air quality are expected to be relatively small (positive in some cases and negative in others), a project-specific monitoring program during the operations phase is not proposed. However, the City of Hamilton will continue to assess area wide air quality under its current monitoring program (through Clean Air Hamilton), and it is expected that the B-Line LRT operations will be captured by this initiative.

4.4 Cultural Environment

4.4.1 Built Heritage and Cultural Heritage Landscapes

The project was assessed against the following criterion with respect to built heritage and cultural heritage landscapes:

- Potential direct and indirect impacts to known cultural heritage resources that may result in isolation of the resource, premature deterioration of the resource due to vibration and/or construction related impacts, and/or removal of the resource.

A cultural heritage resource assessment was undertaken to provide: an existing conditions inventory of above ground cultural heritage resources at the site of the proposed transit project; a description of data reviewed and a summary of results and conclusions; an assessment and evaluation of the impacts of the proposed transit construction, operations and associated activities; and appropriate conservation measures and/or additional investigations that may be required to mitigate potential impacts of the proposed project on above ground cultural heritage resources.

As of July 2011, existing condition inventory data of cultural heritage resources has been updated. General constraints and opportunities of the proposed alignment on cultural heritage resources have been identified; and impacts of the conceptual alignment proposed in Design Workbook 2 v2 (DW2) on identified cultural heritage resources assessed and conservation and mitigation measures recommended. The results of the updated inventory of built heritage and cultural heritage are shown in Table 4.4.

Table 4.4: Identified Built Heritage Resources (BHR) and Cultural Heritage Landscapes (CHL) Adjacent to the Preferred Route for the B-Line Light Rail Transit Corridor

New Feature #	Previous Feature # (ASI 2009)	Location	Feature Type/Name	Age	Description/Comments
BHR 1	BHR 1	1284 Main Street East	School	1930s	Identified in the City of Hamilton's Inventory of Buildings of Architectural and/or Historical Interest.
BHR 2	BHR 29	35-41 King Street East	The Right House	1890	Designated under the Part IV of the Ontario Heritage Act.
BHR 3	BHR 32	100 Main Street West	Hamilton Wentworth District School Board Building	Mid twentieth century	Identified in the City of Hamilton's Inventory of Buildings of Architectural and/or Historical Interest.
BHR 4	BHR 36	621 King Street West	Residence	Nineteenth century	Identified during field review.
BHR 5	BHR 37	619 King Street West	Residence	Nineteenth century	Identified during field review.
BHR 6	BHR 38	581 King Street West	Residence	Nineteenth century	Identified in the City of Hamilton's Inventory of Buildings of Architectural and/or Historical Interest.
BHR 7	BHR 39	577-579 King Street West	Residence	Nineteenth century	Identified in the City of Hamilton's Inventory of Buildings of Architectural and/or Historical Interest.
BHR 8	BHR 40	393 King Street West	Residence	Nineteenth century	Identified in the City of Hamilton's Inventory of Buildings of Architectural and/or Historical Interest.
BHR 9	BHR 41	2 Ray Street	Residence	Nineteenth century	Identified during field review.
BHR 10	BHR 42	374 King Street West	Commercial	Nineteenth century	Identified during field review.
BHR 11	BHR 43	378 King Street West	Commercial	Early twentieth century	Identified in the City of Hamilton's Inventory of Buildings of Architectural and/or Historical Interest.
BHR 12	BHR 44	366/368 King Street West	Residence	Nineteenth century	Identified in the City of Hamilton's Inventory of Buildings of Architectural and/or Historical Interest.
BHR 13	BHR 45	363 King Street West	The Grand Lodge A.E. and A.M. of Canada.	1960	Identified during field review.
BHR 14	BHR 46	354 King Street West	Mount St. Joseph	Early twentieth century	Identified during field review.
BHR 15	BHR 47	4 Queen Street South	The Scottish Rite of Freemasonry: Castle (house) and Cathedral	1895/ 1923	Identified in the City of Hamilton's Inventory of Buildings of Architectural and/or Historical Interest.
BHR 16	BHR 48	15 Queen Street South	All Saints Anglican Church	1872	Identified in the City of Hamilton's Inventory of Buildings of Architectural and/or Historical Interest and Listed on the City of Hamilton Register of Property of Cultural Heritage Value
BHR 17	BHR 49	276-278 King Street West	Commercial	1905	Designated under the Part IV of the Ontario Heritage Act.
BHR 18	BHR 51	1620 Main Street East	Industrial/Factory	Twentieth century	Identified during field review.
BHR 19	BHR 59	66-70 King Street East	Victoria Hall	1887	Designated under the Part IV of the Ontario Heritage Act.
BHR 20	BHR 60	45 Main Street East	John Sopinka Courthouse	1935	Designated under the Part IV of the Ontario Heritage Act; A review of the property's designation by-law suggests that it likely retains provincial significance.
BHR 21	BHR 61	320 King Street East	Commercial	1892	Designated under the Part IV of the Ontario Heritage Act.
BHR 22	N/A	Strathearne Avenue and Main Street East	Traffic Circle	Ca. 1950	Identified during the field review and based on review of twentieth century topographic mapping.
CHL 1	CHL 1	Red Hill Valley	Waterscape	N/a	Identified in the City of Hamilton's Inventory of Cultural Heritage Landscapes.
CHL 2	CHL 2	Water Line	Public infrastructure element	1857-1860	Identified by the City of Hamilton.

New Feature #	Previous Feature # (ASI 2009)	Location	Feature Type/Name	Age	Description/Comments
CHL 3	CHL 3	Main Street East; Kensington Avenue to Edgemont Street; North side of Main Street	Commercial streetscape	Ca. 1920 - 1930	Identified by the City of Hamilton/field review.
CHL 4	CHL 5	Gage Park	Designed landscape/public park	1922	Identified in the City of Hamilton's Inventory of Cultural Heritage Landscapes and Listed on the City of Hamilton Register of Property of Cultural Heritage Value
CHL 5	CHL 6	Toronto, Hamilton, and Buffalo Railway	Railscape	1890s	Identified by the City of Hamilton/field review.
CHL 6	CHL 11	Toronto, Hamilton and Brantford Railway (CP Rail)	Railscape	c.1890s	Identified by the City of Hamilton/field review.
CHL 7	CHL 12	North side of Main Street West, west of Cline Avenue to east of Paisley Avenue South	Part of Westdale Original Subdivision	1920s-1950s	Identified by the City of Hamilton as a Cultural Heritage Landscape in the Ainslie Wood Westdale Secondary Plan.
CHL 8	CHL 13	South side of Main Street West, Bowman Street to east of Cline Avenue South	Part of Ainslie Wood East Neighbourhood	1930s-1950s	Identified during field review and on the Ainslie Wood Westdale Secondary Plan.
CHL 9	CHL 17	King Street West and Main Street West Streetscape, Longwood Road South north along Paradise Road South, and east to Highway 403	Part of Westdale South Neighbourhood.	Early twentieth century	Identified during field review and on the Ainslie Wood Westdale Secondary Plan.
CHL 10	CHL 18	174 King Street West	Cathedral of Christ the King	1931	Identified in the City of Hamilton's Inventory of Buildings of Architectural and/or Historical Interest.
CHL 11	CHL 19	King Street West between Strathcona Avenue to Locke Street	Victoria Park - site of the Crystal Palace	Nineteenth century	Identified in the City of Hamilton's Inventory of Cultural Heritage Landscapes.
CHL 12	CHL 20	King Street West Streetscape, Locke to just past Pearl.	Split residential/commercial streetscape	Nineteenth and early twentieth century	Identified during field review.
CHL 13	CHL 21	King Street West Streetscape, Queen Street to Caroline Street	Split residential/commercial streetscape	Nineteenth and early twentieth century	Identified during field review.
CHL 14	CHL 22	King Street West Streetscape at Bay Street	Commercial streetscape	Nineteenth century	Identified during field review.
CHL 15	CHL 23	King Street East, James to Wellington	Commercial streetscape	Ca. 187os-1900	Identified during field review/Identified by the City of Hamilton; One property located within this landscape (82 King Street East) and is listed on the City of Hamilton Register of Property of Cultural Heritage Value
CHL 16	CHL 24	Gore Park	Designed landscape/Public Park	Ca. 1870s	Identified in the City of Hamilton's Inventory of Cultural Heritage Landscapes.
CHL 17	CHL 25	Wellington Park	Designed Landscape/Public Park	Late nineteenth century	Identified in the City of Hamilton's Inventory of Cultural Heritage Landscapes and Listed on the City of Hamilton Register of Property of Cultural Heritage Value
CHL 18	CHL 26	King Street East Streetscape, Wellington to Wentworth	Split residential/commercial streetscape	Late nineteenth century	Identified by the City of Hamilton/field review.
CHL 19	CHL 27	Ferguson Rail Line	Railscape	Ca.1920s	Identified by the City of Hamilton/field review.
CHL 20	CHL 28	King Street East; Sanford Avenue to Barnesdale	Transitional residential and commercial landscape	Ca. 1900 - 1950	Identified by the City of Hamilton/field review.
CHL 21	CHL 29	King Street East Street, Barnesdale Avenue to Belview Avenue	Residential	Ca. 1920-1930	Identified by the City of Hamilton/field review.
CHL 22	CHL 35	Main Street East Streetscape, Burris Street to the Delta	Split commercial and residential, transitional streetscape	Ca. 1890 – 1930	Identified by the City of Hamilton/field review

A review of historic mapping from 1876, 1893, 1898, and 1914, combined with the updated results of data collection and a field review conducted in 2009, and an updated field review conducted in October 2010 and June 2011 within the context of the conceptual alignment presented in DW1 and DW2, confirmed that wide portions of the study corridor retain numerous cultural heritage resources. Generally, resources are concentrated in the Downtown core, from east of Highway

403 through to the Delta. In the eastern and western extremities of the study corridor under assessment, fewer cultural heritage resources were identified.

Based on compilation and analysis of an existing conditions inventory of cultural heritage resources; identification of overall constraints and opportunities of the undertaking; and an assessment of potential impacts of the proposed conceptual alignment on known cultural heritage resources (refer to Appendix B.5), the following recommendations have been developed:

1. Any proposed Light Rail Transit alignments, property requirements, and associated infrastructure be suitably planned in a manner that avoids any identified, above ground, cultural heritage resource. The following specific and general recommendations have been developed to guide ongoing development of the B-Line LRT corridor:

   1.1 BHR 13: Avoid encroachment on the existing property. Should encroachment be required, conduct a detailed resource-specific heritage impact assessment at the earliest possible stage to develop an appropriate conservation plan.

   1.2 BHR 15: Avoid encroachment onto the existing property. It is recommended that the Queen Street Stop platform be relocated to a less sensitive site, potentially at the southeast corner of the intersection. Should it be determined that there is no other technically feasible location for the platform, encroachment should be minimized and strongly guided by a conservation plan. A detailed heritage impact assessment for the resource should be prepared for the purposes of: designing an appropriate platform that does not negatively impact visual experiences of the resource and its function as an important landmark and visitor destination in the City of Hamilton. The heritage impact assessment should also address conservation strategies for the fencing system and sloped interlocking brick adjacent to the fencing system.

   1.3 BHR 16: Minimize encroachment onto the resource.

   1.4 BHR 22: Consider development of an alternative design option at the Strathearne Avenue and Main Street East intersection. Prior to alteration and/or removal of the subject resource, the subject resource should be subject to photographic documentation and compilation of a cultural heritage resource documentation report.

   1.5 BHR 14: Avoid encroachment onto the existing property. Should encroachment be required, conduct a detailed, resource-specific heritage impact assessment at the earliest stage possible of the preliminary design phase to recommend an appropriate conservation plan.

   1.6 CHL 6: Avoid widening the bridge. Should widening of the subject bridge be required, conduct a detailed, resource-specific heritage impact assessment at the earliest stage possible of the preliminary design phase to recommend an appropriate conservation plan.

   1.7 CHL 7 and 8: If encroachment is managed appropriately, a small setback between residences and the road right-of-way could be appropriate based on analysis of other residential structures contained within the CHL; generally setbacks range from 4–8 m. Should encroachment be expected to result in displacement, a resource-specific heritage impact assessment should be conducted at the earliest possible stage to confirm the resource's specific heritage value and recommend appropriate conservation and/or mitigation measures.

   1.8 CHL 9 (Westdale Collegiate): Avoid encroachment and tree removals. Should encroachment be required, a detailed, resource-specific heritage impact assessment should be prepared to confirm the resource's specific heritage value and to recommend an appropriate conservation plan.

   1.9 CHL 10: Avoid widening the bridge and any removal of trees associated with CHL 10. Should widening of the subject bridge be required and encroachments expected in the vicinity of CHL 10, conduct a detailed, resource-specific heritage impact assessment at the earliest possible stage of the preliminary design phase to recommend an appropriate conservation plan.

   1.10 CHL 16: Alteration to this resource should be avoided given its high cultural heritage significance. Should it not be technically feasible to avoid direct impacts to the resource, removal and reinstallation of curbs, fencing and trees should be managed appropriately to conserve the resource's cultural heritage values. It is recommended that a heritage impact assessment be undertaken to aid in the development of more detailed conservation measures in this area. It should be noted that City staff have determined that there are trees in Gore Park that may have to be removed due to Emerald Ash Borer concerns in any event.

   1.11 CHL 17: Avoid encroachment onto existing property. Should encroachment be required, conduct a detailed, resource-specific heritage impact assessment at the earliest possible stage of the preliminary design phase to recommend an appropriate conservation plan.

   1.12 CHL 18: Ensure that appropriate vehicular access is maintained to the subject resources in accordance with public safety standards and to ensure the long term viability of the resource.

   1.13 CHL 20: Avoid removal of the landscaped median at Proctor Boulevard and alteration of streetscape. Should removal and/or alterations to the median be required, conduct a detailed, resource-specific heritage impact assessment at the earliest possible stage of the preliminary design phase to recommend an appropriate conservation plan. Ensure that appropriate vehicular access is maintained to buildings located within CHL 20, in accordance with public safety standards and to ensure the long term viability of the resource.

   1.14 CHL 22: Document the cultural heritage landscape of this intersection in advance of alteration.

   1.15 Although the proposed undertaking has been generally developed to utilize the existing road right-of-way, vibration studies associated with construction and operation activities should be conducted to confirm that there will not be adverse impacts to resources. Throughout a large part of the corridor, building fronts dating to the nineteenth century are set in very close proximity to the existing road right-of-way. As such, potential vibration impacts need to be carefully considered. Based on the results of vibration studies, appropriate conservation plans should be developed, including but not limited to, building and/or façade stabilization measures or development of appropriate setbacks (refer also to the assessment of vibration impacts in Section 4.3.6).

2. The wide and diverse numbers of cultural heritage resources located along the Main Street and King Street corridors provide opportunities to capitalize on and celebrate these assets in the design of stop infrastructure, minimizing the extent to which introduction of rail infrastructure will adversely alter the setting of cultural heritage resources. Given that numerous stop platforms are proposed adjacent to cultural heritage resources, design principles and branding strategies should be developed in consideration of their scenic amenity, contextual values, and character. In this sense, there are opportunities to sympathetically integrate the proposed rail infrastructure into the existing fabric of heritage resources through the design and branding of stop infrastructure, platforms, signage, shelters, and seating, resulting in a transit undertaking that complements existing cultural heritage resources. The proposed infrastructure also has the potential to present new opportunities for conserving and interpreting cultural heritage resources located within the corridor. The proposed B-Line LRT, and its removal of major traffic movements from Main Street and King Street, has the potential to improve the urban realm of the area. Increasing numbers of cyclists and pedestrians within the corridor has the potential to help foster an awareness and appreciation of the various cultural heritage resources and cultural heritage landscapes located throughout the corridor. Some measures that may be considered as part of the proposed undertaking include introduction of improved sidewalk lighting and sightlines and introduction of public art. These strategies have the potential to present new opportunities for conserving, interpreting and integrating existing cultural heritage resources into the urban realm. As part of the development of station platform prototypes, consideration should be given to designing this infrastructure in a manner sympathetic and sensitive to the cultural heritage landscape corridors identified in this report.

3. In advance of LRT construction, identified cultural heritage landscapes and built heritage resources should be photographically documented to record their existing conditions and to serve as a final archived document in advance of landscape alteration. This task should include photographic documentation of individual resources, including representative views of transportation corridors identified within cultural heritage landscapes, township settlement histories, relevant historic mapping, and historic photographs, where appropriate.

4. When more detailed designs are complete, roads located within, or which intersect identified cultural heritage landscapes, should be reviewed to identify any additional potential alterations. Where alterations are identified, these roads should be documented in and included in the landscape documentation report described above.

5. Where additional light rail infrastructure is proposed in relation to the present undertaking, and which has not been considered as part of this report, a qualified heritage consultant should be consulted to confirm impacts of such infrastructure and to develop appropriate recommendations to mitigate and/or avoid identified impacts.
6. As part of the proposed undertaking, design principles and branding strategies should be sympathetically developed to complement adjacent cultural heritage resources and to respect their scenic amenity, contextual values, and character. There are opportunities to sympathetically integrate the proposed rail infrastructure into the existing fabric of heritage resources through the design and branding of stop infrastructure, platforms, signage, shelters, and seating, resulting in a transit undertaking that complements existing cultural heritage resources.

Construction/Operations Impacts

The proposed undertaking, including construction and operation impacts, has the potential to impact identified cultural heritage resources, as described in detail above. Where appropriate, detailed heritage impact assessment studies and conservation plans have been recommended to be undertaken at the earliest possible stage of developing more detailed designs.

Mitigation Measures and Net Effects

Where recommended, avoidance, minimization of encroachment, maintenance of vehicular access to identified cultural heritage resources, minimization of negative visual impacts through sensitive design of LRT stops and platforms in areas where cultural heritage resources have been identified, and documentation of resources in advance of alteration will be addressed during subsequent design phases.

Monitoring

Although the proposed undertaking has been generally developed to utilize the existing road right-of-way, vibration studies associated with construction and operation activities should be conducted to confirm that there will not be adverse impacts to resources. Throughout a large part of the corridor, building fronts dating to the nineteenth century are set in very close proximity to the existing road right-of-way. Consequently, potential vibration impacts need to be carefully considered. Based on the results of vibration studies, appropriate conservation plans should be developed, including but not limited to, building and/or façade stabilization measures or development of appropriate setbacks.

4.4.2 Archaeological Resources

The Stage 1 Archaeological Assessment of the Hamilton RT study corridor determined that the Main Street and King Street rights-of-way have been previously disturbed by typical road construction and modern development. However, there are several areas adjacent to the disturbed ROW that remain undisturbed and contain archaeological potential. Twenty archaeological sites have been registered within 2 km of the study corridor and three of these sites are located within 100 m of the study corridor. Additionally, a review of the general physiography and local nineteenth century land use of the study corridor suggested that it has potential for the identification of Aboriginal and Euro-Canadian archaeological sites.

In addition to lands that have remained undisturbed, within the urban context in general, and on land that has been intensively developed and redeveloped between the mid- to late nineteenth century and the present, such as is the case within the study corridor, any archaeological resources that may have survived are likely to take the form of subsurface structural features. These areas as noted as "Vacant Lots" in the inventory and assessment completed to date.

Construction/Operations Impacts

The project was assessed against the following criterion with respect to archaeological resources:

- Potential for encountering and disturbing archaeological resources adjacent to the disturbed right-of-way that remain undisturbed and contain archaeological potential.

Given the essentially continuous use of the majority of the individual properties that make up the study corridor, most archaeological resources of the nineteenth century occupations are likely to have been severely compromised and/or highly mixed, consisting of an accumulation of items that could not be conclusively associated with any particular occupation or activity among the myriad of uses that the corridor has witnessed. The continuous occupation of the individual properties for a variety of purposes likely involved repeated episodes of utility upgrades, renovation, structural alteration, landscaping, etc. that would have resulted in further destruction or mixing of earlier deposits that may have formed on any surviving original ground surface or occupation level. These considerations are applicable, in variable degrees along the study corridor, to the aforementioned vacant lots, which function mostly as surface parking facilities today.

In light of the above investigative results, the following conclusions and recommendations are made with respect to the potential construction and operational impacts of the project:

- The Main Street and King Street rights-of-way do not retain archaeological site potential due to previous disturbances. Additional archaeological assessment is not required within the rights-of-way, and those portions of the study corridor can be cleared of further archaeological concern;
- There are areas outside the existing Main Street and King Street rights-of-way that may be affected by the proposed B-Line LRT construction, which exhibit potential for discovery of archaeological resources (e.g., identified vacant lots); and
- Additional piers that may be required to support the Queenston Road bridge crossing the Red Hill Creek Valley have the potential to disturb an area of archaeological potential.

Mitigation Measures and Net Effects

- Potential adverse effects to known or potential archaeological resources should be avoided or mitigated.
- A Stage 2 Archaeological Assessment should be conducted on lands determined to have archaeological potential, if the proposed project is to impact these lands (vacant lots, Red Hill Creek Valley crossing). This work will be done in accordance with the Ministry of Tourism and Culture's Standards and Guidelines for Consultant Archaeologists (MTC 2011), in order to identify any archaeological resources that may be present;
- If the proposed undertaking is to impact the areas noted as "Vacant Lots" to the point of below grade excavations, these areas should be subject to further archaeological investigation (i.e., detailed archival research) in order to document any significant archaeological features that may be present; and
- If the proposed undertaking is to impact the pipeline at the intersection of Main Street and Ottawa Street by deep trenching, Stage 3 mitigation and/or excavation will be required.

Monitoring

During construction, a licensed archaeologist should be on site to monitor earthworks in areas exhibiting archaeological potential.

Should previously unknown or unassessed deeply buried archaeological resources be uncovered during development, they may be a new archaeological site and therefore subject to Section 48 (1) of the Ontario Heritage Act. The proponent or person discovering the archaeological resources must cease alteration of the site immediately and engage a licensed archaeologists to carry out archaeological fieldwork, in compliance with section 48 (1) of the Ontario Heritage Act. Any person discovering human remains must immediately notify the police or coroner and the Registrar of Cemeteries, Ministry of Government Services.

4.5 Summary of Project Net Effects and Monitoring Requirements

Table 4,5 summarizes the environmental factor-specific issues, potential impacts, proposed mitigation measures, and net effects of implementing the proposed LRT service in the B-Line corridor, as well as proposed monitoring and future additional/contingency investigations.

Table 4.5: Summary of Potential Environmental Condition Changes, Mitigation, Net Effects and Monitoring

Factor	Environmental Issue/Concern	Concerned/Interested Party	Location	Potential Construction/Operations Impact/Effect	Mitigation Measures	Potential Net Effect/Impact	Monitoring/Future Work/Contingency
TRANSPORTATION AND UTILITIES							
Transit Operations	Altered levels of transit service in and connecting to B-Line Changes to existing local bus service routing and frequency in the B-Line corridor Changes to existing local/feeder bus service routing and frequency on routes parallel and perpendicular to the B-Line corridor Changes to broader, sub-regional and regional (GO Transit) service Changes in overall transit journey times	City, Transit Patrons	LRT corridor	Alterations to transit system operations in the east-west pattern of bus routes on King Street and Main Street. Bus services along the corridor will be affected by temporary re-routing of the B-Line and other bus services during the construction period.	Changes to existing routes that do not parallel the LRT directly, to improve frequencies on routes that could act as feeders to the LRT Corridor.	Increased service levels in LRT Corridor, matched by efficient transit connections on adjacent routes.	A monitoring and complaint process will be in place to ensure: ▪ Traffic and transit operations are not unduly compromised by construction in the LRT corridor; ▪ Traffic and transit modifications are operating efficiently during the operational phase of the project.
Traffic Operations	Changes to traffic circulation in the B-Line corridor, on adjacent local and arterial roads and across the wider Hamilton downtown highway network Changes to property access Changes in permitted and prohibited turning movements Changes in parking and loading provisions	City, Road Users, Emergency Services Providers	LRT corridor Adjacent arterial road network	Street closures and interruptions will generally be limited to closing 2 out of 4 lanes at a time or a total street closure is required for a short duration. Major changes to traffic circulation in the B-Line LRT corridor. Entrances on the centre-running sections of the route and on the non-LRT side of side-running sections will operate on a right-in/right-out only basis.	A detailed traffic management plan, comprising a construction staging and street closure or lane reduction plan will be prepared as part of the detailed design stage of the project. It is anticipated that only short segments of the alignment will be closed or will experience limited access during construction. To ensure that there will not be undue traffic flow and access restrictions, in the corridor, the construction sequence is intended to in manageable segments, with manageable lengths of the corridor being subjected to lane closures or restricted access at any one time during construction. Improvements to traffic operations/controls on other arterial roads (additional turning lanes; traffic signal optimization; turn prohibitions). Some accesses will be reconfigured to provide access via side streets. At other locations, there are commercial properties that have frontage parking areas accessed individually. Interconnecting these could reduce the number of access points across the tracks.	Implementation of the B-Line LRT can be accommodated by the existing road network, albeit with a general reduction in performance for other motorized road users. This is offset by the increase in people carrying capacity on the corridor and the introduction of some offline intersection and link improvements.	As above.

Factor	Environmental Issue/Concern	Concerned/Interested Party	Location	Potential Construction/Operations Impact/Effect	Mitigation Measures	Potential Net Effect/Impact	Monitoring/Future Work/Contingency
Surface and Subsurface Utilities	Utility relocation and service interruptions during construction Need for relocation of existing services Potential for service interruptions to residents and businesses	City, Utilities Companies, Utilities Users	LRT corridor	In general, the standard construction sequence for completing utility relocations will be used during construction and minimal impacts to existing services or service interruptions are expected.	Owners of existing residential, commercial and business properties will be notified in advance by the City if utility relocation will occur. Alternative access arrangements will be provided to the owner. Adequate protection will be in place to ensure site safety at all times to protect the public and the owners from the construction sites.	Limited service disruptions.	Conduct additional engineering surveys and contact utility owners further to ascertain the existence and nature of their plant, and feasibility of relocation. Monitor and address service disruptions (complaint protocol). A monitoring plan will be in place to ensure: safety as a first priority for the public and employees. Monitoring of environmental protection requirements with regard to utilities, such as storm and sanitary sewers to ensure no runoff and capture of runoff during construction. Monitoring of any potential for contaminated soils as a result of uncovering abandoned utilities.
SOCIO-ECONOMIC ENVIRONMENT							
Land Use Structure and Economic Impacts	Changes to land use structure (redevelopment potential; intensification; housing stock; property impacts; business impacts) Potential to achieve the City's overall land use objectives with respect to intensification, diversity, neighbourhood enhancement and renewal, and redevelopment to higher and better uses Potential to support economic viability of existing land uses and regional destinations in and adjacent to the B-Line corridor Impacts to individual properties and business operations	City, Property Owners, Residents, Business Operators	Proposed LRT corridor	The LRT will be a key driver in realizing land use objectives that emphasize the important connections between land use and transportation by promoting future transit-supportive land uses along rapid transit corridors. Enhanced access to regional attraction nodes. Pressure for redevelopment that would displace existing affordable rental units. Frontage and access impacts to approximately 200 properties along the LRT corridor. Potential loss of passing traffic, loss of on-street parking and loading and unloading areas for businesses.	The City will form a construction liaison committee to provide quick access to construction related information, such as timing and schedule information for business owners and residents. Prior to each phase of construction, the City will conduct a broader public awareness campaign. Acquire property in a manner that ensures individual rights are respected and protected, and to provide fair compensation within the framework of the City's policy and associated legislative instruments governing the acquisition of property for City projects. The acquisition process emphasizes negotiation on a willing seller, willing buyer basis and the achievement of a mutually satisfactory agreement. Engage in property expropriation only as required.	Overall increase in land use diversity and intensification. Increased certainty about project impacts, creation of an acceptable contingency planning regime, and reduction in the potential disruption to business activities and community cohesion.	Continue long-term monitoring of land use transformation to ensure compliance with and relevance of Official Plan objectives, targets and policies. Continue to monitor housing starts intensification to track whether City objectives and Provincial targets are being met. Establish storefront locations dedicated to receiving public comments and concerns about construction activities and impacts.

Factor	Environmental Issue/Concern	Concerned/Interested Party	Location	Potential Construction/Operations Impact/Effect	Mitigation Measures	Potential Net Effect/Impact	Monitoring/Future Work/Contingency
	Changes to Economic Base Changes in mobility and access levels, and associated socio-economic benefits to the people of Hamilton in general, and those with high social needs in particular Changes in employment opportunities Changes in property values	City, Development and Business Interests	Proposed LRT corridor and catchment area	6,000 jobs would be created during the B-Line LRT construction phase, with up to 1,000 ongoing jobs due to operations and maintenance. Benefit of $2 Million annually, based on reductions (7.5%) in a number of air pollutant levels by weight. Property market uplift ranging from $50.0 Million to $143.5 Million (1.5% to 4.3% impact).	None required.	Significant attraction of residents, businesses and investment to the LRT Corridor.	Continue monitoring employment rates as an index of the economic health of the City. Changes in municipal tax assessment base.
Community Cohesion	Community connectivity and mobility Potential to strengthen community cohesion through improved walkability and accessibility to active transportation corridors	City, Community Organizations, Trail Users	Proposed LRT Corridor and catchment area Adjacent trail system	Increased mobility/walkability and access to community attractions and amenities. The LRT will work in parallel with the existing and proposed cycling routes and recreation trails to improve community connectivity to and from the corridor.	None required.	Enhanced quality of life for residents within the corridor influence area, and the City of Hamilton as a whole.	None required.
NATURAL ENVIRONMENT							

Factor	Environmental Issue/Concern	Concerned/Interested Party	Location	Potential Construction/Operations Impact/Effect	Mitigation Measures	Potential Net Effect/Impact	Monitoring/Future Work/Contingency
Surface Water and Aquatic Ecosystem	Harmful alteration, disruption or destruction (HADD) of fish habitat	HCA, MNR, DFO	Chedoke Creek Red Hill Creek	Potential loss of fish habitat as a result of construction and operation activities such as excavation, bridge/culvert structural work, excess material storage, equipment maintenance, waste water management within the study area.	Design and implement erosion and sediment controls to prevent or reduce sediment discharges to the existing sewer system and natural watercourses, including application of best management practices (e.g., *Erosion & Sediment Control Guideline for Urban Construction (2006)*). Conduct work in a continuous fashion to minimize the duration of potential impacts. Maintain the area of disturbance to a minimum. Design drainage and stormwater management systems to mimic natural drainage patterns. Store, handle and dispose of all excess materials to prevent their entry into watercourses. Manage concrete effluent and dewatering to prevent release of contaminated water into receiving watercourses, including capture and transport of effluent off-site. Equipment re-fuelling will take place no closer than 30 m from any watercourse. Prohibit/limit construction access to watercourses / watercourse banks, where practical.	A harmful alteration to fish habitat may result. "Low risk" if mitigation measures are implemented.	Monitoring during construction. Development and implementation of spills management plan.
	Fish mortality during construction	HCA, MNR, DFO	Chedoke Creek Red Hill Creek	Fish may potentially be injured or killed due to spills – chemical or sediment.	Equipment re-fuelling will take place no closer than 30 m from any watercourse. Design and implement erosion and sediment controls. For any in-water works, adhere to the in-water construction timing window in place at the time when proposed construction activities are to occur.	Potential impacts during construction can be managed and reduced with the appropriate mitigation measures as well as the drainage and stormwater management design.	Monitoring during construction.
	Barriers to fish movement	HCA, MNR, DFO	Chedoke Creek Red Hill Creek	None expected.	None required.	None expected.	None required.
	Baseflow alterations	HCA, MNR, DFO	Chedoke Creek Red Hill Creek	None expected.	None required.	None expected.	None required.
	Increased water temperature	HCA, MNR, MOE	Chedoke Creek Red Hill Creek	None expected.	None required.	None expected.	None required.
	HADD of rare, threatened or endangered (RTE) species	HCA, MNR, DFO	Chedoke Creek Red Hill Creek	No RTE species identified.	None required.	No net impacts.	None required.

Factor	Environmental Issue/Concern	Concerned/Interested Party	Location	Potential Construction/Operations Impact/Effect	Mitigation Measures	Potential Net Effect/Impact	Monitoring/Future Work/Contingency
Terrestrial Ecosystems - Vegetation Communities	Loss of street trees and vegetation from natural areas resulting from new alignment and widening of existing roads to accommodate the LRT Potential impacts to designated Environmentally Sensitive Areas / Areas of Natural and Scientific Interest/Provincially Significant Wetlands	HCA, MNR, City	Main Street W. Gore Park Scott Park Delta S.S. 403 crossing and Cathedral Park Red Hill Creek Valley Chedoke Creek Valley	Loss of approximately: ▪ 0.7 ha of Dry Fresh Silver Maple Deciduous Forest; ▪ 0.22 ha of Dry Fresh Manitoba Maple Mineral Cultural Woodlot; ▪ 0.9 ha of Dry Moist Old Field Cultural Meadow; ▪ 2.54 ha of Manicured Grass/trees ▪ 0.06 ha Reed Canary Grass Meadow Marsh Displacement of street trees. Potential construction access impacts to vegetation at Red Hill Creek valley for Queenston Road bridge reinforcement. Potential construction access impacts to vegetation and Chedoke Creek valley for construction access to guideway piers.	Minimize encroachment on remnant woodlots and large healthy trees. Trees and areas to be preserved within and adjacent to the ROW will be identified in a Tree Protection Plan and protected with snow fence defining Tree Protection Zone(s) Inclusion of hard and soft landscaping in the corridor, including planting of additional street trees, where opportunities present themselves Approval will be obtained, and compensation/reimbursement will be provided, as required, for displacement of publicly owned roadside trees on public property, in compliance with City of Hamilton's Public Tree Removal Policy, the Forest Management Plan (Reforestation Policy) and By-Law 06-151 (Public Trees By-Law), as amended. Movement of construction machinery will be limited to the boundaries of the ROW and operated in a manner that minimizes damage to adjacent trees. Roots and branches, if damaged, will be treated using approved horticultural methods. Wherever possible, construction activities will be restricted within the dripline of all trees not required for removal. Utilize native species for identified restoration areas. Return ROW to pre-construction or better condition.	Potential impacts during construction can be managed and reduced with the appropriate mitigation measures, assuming compensation and reimbursement funds are directed to post-construction tree replacement.	Environmental site inspections during construction to ensure environmental protection/re-vegetation measures are implemented and working and any required remedial action is undertaken. Plantings of woody and herbaceous vegetation will be checked periodically for a period of one year to ensure an acceptable survival rate. For design and implementation of works in the Red Hill Valley, the City will work collaboratively with the Red Hill Valley Stewardship Board to develop Environmental and Ecological Principles, which will initially be prepared and provided to the RT Team by the Board.
	Impacts to rare or significant plant species	HCA, MNR	Chedoke Creek Valley Red Hill Creek Valley	None expected.	No rare or significant species have been identified within the study area, based on limited surveys. However, if observed, MNR will be contacted to determine how species at risk will be treated.	None expected.	Additional seasonal vegetation surveys may be required.

Factor	Environmental Issue/Concern	Concerned/Interested Party	Location	Potential Construction/Operations Impact/Effect	Mitigation Measures	Potential Net Effect/Impact	Monitoring/Future Work/Contingency
Terrestrial Ecosystems - Wildlife Habitat	Destruction/disturbance of wildlife habitat. Wildlife mortality during construction.	HCA, MNR	LRT Corridor	The new guideway crossing Highway 403 and the existing Queenston Road structure are elevated over the Chedoke Creek Valley and Red Hill Creek Valley, thereby minimizing potential wildlife and LRT vehicle conflicts. Work on Queenston Road bridge may disturb migratory birds. Displaced trees that are habitat for migratory birds and common urban mammals.	During construction, the requirements of the Migratory Birds Regulations (MBR) under the Migratory Birds Convention Act (1994) must be adhered to. Adherence to Ontario Fish and Wildlife Act, which prohibits the destruction or taking of nests or eggs of wild birds. Implement timing constraints so that no vegetation or buildings suitable for migratory birds will be removed during the nesting and breeding season (April 1 to July 15). Implement migratory bird prevention and protections measures (tarping, etc.) A nest search must be conducted if working within the above timeframe. Conduct a general site visit prior to April 1 in the first year of construction to inspect structures (bridges/buildings) scheduled for alteration or removal. If nesting is likely, the Contractor must install bird nesting preventative measures before April 1. The measures must remain in place until July 15.	The effects of the proposed B-Line LRT on wildlife species are anticipated to be minimal, as extensive vegetation clearing and building removal is not required.	Monitoring of the migratory bird prevention measures will occur during the critical nesting season (April 1-July 15). If any wildlife species, including nesting birds, are encountered during construction, a qualified biologist will be contacted immediately.
	Barriers to wildlife movement	HCA, MNR	LRT corridor	The new guideway crossing Highway 403, and the existing Queenston Road structure, are elevated over the Chedoke Creek Valley and Red Hill Creek Valley, thereby minimizing potential barriers in the major wildlife corridors.	None required.	Since the proposed LRT infrastructure and operation will be within the existing Main Street–King Street corridor, the barrier effects already exist and will not increase during operation of the proposed service.	None required.
	Disturbance to significant Wildlife species	HCA, MNR	LRT corridor	No rare, threatened or endangered wildlife identified in within the study area, except chimney swift and peregrine falcon, which are accustomed to street level disturbance during the breeding season and should not be adversely affected by the RT line construction or operation. B-Line not expected to displace existing buildings which are suitable habitat for chimney swifts and common nighthawks.	Implement migratory bird prevention and protection measures, as above.	No net impacts.	Monitor bird prevention and protection measures during construction.

Factor	Environmental Issue/Concern	Concerned/Interested Party	Location	Potential Construction/Operations Impact/Effect	Mitigation Measures	Potential Net Effect/Impact	Monitoring/Future Work/Contingency
Hydrogeology and Groundwater	Potential contamination of or interference with shallow groundwater resources Potential need for construction dewatering Potential groundwater impacts on surface water where there is interaction in proximity to Chedoke Creek and Red Hill Creek.	HCA, MOE	LRT corridor	Shallow groundwater levels may be temporarily affected if dewatering is required for excavation. Contaminated soil and groundwater may be encountered. Groundwater contamination may occur from excavation (leaching of contaminants into groundwater), construction equipment and or associated spills.	Potential impacts to groundwater will be managed in accordance with O.Reg. 153/04, as amended, and the City of Hamilton's Contaminated Site Management Program for Municipal Works manual. Construction methods will reduce the potential for excessive groundwater taking at excavation sites (e.g., use of sheet pile enclosures). Construction equipment should be maintained in good working order with appropriate safety and emergency measures. Contingency plans will be developed to address groundwater contamination, including a spills response plan.	No extensive soil or groundwater impacts are anticipated.	An overall monitoring plan is not required. Temporary or localized plans can be prepared on an as needed basis.
Contaminated Property	LRT construction works encountering contaminated soils and groundwater	HCA, MOE	LRT corridor	There are properties within the study area that have the potential to contribute to environmental contamination.	Where removal of potentially contaminated soil must take place, soils will be tested for those chemicals that may have been used or dumped within the area, and will be handled in accordance with Part XV.I of the Environmental Protection Act (EPA) and Ontario Regulation 153/04, Records of Site Condition. MOE District Office will be contacted if contaminated sites are positively identified. The City of Hamilton's Contaminated Sites Management Program manual will be applied to the project, including health and safety special provisions (hazard assessment, training, air monitoring, use of personal protective equipment, site control and decontamination).	Proposed mitigation and safety precautions should address the project impacts relative to contaminated soil and groundwater impacts, as well as airborne contaminants.	Phase 1 Environmental Site Assessment and potentially Phase 2 Environmental Assessments will be undertaken during detail design, if required. Implement the City's Contaminated Sites Management Program procedures for training on encounter of contaminated materials and engage in standard general on-site and perimeter air monitoring, as well as non-routine monitoring, which will be applied to this project.

Factor	Environmental Issue/Concern	Concerned/Interested Party	Location	Potential Construction/Operations Impact/Effect	Mitigation Measures	Potential Net Effect/Impact	Monitoring/Future Work/Contingency
Drainage and Stormwater Management	Increases in impervious surface area and resultant changes in stormwater quantity and quality	HCA, MOE, City	McMaster University Highway 403 Main Street	Increase of 1.62 ha of impervious surface due to replacement of grassed area at McMaster University, replacement of pervious median areas on Main Street, and addition of new bridge structure over Highway 403.	New storm sewer or stormwater detention facility at McMaster University. MTO storm sewer can accommodate increased ruonoff at Highway 403. Incorporation of roadway conveyance control measures (oil/grit separators), where practical. Incorporation of vegetated drainage swales in the Highway 403 crossing area immediately adjacent to the guideway to act as filters and provide quality treatment to the water prior to entering the Chedoke Creek system.	Proposed mitigation treatment should be able to address the project impacts relative to both water quality and quantity concerns.	A detailed surface water management plan will be prepared and used for monitoring throughout construction.
Noise and Vibration	Noise and vibration effects during construction phase	MOE, City, Residents, Business Operators	LRT corridor	Increased noise and vibration levels during construction due to construction activities.	Although the specifics of the construction equipment have yet to be determined, provincial and municipal guidelines provide basic restrictions and recommendations with regard to construction noise and vibration. Comply with the noise limit outlined in NPC-115 guidelines. Ensure proper and regular maintenance of construction equipment. Use of noise abatement equipment on machinery (mufflers, etc.). The City of Hamilton By-Law No. 03-020 prescribes appropriate period for construction activities, which is between the hours of 7:00 a.m. and 7:00 p.m. Noise by-law exemption will be obtained prior to construction in periods prohibited by the noise by-law, if required.	Noise level increase during construction is temporary and can be mitigated. Vibration from sources such as pile drivers are not expected for an at-grade route.	A more detailed noise and vibration assessment will be conducted during the detail design phase of the project, when vehicle and LRT infrastructure design parameters have been refined and more site-specific information will be available (i.e., LRT vehicle and suspension type; track structure; soil conditions and receptor structure setback, type, condition and use). A noise and vibration monitoring plan will be developed during detail design. A complaints protocol will be developed to monitor and investigate complaints.
	Changes in noise levels greater than 5 dBA in operations phase	MOE, City, Residents	LRT corridor	No noise sensitive areas will be subject to noise increases greater than 5 dBA during the LRT operation. With minor exceptions (west and east ends), noise sensitive locations in the LRT corridor will experience reductions in sound levels ranging from 1-2 dB at night to 1-8 dB during the daytime. This is primarily a result of LRT vehicles replacing buses and other motorized vehicles in the corridor. Adjacent roads receiving traffic diverted from the LRT corridor may experience noise increases of 1-3 dB.	None required.	In many areas in the downtown core along the LRT route. The project will result in a noticeable and sometimes significant reduction in road noise due to the diversion of traffic onto other parallel streets.	Although the City of Hamilton does not currently have a post-construction transit noise monitoring policy, noise monitoring can be conducted once the project is completed to provide an indication of the actual sound levels along the LRT route. Monitor and investigate complaints on construction noise issues.

Factor	Environmental Issue/Concern	Concerned/Interested Party	Location	Potential Construction/Operations Impact/Effect	Mitigation Measures	Potential Net Effect/Impact	Monitoring/Future Work/Contingency
	Ground-borne vibration and vibration induced noise levels that exceed government guidelines/criteria related to annoyance, structural impacts and human health	MOE, City, Residents, Business Operators	Buildings within 20 m of LRT corridor	At distances of more than 20 m from the nearest track, the vibration levels from the LRT system will meet the applicable guidelines. For residential receptors located closer than 20 m, particularly in the Downtown core and where the LRT is side running in the corridor, vibration guideline levels will be exceed if no special isolation measures are incorporated in the trackbed design.	It is assumed that there will be a basic level of vibration isolation installed throughout the system. This will include encapsulated rail (rail embedded in a rubber casing to dampen vibration). Various levels of upgraded vibration isolation will be considered (e.g., improved encapsulated rail systems or floating slab track) during the detail design phase.	Vibration can be reduced to acceptable levels.	Monitor vibration levels during operations phase.
Air Quality	Degradation of air quality during construction phase	MOE, City (Clean Air Hamilton), Residents, Business Operators	LRT corridor	Construction activities can generate air pollutants (equipment exhaust emissions, dust). Potential exposure of workers and the adjacent populations to airborne contaminants during excavation of soil.	Application of dust suppressants (including consideration of non-chloride suppressants); reduced travel speeds for construction vehicles; implement a no idling policy; efficient staging of activities; minimize haul distances; consideration of installation of solid barriers; and covering of stockpiles. Where construction involves excavation of potentially contaminated soils, the tendering process will include requirements for testing of the soils prior to excavation and ongoing monitoring during the excavation, if the initial testing indicates that monitoring is warranted (in compliance with City of Hamilton Contaminated Sites Management Program manual). The City of Hamilton's Contaminated Sites Management Program manual will be applied to the project, including health and safety special provisions (hazard assessment, training, air monitoring, use of personal protective equipment, site control and decontamination).	Effects are temporary and can be mitigated.	Implementation of an emissions management plan during construction, including the City's Contaminated Sites Management Program procedures for standard general on-site and perimeter air monitoring, as well as non-routine monitoring.

Factor	Environmental Issue/Concern	Concerned/Interested Party	Location	Potential Construction/Operations Impact/Effect	Mitigation Measures	Potential Net Effect/Impact	Monitoring/Future Work/Contingency
	Degradation of air quality during operations phase	MOE, City (Clean Air Hamilton), Residents, Business Operators	LRT corridor and adjacent arterial roads	Segments of the B-Line LRT corridor, where volumes of other motorized traffic will be reduced, are expected to experience an improvement in air quality. A few areas that currently have relatively high daily traffic volumes and may experience increases in traffic due to diversion of traffic from the LRT corridor (Locke Street – Hess Street on York Boulevard), may experience some exceedances of the applicable air quality criterion for air pollutants of concern (inhalable particulate matter; benzene), but only under worst-case weather conditions, which would be infrequent.	Consider planting tall vegetation barriers to reduce pollutant concentrations downwind of roadways and immediately behind the barrier (within 80 m) (e.g., on public land adjacent to York Boulevard between Inchbury Street and Hess Street).	Net improvement in air quality is expected to result in a benefit of $2 Million annually, based on reductions (7.5%) in a number of pollutant levels by weight.	Due to overall net benefits, a project-specific monitoring program during the operations phase is not proposed The City of Hamilton will continue to assess area wide air quality under its current monitoring program (through Clean Air Hamilton).
CULTURAL ENVIRONMENT							
Built Heritage and Cultural Landscapes	Displacement or disturbance of Built Heritage Resources (BHR) or Cultural Heritage Landscapes (CHL)	MTC, City	LRT corridor	Potential impacts to: BHR 13, BHR 15, BHR 16, BHR 22 , BHR 14 CHL 6, CHL 7, CHL 8, CHL 9, CHL 10, CHL 16, CHL 17, CHL 18, CHL 20, CHL 22	Avoid encroachment on the existing properties. Minimize negative visual impacts through sensitive design of LRT stops/platforms in areas where cultural heritage resources have been identified. Photographic documentation and compilation of a cultural heritage resource documentation report prior to alteration of BHR/CHL.	Potential displacement and disruption to some cultural heritage resources avoidance and design modifications are not considered practical. Preservation of BHR/CHL through documentation.	Conservation plans (building and façade stabilization measures; development of appropriate setbacks) should be developed based upon the results of vibration studies associated with construction and operation activities.
Archaeological Resources	Possible impacts to areas with potential for identification of archaeological resources	MTC, City	LRT corridor	The Main, King and James Street rights-of-way do not retain archaeological site potential due to previous disturbances. Soil disturbances associated with grading, excavation and placement of fill may result in the loss of archaeological resources. The project may affect areas with archaeological potential outside the existing right-of-way (“vacant lots”; the pipeline at the intersection of Main Street and Ottawa Street by deep trenching).	A Stage 2 Archaeological Assessment should be conducted on lands determined to have archaeological potential. If the proposed undertaking is to impact the pipeline at the intersection of Main Street and Ottawa Street by deep trenching, Stage 3 mitigation and/or excavation will be required.	Potential adverse effects to known or potential archaeological resources would be avoided or mitigated.	Should previously unknown or unassessed deeply buried archaeological resources be uncovered during development, the proponent must cease alteration of the site immediately and engage a licensed archaeologist to carry out archaeological fieldwork in compliance with Section 48(1) of the Ontario Heritage Act. Any person discovering human remains must immediately notify the police or coroner and the Registrar of Cemeteries, Ministry of Government Services.

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5.0 PERMITS AND APPROVALS REQUIRED FOR PROJECT IMPLEMENTATION

The City of Hamilton will obtain the necessary permits and approvals for the construction and implementation of the B-Line RT project. This section of the report identifies both project-specific permits and approvals that are known to be required at this time, and those that are typically required for this type of project.

5.1 Municipal

The following municipal permits and approvals may be required for the construction of this project:

- City Council approval
- Planning approvals (including Site Plan Approval) for building structures and facilities.
- A Development, Interference with Wetlands and Alterations to Shorelines and Watercourses Permit from the Hamilton Conservation Authority (HCA), in accordance with Ontario Regulation 161/06 of the Ontario Conservation Authorities Act; possible for the crossing of the Red Hill valley. Note: Chedoke Creek at Highway 403 is deemed to be a closed watercourse and is not included in HCA regulated area for this watershed.
- Approval for stormwater management.
- Sewer discharge approvals.
- Exemptions from appropriate By-Law 03-020 for construction activities that must be conducted outside the hours of operation.

5.2 Provincial

The following provincial permits and approvals may be required for the construction of the project:

- Permit to Take Water (PTTW) from the Ministry of the Environment (MOE) if dewatering for guideway foundations exceeds 50,000 litres per day. It is not expected that the PTTW requirement related to dewatering or diversion of flow from watercourse via mechanical means (pumping) will be required.
- Certificates of Approval from MOE for new/relocated sewers and stormwater management outfalls, sewer use for discharge of dewatering effluent (in compliance with s. 53 of the Ontario Water Resources Act and relevant MOE guidelines), or noise and air quality emissions.
- Ministry of Tourism and Culture agreement on any documentation of additional archaeological and built heritage resource investigations required to clear the corridor from further concern for this project. Accordingly, further archaeological and built heritage investigations will be conducted and the associated reports will be submitted to MTC for review and acceptance prior to any ground disturbance.
- Excess waste generated on-site that requires off-site removal should be in accordance with Ontario Regulation 347 under the Environmental Protection Act that provides for the transportation and processing of hazardous and non-hazardous waste.
- Where removal of potentially contaminated soil must take place, soils will be tested for those chemicals that may have been used or dumped within the area, and will be handled in accordance with Part XV.I of the Environmental Protection Act (EPA) and Ontario Regulation 153/04, Records of Site Condition. Similarly, the quality of all fill material brought on site will meet the Ontario Regulation 153/04 requirements for the respective property use.
- Approval from the Ministry of Transportation of Ontario for crossing the Highway 403 corridor.
- The project may also trigger the Ministry of Energy and Infrastructure (MEI) Class EA, particularly if lands managed by the Ontario Realty Corporation are to be acquired for project implementation (e.g., hydro corridor at Queenston Traffic Circle). Property requirements will be refined during the Detail Design phase of the project and requirements under this Class EA process will be identified in consultation with MEI.

5.3 Federal

The following federal approvals may be required for the construction of the project:

- If an agreement cannot be reached with CP Rail for an at-grade crossing their spur line, which connects CP's Kinnear Yard on the TH&B line to industrial areas north of Barton Street, approval by the Canadian Transportation Agency (CTA) under the Canada Transportation Act may be required.

It is possible that an environmental assessment prepared in compliance with the Canadian Environmental Assessment Act (CEAA) may be required. CEAA triggers and the prospect for invoking them are:

- A federal authority is the project proponent – The City of Hamilton is deemed to be the proponent (no trigger).
- Federal money or other form of financial support will be provided to implement the project – Metrolinx is deemed to be the primary funding agency for the project. However, not all funding sources for the project have been determined, so federal monies may yet be sought for implementing the project.
- Federal lands will be provided to implement the project – there are no federal lands that will be required for implementation of the B-Line (no trigger).
- A federal authority will exercise a regulatory duty under the Law List Regulation in relation to the project – it is possible that federally regulated permits, approvals or authorizations may ultimately be required (e.g., CTA, Fisheries Act) (possible trigger).

As design progresses, the City of Hamilton will continue to monitor the B-Line RT project for potential CEAA triggers. If required, the City will prepare a Project Description for review by the Canadian Environmental Assessment Agency. If only one responsible federal authority is likely to be involved, the City will deal directly with the RA to assist in completing a CEAA screening for the project.

5.4 Environmental Project Report Amending Procedure

The Transit Project Assessment Process includes an addendum process (refer to Section 15 of Regulation 231/08) for proponents to make changes to a transit project after the Statement of Completion for the transit project is submitted. Modifications to the design and implementation of the B-Line LRT proposed in this Environmental Project Report may occur due to unforeseen circumstances, including: changes in environmental conditions in the corridor that may affect anticipated project impacts and means of mitigating adverse effects; technological advancements; and funding availability. This may result in the project being inconsistent or non-compliant with commitments made in the EPR. Modifications to the project proposals will require preparation of an addendum to the EPR. Changes to the project may also be required if there is a significant lapse of time (i.e., ten years) between the Statement of Completion and the start of construction, which will require a formal review of the project by the City.

In compliance with Section 15(1) of Regulation 231/08, the City of Hamilton will prepare an addendum to the EPR if changes to the project occur after the Statement of Completion is issued. This will include the Maintenance and Storage Facility investigations, as cited in Section 2.2.7 of this EPR. The MSF study will include documentation of the site selection investigations; the proposed design of the facility; the assessment of potential environmental effects; commitments to environmental mitigation, additional investigations and stakeholder consultation; and a full consultation record. If the MSF siting requires completion of its own Transit Project Assessment Process it will be completed in accordance with Regulation 231/08.

If the City is of the opinion that the change documented in the addendum is not significant, the City will document the reasoning behind this opinion and keep a record of the addendum to the Environmental Project Report with its project file. In accordance with Section 15(3) of the Regulation, if the City is of the opinion that the change is significant (which will be stated in the addendum), as will be the case with the Maintenance and Storage Facility proposals, the City will prepare a Notice of Addendum to the Environmental Project Report, publish the notice in a local newspaper and post the notice on

its project website. The notice will also be provided to the Director of the Ministry of the Environment's Environmental Assessment and Approvals Branch, the MOE Regional Director, every property owner within 30 m of the site of the change, Aboriginal communities that were given a Notice of Commencement, and any other person who the City thinks may be interested in the change to the project.

Under the provisions of Sections 15(11), 15(12) and 15(21) of the Regulation, the process and timelines for making objections, and for the Minister to act and consider any requested revisions to the addendum are essentially the same in the addendum process as in the process associated with the original Notice of Completion, as described in Section 1.3 of this EPR.

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6.0 CONSULTATION PROCESS

Within the context of the City of Hamilton's communications program on its Rapid Transit Initiative, the public, regulatory agencies, aboriginal communities and other interested parties have been provided with the opportunity to review and comment on the B-Line RT project. Such opportunities have extended from development of the City of Hamilton's Rapid Transit Vision, through the Rapid Transit Feasibility Study to the current Transit Project Assessment Process. This chapter provides details on the consultation that was conducted during the Pre-Planning phase, prior to issuing of the TPAP Notice of Commencement for the Hamilton B-Line LRT on June 17, 2011. In addition, consultation that has been undertaken since issuing the Notice of Commencement is included in this chapter. Additional opportunities for providing input to the project decision-making process, following publication of this EPR, are also identified.

Appendix C contains the Consultation Record prepared by the City in compliance with TPAP requirements, including copies of all correspondence, minutes of meetings and comments from the aforementioned stakeholders.

In summary, the input received during the consultations undertaken during the Pre-Planning phase and TPAP phase indicates that there is broad public and stakeholder support for the B-Line LRT project.

6.1 Overview of Consultation Process

6.1.1 Study Organization and Phased Consultation

During this study, a technical working team comprised of specialists from within the planning and public works departments at the City of Hamilton, and representatives from Metrolinx, the Regional Transportation Agency in the Greater Toronto and Hamilton Area (GTHA), has met frequently and shaped development of the project. This has been supplemented and strengthened by quarterly meetings of a Corporate Working Team of specialists from across City departments. These service representatives have reviewed and commented on the project and helped to shape its development. A Rapid Transit Citizen Advisory Committee (RTCAC), with representation from City residents, business owners and community groups, has also provided input and advice to the City of Hamilton in developing the B-Line LRT proposals on a monthly basis since mid-2010. Numerous staff and information reports have gone before City Council.

There have been two distinct phases to this study - the Pre-Planning phase and the current TPAP phase.

Pre-Planning Phase - The objectives of consultation during the Pre-Planning phase were to discuss the planning of rapid transit, including examination of project alternatives, and to develop details of the project. This was undertaken between April 2008 and June 16, 2011. Consultation undertaken during this period is outlined in Section 6.2 below.

TPAP Phase - The objective of the consultation during the TPAP phase was to consult on the developed project and the potential impacts and proposed mitigation measures. This phase commenced on June 17, 2011 concurrent with the Notice of Commencement. Consultation undertaken during this period is outlined in Section 6.3 below.

The public, regulatory agencies, aboriginal communities and other interested parties were able to choose their level of involvement from one or more of the following options:

- Public open houses;
- The project website;
- The project Facebook page;
- Twitter;
- Face-to-face meetings;
- Presentations to stakeholder groups, including Chamber of Commerce, Business Improvement Areas (BIAs);
- Appearance and stands at local community events and festivals;
- Regular newsletters;
- Corridor walkabouts;
- Contacting the RT Team directly via either telephone, through the website, email or postal mail; and,
- Contacting a member of the Rapid Transit Citizen Advisory Committee

At the public open houses, display panels and video presentations were used to present information about the project. Project staff (City staff and consultant staff) were available at the open houses to answer questions that were raised.

Six formal rounds of public consultation/engagement have been undertaken; five as part of the Pre-Planning phase and the sixth as part of the TPAP phase.

6.1.2 Notification Protocol

A number of communication methods have been used to notify stakeholders of events, latest project news and opportunities to input and comment. These include:

- Regular newsletters;
- E-mails to interested parties, both members of the public and stakeholders, on the Rapid Transit teams mailing list (and letters to mailing members without email);
- Information posted on the project website;
- Project Facebook page;
- Twitter;
- Corridor walkabouts;
- Advertising of events and project articles in the local media; and
- The Rapid Transit Citizen Advisory Committee meetings.

The City of Hamilton RT Team has directly contacted First Nations and local Aboriginal organizations for their views and input to development of the project, including provision of milestone notification of all opportunities to review and comment on project proposals.

6.2 Consultation During Pre-Planning

This section describes the consultation activities that have taken place between April 2008 and May 2011 during the Pre-Planning phase of the B-line LRT project.

There is a wide range of interests and stakeholders associated with the project, including, but not limited to:

- Metrolinx
- Developers/real estate/homebuilders association
- Other municipalities
- Provincial agencies with an interest in the project
- Business Improvement Areas and business owners
- Hamilton Chamber of Commerce
- Hamilton's top employers
- Special Interest Groups
- Colleges and Universities
- General public

- Youth groups
- Seniors groups
- Neighbourhood groups
- Conservation Authorities
- Aboriginal communities and First Nations representatives
- Property owners

A mailing list, which as of July 14, 2011 comprised 2,319 contacts, was created at the beginning of the project to identify directly affected property owners, government agencies, interest groups, other key stakeholders, and residents who were interested in receiving project information. The list of stakeholders consulted is dynamic and has been expanded to incorporate new stakeholders during the course of the project. A link on the project website (www.hamiltonrapidtransit.ca) provided the opportunity for any interested individuals or organizations to be added to the contact list and all consultation feedback material provided the opportunity to register to be kept updated.

A copy of every newsletter that has been sent to the mailing list can be found in Appendix C.1 and C.2.

6.2.1 Summary of Consultation with Aboriginal Communities

In April of 2002, as part of the Red Hill Valley project, the City of Hamilton and Six Nations community initiated an in-depth and focused dialogue to understand and address important cultural issues centered on the Red Hill Valley. Rather than engage in debate or dispute about the nature of their rights in the Valley, the Parties have resolved instead to concentrate on agreeing about the nature of their responsibilities and about how those responsibilities will be fulfilled. The agreements reached reflect those important objectives, and the Joint Stewardship Board is to be involved in any type of development on any city-owned land in the Red Hill Valley.

The Haudenosaunee - Hamilton Red Hill Agreements can be found on the following website:

http://jointstewardshipboard.com/images/stories/executivesummary.pdf

All notices for public consultation events were circulated to First Nations Contacts through technical agencies mail outs (Appendix C.1 Technical Agencies and Municipal Staff). All responses received are attached in Appendix C.1 Aboriginal Communities.

No comments have been received from the First Nations communities.

In an e-mail response received November 9, 2010 from Indian and Northern Affairs Canada (INAC), Mei Ling Chen was identified as the City's INAC contact for future requests.

In an e-mail received from Conseil de la Nation Huronne-Wendat on November 10, 2010, Mr. Gaetan Sioui was identified as the person responsible for all Ontario files for the Huron-Wendat First Nation.

A letter dated November 12, 2010 from INAC, states that the City's notice was forwarded to the Consultation and Accommodation Unit and that further inquiries should be directed to CAU-UCA@inac-ainc.gc.ca, and that future notices should be directed to EACoordinatoin_ON@inac-ainc.gc.ca or the physical mailing address listed within the letter.

An e-mail received from INAC on November 18, 2010 outlined the City's duty to consult and identified how to go about determining which Reserves to engage in our area of interest.

In an e-mail received from INAC on November 18, 2010, it is stated that "the office of the Federal interlocutor for Métis and Non-Status Indians (OFI) would like to inform you that there are no known Métis Nation of Ontario (MNO) assertions in the vicinity of the "B-L-A-S-T" project in the City of Hamilton, Ontario".

A letter received January 31, 2011 from the Ministry of Aboriginal Affairs outlined when Aboriginal communities may have an interest in a project and who to contact.

In response to a City of Hamilton mail-out, an e-mail dated February 22, 2010 from INAC, similar to the email received on November 18, 2010, was received.

6.2.2 Summary of Consultation with General Public and Property Owners

The Rapid Transit Team has also been active in reaching out to the community through attending various community organized events. While in attendance at these events, staff were available at information booths and handed out brochures, surveys and answered questions regarding the Rapid Transit Initiative. These events included:

- Hamilton Light Rail Workshop on May 1, 2008
- Hamilton International Airport on May 15, 2008
- The Landsdale Neighbourhood Association's "Summer in the Park" event on July 6, 2008 at JC Beemer Park
- St. Joseph's Hospital on July 2, 2008
- Jackson Square on July 21, 2008
- Eastgate Square on July 22, 2008
- Limeridge Mall on July 24, 2008
- The University of McMaster "Clubfest" on September 3, 2008;
- The North End Neighbourhood Association BBQ on September 13, 2008;
- Westitalia (by Westdale Village BIA) on September 13 and 14, 2008;
- Ancaster Community Council Meeting in September 2008
- McMaster Student's Union in November 2008
- Mohawk College on December 17, 2008
- Stipely Neighbourhood Community Meeting in March 2009
- Landsdale Neighbourhood Association on November 23, 2009
- Art Gallery of Hamilton on January 28, 2010
- Ward 5 Residents Meeting on February 11, 2010
- Visit to Downtown BIA Members on February 9, 2010
- Ward 1 Meeting on March 22, 2010
- International Village BIA property owners visits on March 26, 2010
- McMaster University Station Location Update Meeting on June 24, 2010
- Meeting with Nicholas Kevlahan on September 22, 2010
- Fortinos, January 4, 2011
- William & Michael Struss, property owners on January 19, 2011
- Crown Point Planning Hub Meeting on February 28, 2011
- South Sherman Planning Hub Meeting on March 7, 2011
- Cathedral High School on May 9, 2011
- Staff also worked with Councillors to use their existing communication channels to help spread the word about the B-Line Rapid Transit project. This has included the use of their Ward newsletters and updates at Ward meetings.

Public Open Houses #1 and 2

Several Open Houses were held between April 2008 and March 2009. Two Open Houses were held in May of 2008 following the completion of the Rapid Transit Feasibility Study (FTFS) Phase 1. The Open houses were held at:

- Sackville Hill Seniors Recreation Centre on May 6th 2008;
- Board of Education on May 8th 2008

The purposes of the Open Houses were to present information about the project and to receive public feedback on the type of Rapid Transit that should be pursued.

In December 2008, Open House Community Update meetings were held at:

- Hamilton Convention centre on December 2 2008; and
- Barton stone united Church on December 4th 2008

The purposes of the Community Update Meetings were to:

- Provide information to the public on the status and next steps of the rapid transit initiative;
- Provide comments on the draft Vision Statement;
- Get the public thinking about their role in providing rapid transit in Hamilton and how they would like to participate in the planning as the project moves forward; and
- Bring forward for comment the overriding draft vision statement that was developed by staff to guide rapid transit planning through to implementation, for their consideration and comment.

The Open Houses and Community Update meetings were interactive and included a formal presentation by Jill Stephen, Rapid Transit Director, and one-on-one interaction among attendees and City staff. Display panels were set up and provided information about the project. All attendees were greeted at the entrance and were asked to sign-in. More than 150 people attended the May Open Houses and nearly 100 people attended the two Community Update meetings in December.

Appendix C.1 (General Public and Property Owners) includes the presentations for the May 2008 PICs and the December 2008 Community Update Meetings in Consultation_Report_FINAL-April-2009.pdf document. The survey form handed out to the public at the December meetings is included in this document.

Property Owners Workshops

Two property owner workshops were held in February 2009. These sessions were aimed at establishing a foundation and positive working relationship, providing information about the project and engaging property owners to ask questions and provide comments to help the City better understand their issues and concerns.

Appendix C.1 (Consultation_Report_FINAL-April-2009.pdf) includes the materials that were presented to corridor property owners and provides the summary results of both the afternoon and the evening workshops.

On November 9, 2010 A Loading and Deliveries Survey was distributed to businesses within International Village. The survey asked how customers arrive, the proportion that park on the street as well as the logistics of deliveries. 16 surveys were completed and can be found in Appendix C.1 (General Public and Business Owners).

Public Open House #3

Three Community Update events in the east, west and Downtown were held at the beginning of June 2009 to update the public on the options being investigated and the next steps for the project. These were attended by 73 people who saw a series of display boards and a presentation given by the RT Team, as contained in Appendices C.1 (General Public and Property Owners), along with a copy of the submitted comment forms.

West: St. Paul Anglican Church – June 1, 2009

East: Church of the Nativity – June 3, 2009

Downtown: Sheraton Hotel – June 9, 2009

Rapid Transit Citizen Advisory Committee

To ensure regular engagement and input into the development of the project the City established a Rapid Transit Citizen Advisory Committee (RTCAC) in the Summer of 2010.

The role of the RTCAC is to provide input and advice to the City of Hamilton regarding the planning and development of the Rapid Transit Initiative and related land use planning studies.

The Committee of 26 members is made up of members of the public, property owners in the corridor and a number of stakeholder organizations. Membership was by application, in response to advertisements seeking interested citizens. In total, over 214 applications were received and final membership was determined through a process of filtering to ensure there was representation from all areas of the City. The Committee includes 9 general public Members, 6 property owners in the corridor, with the remainder representing business or community stakeholders.

The RTCAC met for the first time in September 2010, where they agreed to a Terms of Reference, a copy of which is included at Appendix S4. While the RTCAC is not a decision making body, it meets with the RT Team generally on a monthly basis to provide feedback and input on emerging ideas, project related work activities and other elements, such as consultation material. To date, 11 meetings of the RTCAC have been held (latest meeting on September 15th, 2011) and RTCAC members have played an active role at each of the consultation events that have been held since its formation. All meeting materials and minutes from the RTCAC are located on the project website (www.hamiltonrapidtransit.ca)

Public Open House #4

A Public Open House was held on the evening of September 30, 2010 to give the public an update on progress developing the project and to introduce the Rapid Transit Citizens Advisory Committee. Information panels, included in Appendix C.1 (General Public and Property Owners), along with a video of LRT examples, were on display and RT Team staff and members of the consultant team were on hand to answer questions from the 31 attendees. All submitted comment forms are contained in Appendix C.1 (General Public and Property Owners).

Public Open House #5

The next round of Public Open Houses was held in January and February 2011. Open Houses were held at 7 locations in the City, 6 on or near the B-Line route, and 1 on the mountain, as follows:

- January 19 Scottish Rite, Downtown Hamilton
- January 20 Westdale Secondary School
- January 24 International Village Business Improvement Area (BIA), Downtown Hamilton
- January 25 Sir Winston Churchill Secondary School
- January 27 Courtyard Marriott Hotel
- January 28 McMaster University Students Union
- February 2 Downtown BIA

In total, these events, which included comprehensive information panels (refer to Appendix C.1 (General Public and Property Owners)) and a video simulation of LRT in Downtown Hamilton, were attended by over 650 people. The video simulation is available on the project website and on YouTube (http://www.youtube.com/watch?v=JJVa-rSXOSA), where it has been viewed nearly 4,000 times.

A summary of comments received is available in Appendix C.1 (General Public and Property Owners).

In addition to specific Open House events, Rapid Transit Team members have held or presented project details at a number of meetings with stakeholders. These include:

- Realty Association, May 13, 2008
- Hamilton Chamber of Commerce, June 10, 2008

- Hamilton Halton Home Builders Association, July 17, 2008
- The Barton Village Business Improvement Association (BIA) First Annual Festival, July 19 and July 20, 2008 at Woodlands Park
- Festival Board, Summer, 2008
- GIS Day, November 12, 2008
- McMaster Centre for Spatial Analysis, February 27, 2009
- Transportation Summit, April 2, 2009
- Hamilton Environmental Industrial Association, April 9, 2009
- Downtown Hamilton BIA – Annual General Meeting, November 3, 2009
- Hamilton Association of BIA's (HABIA), December 15, 2009
- Mohawk College Student Project Background Presentation on Rapid Transit in Hamilton on January 20, 2010
- Downtown BIA, January 26, 2010
- Spectator Editorial Board, February 16, 2010
- CHML, March 26, 2010
- Hamilton Association of BIA's (HABIA), April 13, 2010
- Downtown BIA and international Village BIA, October 4, 2010
- Hamilton TMA, November 2, 2010
- Downtown BIA Annual General meeting, November 2, 2010
- Hamilton Chamber of Commerce on December 7, 2010
- International Village BIA, December 13, 2010
- Downtown BIA, December 17, 2010
- Hamilton Chamber of Commerce, December 17, 2010
- Liuna, December 21, 2010
- International Village BIA Board, January 12, 2011
- Downtown BIA Board, January 19, 2011
- Art Gallery Hamilton, February 10, 2011
- McMaster University, March 1, 2011
- Hamilton Businessmen Breakfast, March 10, 2011
- Environmental Arts Night at Sherwood Secondary School, March 23, 2011
- King Street West BIA meeting, March 30, 2011
- Ecohouse Green Adventures family weekend, April 8 and 9, 2011;
- McMaster University, April 14, 2011
- 11th Health & Safety Fair, April 26 and 27, 2011;
- Winona Community Information Night, May 10, 2011;
- Hamilton Economic Summit, May 12, 2011
- Business Development Committee, June 2, 2011
- Open Streets, June 12, 2011;
- Transportation & Healthy Living Fair, June 16, 2011.
- Bill Kelly Show (CHML), June 20, 2011
- McMaster Institute of Transportation & Logistics (MITL), July 20, 2011

6.2.3 Summary of Consultation with Technical Agencies and Municipal Staff

Throughout the study process, the Rapid Transit Team has kept in close contact with Metrolinx. This has included regular Rapid Transit Technical Team meetings that have helped shape the project.

Direct consultation commenced in February 2009, when a workshop session was held with technical agencies and organizations, including federal departments and provincial ministries with an interest in the project, members of the Government Review Team, utility companies, hospitals, schools, and affected conservation authorities.

One hundred representatives were invited to attend the workshop, although only nine of these attended. The workshop provided information about the project and also encouraged the technical agencies to ask questions and provide comments to help the City better understand stakeholder issues and concerns. Some of these concerns included:

- Cost and timeline of infrastructure relocation
- Overhead wires obstructing Fire Rescue ladders
- Ease of walking from King to Main to take the transit system in both directions
- Effects of the Rapid Transit line on subsurface infrastructure.

Appendix C.1 (Consultation_Report_FINAL-April-2009.pdf) includes the materials presented to the technical agencies at the February 23, 2009 workshop, including the agenda, presentation, invitees, attending agencies, comment form, and the comments that were submitted.

In addition the following meetings were held with agencies:

- May 1, 2008 – Metrolinx
- July 14, 2008 – Clean Air Hamilton Committee
- October, 2008 – Downtown – West Harbourfront Coordinating Committee
- October, 2008 – Hamilton Roundtable for Poverty Reduction
- October 14, 2008 – Advisory Committee for Persons with Disabilities
- January 20, 2009 – Youth Advisory Committee of Council
- February 23, 2009 – Hamilton Utility Policy Review Committee
- January 27 & 29, 2010 – Metrolinx
- March 3, 2010 – John Howe (Metrolinx)
- March 3, 2010 – Police Chief
- August 12, 2010 – Canadian Pacific Railways
- October 12, 2010 – Implementing Rapid Transit Projects Group
- October 18, 2010 – Hydro One
- October 25, 2010 – Jim Dunn (McMaster)
- October 27, 2010 – GO-Strachan Community Office
- November 22, 2010 – Hamilton Day at Queens Park

- December 8, 2010 – McMaster
- December 14, 2010 – Green Venture
- January 10, 2011 – Ministry of Transportation
- March 16, 2011 – John Brodhead (Metrolinx)
- June 3, 2011 – Metrolinx Re: PDE/MSF
- June 3, 2011 – Hamilton Fire Chief Rob Simonds
- June 9, 2011 – Karen Stintz, Chair of TTC
- June 15, 2011 – Translog
- June 24, 2011 – City Manager's Office/Planning/Rapid Transit – Re: Scott Park
- July 18, 2011 – Ministry of Transportation

Development on the B-Line project has included consultation with City of Hamilton staff including Public Works (Transit, Capital Planning & Implementation, Energy, Fleet & Facilities, and Operations & Maintenance), Planning and Economic Development (Development Planning, Community Planning, Downtown and Community Renewal, Strategic Services and Special Projects, Real Estate, Parking and By-law Services), Corporate Services, Community Services and Public Health Services. Public Works has continued to work collaboratively with Planning and Economic Development in this process, as the project is of importance to the City as a whole, with great economic potential, and has implications to the Nodes and Corridors Policies of the Official Plan, Zoning By-laws and the Urban Structure Plan. Public Health Services also plays an important role, especially in the area of improved air quality as a result of rapid transit implementation, as does Community Services, in regards to station design and residential intensification along the corridors.

Consultation with municipal staff included two Lunch & Learn sessions and two workshops. Lunch & Learn sessions were held to educate City staff on the project on July 24 and 25, 2008. A downtown lunch time Public Information Centre was also held on July 28, 2008 to capture downtown commuters who are potential riders of a rapid transit system, many of whom presently commute to work using a single occupancy vehicle.

On November 19, 2008 a cross-departmental workshop was held with 25 City staff representing six City Departments including Public Works, Planning & Economic Development, Emergency Services, Corporate Services, Community Services and Public Health. The purpose of the workshop was to:

- Provide information to City staff on the status and next steps of the rapid transit initiative;
- Get all City departments thinking about their role in providing rapid transit in Hamilton;
- Determine key contacts in each department;
- Understand any opportunities or challenges departments see with the project and specifically with their role;
- Identify key considerations for project decision making moving forward; and
- Develop an overriding statement that would guide rapid transit planning through to implementation.

A follow-up workshop was held with municipal staff on February 5, 2009 to provide an update on the information that has been gathered to date and to obtain comments on potential corridor and route alternative impacts.

These two initial workshops helped form the mandate of the Corporate Working team which comprised over 70 municipal staff from all departments across the City. The Corporate Working team members met on a quarterly basis (approximately) and received updates on the development of the project. The Corporate Working team members acted as the primary points of contact and coordinators for their service areas and were given project material to circulate, review and compile comments which was fed back to the Rapid Transit team. In this way, the views and input from all sectors of the City have been taken into consideration and have helped shape the project during the Pre-Planning phase into its current form.

The minutes, presentations and other materials for workshops #1 and #2 and for meetings 3-to-8 are available in appendix C.1 (Technical Agencies and Municipal Staff). Meeting agendas have included the following discussion items (Note: Meetings 1 and 2 were the initial workshops as previously outlined):

- October 26, 2009
  - What is LRT and What Can it Achieve? (Educational Presentation by SDG)
  - LRT Implementation and Issues. (Educational Presentation by SDG)
  - Interactive workshop/discussion of issue areas along the B-Line
- June 23, 2010
  - Rapid Transit Initiative Status Update
  - Workplan / Critical Path
  - Role of Corporate Working Team
- September 9, 2010
  - Rapid Transit Initiative Status Update (Project Timelines)
  - B-Line Corridor Land Use Update
  - Design Workbook 2 Presentation & Discussion
  - Project Financial Update
- December 9, 2010
  - Rapid Transit Initiative Status Update (Project Timelines)
  - B-Line Corridor Land Use Update
  - Design Workbook 2 Presentation & Discussion
  - Project Financial Update
- March 3, 2011
  - Consultation update
  - Post consultation suggested amendments
  - Land use update
  - Modelling (Steer Davies Gleave)
  - Next steps
- June 17, 2011
  - B-Line Transit Project Assessment Process
  - Maintenance and Storage Facility update
  - Subsurface Infrastructure Update
  - Land use update / Industry Focus Group Report
  - Making the Case Study
  - Next steps/Timelines upcoming deliverables

6.3 Consultation During Transit Project Assessment Process Phase

The Notice of Commencement officially starting the TPAP phase was placed in the Hamilton Spectator newspaper on June 17 and June 24, 2011. A copy of the Notice is included in Appendix C.2 (General Public and Property Owners).

In addition, the Notice was:

- Sent to the MOE Regional Director, Environmental Assessment and Approvals Branch Director, and Project Coordinator. A full list of recipients is included in Appendix C.2 (Technical Agencies and Municipal Staff).
- Sent to all property owners within 30 m of the project corridor;
- Sent to all mailing list recipients (email and postal mail);
- Shown in the Spectator in the "At Your Service" advertisement section (June 17 and 24); and
- Posted on the project website.

A full list of statutory bodies and organizations that were sent the Notice is contained in Appendix C.2 (Technical Agencies and Municipal Staff).

6.3.1 Summary of Consultation with Aboriginal Communities

A copy of the Notice of Commencement was sent to 18 First Nations representatives, as detailed in Appendix C.2 (Technical Agencies and Municipal Staff), on June 30, 2011.

A follow up letter, see Appendix C.2 (Aboriginal Communities), asking for comments and including a further copy of the Notice of Commencement, was sent to the same First Nations contacts (Appendix C.2 (Technical Agencies and Municipal Staff) on July 14, 2011 and this was followed up with telephone calls and/or emails on July 29, 2011, and October 3, 2011. All follow up calls and e-mails have been tracked in Appendix C.2 (Aboriginal Communities).

A letter, titled Queenston Road Bridge over the Red Hill Valley, was sent to the Joint Stewardship Board on September 23, 2011 with a follow up call on October 3rd, 2011. The letter outlines preliminary impacts of the required Queenston Road Bridge improvements to facilitate the installation of the Light Rail Transit line.

No comments have been received from the First Nations communities. The City of Hamilton remains committed to engagement with First Nations and will meet with First Nations officials, should they express any interest or concern.

INAC has responded to the Notice of Commencement, providing information on resources that may be useful to identify reserves in the area. It was also recommended to keep up to date with the reports on the INAC website. The full email can be found in Appendix C.2 (Aboriginal Communities).

The Assembly of First Nations (AFN) responded stating that, as an organization the AFN does not have any entitlement to the lands referenced in our notice of commencement and that they cannot speak on behalf of the First Nations in our area. They further identified that it is in the nature of respect for the First Peoples that consultation and accommodation should be pursued. They commended the City of Hamilton for being proactive in informing them of the City's plans and further stated that this should be extended to the First Nation communities in the City's area for this and future projects. The full letter can be found in Appendix C.2 (Aboriginal Communities)

Aboriginal Affairs and Northern Development Canada also provided the City with a response that stipulates that the department recently developed a new information system that brings together information regarding Aboriginal First Nations such as their location, related treaty information, claims and litigation. This system was then used within a 100km radius that identified 15 First Nations with potential interests in the area in order to assist the City in planning any consultation that may be required for this project. It should be noted that the Notice of Commencement and the follow up letter had been circulated to all the contacts referenced within this letter. The full letter can be found in Appendix C.2 (Aboriginal Communities)

The Environmental Unit of the Environmental Assessment Coordination, Aboriginal Affairs and Northern Development Canada responded in a further e-mail stating that since no triggers for a Federal EA under the Canadian Environmental Assessment Act has been indicated in this project, they do not have any comments at this time. However, they provided a complete list of resources that could assist the City with identifying First Nations and other groups within the vicinity of the proposed project. It should be noted that the Notice of Commencement and the follow up letter had been circulated to all the contacts referenced within this letter. The full letter can be found in Appendix C.2 (Aboriginal Communities).

The Hamilton Executive Directors Aboriginal coalition was interested in the project and a link of the Public Information Centre boards via the Rapid Transit Website, was submitted on August 24, 2011 and on October 3, 2011, to them for their review and comments. They stated that they would relay the information to their members and they would like to receive a brief synopsis of the Rapid Transit Project. This synopsis was sent on October 5, 2011 and will be distributed at their future board meeting. The synopsis email can be found in Appendix C.2 (Aboriginal Communities).

6.3.2 Summary of Consultation with General Public and Property Owners

One round of consultation was held after the formal Notice of Commencement was issued. Notices of Public Information Centres are included in Appendix C.2 (General Public and Property Owners and Technical Agencies and Municipal Staff) and were issued in the Brabant Community News on Thursday August 4, 2011 and in the Hamilton Spectator on August 5 and 12, 2011. Notices were also mailed to all property owners within 30 metres of the subject area, the project mailing list, agency contact list and posted on the project website.

This is summarized below and included four Public Open Houses held between August 15 and August 18, 2011. In addition, the panels displayed during the public open houses were posted on the project website on August 22, 2011.

Public Open House #6

The purpose of the consultation was for the public and other stakeholders to:

- Review work done to date;
- Review the updated alignment since the January/February 2011 Public Open Houses;
- Review potential impacts of the project and proposed mitigation treatment;
- Provide feedback on the project as presented;
- Provide comments or ask questions;
- Obtain information on the future program for the project.

Open House events were held on:

- August 15 at Sackville Hill Seniors Recreation Centre between 6 p.m. and 8 p.m.;
- August 16 at the Grand Olympia between 6 p.m. and 8 p.m.;
- August 17 at Hamilton Convention Centre between noon and 8 p.m.; and
- August 18 at Hamilton Convention Centre between noon and 8 p.m.

The Open Houses included detailed panels along with mock up montages and a video simulation illustrating how the project might look when implemented. A copy of the panels on display at the open houses is contained in Appendix C.2 (General Public and Property Owners). Staff from the City's Rapid Transit Team and the consultant team were on hand to answer any questions or discuss any aspect of the project with interested attendees.

Approximately 67 people attended to view the information panels on display, fill in comment forms and talk to members of the project team.

A total of 23 comment forms and two letters were submitted and, overall, 22 comments were received via email or through other communications. The comments received can be summarized as falling into the following bands:

- Operations and Maintenance issues including Emergency services and snow storage
- Benefits verses costs and justification based on ridership or cost

- Design considerations including stop locations, access and HSR service
- Land Use
- Routing, including preference of A-line over B-line
- Traffic issues that include lack of capacity and concerns about vehicular lane closures
- Support and General Comments

These comment bands have been summarized with responses in Table 6.1.

Table 6. 1: Public Comments During TPAP Phase and Project Team Responses

Theme	Summary of Comments/Concerns	Response
Operations and Maintenance		
1	Emergency response times and blocking of traffic	The planning of the B-Line LRT corridor has incorporated meetings with various departments and agencies including emergency services. The design of the LRT tracks permits the use of the guideway for emergency purposes and improves response times and will not obstruct existing traffic flows.
2	Location of the Maintenance and Storage Facility	The location of the MSF must be determined as part of the next phase of this study. An addendum to this Environmental Assessment or A separate Transit Project Assessment Process will need to be complete in order to determine the best location.
3	Snow removal adjacent to the tracks – where will it be stored	The review of the LRT system involved a look at the operations and maintenance within the corridor. The recommended strategy involves heightened level of service for snow removal within the corridor.
Benefits Verses Cost		
4	Decrease in property values	While property values are affected by a number of criteria, economic studies have been done for the B-line corridor that have identified that properties within 500m may see values increase.
5	Justification for LRT based on Ridership and/or Cost	Metrolinx has completed a Benefits Case Analysis recognizing that the B-Line corridor produces a positive benefit ratio.
6	If only 3 min faster on LRT verses existing HSR service, why spend the money?	LRT will operate in a dedicated corridor which will reduce overall variability in travel time. A small trip saving time has significant cumulative benefits over time.
7	Increase of taxes	There are a number of ways to fund LRT implementation, beyond the traditional method of using taxes. These will be investigated further as the project develops.
8	Too costly and less flexible than buses.	The benefits case analysis evaluated bus rapid transit and light rail transit. While each option identified positive benefits, light rail transit was found to have more significant environmental and value uplift benefits.
9	Consider Bus Rapid Transit over Light Rail Transit - use Trolley Busses for BRT.	Evaluation of both modes was completed by Metrolinx in the Benefits Case Analysis (BCA). The BCA identified increased economic uplift and other benefits attributed to LRT. Therefore, this design has evaluated an LRT system along the B-Line corridor. Both LRT and BRT have been identified as beneficial in communities with a goal to modernize public transportation. In many North American communities, transit user feedback identifies LRT as being more comfortable and quieter for riders, with no emissions on the street, and greater carrying capacity compared to private automobiles. While providing high quality transit is one of several key objectives for Rapid Transit, a safe, comfortable walking environment, bicycle lanes, attractive streetscaping and public art are also important objectives. With the integration of municipal transportation and land use policies, LRT has the potential to increase property values and brings greater potential to create economic spin-offs including job creation, increase assessment value and private investment.

Theme	Summary of Comments/Concerns	Response
Design Considerations		
10	Distance between stops and access for Seniors	LRT stops are spaced approximately 800m apart (except downtown where stops are 400m apart). The location of LRT stops was based on the need to balance a number of factors including the need for the transit to be rapid. Other factors include identifying appropriate stop locations at important intersections or destination points, and the need to create walkable environments for pedestrians. The distance between stops is within a 5 to 10 minute walk for the average person. Also, local HSR bus service will still run on the existing Main/King corridor with its current stop spacing.
11	Not enough stops to service Westdale.	The proposed LRT route along Main Street West allows for important connections to Westdale Secondary School, the West Hamilton Innovation District, and the main entrance to McMaster University. When route alignments were evaluated, consideration was given to maintaining the character of Westdale Village, preserving the surrounding neighbourhood area and technical considerations (road widths and turning radii). Westdale Village is within a 5-10 minute walk of the Longwood Road transit stop and future planning work will look at opportunities to enhance pedestrian connections between Westdale Village and B-Line LRT. Bus service levels in Westdale will continue.
12	How will customers who choose to drive be able to access commercial destinations along the route?	Access to most properties will not change. While some street parking will be reduced along the corridor, the parking and loading study has identified areas for new parking locations and less parking restrictions.
13	HSR should increase frequencies to some of their feeder routes	Local HSR routes have been addressed as part of this study, so that they feed into the LRT system. The LRT will remove buses from service, which could be used to service other areas of the City and help feed into the B-Line.
14	Better integration of GO Express bus and the 403 ramp is required.	This is outside of the scope of this study; however, we are integrating with existing GO transit locations.
15	Will the line move freight at night?	No. The LRT is being designed for passenger transportation only.
16	Concerns about limited turns across tracks. - Concerns about limiting access to existing properties, loss of left turn lanes.	Some property access will be impacted by the LRT. Where feasible, alternative access will be provided. Where changes to entrances or accesses are proposed, consultation with impacted property owners or occupants will take place prior to project implementation. The roadway design aims to provide left turn lanes at signalized intersections.
Land Use (for more information on the B-Line Corridor Land Use Study, please visit www.hamilton.ca/nodesandcorridors)		
17	What is the future land use along the corridor?	The City is currently completing nodes and corridors study for the entire B-Line corridor that will establish a secondary/corridor plan and appropriate zoning to support the Rapid Transit Corridor.
18	Concern that good transit will not automatically build neighbourhoods.	Investment in Rapid Transit is an important component to encourage revitalization and further investment along the corridor. There are many inter-related factors that contribute to neighbourhood building. The B-Line Land Use Plan and implementation strategy will look to address these pieces of the puzzle that together, will work to strengthen communities and neighbourhoods along the corridor.
Route		
19	Preference for the A-Line to be developed before the B-Line.	The B-Line is recognized by Metrolinx as a top 15 priority project in the Regional Transportation Plan (RTP), within the first 15 years. The A-Line has been identified as a 15 year project. While the B-Line is proceeding first, work on the A-Line feasibility study is also being completed. The recommendation for the B-Line coincides with one of the most used transit routes operated by the HSR, within the most highly used

Theme	Summary of Comments/Concerns	Response
		transportation corridor in the City of Hamilton. Conversely, A-Line ridership may take longer to establish and to justify the implementation of Rapid Transit.
20	Why does the B-Line end at McMaster?	The City has identified the long-term need to extend the B-Line to University Plaza. Metrolinx has funded this study to focus on the first phase of the B-Line corridor from McMaster University to Eastgate Square.
Traffic		
21	Traffic flow should be maintained on King Street between Mary and Walnut	The LRT stop was planned for this location to allow local traffic and deliveries in International Village while eliminating through traffic in the corridor.
22	Does King Street have the capacity to take away two lanes for LRT?	While the number of traffic lanes is being reduced, the people carrying capacity of the corridor is increasing. Traffic modeling for the entire lower City was completed as part of this study. The modeling has determined that there is enough capacity within the network.
23	The reduction of traffic lanes will reduce population density since people will not want to drive here.	This assumes that all new residents will own an automobile. Investment in high-order transit helps shift mode share from private auto use to transit and active transportation.
24	There is not enough space in the corridor for this to work. Concern that LRT would be more of a hindrance to the core.	This study has taken into consideration all components of the traffic network and identifying all constraints and opportunities with the provision of an LRT route. The design recognizes these constraints and has established an LRT system integrated with the surrounding community, with an enhanced pedestrian environment and reducing overall property acquisitions. Opportunities have been identified for continued vehicular movement throughout the lower City.
General Comments		
25	The construction for this should be done by Hamilton firms.	Comment noted.
26	LRT would serve the transportation needs within Hamilton, whereas GO only takes us away to other cities.	LRT serves a local transit function while GO Transit serves a regional transit function.
27	Why not increase frequency of existing B-Line?	Comment noted.
28	Names of Stations should be changed	There will be opportunity in the future for neighbourhood involvement to help brand the line.
29	LRT should connect to proposed east end GO station at Centennial Parkway @ QEW	Comment noted.

Prior to filing the Notice of Completion a letter was sent to:

- Property owners who own land that may be required to be purchased by the City to implement the Rapid Transit Project; and,
- Properties owners who may require changes in accessing their property.

A copy of the letter is contained in Appendix (C.2 – General Public and Property Owners). The letter states that there will be further design refinements as the project planning proceeds and we will keep them informed. The design refinements may change the original impacts as outlined in this report.

Members of the public have established a citizen-initiated website, titled: *Hamilton Light Rail Initiative* (http://hamiltonlightrail.com), which was launched on September 21, 2011 and contains over 787 supporters and 391 statements from members of the public (as of October 6, 2011). The statements, which the Rapid Transit Team are a recipient of, are highly supportive of Light Rail on the B-Line corridor.

6.3.3 Summary of Consultation with Technical Agencies

As was the case during the Pre-Planning phase, the Rapid Transit Team consulted and engaged with federal, provincial and municipal staff on a regular and ongoing basis, and as otherwise required. This has included the Rapid Transit Technical Team. Meetings of the Technical Team were scheduled and generally held on a two week basis throughout the Pre-Planning phase and the TPAP phase (although on a less frequent basis during the TPAP phase).

The Corporate Working Team met once at the beginning the TPAP phase, although relevant material was circulated on an as and when basis to elicit feedback and comments.

Direct engagement with technical agencies has included:

- Ontario Ministry of the Environment Environmental Assessment and Approvals Branch Senior Project Officer and Senior Noise Engineer (May 27, 2011) – agreement on scope and criteria to be used for noise and vibration assessment; review/agreement on content/layout of Environmental Project Report; and review/sign-off on draft EPR and selected technical reports; discussion of TPAP process and timeline;
- Ontario Ministry of Tourism and Culture – pre-submission and sign-off on archaeological, built heritage resources and cultural heritage landscape components;
- Ontario Ministry of Transportation – Review of 403 crossing and modelling of ramps (July 18, 2011);
- Metrolinx – network development opportunities, impacts to existing services and connectivity to existing and future GO services.

Agencies were circulated a copy of the Notice of Public Information Centres in the week of August 2, 2011. A complete hard copy of the draft EPR was couriered to the Ministry of Transportation, the Hamilton Conservation Authority, the Ministry of Tourism and Culture and the Ministry of Natural Resources the week of August 8, 2011. A response was received from the Ministry of Tourism and Culture, which has been summarized in Table 6.2.

Further correspondence was sent via email to the above noted agencies on September 8, 2011. The MNR responded by stating that they do not anticipate being able to review the documents provided by the requested timelines, and they understand that the City will proceed according to the project schedule without MNR comments. Additional correspondence was sent to the Hamilton Conservation Authority on September 9, 2011 and the MTO on September 21, 2011. However, no responses were received from either the Hamilton Conservation Authority or the MTO. Copies of the mailing list, Notice of Commencement, email correspondence and responses received are located in Appendix C.2 (Technical Agencies) and are summarized as follows.

Table 6. 2: Agency Comments on Draft EPR and Project Team Responses

Item	Section/ Paragraph	Agency Comment	Response to Comment/ Action
Ministry of the Environment Environmental Assessment and Approvals Branch (September 21, 2011)			
1. Introduction and Study Process			
1	Section 1.2	An explanation for the acronym EMME model is required.	Noted. EMME Model has been added to the Glossary.
2	Section 1.5.3	As required by the Transit Regulation, descriptions of related studies undertaken in relation to the transit project, including summary of data collected or reviewed and summary of results and conclusions are to be provided. Providing cross references to locations in the EPR where the information can be found would be helpful.	The results of the two principal related studies are included in this section. A summary statement has been added, as has a statement that the studies are available for review by visiting the City's project website.
2. Project Description			
3	a.	A clear statement of the purpose of and description of the final transit project must be presented in the final EPR.	Noted. The purpose of the project is related to the City's Vision Statement, which is included in this section. A succinct summary of the project description has been added.
4	b.	Clarification is required concerning the planning of the maintenance and storage facility	Noted. Clarification added as Section 2.2.9 (future study) and Section 5.4 (addendum to this EPR or a separate environmental assessment).
5	c.	The Notice of Commencement indicates that the B-Line corridor will be introduced within the next five years, yet the EPR does not discuss implementation. Provide details.	The text has been amended to provide contextual milestones.
6	d.	Clarify which vehicles have priority at the CP Rail crossing.	The text has been amended to provide clarification.
7	e.	A map showing the proposed alignment, including stops, should be included in the *Preferred Design* section.	The requested map has been added.
8	f.	Identify all other locations along the alignment at which special trackwork are to be installed.	Special trackwork is identified on the Design Plates in Appendix A.1.
9	g.	Details of anticipated property acquisitions for the proposed LRT alignment, special trackwork, and power substations should be provided in the final EPR.	Property required for the LRT alignment is identified on the Design Plates in Appendix A.1. Special trackwork does not require property acquisition. The property for traction power substations (TPSS) will be identified during the detail design phase. Appendix A.5 shows the conceptual TPSS locations, which have a range of 200 m either side.
3. Existing Conditions			
10	a.	Section 3.1.4: *Surface and Subsurface Utilities* ensure commitments to future work, consultation, etc. describe here are carried forward to Table 4.5.	Noted. Commitments have been carried forward to Table 4.5.
11	b.	Section 3.3.4: *Noise and Vibration* in Table 3.6 POR-8 is blank; provide explanation relating to the text given under subsection *Stationary Noise Criteria*.	Noted. POR-8 was initially used for the Maintenance and Storage Facility site, which is no longer under consideration in this EPR. Therefore, noise receptors have been renumbered, and the table has been adjusted accordingly. It should also be noted

Item	Section/ Paragraph	Agency Comment	Response to Comment/ Action
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			that PORs in Chapter 3 are referred to as "Receptors". Chapter 4 PORs may differ slightly from the Receptors cited in Chapter 3, based on refinements to the design between the inventory and impact assessment stages, and due to the need to adopt the most conservative approach for assessing noise impacts (i.e., mid-block receptors are used to avoid the influence of noise on major crossing roads. Refer to figures in Appendix B.3).
4. Project Environmental Effects, Mitigation and Monitoring			
12	a.	The Transit Regulation requires the proponent to prepare an EPR that contains an assessment and evaluation of the impacts that the preferred method of carrying out the transit project and other methods might have on the environment **and** the proponent's criteria for assessment and evaluation of those impacts. Revise wording, as appropriate.	The criteria against which the project has been assessed have been listed at the beginning of each subsection.
13	b.	Ensure all commitments to future work, consultation, mitigation and monitoring described in this section include timeframes for completion, all of which, including all identified potential impacts and net effects, are to be carried forward to Table 4-5.	Where possible/known, commitment timeframes have been stated in relation to the stage of the project within which they will be fulfilled, and have been carried forward to Table 4.5.
14	c.	An assessment and evaluation of impacts for all described local environmental conditions are to be provided in the final EPR, including identification where impacts are not anticipated.	Noted. Text has been amended.
15	d.	As mentioned above, clarification is required concerning the proposed transit project and the planning for the maintenance and storage facility.	Noted. Please see Response 4.
16	e.	Table 4.5 spans seven pages; as such column headings need to be repeated across all pages. In addition, it is important to ensure that the language used reflects the commitments made rather than suggesting an action	Noted. Table header row has been included and language is consistent with the rest
			that could be taken.	of Chapter 4.
5. Permits and Approvals Required for Project Implementation			
17	a.	It is recommended that additional information about the amending procedure be provided, such as reference to the following sections: 15(11), 15(12), and 15(21).	Noted. Text has been amended at Section 5.4 to include these references.
6. Consultation Process			
18	a.	Ensure this section accurately separates consultation undertaken during pre-planning from consultation undertaken during TPAP.	Consultation during pre-planning and during the TPAP phases are already clearly separated in Sections 6.2 and 6.3 respectively.
19	b.	Identify if and how the Six Nations community has been involved in the process.	Engagement of the Six Nations community is described in Section 6.2.1 and Section 6.3.1, with supporting documentation included in Appendix C.
20	c.	Ensure the consultation record of activities undertaken during TPAP includes summaries of comments submitted and description of what was done to respond to the concerns raised.	Noted. Tabular summaries of comments submitted and a description of what was done to respond to the concerns raised have been added to the subsections describing consultation with Aboriginal Communities, the General Public and Property Owners, and Technical Agencies and Municipal Staff.
Appendix B. Technical Support Documents			
21	Appendix B.2	Contains an update to a prior (2009) hydrogeological report yet a discussion about the prior report and a summary of findings is not given. Provide missing information.	Noted. The report text has been amended.

Item	Section/ Paragraph	Agency Comment	Response to Comment/ Action
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22	Appendix B.4	Mitigation measures (7.2) provide information related to the north side of Roadway 401 located east and west of Warden Avenue. Adjust accordingly.	Noted. This section has been amended to clarify the reference.
23	Appendix B.7	Geotechnical section is blank; ensure final appendix contains complete information	Noted. The Geotechnical report has been added to Appendix B.
24	Appendix B.8	Design Criteria is blank; ensure final appendix contains complete information.	Noted. The Design Criteria have been added to Appendix B.
25	Appendix B.9	No systems operation plan was provided as stated in the EPR; ensure final appendix contains complete information.	Noted. Systems operation information has been included in Appendix B.9 Track Plan
Appendix C. Consultation Record			
26	Appendix C.1	Ensure final appendix contains complete information	All relevant information is included in Appendix C.1.
27	Appendix C.2	Ensure final appendix contains complete information.	All relevant information is included in Appendix C.2.

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Surface Water Impact Evaluation			
1	Para 2	The DEPR has adequately characterized the natural environment surrounding surface waters within the proposed project area. However, given the "high-level" nature of the DEPR's treatment of potential construction impacts and mitigation measures, it is expected that additional information would follow in the detailed design phase therefore we can only make reference to the *potential* need for a Permit to Take Water (for any dewatering during construction) or Certificate of Approval (for the discharge of sewage). Reference to these potential approval requirements has been made in Section 5.1 of the DEPR.	Noted. Additional geotechnical and foundations investigations will determine whether a Permit to Take Water for dewatering, or a Certificate of Approval for discharge of sewage are required.
2	Para 3	Based on the information provided, the proposed B-Line light rail transit corridor	Detail design investigations will further confirm potential impacts to

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		represents low-risk to both the Chedoke and Red Hill Creeks. This assessment is based on the supposition that stormwater management, concrete effluent, and dewatering contributions to the Creeks are properly managed and treated if required, to prevent potential impacts to water quality and quantity. This is particularly the case for Red Hill Creek, which could be more susceptible to impacts associated with construction activities. Collection and analysis of stream samples and collected runoff released from the site could be included as part of the monitoring plan that has been suggested for the construction phase to assess the effectiveness of recommended mitigation measures that will be employed.	watercourses that may receive discharge/effluent from the construction site. Appropriate practices for surface water management and watercourse protection will be identified at that time. This will include consideration of construction period monitoring of water quality.
Groundwater Impact Evaluation			
3	Para 2	The proponent should be aware that the generalities of the geological and hydrogeological conditions described in the report will not be sufficient to satisfy the requirements for a Permit to Take Water (should dewatering be required to enable construction in the dry) or for a sewage approval.	Noted. If required, a Permit to Take Water application will be prepared and submitted to the MOE for approval in accordance with O.Reg. 387/04, as amended. The application document will include detailed and appropriate evaluation of geological and hydrogeological conditions for the area requiring dewatering during construction.
4	Para 3	The DEPR indicates that mitigation measures will be designed at a later date after the completion of geotechnical testing, detailed construction design, selection of construction methods and update of potential and existing sources of contamination. As overall monitoring is not suggested, the report indicates that a monitoring program would be prepared on an as-needed basis in the vicinity of the creeks. In light of this deferral, it is reasonable to require the proponent to provide review agencies having an interest in surface water quality/quantity the opportunity to review and comment on a monitoring and mitigation program.	Where groundwater may impact surface waters, a hydrologist will be consulted for input for the monitoring plan. The monitoring plan will be provided, in advance of the construction, to the appropriate regulatory agencies for their review and comment, as needed.wii
5	Para 4	The development of a contingency plan in the event that contaminated soils from any of the potential locations are in fact encountered has also recommended. Apparently, the City has developed a protocol entitled "Contaminated Sites Management Guideline" which they intend to follow. Given our lack of experience with this Guideline, and the deferred preparation of any contingency plan, it is reasonable to allow	The City's Contaminated Sites Management Program for Municipal Works manual will be provided to review agencies on request. MOE Hamilton District Office staff will be provided with the opportunity to review and have input to the contingency plan.

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		Hamilton District Office staff the opportunity to review and have input to the contingency plan.	
6	Para 5	Section 4.3.4 has been written to address mitigation and monitoring relating to contaminated soils. It makes incorrect reference to the *Guideline for Use at Contaminated Sites in Ontario* which was superseded by Ontario Regulation 153/04 as amended. Correct reference to Ontario Regulation 153/04 as amended is made further in this section, in relation to the "handling" of contaminated soils. This section should be corrected.	Noted. This section has been amended.
Air Quality Impact Evaluation			
7	1	Benzo(a)pyrene is a component of motor vehicle emissions. However, it was not modeled or discussed in the actual Air Quality Assessment prepared by RWDI. No justification was given by RWDI for the exclusion of benzo(a)pyrene from the modeling. It is recommended that benzo(a)pyrene be included in revised air quality modeling. Benzo(a)pyrene is a contaminant relevant to Hamilton and in particular the downtown area because of the proximity to industrial uses. In light of the new benzo(a)pyrene Upper Risk Thresholds set in Schedule 6 of O.Reg. 419/05, and the more stringent AAQC and Standards set in Schedule 3 of the Regulation which will come into effect in July 1, 2016, benzo(a)pyrene should be modeled. With the upcoming changes, this is considered a serious omission. Furthermore, it [benzo(a)pyrene] needs to be factored into the overall modeling of predicted impact to identify the areas where particular consideration needs to be given as to effective and reasonable mitigation measures. One possible measure is that of tree planting at most affected areas to act both as a screen, and for the take-up of contaminants with emissions that vegetation provides.	Benzene was used as a surrogate for all organic pollutants that were not explicitly modeled, including benzo(a)pyrene. Available emission factors for these two contaminants indicate that they are emitted from motor vehicles in a similar ratio to the ratio of their ambient air quality standards (i.e., a ratio on the order of 10^4). Therefore findings for BaP are similar to those reported for benzene in Section 7.1 of the air quality report and, as such, benzo(a)pyrene is already factored into the identification of areas where consideration of mitigation is warranted. This approach is consistent with MTO practice for air quality assessments of highway projects in Ontario, in which benzo(a)pyrene has not been explicitly modelled. One reason for taking this approach is that the available emissions models (MOBILE6.2 and MOVES) do not include emission factors for benzo(a)pyrene. The EPA has in the past provided factors that can be used with MOBILE6.2 to determine BaP as a function of PM emissions. The EPA has used this to estimate national inventories. These factors, however, do not differentiate by vehicle speed, making them less useful for predicting project-level emissions. Another reason is that background monitoring data for benzo(a)pyrene are scarce. In Hamilton, data are available

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			from monitoring sites operated as part of the HAMN monitoring program, but most of these sites are in the industrial basin and are not representative of background conditions in Downtown Hamilton, where the proposed LRT is located. The air quality assessment and the EPR have been amended so that they refer to benzo(a)pyrene and explain why it was not modeled explicitly, as per the above comments.
8	Appendix B.4 'Air Quality Report'	RWDI utilized 2009 meteorological data in the model. It was selected based on a screening of the applicable meteorological data sets for the years 2005-2009 for worst case scenario using the CAL3QHCR model. The same five years of historical monitoring data should be used in conjunction with meteorological data to be consistent with the modeling.	When combining the background data with model results, a reasonable worst-case approach was adopted, in which it is assumed that the statistical 90th percentile background concentration from historical monitoring data could, at some point in time, occur at the same time as the maximum predicted contribution from the modeled sources under worst-case meteorological conditions. When using this approach, there is no need for background data to come from the same time period as the meteorological period used in the dispersion model. It is only necessary that representative periods be used for both.
9	Appendix B.4 'Air Quality Report'	Also, when choosing the value of background contaminant concentrations the maximum 24hr-90th percentile should be selected and used since the use of the average 24hr-90th percentile may underestimate background concentrations and predicted impact.	90th percentile concentrations were extracted from the historical monitoring data, for each station and each year examined. They were then averaged across all stations and years. Averaging over all years was done in recognition of the fact that the monitoring data are historical (going back to the mid-2000s and earlier) and, for most of the pollutants, the concentrations have been exhibiting a declining trend for many years. Most are expected to continue to decline in future years due to many ongoing regulatory initiatives. Given that the study is intended to represent a future (2021) horizon year, RWDI believes the use of average values of 90th percentile concentration is more appropriate than using a maximum value from among the historical data. In any case, Table 5 of the air quality report

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			shows both the average and maximum 90th percentile values, so that the reader has enough information to ascertain the implications of using one versus the other.
10	2. Appendix B.4 'Air Quality Report'	In order to determine representative background concentrations of the contaminants of interest, RWDI looked at historical air pollutant monitoring in Hamilton or a representative community if none was available. Data was taken from MOE, HAMN and NAPS stations in the Hamilton area but it is unclear how the data sets were chosen. Uniform years were not selected for all parameters for consistency with the model (i.e. years 2005-2009). Additionally some data sets that were used are incomplete. In some cases data is not available for particular years, however in others the available data was not included by RWDI. No justification was given for this seemingly random exclusion of data.	The analysis of background data was undertaken in November of 2010. The approach for selecting historical monitoring data was to aim for the 5 most recent years of data available at the time, for each station used. Based on that criterion, Table 4 of the Air Quality report summarizes all of the data that could be found from publicly available downloads at that time. We are not aware of any data available at the time that were not included. The data set included multiple years and multiple stations and, as such, took a good account of potential temporal and spatial variability. If some available data were inadvertently overlooked, they are not likely to significantly alter the outcome.
11	Appendix B.4 'Air Quality Report'	Rather than using incomplete data sets from numerous stations it is preferable that at least one data set from the most representative station(s) be used. For example the NAPS Elgin/Kelly – MOE Downtown Hamilton Station would give a complete data set for 2005-2009 for NO_2, CO, $PM_{2.5}$, benzene and 1,3-butadiene. It is reasonable to request the proponent to provide a justification for the data used, or to rerun the modeling with a complete and relevant data set as the data that has been used could skew the results and give background values that are not truly representative of conditions in the study area.	Given that there is some spatial variability, we believe it is better to include all data from in and near the study area, to the extent available. In any case, Table 5 of the air quality report shows that, for most contaminants, the average 90th percentile values are similar in magnitude to the maximum 90th percentile values, indicating that the background value is not overly sensitive to the choice of station or year and there is no significant skewing of the data.
12	Section 4.3.4	Section 4.3.4 of the DEPR briefly discusses nine sites with contaminated soils within the study area. It goes on to refer to a full contaminated soils list in Appendix J. Appendix J could not be found. Therefore the location of the sites and nature of the contaminants were not available for review and comment. During the excavation of contaminated sites, vapours may be released and/or contaminated soil may become suspended in the air. It is essential to ensure	Appendix J has been excluded from the EPR since it contains personal information on contaminated sites that is not appropriate for publication. Appropriate wording has been added to Chapter 4.3.7 (Air Quality) of the EPR to indicate that such requirements would be incorporated into the construction tender process. The City of Hamilton will

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		that air quality at off-site locations will not be negatively impacted during the excavation process particularly given the proximity to residential uses along the B-line alignment. A mitigation and ambient air monitoring plan, appropriate to the type of contaminants, should be in place during the construction phase of the Hamilton Rapid Transit if there is potential for compromised air quality.	consider the development and implementation of an air quality monitoring plan during the construction period.
13	Appendix B.4 , Section 7.2 of 'Air Quality Report'	It is recommended that the mitigation measures outlined in section 7.2 of the Air Quality Assessment be used during the construction phase of this project. The use of *non-chloride* dust suppressants is suggested.	Section 7.2 discusses tree screens and noise barriers as potential mitigation measures. Tree plantings are a long-term measure, as their effectiveness is limited until the trees grow to a large size. As such, they are generally not suitable as a short-term measure during the construction phase. Solid barriers, on the other hand, may be feasible in some locations during construction. Chapter 4.3.7 of the EPR will be revised to identify temporary solid barriers as a potential mitigation measure during construction. The City of Hamilton will consider the use of non-chloride dust suppressants during construction if practical alternatives are available. The City currently uses water and/or calcium chloride flake for dust suppression. Most municipalities are also using this combination. The City has not reviewed any alternates to date. The Ontario Provincial Standard Specification also allows magnesium chloride flake and solution. Of the available alternates, calcium chloride flake is the most readily available, cost-effective and has a long history of use.
14	Section 3.3.5 'Air Quality Existing Conditions'	While Hamilton's climate conditions were discussed in Section 3.3.5 of the DEPR, the area's propensity towards atmospheric temperature inversions which occur predominately during the spring was not addressed.	It is true that Downtown Hamilton may experience an above-average frequency of inversion conditions due to its unique geography. However, all locations experience some frequency of inversion conditions. Therefore, the meteorological data used in the dispersion model covered some inversion conditions and the predicted maximum 1-hour concentrations shown in our report are reflective of those conditions. Therefore,

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Ministry of Environment West Central Region (September 8, 2011)			
			we believe the model results realistically reflect potential maximum concentrations.
15	Section 3.3.5 'Air Quality Existing Conditions' and Appendix B.4 'Air Quality Report'	From the text in both the DEPR and the actual air quality study, it is not clear as to how and whether inversions have been taken into consideration and how these periods may affect air quality in the study area.	RWDI compared its predicted maximum concentrations of NO_2 and PM_{10} to mobile measurements along roadways that were conducted in Hamilton in 2006 and 2008 ("Health-Impacting Air Pollutants: A Mobile Monitoring Study to Identify and Rank Sources in Hamilton, Ontario,"). Overall, the available measurements were consistent with predicted levels in our study. Measured 1-hr NO_2 levels in the Downtown area were in the range of 60-80 ug/m3, compared to maximum values of 88 to 138 ug/m3 predicted by the Air Quality study. Measured 24-hr PM_{10} levels were on the order of 27 to 45 ug/m^3, compared to maximum values in the range of 37 to 51 ug/m^3 predicted by our study. This suggests that the model results are realistic for Downtown Hamilton.
16	Appendix B.4 'Air Quality Report'	This air quality assessment did not model and compare existing conditions with future build conditions (2021). It is recommended that this type of comparison is done as it helps with responses to public concerns.	RWDI believe the relevant concerns are as follows: (a) whether any air quality criteria will be exceeded with the project is in place; and (b) if so, whether the project worsens or improves the exceedances. Section 7.1 of the air quality report addresses both of these concerns. It illustrates which contaminants may exceed applicable air quality with the project in place. For the two identified contaminants (PM_{10} and benzene). Section 7.1 also describes what the predicted change in air quality is compared to the no-build alternative. Analysis of the existing condition would not shed any further light on how the project might impact future air quality.

Item	Section/ Paragraph	Agency Comment	Response to Comment/ Action
Ministry of Environment Noise Reviewer (September 2, 2011)			
1	Section 3.3.4 'Noise and Vibration Existing Conditions'	Points of Reception (POR's): The POR's identified in the EPR do not match the POR's identified in the Report. In addition, POR-8 has been intentionally left blank in Tables 3.6, 3.8 and 3.9 without any justification. The POR's must be in conformance among all documents of the project and all relevant POR's must be included in the noise and vibration assessment.	The receptors initially selected during the existing conditions review generally characterize current noise conditions in the B-Line corridor. These locations are now referred to as "Receptors" in Chapter 3 and have been revised for the project assessment (PORs) in Chapter 4, as explained at Page 3-23 and Table 4.2 of the main volume of the EPR, and on Page 8 of Appendix B.3. The PORs in Chapter 4 were chosen to reflect higher midblock sensitivity to additional LRT traffic. The existing conditions review is not required to be included in the project review, as per the MOE/MTO Joint Noise Protocol, and has been provided only as an informative tool for the public. POR-8 was initially used for the Maintenance and Storage Facility site, which is no longer under consideration in this EPR. Therefore, noise receptors have been renumbered, and the table has been adjusted accordingly.
2	Section 3.3.4 'Noise and Vibration Existing Conditions'	Traffic Count Information: The EPR states that the traffic counts including the medium/heavy truck percentages are primarily derived through the traffic count testing. The reported existing and future traffic data must be verified with the City of Hamilton.	The traffic data were derived from counts provided by the City of Hamilton, as this is a City of Hamilton project.
3	Appendix B.3 'Noise and Vibration Impact Assessment'	Points of Reception (POR's): The Report has identified fourteen (14) POR's in the study area. However, there are other potential POR's that also need to be assessed, including but not limited to:	The 14 PORs identified were selected based on representative noise characteristics, traffic volumes and the project alignment. Generally, PORs at intersections or PORs that are further away from the transit corridor are less sensitive than those located closer, or those that are located midblock between intersections. As the corridor is dominated by reflective ground surfaces, the effects on apartment buildings

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Ministry of Environment Noise Reviewer (September 2, 2011)			
			and low-rise dwellings are very similar. Therefore, the inclusion of the suggested PORs would not add any significant insights to the noise impact assessment (refer to responses below).
3.a	Appendix B.3 'Noise and Vibration Impact Assessment'	Dwelling at the south-west corner of Main Street East and Park Row South;	Aside from the fact that this dwelling is located at an intersection, it is at a similar position relative to the project alignment as POR10 and the traffic volumes do not change noticeably. Further analysis is not warranted.
3.b	Appendix B.3 'Noise and Vibration Impact Assessment'	Dwellings to the north of Main Street East/King Street East, between Kensington Avenue North and Belview Avenue	These dwellings are on the north side and are not as greatly impacted by the project, as the LRT alignment remains on the south side of Main Street. POR9 represents a somewhat worse case for this stretch and shows no impact. Hence, no impact would also be the case for the suggested new POR, even without calculation.
3.c	Appendix B.3 'Noise and Vibration Impact Assessment'	Dwelling at the south-west corner of King Street East and Glendale Avenue South	Aside from the fact that this dwelling is located at an intersection, it is at a similar position relative to the project alignment as POR9, and the traffic volumes do not change noticeably. Further analysis is not warranted.
3.d	Appendix B.3 'Noise and Vibration Impact Assessment'	Dwelling at the south-east corner of King Street East and Barnesdale Avenue South;	Aside from the fact that this dwelling is located at an intersection, the closest point of this dwelling is at a similar position relative to the project alignment as the closest point of POR8, and the traffic volumes do not change noticeably. Further analysis is not warranted.
3.e	Appendix B.3 'Noise and Vibration Impact Assessment'	Dwelling at the south-east corner of King Street East and Grant Avenue;	The closest point of this dwelling is at a similar position relative to the project alignment as the closest point of POR8 or POR9, and the traffic volumes do not change noticeably. Further analysis is not warranted.
3.f	Appendix B.3 'Noise and Vibration Impact Assessment'	Dwelling at the north-east corner of King Street East and West Avenue North;	The configuration of this dwelling relative to the alignment is similar to that of POR5. Further, the future "with project" traffic volumes are lower in this section of the corridor than at POR5, indicating no impact (actually a greater reduction in noise). No further analysis is recommended.
3.g	Appendix B.3 'Noise and Vibration Impact Assessment'	Dwellings to the north of Main Street West, between Longwood Road South and Bond Street South.	These dwellings would be less sensitive than POR2 due to increased setback and higher noise from Longwood Road. With no impact at POR2, there is also then no impact to this new proposed POR. No further analysis is recommended.
3.h	Appendix B.3 'Noise and Vibration Impact Assessment'	Dwelling at the north-east corner of Main Street West and Paisley Avenue South.	This dwelling is very similar to POR2 relative to the project alignment. No impact is expected and no further analysis is recommended.
3.i	Appendix B.3 'Noise and Vibration Impact Assessment'	High-rise apartment building located at 981 – 1001 Main Street West.	This apartment is further away than POR2 is relative to the project alignment
3.j	Appendix B.3 'Noise and Vibration Impact Assessment'	Dwellings at both the north-east and north-west corners of Main Street West and Newton Avenue.	These dwellings are similar to POR2 relative to the project alignment.
3.k	Appendix B.3 'Noise and Vibration Impact Assessment'	Dwellings to the north of Main Street West, between Cline Avenue South and Haddon Avenue South.	These dwellings are similar to POR1 relative to the project alignment.

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3.l	Appendix B.3 'Noise and Vibration Impact Assessment'	Dwellings to the south of Main Street West, from the south-east corner of Main Street West and Dow Avenue to the south-east corner of Main Street West and Dalewood Avenue.	These dwellings are similar to POR1 relative to the project alignment.
3.m	Appendix B.3 'Noise and Vibration Impact Assessment'	Dwellings to the north of Main Street West, between Dalewood Avenue and Forsyth Avenue South.	POR1 near this point would be more sensitive to noise from the project due to a reduced setback and shows no impact.
3.n	Appendix B.3 'Noise and Vibration Impact Assessment'	Dwellings to the south of Main Street West, between Emerson Street and Leland Street.	As the project alignment moves north of Main Street West at this point, the impact at these dwellings would be lower than that reported for POR 1.
4	Appendix B.3 'Noise and Vibration Impact Assessment'	Light Rail Vehicle (LRV) Noise Emissions: Section 4.2.1 of the Report states that the assessment uses the emissions of two medium trucks to represent one LRV. This is incorrect approach as it results in lower sound levels. The CLRV / ALRV setting of STAMSON should be used in the LRV sound level calculations.	The proposed vehicle system is neither a Canadian Light Rail Vehicle nor an Articulated Light Rail Vehicle. The sound profile used for these two vehicle types is decades old and does not reflect the type of equipment expected in this proposal. Modern light rail vehicles, as currently used throughout Europe and part of the Middle East, are significantly quieter than CLRVs or ALRs, as evidenced by measurements as well as specifications. To arbitrarily use a higher sound level profile would not be representative of the project's effects and would incorrectly bias the EA findings.
5	Appendix B.3 'Noise and Vibration Impact Assessment'	Traffic Count Information: Section 4.2.2 of the Report states that the traffic volumes with and without the project have been provided by Steers Davies Gleave. The reported existing and future traffic data must be verified by the City of Hamilton. This includes but is not limited to, existing and projected traffic counts, medium/heavy truck percentages and daytime/night-time splits.	The traffic data were derived from counts provided by the City of Hamilton, as this is a City of Hamilton project.
6	Appendix B.3 'Noise and Vibration Impact Assessment'	Wheel Squeal Noise: Section 4.2.4 of the Report states that wheel squeal noise is not expected to be an issue due to lubricated rails and slower speed on turns. Wheel squeal noise needs to be confirmed as a non-issue at the following turns: a. Queenston Road west of Rosewood Road; b. Queenston Road to Main Street East, east of Berry Avenue; c. intersection of Main Street East and King Street East, between Kensington Avenue North and Belmont Avenue; d. intersection of King Street East and Barnesdale Avenue North; e. King Street West, west of Breadalbane Street; and f. Bridge as it connects with Main Street West.	Wheel squeal has been an issue on only sharp radius turns. In Toronto, the turning radii of current TTC facilities can be as low as 9m. The smallest turning radius along this corridor is 100m. Combined with proper rail maintenance and damped wheels, wheel squeal is not an issue for such wide turns. The FTA Transit Noise and Vibration Impact Assessment Guidelines (Section 6.8.2) reports that, with damped wheels, rail lubrication, and maintenance, the sound level of even sharp turns can be reduced by 20dB, which leaves the levels virtually unchanged from tangent track.
7	Appendix B.3 'Noise and Vibration Impact Assessment'	Vibration Setback Distances: Table 9 of the Report indicates that some residential receptors located closer than the setback distances will require additional vibration isolation. As the assessment assumes that Level 1 vibration isolation system will be used, additional vibration control measures may need to be identified for some of the POR's that are located very close to the proposed LRV alignment, as applicable.	The requirements for vibration control are dominated by vibration-induced noise. Table 10 and Section 5.4.2 of the Report outline the additional vibration control recommended to control structure-borne sound, which also addresses ground-borne vibration (i.e., vibration that can be felt).
8	Appendix B.3 'Noise and Vibration Impact Assessment'	Power Substation TPSS-7: For power substation TPSS-7, the Report indicates that it will be located next to a high-rise apartment building, and the setback distance will be closer than 20 metres. The noise emission of the power substation needs to be confirmed at this location taking into account both the cooling fans and the tonal hum of the transformer.	There is a clear commitment on Page 16/17 of the Report and in Section 4.3.6 of the EPR to study these stationary sources in more detail as specifics become available. It is far too early in the design phase to accurately predict the sound level that can be expected from these substations. Further, the TPSS locations include a (400m) range of placement, which provides the flexibility to situate the substation further from the apartment building.
9	Appendix B.3 'Noise and Vibration Impact Assessment'	Construction Noise and Vibration: In addition to the documents identified in Section 6.2 of the Report, MOE Publications NPC-118 and NPC-207 also need to be included as part of the construction document requirements of the project.	It is our understanding that NPC-207 was intended for drop forges and punch presses and was introduced in a draft form in 1983 (28 years ago). It appears that MOE has not made the finalization and implementation of this document, as a formal Ministry guideline, a priority, and it is not currently available on the MOE websites. It is our opinion

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			that NPC-207 does not include appropriate measurement methods or a proper instrumentation specification to be used in conjunction with it. It uses assessment methods other than those normally accepted for the evaluation of vibration, such as ISO 2631, which uses 1 second averaged (slow) RMS response instead of peak response. Given that it has been a draft for 28 years, NPC-207 is out of date and applies to a different type of vibration issue than construction, and it would appear to be an inappropriate control to apply to the temporary vibration impact of the construction phase of a modern LRT system. We have reservations about the inclusion of the current version of NPC-118. NPC-118 (another draft from the 1970s that has never been finalized) relates to governed diesel engines measured at 7m and suggests a limit of 95 dBA at that distance (equivalent to 89 dBA at 15m). Current/new conveyances (and for about the last 25 years) are limited to 83 dBA at 15m by Federal statute – please refer to the Transport Canada website regarding permitted sound levels for trucks. http://www.tc.gc.ca/eng/acts-regulations/regulations-crc-c1038-sch-v.1.htm. The use of Draft NPC-118 then implies that it would be acceptable to have motor vehicles on construction sites that are 6 dB louder than the present standards for new vehicles. This would imply that the vehicle exhaust system had been modified and would not meet the *Environmental*

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			Protection Act requirements and thus be illegal. We would suggest that it is inappropriate to permit vehicles this noisy and, thus, NPC 118 should not be referenced in our report. We believe that further discussion on NPC-118, and public evaluation through the EBR process, is required prior to adopting it for use on this project.

Item	Section/ Paragraph	Agency Comment	Response to Comment/ Action
Environmental Assessment and Approvals Branch – Waste Water Unit, Certificate of Approvals Section (August 23, 2011)			
1	1.	The Owner shall ensure adequate sediment and erosion control measures are taken to prevent or reduce sediment discharges to existing sewer system and natural watercourses, details of which can be found in the document entitled "Erosion & Sediment Control Guideline for Urban Construction (2006).	Noted. Section 4.3.1 and Table 4.5 text amended.
2	2.	Should the quantity of dewatering exceed 50,000 L of more during construction, then a Permit to Take water (PTTW) should be sought from the Ministry.	Noted and currently included in Section 5.2.
3	3.	Should contaminated soils and/or be encountered during construction period, then the Ministry's *Guideline for Use at Contaminated Sites in Ontario* (February 1997) shall be applied and the District Manager of the Ministry's Hamilton District Office notified.	We understand that this guideline has been superseded by Ontario Regulation 153/04, per MOE Central West Region's Comment 6.
4	4.	The construction of sewage works (e.g., storm sewers and/or stormwater management facilities) require an approval under s. 53 of the *Ontario Water Resources Act* (OWRA) and the design should comply to relevant Ministry guidelines.	Noted. Section5.2 has been amended to reference the OWRA.

Item	Section/ Paragraph	Agency Comment	Response to Comment/ Action
Ministry of the Environment Hamilton District Office (September 9, 2011)			
1	Bullet 1	The District Office is not familiar with the City's "Contaminated Sites Management Guideline" requirements – their attachment would provide clarification.	The City's Contaminated Sites Management Program for Municipal Works manual will be provided to review agencies on request. MOE Hamilton District Office staff will

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Ministry of the Environment Hamilton District Office (September 9, 2011)			
			be provided with the opportunity to review and have input to the contingency plan for encounter of contaminated sites.
2	Section 4.3.4	The Ministry's *Guideline for Use at Contaminated Sites in Ontario* (February 1997) has been replaced by Ontario Regulation 153/04 for most issues related to contaminated sites.	Noted. Text has been amended accordingly.
3	Bullet 3	MOE notification if contaminated sites are encountered is good, it has been in practice by the City; this should be part of the contingency plans.	Noted.
4	Section 5.2	The quality of all fill material brought on site should meet the Reg. 153/04 requirements for the respective property use (sec. 5.2).	Noted. Section 5.2 text has been amended.

Item	Section/ Paragraph	Agency Comment	Response to Comment/ Action
Metrolinx (September 8, 2011)			
1	General	Our review was mainly focused on • network development opportunities • impacts to existing services • connectivity to existing and future GO services The building of an integrated network and facilitating linkages to other urban centres are part of primary objective of the project. In this case, there are opportunities for three GO service interfaces that would have mutually positive impacts for transportation in Hamilton. These opportunities need to be reinforced, documented and either included as part of the EA scope or identified as a commitment to be carried forward with in Section 6.4, Commitments to Future Work and Consultation, of the EPR.	Noted. Interfaces between GO, Transit and LRT will be kept under review and The city will work with Metrolinx to ensure opportunities are maximized. Text amended at 6.4
2	Section 6.4 'Commitment to Future Work and Consultation'	More specifically the EPR needs to incorporate the following; • Revise Section 6.4 "Continue discussions with McMaster University and GO Transit with regard to: – the location and configuration of the terminal stop at the University; – potential for electromagnetic interference impacts; – drainage and other infrastructure requirements; and – the most effective way to provide the interface	Noted. Text amended at 6.4

Item	Section/ Paragraph	Agency Comment	Response to Comment/ Action
Metrolinx (September 8, 2011)			
		between the campus, the LRT service, GO Transit Bus service and other possible transit initiatives in the area.	
3	Section 2.2.1 'McMaster University Terminus'	The GO bus facility at McMaster should be identified as an important transit link. GO has an extensive inter-regional service to/from McMaster (407 service and train connections). Having a connection between 2 high frequency services will provide overall benefits. This should be highlighted in Section 2.2.1 as well as Appendix A in drawing B01 next to the provided text regarding working closely with McMaster.	Noted. Text at 2.2.1 amended
4	Section 4.1.1 'Transit Operations'	GO Buses are a major user of the B-Line corridor. Further assessment of measures to provide good transfer opportunities and address service impacts to the GO inter-regional service is required. Existing GO Transit bus stops for these routes are in close proximity to the following LRT stops: Longwood Road, Dundurn Street, Queen Street and MacNab Street. GO Transit is keen to discuss these opportunities to ensure good quality interchanges between GO Bus services and the proposed LRT.	Noted. Additional text added at 4.1.1
5	Section 4.1.1 'Transit Operations' and Section 6.4 'Commitment to Future Work and Consultation'	Metrolinx has identified Downtown Hamilton as a Mobility Hub, which means the area serves a critical function in the regional transportation system as the origin, destination, or transfer point for a significant number of trips. Given that it is not feasible to operate the B-Line directly via the Hamilton GO Centre and that riders wishing to connect between them will have to walk approximately 500 metres, consideration of high quality streetscaping and way-finding (signage) improvements needs to be included in the scope of the EA on relevant north/south streets between King Street (B-Line corridor) and Hunter Street (the Hamilton GO Centre) including: MacNab Street, James Street, Hughson Street, John Street, Catharine Street and Walnut Street. These should be considered during the detailed design stage.	Noted. Additional text added at 4.1.1 and commitment included at 6.4 to continue to work with Metrolinx to maximize integration.
6	Section 3.1.1 'Road Network Existing Conditions'	The Niagara GO Rail Service Extension identified a new station at Centennial Parkway. This would provide an opportunity to link the inter-regional rail service and the LRT. The GO EA group met with Hamilton to discuss this connection and the need to protect for this in the future. This should be noted as a component of the EPR to maintain flexibility in future extensions.	Noted. Additional text added at 3.1.1

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Metrolinx (September 8, 2011)			
7	Non-Section Specific Comments	No park-and-ride opportunities have been identified. Is there a policy reason for this? Or will this be addressed alternatively in the city's parking strategy? The rationale for the approach should be described in this document. The TPAP process allows for ancillary facilities to the transit project to be considered, including parking. It is conceivable that there will be demand for park-and-ride facilities at and near termini stations for customers wishing to travel downtown where only paid parking is available. Bicycle storage and bicycle parking and how the LRT accommodates this (or doesn't accommodate it) should be included as part of the project description.	Noted. Additional section on Park and Ride added as 2.8 and additional section on Bicycles added as 2.9
8	Glossary of Terms and Acronyms	Major Transit Station Areas – the report states "station areas generally are defined as the area within an approximate 500 meter radius of a transit station, representing about a 10-minute walk." as per the Growth Plan for the Greater Golden Horseshoe, 2006. Note that Mobility Hubs identified in The Big Move are defined as an area of approximately 800 metres around major transit stations. The Metrolinx Mobility Hub Guidelines identifies between about 500 and 800 metres as a 10-minute walk.	Noted but text unchanged. The text included is within the range stated in the Mobility Hub Guidelines.
9	Glossary of Terms and Acronyms	BRT – Good consistency with the definition in The Big Move. However, the upper limit of the capacity (i.e. 10,000) should be contextualized for the City of Hamilton. That for a more urban setting, like through Hamilton, has an upper limit of capacity closer to 5,000 pphpd.	The view expressed is noted but the text remains unchanged. A capacity range is given that covers the number suggested.
10	Section 1.1 - Introduction	In reference to the Regional Transportation Plan (RTP), this section should mention and/or include the title of the RTP The Big Move. This should be considered elsewhere in the report as well.	Noted. Amendments made.
11	Section 1.5.1 – Provincial Planning Process and Policies	This section should reference and provide background/descriptions for the Ontario Transit-Supportive Guidelines and the Metrolinx Mobility Hub Guidelines. Also, The Big Move should fall under its own separate sub-heading rather than being included under "MoveOntario 2020".	Noted. Additional text added.
12	Section 2.2.1- McMaster University Terminus	This section discusses the iterative process undertaken in developing the stop locations for McMaster University and Hospital. The EPR should also make note that GO Buses currently call at the McMaster Bus Terminal and that this is a major interregional transit connection in the City. The EPR proposes that the B-Line be extended west and north to this Terminal. GO Transit was responsible for having this Terminal constructed and there is an existing Memorandum of Understanding	Noted. Text amended.
		between us and the University. GO Transit staff should be included as a primary stakeholder in any future discussion with the University regarding this proposed concept as to-date, we have had little discussion with either party regarding this.	
13	Section 2.2.3 CP Rail Crossing	"The height of trains that can use the spur line is constrained by the headroom available at the bridge that takes this line beneath the CN main line, south of Beach Road. The maximum height of the LRT overhead contact system is 6.8m above rail level, and this is sufficient to meet the needs of CP." The last statement regarding the maximum height constraint of 6.8m needs to be confirmed with CP. Whereas the CN bridge is a height constraint, it still needs to be confirmed that the 6.8m height will be acceptable as it may have other day-to-day operational impacts.	Noted. Will use on-board battery while crossing CP tracks, height restrictions no longer apply.
14	2.3.1 – Transit Elements	"Peak hours" and "off-peak hours" should be defined.	Noted. Definition added in Section 2.3.1
15	2.3.1 – Transit Elements	It states the "design speed for the system is 70 km/h". Table 2.1 clarifies that 70 km/h is actually the "Maximum Catch up Speed" and the "commercial operational speed" is 25 km/h. The text should be refined to correspond with the language used in the Table.	Noted. Table 2.1 amended.
16	Section 2.3.2 to Section 2.3.4 – Other Design Criteria	The report explicitly states that they will "maintain the existing road alignment, except as required for LRT operation." This statement implies that the road can only be modified for the LRT right-of-way and not for other corridor improvements, such as widening pavement widths for pedestrians. The report goes on to establish urban design elements (Section 2.3.3) and notes "the City of Hamilton proposes to take an aspirational, collaborative approach to the wider urban design and public realm". A conceptual cross-section is also provided to further illustrate these elements. There seems to be an inherent contradiction here. For example, the cross-section shows a preferred pavement width of 2.5 metres and a minimum width of 2.0 metres. It is not clear how these widths are to be achieved without pre-supposing that the B-Line project may impact the existing road alignment for reasons other than LRT operation. The Ministry of Environment's TPAP Guide explicitly includes "other streetscape treatments" as elements which are "ancillary to transit projects" and are recommended to be included by the proponent through the TPAP process. Suggest that this	Noted. Text in Section 2.3.2 'Road Elements' amended.

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		contradiction needs to be clarified somehow in the final report.	
17	Section 2.3.1 - Table 2.2	Please note that the tolerance for floor height above TOR should be kept at ±11mm per ADA requirement	Noted. Text amended.
18	Section 2.3.1 - Table 2.2	Please note that there are 2 double doors and 2 single doors per side of the vehicle.	Noted. Text amended.
19	Section 2.3.1 - Table 2.2	A single LRV will be able to operate on gradient of up to 5% at maximum speed of 25 km/h for an unlimited distance and 6% sustained for 250m.	Noted. Text amended.
20	Section 2.3.1 – Power Supply and Distribution	It is recommended that the OCS system should be "Staggered" and not "Center". When stagger is employed, the contact wire uniformly sweeps the width of the pantograph carbon as the vehicle travels along the alignment, thus eliminating localized pantograph wear.	Noted. Text amended to clarify that 'Type of OCS' refers to catenary poles only, not contact wires.
21	Section 3.1.2 – Transit Network	The first paragraph in this section states "…with possible long term extensions westward toward Dundas and eastward into Stoney Creek." There had been extensive discussion regarding potentially extending the LRT from Eastgate north to meet the proposed new GO station at Centennial Parkway. Propose that this be rephrased to include "extending the LRT from Eastgate north to meet the proposed new GO station at Centennial Parkway" to maintain flexibility in future extensions".	Noted. Text amended.
22	Section 3.1.2 – Transit Network	For the bph indicator, it's not clear whether this is in each direction or whether this is east/west combined.	Noted. Text amended.
23	Section 3.1.2 – Transit Network	This section should note that GO Buses are a major transit user of the B-Line corridor, including Route 16 – Hamilton QEW GO Bus; Route 18(A) – Lakeshore West Train-meet Service; Route 47 – Hwy. 407 West GO Bus; and, between McMaster and Highway 403, Route 15 – McMaster Train-meet Bus. The number of GO Buses during the peak period operating in each direction on the corridor is in the range of 6-8 bph.	Noted. Text amended.
24	Section 3.2.2 - Existing Land Use and Community Features	It would be helpful if the descriptions in this section actually specified the start and end points of the four Sections.	Noted. Descriptions of the four sections added.
25	Section 3.2.2 - Existing Land Use and Community Features	Under the Downtown Section, the report notes that Hamilton Downtown is identified as a Mobility Hub. Suggest include some additional detail here describing the Mobility Hub concept. Proposed text: "Metrolinx has identified Downtown Hamilton as a Mobility Hub, which means the area serves a critical function in the regional transportation system as the origin, destination, or transfer point for a significant number of trips. Metrolinx emphasizes their importance in being places of connectivity where different modes of transportation – from walking to riding transit – come together seamlessly and where there is an intensive concentration of working, living, shopping and/or playing." In addition, this section should note that the Hamilton GO Centre is a major regional transit station within walking distance to the B-Line corridor.	Noted. Text amended.
26	Section 3.2.2 - Existing Land Use and Community Features	In the east section, there is recognition of park 'n' ride opportunity but does not include the future Centennial Station as feeder to the LRT to serve demand from the Niagara Peninsula.	See Response 20.
27	Section 4.1.1 – Transit Operations	This section should include information regarding GO Bus services, which operate within the B-Line corridor, including: • Route 15 - McMaster GO Bus service (express service connecting McMaster with GO Train service at Aldershot GO and Burlington GO) • Route 16 - QEW Express GO Bus (daily, frequent service between Hamilton GO Centre and Toronto Union Station) • Route 18 - Lakeshore West Train-Meet GO Bus (bus service connecting Hamilton to rail service at Aldershot GO and Burlington GO) • Route 47 - Hwy. 407 West GO Bus (connects Hamilton GO Centre and McMaster with Square One, Bramalea and York University)	Noted. Additional text added in 4.1.1
28	Section 4.1.1 – Transit Operations	Existing GO Transit bus stops for these routes are in close proximity to the following proposed LRT stops: Longwood Road; Dundurn Street; Queen Street; MacNab Street. Opportunities for high quality service integration, such as good pedestrian connectivity between our bus stops and the proposed LRT stops as well as shared branding opportunities.	Noted. Additional text added in 4.1.1
29	Section 4.1.2 – Traffic Operations	It would be helpful if this section of the report were more location-specific about its recommendations regarding roadway geometric improvements. For example, it states that at "Aberdeen/Longwood – provide additional third lane as dedicated right-turn bay". It's not clear on	Noted. Text amended.

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		which approach this third lane should be implemented. This section contains a few other examples where locations and/or approaches are not explicitly stated.	

Item	Section/ Paragraph	Agency Comment	Response to Comment/ Action
Ministry of Tourism and Culture (September 7, 2011)			
1	Appendix B.5 'Cultural Heritage Assessment Report: Built Heritage Resources and Cultural Heritage Landscapes'	Appendix B of the EPR *included Draft Cultural Heritage Assessment Report: Built Heritage Resources and Cultural Heritage Landscapes – Existing Conditions – Impact Assessment B-Line Rapid Transit Corridor from Eastgate Square / Centennial Parkway to McMaster University, City of Hamilton* dated July 2011 prepared by Archaeological Services Inc (ASI). MTC has reviewed this report and has no issues with this technical assessment report and the cultural heritage resources identified. This report may be subject to further review, comments or suggestions made by the City of Hamilton's Heritage Planning Staff. The conservation recommendations outlined in Section 6.0 of the CHAR report should be considered. These recommendations include further detailed resource-specific assessments of identified cultural heritage resources should they be impacted by the proposed undertaking.	Noted. Recommendations from Chapter 6 of the report have been included in the main body of the EPR and will be considered during subsequent design phases.
2	Section 3.4.1	Section 3.4.1 Built Heritage and Cultural Landscapes of the EPR addresses the existing conditions of the study area. Section 3.4.1 is consistent with the existing conditions identified in the CHAR prepared by ASI mentioned above. We note that numerous built heritage resources and cultural heritage landscapes were identified within or near the study area that have the potential to be impacted by the proposed undertaking.	Noted. No response required.
3	Section 3.4.2	Section 3.4.2 Archaeological Resources indicates that a Stage 1 archaeological assessment has been completed. In this regard MTC has received, reviewed and accepted the recommendations of a Stage 1 archaeological assessment. Please note that further archaeological assessment is recommended. In addition, all archaeological assessment reports must be reviewed and the recommendations accepted prior to any ground disturbance. Please be aware that MTC may have further comments while reviewing the reports.	Noted. Further archaeological investigations will be conducted and the associated reports will be submitted to MTC for review and acceptance prior to any ground disturbance. Section 5.2 text has been amended accordingly.

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Ministry of Tourism and Culture (September 7, 2011)			
4	Section 4.4.1	Section 4.4.1 Built Heritage and Cultural Landscapes considers the project's environmental effects and outlines mitigation and monitoring strategies. Section 4.4.1 includes an existing conditions inventory of cultural heritage resources (CHR) as identified as of July 2011. These include those CHR that are designated under the Ontario Heritage Act, those identified in the City of Hamilton's Inventory of Buildings of Architectural and/or Historical Interest, as well as those identified during the field review. The recommendations included in Section 4.4.1 generally follow the conservation recommendations of the *Draft Cultural Heritage Assessment Report: Built Heritage Resources and Cultural Heritage Landscapes – Existing Conditions – Impact Assessment B-Line Rapid Transit Corridor from Eastgate Square / Centennial Parkway to McMaster University, City of Hamilton* referred to above. These recommendations include, conducting a detailed, resource–specific heritage impact assessments (HIA) at the earliest stage possible of the preliminary design phase to recommend an appropriate conservation plan, should encroachment or other impact of a cultural heritage resources be required.	Noted. No response required.
5	Section 4.4.2	Section 4.4.2 Archaeological Resources indicates that Stage 2 and Stage 3 archaeological assessments have been recommended. Please refer to our comments above, that all archaeological assessment reports must be reviewed and the recommendations accepted prior to any ground disturbance, and that MTC may have further comments while reviewing reports.	**Noted. Further archaeological investigations will be conducted and the associated reports will be submitted to MTC for review and acceptance prior to any ground disturbance. Section 5.2 text has been amended accordingly.**

6.4 Commitments to Future Work and Consultation

During this Transit Project Assessment Process, the City of Hamilton Rapid Transit Team has worked closely with other City staff and key stakeholder agencies to address and resolve any issues or concerns. Commitments to future work for the project, and related consultation activities, are listed below.

LRT Design

- Continue consultation with the public, property owners, business operators, regulatory and other government agencies, Aboriginal communities, and other interested stakeholders during design of the LRT alignment, stops and ancillary facilities, such as traction power substations and the location of maintenance and storage facility.
- Consultation with Red Hill Valley Stewardship Board - The City will circulate to the Board, via the coordinator, proposed design plans for their input and will attend any Board meetings to discuss the project. Extensive

construction management, mitigation and restoration programs were utilized for the construction of the Red Hill Valley Parkway and the City will commit to following these practices for any work In the Red Hill Valley. In addition, for design and implementation of works in the Red Hill Valley, the City will work collaboratively with the Board to develop Environmental and Ecological Principles, which will initially be prepared and provided to the RT Team by the Board.

- Continue consultation on integration of the LRT system and public realm enhancement initiatives.
- Work with residents and business along the corridor to develop parking and loading strategies to minimize impacts
- Continue discussions with McMaster University with regard to:
  - the location and configuration of the terminal stop at the University;
  - potential for electromagnetic interference impacts;
  - drainage and other infrastructure requirements; and
  - the most effective way to provide the interface between the campus, the LRT service, and other possible transit initiatives in the area (e.g., GO Transit bus service).
- Consult with the owners and tenants of Eastgate Square with regard to the location and configuration of the terminal stop at the Mall.

Detail Design Investigations

- Red Hill Creek structure enhancement.
- Geotechnical investigations.
- Noise and vibration.
- Archaeological resources.
- Built heritage conservation.
- Continue discussions and liaison with Metrolinx/GO Transit to ensure that opportunities for high quality service integration are realised and good pedestrian connectivity is achieved between LRT stops, GO transit bus service stops and GO Rail service stations.

Permits and Approvals

- Secure any necessary approvals, permits and authorizations from municipal, provincial and federal regulatory agencies with a mandate governing implementation of the project. This will include conducting additional environmental investigations to obtain information that supports the various applications and facilitates negotiations with regulatory agencies.

Property Acquisition

- Refine property requirements through the design phase.
- Develop a property acquisition strategy based on how implementation of the project will be staged.
- Proceed with acquisition of the required property through negotiation, or expropriation if required.

Address Construction Issues

- Establish a community liaison committee during construction to provide quick access to construction related information, specifically schedule and timing information for business owners and residents. The committee will be made up of City and Contractor staff who will meet on site periodically.
- Develop and implement a detailed traffic management plan, comprising a construction staging and street closure or lane reduction strategy, including an emergency response component (Fire, Police, Emergency Medical Services).
- Develop and implement a detailed utilities relocation/replacement plan that is fully integrated with the traffic management plan to ensure minimum disruption of services.
- Strictly control air, noise and vibration emissions.
- Implement a strategic erosion and sediment control plan to protect watercourse crossings (Red Hill Creek and Chedoke Creek), including provision of adaptive management to address construction staging requirements.
- Minimize impacts to street trees and natural areas not scheduled for removal through development and implementation of a Tree Management Plan.

Monitoring

- Monitor construction activities for compliance with environmental protection commitments made during the Environmental Assessment phase.
- Monitor construction activities for effectiveness of environmental protection and mitigation measures adopted to reduce or eliminate any adverse effects.
- Monitor during the operations phase to assess predicted benefits and net environmental effects of the project, including:
  - land use redevelopment;
  - assessed property values;
  - integration of LRT and public realm;
  - air quality, noise and vibration;
  - traffic operations;
  - Parking and Loading; and
  - LRT/Bus system usage.

In cooperation with the appropriate funding agencies, the City will also negotiate the necessary funding, service and project implementation agreements.

6.5 Notice of Completion and EPR Review Period

With the completion and submission of this report to the Ontario Ministry of the Environment, a Notice of Completion of the Environmental Project Report (EPR) was published on October 14, 2011. Additional consultation, notification and possible study investigation activities following the publication of the Notice of Completion will include:

- The public, regulatory agencies, aboriginal communities and other interested parties will have 30 calendar days to review the EPR.
- Following the public review period, the Minister of the Environment will have an additional 35 days to act (provide notice of his/her decision on the project):
  - Project can proceed;
  - Project can proceed in accordance with the EPR, subject to conditions; or
  - The City must conduct additional work if the Minister has concerns that there is the potential for a negative impact on a matter of provincial importance that relates to the natural environment or has cultural heritage value; or is of interest to, or has an impact on a constitutionally protected Aboriginal or treaty right. If additional work is required, a revised EPR will be submitted within the time frame prescribed by the Minister and the Minister will render a decision within 30 days thereafter that the project can proceed, or that the concerns have not been adequately addressed, in which case the Transit Project Assessment Process may be terminated.
- If the TPAP is terminated, the City will have to follow an approved Class Environmental Assessment process (e.g., Municipal Engineers Association Class Environmental Assessment), or a process under Part II of the Environmental Assessment Act, which governs individual environmental assessments.
- If the project is allowed to proceed after the 35 day review by the Minister, or the Minister gives no notice within 65 days of the City providing the Notice of Completion, a Statement of Completion will be issued by the City of Hamilton as noted in Section 6.6.

6.6 Statement of Completion

The Transit Project Assessment Process for the B-Line LRT project will be completed when the City of Hamilton submits a Statement of Completion to the Director of the Ministry of the Environment's Environmental Assessment and Approvals Branch and the MOE Regional Director.

The Statement of Completion must indicate that the proponent intends to proceed with the transit project in accordance with either:

- The EPR;
- The EPR subject to conditions set out by the Minister; or
- The Revised EPR.

The City will also post the Statement of Completion on its project website. Construction activities associated with the B-Line LRT project that are subject to the TPAP cannot begin until the requirements of the TPAP have been met. If compliance is achieved, the project may proceed subject to any other applicable approvals, permits, authorizations or certification (refer to Chapter 5).