

REPORT

# **Trillium Line Light Rail Transit Extension Addendum**

**Ellwood Diamond, Walkley Yard,  
Bowesville Station, Limebank Extension**

Ottawa, Ontario

Presented to:

City of Ottawa  
180 Elgin Street  
Ottawa, ON K2P 2K3

Work Package ID: 31711100, 35001270

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## REVISION INDEX

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# 1. INTRODUCTION AND BACKGROUND

The O-Train was introduced to the City of Ottawa in 2001 as a pilot project. It currently runs from Bayview Station to Greenboro Station on an existing Canadian Pacific (CP) Railway track using six (6) diesel multiple unit (DMU) trains.

In April 2004, the City of Ottawa initiated an Environmental Assessment Study for the North-South Corridor Light Rail Transit (LRT) to address the existing and future transportation demand between the rapidly growing communities in the south and downtown Ottawa, as well as the points in between including the Airport. The recommended North-South LRT consisted of 31 km of LRT from the Rideau Centre downtown to the future Barrhaven South Town Centre through the future planned communities (Figure 1-1).

In 2008, the City of Ottawa updated its Transportation Master Plan (TMP), which identified a new vision for rapid transit in this corridor and on November 2013, the City's 2013 TMP update confirmed that the O-Train would be extended farther south to Bowesville Station as part of the 2031 Affordable Rapid Transit Network.

The proposed Trillium Line South (TLS) Light Rail Transit (LRT) Extension will provide LRT service south of Greenboro Station to Riverside South and includes a spur line to the Ottawa Macdonald-Cartier International Airport. The TLS LRT Extension is one of three rail extensions that together constitute the City of Ottawa's Stage 2 LRT project. The other Stage 2 extensions include an extension east from Blair to Trim Road Station (Confederation Line East) and an extension farther west from Tunney's Pasture to Moodie Drive Station (Confederation Line West).

In 2014, the City of Ottawa initiated this planning and design study to identify a Recommended Plan to extend the existing diesel-powered Trillium Line (formerly O-Train) service south of its current terminus at Greenboro Station to a new terminus near Bowesville Road, as well as to the Ottawa Macdonald-Cartier International Airport. This study included documenting the need for the project, reviewing and evaluating design alternatives, developing a functional design for the project, and identifying all permits and approvals required for project implementation.

An Environmental Project Report (EPR) was submitted to the Ministry of the Environment Parks and Conservation (MECP), formerly the Ministry of the Environment and Climate Change (MOECC), January 22, 2016 for the TLS LRT project in accordance with the Transit Project Assessment Process (TPAP) detailed in the *Environmental Assessment Act, Ontario Regulation (O.Reg.) 231/08*. The Notice to Proceed with the project was provided by the Minister on March 21, 2016 (**Appendix A**). No additional conditions other than those detailed in the EPR were included in the Notice.

As outlined in the 2016 EPR, the TLS Extension will add 12 km of rail to the City's overall transit network and seven new LRT stations at Gladstone, Walkley, South Keys, Uplands, Airport, Leitrim and Bowesville. To provide the required capacity, the TLS LRT Plan includes 77 m station platforms at all existing and new stations on all segments of the line. New passing tracks will provide 12-minute service along the main line and the Airport Rail Link.

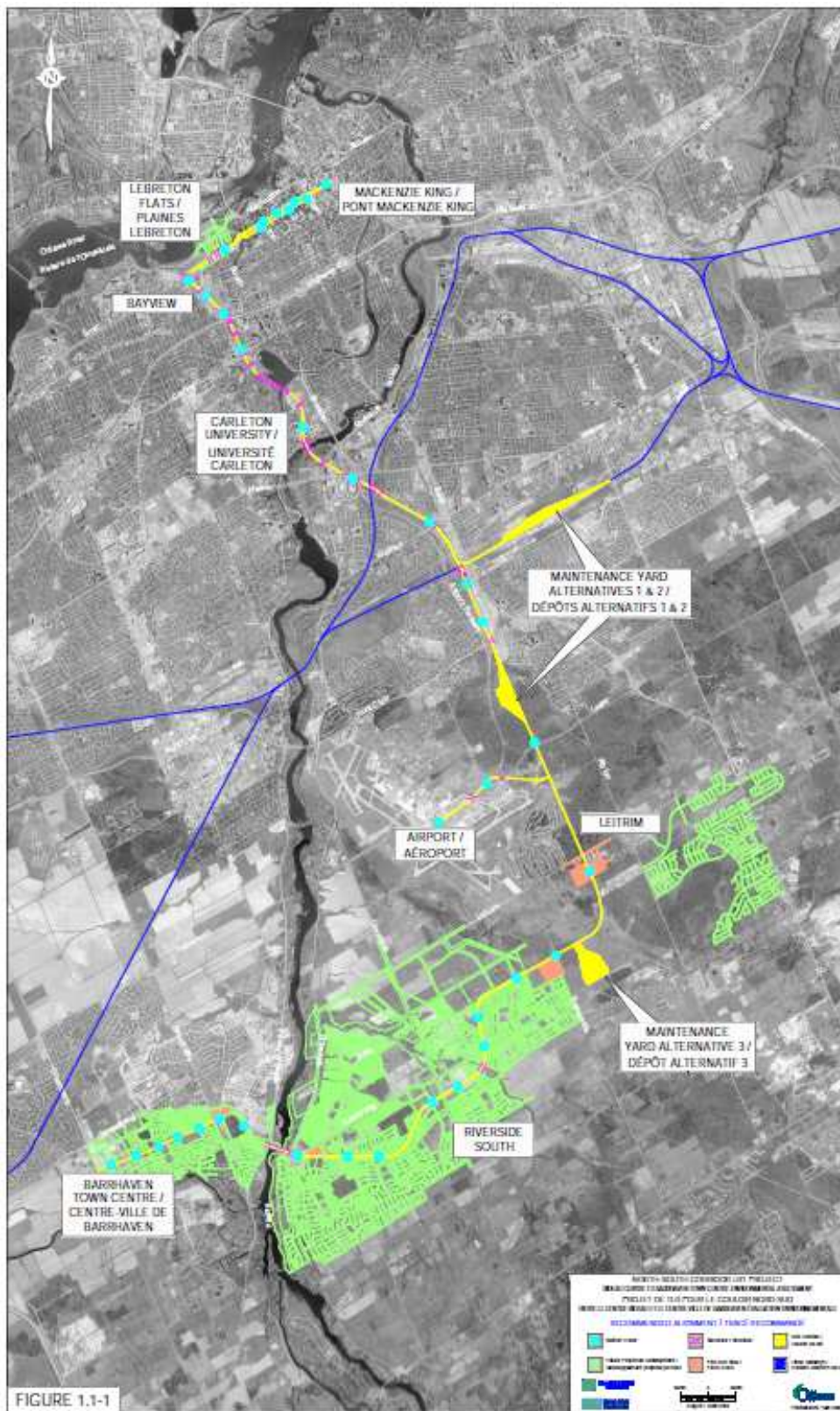


Figure 1-1: North-South LRT



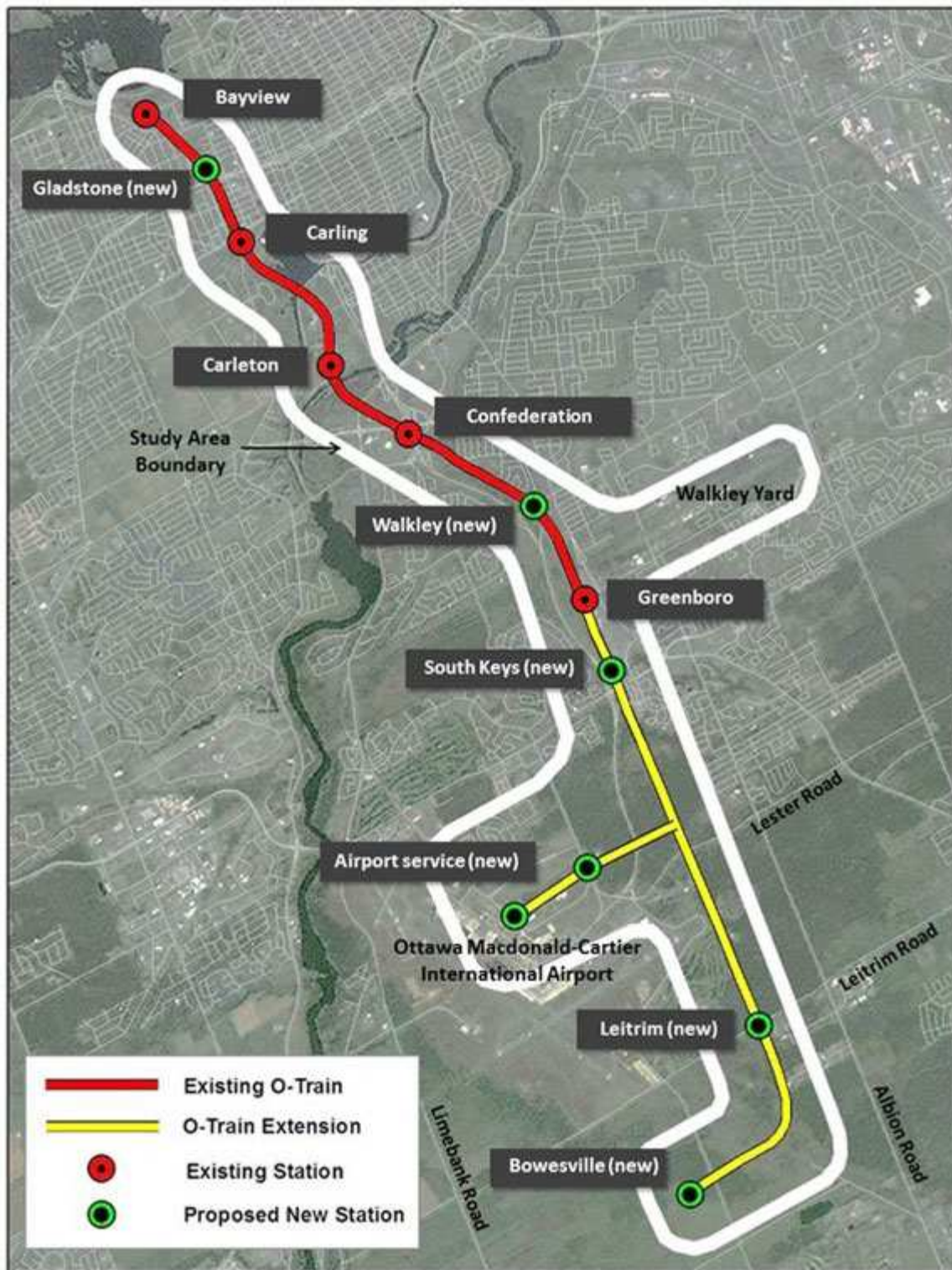


Figure 1-2: Original TLS LRT Extension EPR Study Area



**Figure 1-3: City of Ottawa Ultimate Network**

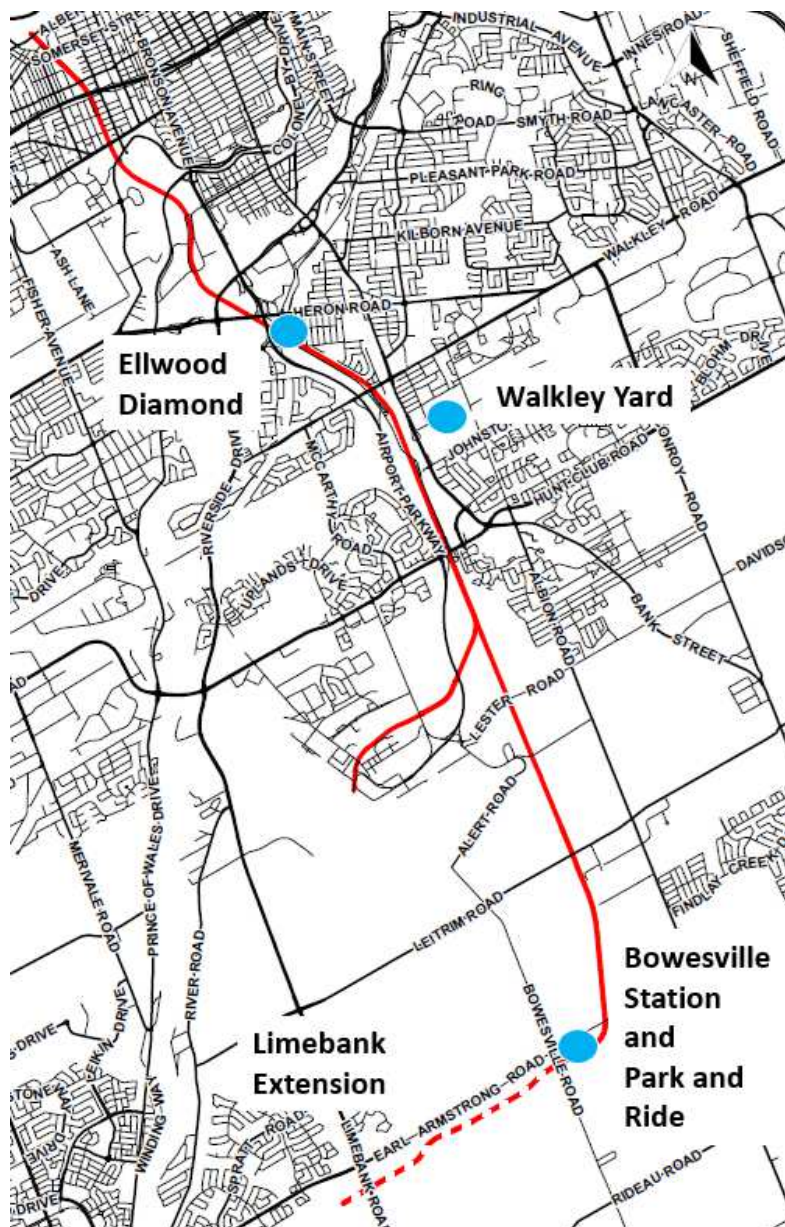
## **1.1 Modifications**

Since the EPR was submitted in January 2016, further discussions have taken place and preliminary design changes have occurred.

These changes are related to the following areas (Figure 1-4):

- Ellwood Diamond
- Walkley Yard Maintenance and Storage Facility
- Bowesville Station and Park and Ride
- Limebank Extension





**Figure 1-4: Location of Modifications**

In accordance with the TPAP, an Addendum to the EPR is required. For each of the four changes, this Trillium Line LRT Extension Addendum (Addendum) report will outline:

- a description of the changes;
- the reasons for the change;
- an assessment and evaluation of any impacts and mitigation measures; and
- an opinion of the significance of the change to the transit project.



### 1.1.1 Indigenous Consultation

Indigenous organizations with a potential interest in the project were consulted to comment on the approved EPR including the Algonquin Consultation office and the Ottawa Region Métis Council. Both organizations were contacted during pre-consultation as the project area is located within Algonquin Traditional Territory.

As part of the Stage 1 and Stage 2 LRT Projects, the City of Ottawa has an ongoing consultation with local Indigenous groups including:

- Algonquins of Ontario Consultation Office;
- Algonquins of Pikwàkanagàn;
- Kitigan Zibi Anishinabeg First Nation;
- Quebec Métis; and
- Métis Nation of Ontario.

These local Indigenous groups were contacted specifically with respect to the proposed changes for the Trillium Line South Addendum projects. No additional comments were received.

## 1.2 Updated Existing Conditions

Existing conditions within the area of the changes have been updated to provide a baseline against which to assess potential environmental effects. This baseline data was collected in the vicinity of the changes and analyzed for key environmental parameters in order to:

- provide an understanding of existing conditions;
- allow for an assessment of how the proposed project may cause these environmental conditions to change;
- identify mitigation measures; and
- provide a basis for designing monitoring programs.

General existing conditions and reliant information are noted below.

### 1.2.1 Source Water Protection

Under the Ontario Clean Water Act (OCWA), 2006, municipal drinking water sources must be protected from contamination and depletion. Source water protection safeguards public health from drinking water threats by raising awareness and protecting the drinking water supply. Source protection policies related to significant drinking water threats only apply within a Drinking Water Protection Zone. These vulnerable areas are also known as Intake Protection Zones (IPZ) and Wellhead Protection Areas (WHPA).

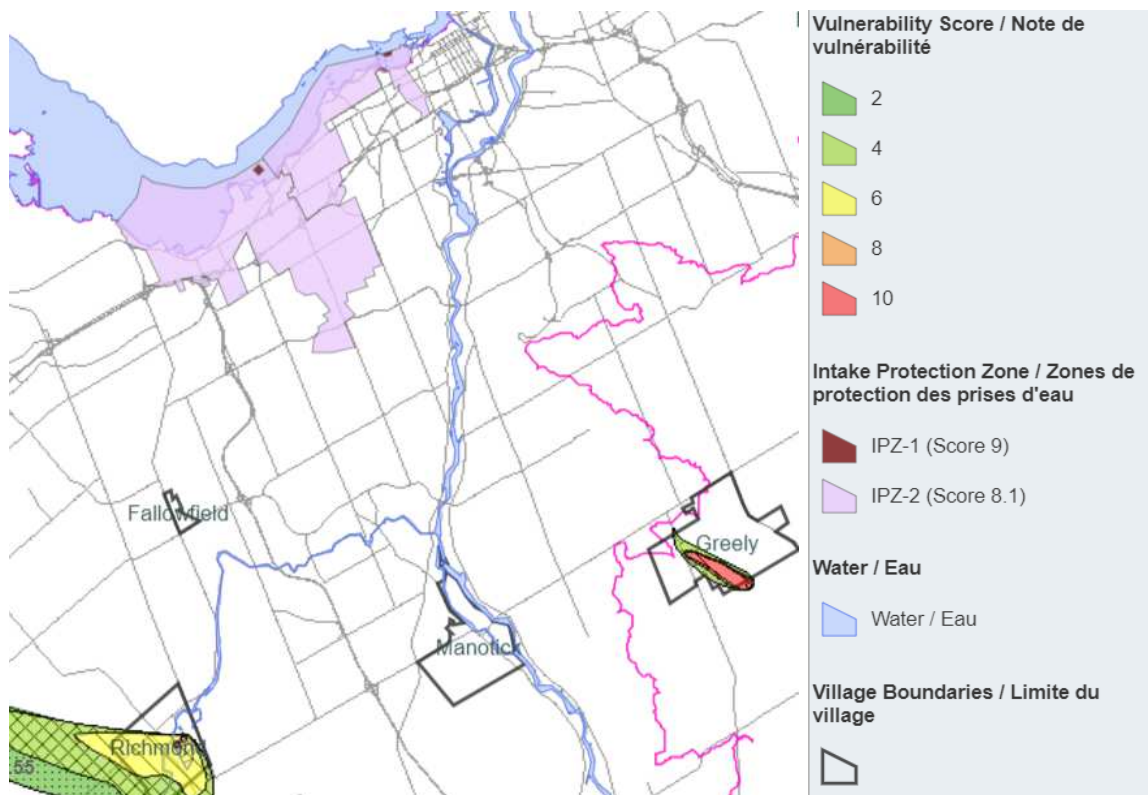
Roads Services is responsible for the City's snow and ice control program. It is committed to helping make Ottawa's roads, sidewalks and cycling network safe and passable for vehicles, pedestrians and cyclists. An effective winter maintenance program is essential to allow the City to function under normal winter weather conditions. The application, handling and storage of road salt in certain areas are considered drinking water threats under OCWA, 2006. The City salt handling practices include consideration for protecting drinking water and avoiding road salting activities near municipal drinking water sources in the City of Ottawa.

The shift to rail transit, has overall benefits of reductions for salt contamination in the local environment.

The City of Ottawa winter maintenance program reduces the use of salt to the extent possible by:

- rock salt is sprayed with a liquid de-icer as it is spread. This speeds up ice melting by making the salt sticky so it can adhere to the road.
- Anti-icing is used before or at the beginning of freezing rain or other winter precipitation. The de-icing solution consists of pre-wetted salt or a liquid solution. It is applied to the Transitway and Ottawa Road 174 to prevent ice from forming and bonding to the pavement.
- Abrasive materials such as sand are used to increase traction in colder temperatures when salt is not effective.

The Trillium LRT Addendum areas would be occurring within the Rideau Valley Source Protection Area in the City of Ottawa and consider applicable source protection policies established under the Clean Water Act, 2006. The Rideau Valley Source Protection Area is in the Mississippi-Rideau Source Protection Region, and falls under the "Mississippi-Rideau Source Protection Plan." The Trillium LRT Addendum areas are not within either an IPZ or WHPA of the Mississippi-Rideau Source Protection Region (Figure 1-5).



**Figure 1-5: Source Water Protection Ottawa**

While the Trillium LRT Addendum areas do not intersect with WHPAs and IPZs, some of these areas do intersect with two vulnerable areas: SGRA (Significant Groundwater Recharge Area) and HVA (Highly Vulnerable Aquifer).

Correspondence with staff from the Mississippi-Rideau Source Protection Region has confirmed though that activities within these areas do not pose a significant threat to drinking water. There can be moderate and low threats in the HVA however these are all associated with the establishment or maintenance of a waste disposal site as defined in Part V of the Ontario Environmental Protection Act. The activities within the LRT addendum areas as proposed herein do not include any waste disposal sites. It can therefore be concluded that there are no additional requirements under Source Protection (pers. comm Brian Stratton RVCA).

### 1.2.2 Background Reports

Several technical reports were prepared in support of the previously completed Environmental Assessments. These reports were relied upon as the basis for assessing the impacts of the proposed changes that are included in the appropriate sections of this Addendum. They include the following:

- Air Quality, Noise and Vibration Impact Assessment O-Train Extension EA, GWE, 2016
- Noise and Vibration Assessment Ottawa Light Rail Transit (Stage 2), CTP January 9, 2017

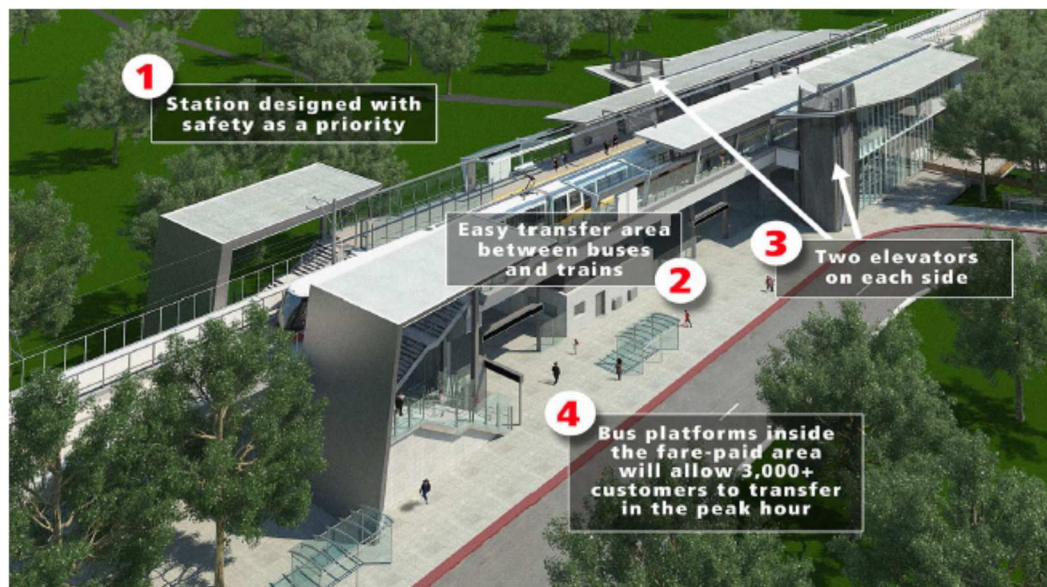
The impacts and mitigation measures related to the proposed changes outlined in the Trillium Line LRT Environmental Project Report Addendum have been drawn out of the results of the background reports and incorporated into the Addendum for the Trillium extension.

### 1.3 Best Management Practices

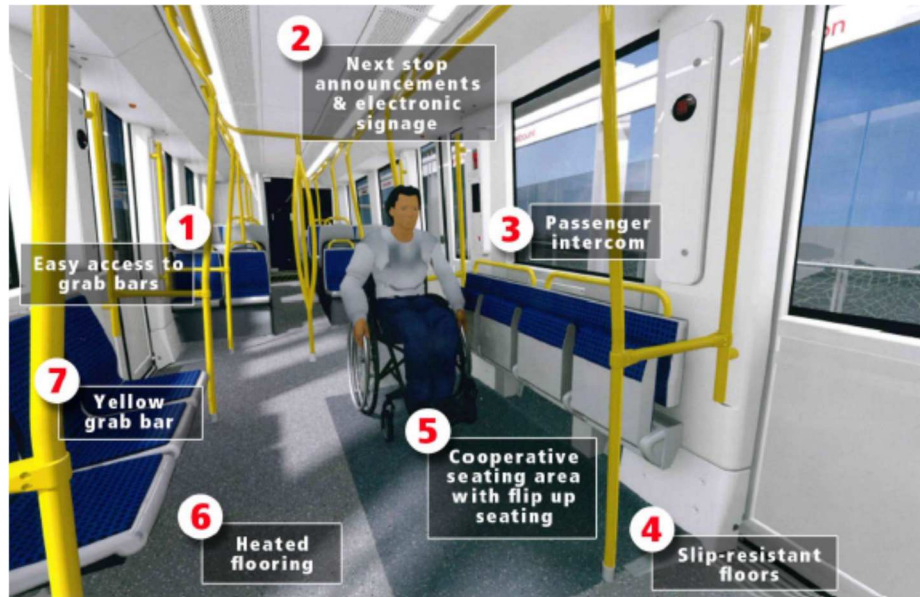
Mitigation measures including planning decisions, design features, construction requirements and construction constraints, will be employed to reduce potential project impacts on the environment. The following mitigation measures and Best Management Practices are continuing to be brought forward as part of the project implementation.

#### Accessibility

The entire Stage 2 project will be designed to meet Accessibility for Ontarians with Disabilities Act (AODA) and build on Confederation Line performance standards. Universal accessible design standards are in place for stations and vehicles.







Information on the AODA designs and overall network connectivity have been shared with the City of Ottawa Accessibility Advisory Committee. Comments from the Committee were provided to the Transportation Services department for consideration and follow up. The Committee is available for continued involvement as required.

### **Aquatic Habitat**

Where extensive modifications or loss of aquatic habitat is likely to occur and federal or provincial agency permits/approvals are required, such impacts may require compensation or offsetting to counterbalance the negative effects. Any requirements for enhancement or restoration of aquatic habitats through development of compensation/offsetting plans shall be determined through the agency permit/approval processes.

### **Archaeology Risk Management Plan**

During construction, there may be archaeological resources or human remains discovered. The preparation of an Archaeology Risk Management Plan will outline:

- the actions required resulting from the recommendations of the Archaeological Reports including any archaeological monitoring requirements by a licenced archaeologist during the Construction Activities;
- a process for amending the Archaeological Risk Management Plan to incorporate any additional actions required resulting from subsequent archaeological assessment reports completed;
- a protocol to be followed if human remains are discovered which includes how it will be ensured that human remains are managed in compliance with Applicable Law and all requirements of Governmental Authorities with respect to such discovery, including the *Funeral, Burial and Cremations Services Act, 2002* (Ontario), the *Standards & Guidelines for Conservation of Provincial*

*Heritage Properties* issued under the *Ontario Heritage Act* (Ontario) and the *Standards and Guidelines for the Conservation of Historic Places in Canada*;

- the protocol addressing the discovery of human remains on federal lands to be developed in consultation with the archaeologist of the National Capital Commission (NCC) heritage program to reflect the NCC's requirement for notification and their need to inform First Nations, in particular for human remains identified as pertaining to Indigenous individuals, in accordance with current protocols between the NCC and First Nations;
- a protocol to be followed if previously undocumented archaeological resources are discovered which comply with Applicable Law regarding management of previously undocumented archaeological resources;
- a protocol to be followed should the discovery of previously undocumented archaeological resources occur on NCC lands must include the notification of the NCC Heritage Program.

### **Construction Waste Management Plan**

During construction, there may be excess materials that must be disposed of off the project site. These materials could include asphalt, waste steel/metal structural components, earth, and road right-of-way appurtenances such as signs, lighting and utility poles. A Construction Waste Management Plan will be developed to emphasize that surplus or scrap material is to be recycled whenever possible, and to describe the methods to be used by the contractor for disposal of non-recyclable surplus material in accordance with provincial and City of Ottawa practices and guidelines.

### **Dewatering Management Plan**

During construction, there may be a requirement for dewatering activities. A Dewatering Management Plan shall include, but not be limited to, the following:

- how groundwater control for the Project will be performed in compliance with Environmental Laws;
- procedures for conducting all monitoring as required in the Project permits and approvals;
- additional impact assessments and acquisition of appropriate approvals prior to discharging groundwater into adjacent natural environments from an area of known or suspected groundwater contamination;
- procedures for addressing any complaints received related to groundwater control activities;
- no groundwater from an area of known or suspected groundwater contamination should be discharged to the environment without the completion of an impact assessment and the appropriate approvals; and
- reporting procedures to document how all groundwater management activities and best practices have been implemented.

## **Department of Fisheries and Oceans (DFO) Requirements for Culvert Extensions**

The *Fisheries Act* requires that projects avoid causing serious harm to fish unless authorized by the Minister of Fisheries and Oceans Canada. A DFO self-assessment should be undertaken to determine whether or not the project must be reviewed by DFO through the Request for Review process before proceeding to construction. If, after project review, DFO determines that the project is likely to result in serious harm to fish that are part of or that support a commercial, recreational or Aboriginal fishery, an Authorization under Paragraph 35(2)(b) of the Fisheries Act will be required.

### **Dust Control Plan**

Construction activities such as: site preparation; storage piles; material handling and transfer systems; road surfaces; and demolition and deconstruction may create excess dust. A Dust Control Plan will be implemented during the Works to limit the generation and dispersion of, and mitigate potential effects of, air-borne particulate matter associated with the Works. The Dust Control Plan shall address air-borne particulate matter issues in the context of the potential environmental impacts, nuisance impacts and impacts on human health and safety in accordance with *Ontario Regulation 419/05*. Mitigation measures may include: application of non-chloride dust suppressants; grading the site in phases; wind fences; Erosion and Sediment Control; soil compaction; and reduction of activities during windy periods.

### **Erosion and Sediment Control Plan**

During construction, erosion and sediment control will be required. An Erosion and Sediment Control Plan will be used to document the degree of erosion and sedimentation that would occur under normally anticipated weather conditions during the life of the project, and to develop and describe mitigation strategies to control foreseen areas determined to be predisposed to the problem. The plan should be developed in a manner that allows for inclusion of site specific measures for each area of work within a regulated floodplain or within 30 m of the high water mark of a surface water feature, or where there is a risk that erosion could result in downstream surface water impacts. A surface water monitoring program shall be implemented for all works which take place below the high water mark and shall include, as a minimum, daily turbidity readings until such time as the qualified inspector determines that the risk of erosion and sedimentation is negligible. The results of the monitoring program shall be kept on site during the monitoring period and made available to a provincial environmental officer upon request. The plan shall be prepared and inspected by an appropriately qualified inspector of erosion and sediment controls and would include controls such as, but limited to:

- identifying planting and slope rounding specifications within the contract;
- identifying and specifying seeding and sodding locations;
- identifying areas requiring slope benching or retaining structures in the detail design process; and
- monitoring during construction, as well as post construction monitoring and mitigation practices.



## **Emergency Response Plan**

The preparation of an Emergency Response Plan to be used by the construction contractor will be included to allow full access to emergency services during the construction period, so that at any given time there is a method to access all adjacent land uses. Additionally, the Emergency Response Plan will include provisions for providing temporary services to end users in the event of a construction-related service outage or other service disruption.

## **Environmental Protection Plan**

The development of an Environmental Protection Plan will detail preventative measures to ensure that no contamination, waste or other substances, which may be detrimental to terrestrial/aquatic life or water quality, will enter a watercourse or natural terrestrial habitat as either a direct or indirect result of construction. These measures include, but are not limited to:

- machinery should not cross or come in close contact with any waterbody, watercourse or wetland;
- machinery will be clean and free of fluid leaks, invasive species and noxious weeds on arrival at the construction site and will be maintained in this condition through regular inspections (i.e. daily);
- refueling, maintenance and washing of machinery will not take place on site, any immediate necessary repairs will be carried out on a site designated for this purpose located away from any waterbody, watercourse or wetland, up to the annual high-water mark. A tarp will be placed under the machinery during refueling;
- any floating debris resulting from construction that accumulates on drainage channels towards area watercourses, is to be immediately cleaned up and disposed of;
- do not use treated wood in or within 15 m of a waterbody, watercourse or wetland;
- do not apply fertilizers or other products containing phosphorus or nitrogen within 15 m of a waterbody, watercourse or wetland;
- measures will be taken to maintain or reduce overland surface water velocities (e.g. filter berms, hay bales, etc.) and these measures will be removed once the project is complete;
- creating holes and ruts that restrict surface water runoff and soil infiltration will be avoided by using vehicles adapted to the soil's bearing capacity and taking care not to operate vehicles on wet soil;
- ensure that site clearing is carried out only in areas where it is specifically required, and that the areas to be cleared are carefully and clearly delineated with the specifications outlined in Ontario Provincial Standard Specification (OPSS) 201;
- minimize the extent of organic debris removal below the high water mark that is required for construction;





- asphalt should either be mixed away from the site or should be prepared on paved surfaces to minimize the effects of a spill. Excess asphalt must be disposed off-site at a location that meets all regulatory requirements;
- concrete should either be mixed away from the site or should be prepared on paved surfaces if only small quantities (e.g. for minor repairs) are required;
- excess concrete must be disposed off-site at a location that meets all regulatory requirements;
- washing of concrete trucks and other equipment used for mixing concrete should not be carried out within 30 m of a waterbody, watercourse or wetland and should take place outside of the work site;
- concrete trucks should collect their wash water and recycle it back into their trucks for disposal off-site at a location meeting all regulatory requirements; and
- place drip pans/tarps under all stationary equipment that is located within 30 m of the high water mark prevent unexpected fluid leaks from entering the adjacent waterbody.

### **Excavated and Imported Materials Management Plan**

During construction, there will be management of excavated and imported materials. An excavated and Imported Materials Management Plan will describe the management of all excavated and imported materials generated as part of the Works, i.e. soil, rock, solid waste, liquid waste, hazardous waste, and contamination. Management of excavated and imported materials includes, but is not limited to, excavation, handling, transportation, testing, on-site re-use, off-site re-use, disposal, and/or ultimate disposition. The Excavated and Imported Materials Management Plan shall be written by a Qualified Person within the meaning of Section 5 of *O.Reg. 153/04*. The Excavated and Imported Materials Management Plan shall be written with due consideration for “Management of Excess Soil – A Guide for Best Management Practices” (MOECC, January 2014).

### **Excess Water Management Plan**

During construction there may be excess water. An Excess Water Management Plan will be developed by the contractor to manage excess water as a result of dewatering activities. The plan will minimize the potential for water contamination, and prevent the release of polluted water into the environment. Additionally, surrounding surface and groundwater quality is monitored. Consideration of all of the above factors will inform the appropriate discharge method for the water will be selected.

### **Exclusionary Fencing**

Exclusion fencing should be installed prior to working in or around natural areas, to prevent wildlife (especially turtles) from entering work zones. If wildlife does enter a work zone it should be carefully relocated prior to commencing work. Permits may be required for relocation of SAR or aquatic species.

## **Geotechnical Investigations**

Geotechnical investigations have been completed for the preferred alignment, as well as the Maintenance Storage Facility (MSF) site. Additional geotechnical investigations in the detailed design stage may be required to confirm groundwater and subsurface conditions and the potential impacts as the alignment design is developed further. Foundation investigations will be required for structural design of new structures and any possible extension of culverts

## **Health and Safety Plan**

The preparation of an Occupational Health and Safety Plan by the contractor before any work begins will be required, to ensure that proper protocols and recommendations are in place to protect workers against personal injury or loss of life.

## **Lighting Treatment Plan**

In accordance with municipal standards a Lighting Treatment Plan will be prepared during the pre-construction phase. This plan will include lighting fixtures and illumination along the various sections of the corridor. A lighting audit of the preferred lighting design plan may be conducted to confirm clear sight lines and appropriate illumination. City of Ottawa policy regarding lighting of connections to LRT stations will be followed. Consideration should also be given to the use of wavelengths safe for wildlife.

## **Noise and Vibration Control Plan**

During construction, there may be excess noise and vibration. A Noise and Vibration Control Plan will be developed to identify and document the processes, required analyses and surveys, and any other supporting effort necessary to ensure that the Project Operations are carried out in compliance with the Applicable Noise and Vibration Requirements and include:

- identify major noise and vibration producing construction activities and identify a plan to minimize, monitor and mitigate noise and vibration levels to the extent reasonably possible;
- identify ground-borne and air-borne noise and vibration prediction and measurement procedures, and methods to evaluate ground-borne and air-borne noise and vibration from the Project Operations, the New City Infrastructure, and the operation of the light rail transit vehicles on the System Infrastructure in accordance with the LRT Rules and Standard Operating Procedures;
- identify possible mitigation measures to be applied when and where calculated ground-borne or air-borne noise or vibration levels exceed the Noise and Vibration Performance Limits; and
- procedures for conducting compliance verification measurements, measurement processes, measurement equipment and analysis methods, during the Construction Period.



The following references and guidelines will be complied with in carrying out the project:

- City of Ottawa Noise Control Guidelines, January 2016;
- City of Ottawa Noise By-law No. 2004-253;
- City of Ottawa Specification S.P. No: F-1201 'Use of Explosives';
- MOE, Model Municipal Noise Control By-law, August 1978, including any updated Noise Pollution Control publications issued by the MOE;
- MOE Publication NPC-300, August 2013;
- NFPA-130 Standard for Fixed Guideway Transit and Passenger Rail Systems 2014;
- FHWA Highway Construction Noise Handbook 2006;
- US FTA Transit Noise and Vibration Impact Assessment Manual (2006); and
- Ministry of Transportation Ontario Environmental Guide for Noise 2006.

The following noise and vibration performance limits will apply to the project.

**Table 1-1: Air-borne Noise Performance Limits**

Source	Receiver	Descriptor	Limit Requiring Mitigation
Construction equipment	Source-based limits - as described in the relevant publication set out in the "Limit Requiring Mitigation" column	As described in the relevant publication set out in the "Limit Requiring Mitigation" column	For a particular item of equipment, the most stringent sound level contained in: a) MOE NPC 115; b) NPC 118; c) Commonwealth of Massachusetts Big Dig, Section 721.560 Table 2; and d) FHWA Highway Construction Noise Handbook 2006.  Only broadband backup alarms are permitted.
Construction	Nearest Sensitive Receiver	Leq,8h	80 dBA during daytime/evening (any 8 hour period between 07:00-23:00) and 70 dBA during night-time (23:00-07:00)
Combined Revenue Vehicle Operations and road traffic noise	Residential outdoor living areas (as defined in City of Ottawa Environmental Noise Guidelines)	Leq,16h	Refer to City of Ottawa Environmental Noise Guidelines

Source	Receiver	Descriptor	Limit Requiring Mitigation
LRT Station or Bus Facility Paging System	Nearest Sensitive Receiver exterior		Paging shall be lower than the ambient sound level
Stationary noise sources including ventilation shafts, substations and bus transfer stations.	Sensitive Receiver exterior (as defined in MOECC publication NPC-300)	Leq, 1h	Refer to NPC-300
Emergency operations noise	Inside Station	Leq, 5min	80 dBA
	In Tunnel	SIL (500- 4000Hz)	78 dB

**Table 1-2: Ground-borne Noise and Vibration Performance Limits**

Source	Receiver	Descriptor	Limit Requiring Mitigation
Construction Equipment	Ground outside any building or adjacent to any structure	Peak Particle Velocity	Refer to construction vibration damage criteria in the <i>Federal Transit Administration's Transit Noise and Vibration Impact Assessment, Report FTA VA 90 1003 06, Federal Transit Administration, U.S. Department of Transportation, 2006</i> , as amended.
Revenue Vehicle passby vibration	Inside highly sensitive buildings (e.g. concert halls, television studios, recording studios, vibration-sensitive research and manufacturing facilities, hospitals with vibration-sensitive equipment, some university research facilities)	Vertical vibration velocity passby rms	Not to exceed 65 VdB re: 1 microinch/sec (0.045 mm/sec)
	Inside residences and buildings where people normally sleep (e.g. residential buildings, hotels, hospitals); or theatres and auditoriums	Vertical vibration velocity passby rms	Not to exceed 72 VdB re: 1 microinch/sec (0.1 mm/sec)

Source	Receiver	Descriptor	Limit Requiring Mitigation
	Inside sensitive institutional buildings and office buildings (e.g. schools, churches and quiet/commercial offices)	Vertical vibration velocity passby rms	Not to exceed 75 VdB re: 1 microinch/sec (0.14 mm/sec rms)
Revenue Vehicle passby ground borne noise measured as maximum passby sound pressure level using slow response or	Inside concert halls, television studios, recording studios	Ground-borne passby Leq or Lmax,S	Not to exceed 25dBA re: 20 micropascals
	Inside theatres and auditoriums	Ground-borne passby Leq or Lmax,S	Not to exceed 30dBA re: 20 micropascals
	Inside residences and buildings where people normally sleep (e.g. residential buildings, hotels, hospitals)	Ground-borne passby Leq or Lmax,S	Not to exceed 35dBA re: 20 micropascals
	Inside sensitive institutional buildings and office buildings (e.g. schools, churches and quiet/commercial offices)	Ground-borne passby Leq or Lmax,S	Not to exceed 40dBA re: 20 micropascals

### Management of Contaminated Materials

The MECP and the construction manager are to be notified immediately upon discovery of any contaminated material encountered within the construction area. If contaminated materials or contaminated groundwater are encountered within the construction limits, these are to be removed and disposed of in accordance with all applicable acts and regulations. Contaminated materials if encountered should not be placed within areas where they may enter surface water features. Treatment and discharge of contaminated groundwater is to be in accordance with applicable legislation and regulations (e.g., Provincial Water Quality Objectives (MOECC, 1994)) to ensure that it can be discharged without causing an environmental impact/impairment/adverse effect.

Contaminated soil will be encountered and possibly contaminated groundwater. Groundwater supply wells that may be at risk due to construction activities should be monitored and Contingency Plans developed to provide temporary alternate water supply should the need arise.

### Landscape Plan

A Landscape Plan must consider the use of landscaping features to provide visual abatement of the TLS LRT project from adjacent communities and uses.

### Public Communications Plan

The purpose of a Public Communications Plan is to make residents and other stakeholders aware of scheduled road closures, transit service modifications and other disruptions to normal service ahead of time to help them plan their activities with minimum disruption. The Public Communications Plan will detail how to communicate information about the work in progress to the public, what information should be disseminated, and at which project stage the communication should take place.

### **Spills Response and Action Plan**

During construction there is a potential for spills of contaminants, fuels and other materials that may reach natural areas. A Spills Response and Action Plan will be prepared and adhered to by the construction contractor. Spills or discharges of pollutants or contaminants will be reported immediately. To avoid the release of any deleterious substances during construction activities, the construction manager must ensure that the operation, refueling and maintenance of equipment with the use of toxic materials is performed either off-site. Hazardous chemicals, including refueling stations, should not be located with the limits of a regulated floodplain or within 30 m from a surface water feature. Additionally, an adequate supply of clean-up materials shall be on-site with a work crew that is fully trained to prevent and respond to accidental spills. Clean up shall be initiated quickly to ensure protection of the environment. In the event of a spill, MECP Spills Action Hotline shall be contacted (1-800-268-6060), as well as the NCC if the spill is within, adjacent to, or could potentially affect federal lands.

### **Species at Risk**

The *Species at Risk Act* (SARA) and Endangered Species Act (ESA 2007) are updated on a regular basis. Legislation updates should be reviewed and an update of the potential species present and their associated habitat should be completed prior to construction. Protection afforded to any species shall be in accordance with appropriate federal/provincial jurisdiction. If a Species at Risk (SAR) is observed during construction, in the construction zone, the MECP, and Environment and Climate Change Canada (ECCC) are to be contracted immediately and operations modified to avoid any negative impacts to the species or their habitat until further direction is provided by the governing authority.

### **Timing windows**

All activities related to the construction should avoid certain timing windows dependent on the wildlife that is potentially impacts. This includes: Fisheries; Migratory Birds; Bats; Turtles; and Species at Risk.

### **Traffic and Transit Management Plan**

During construction there may be a need for traffic and transit detours. A Traffic and Transit Management Plan will be used to support the development of the transit detours. The objective is to document how traffic will be managed during construction. Each specific stage of the work will require its own specific plan to address local issues and identify how an acceptable level of service will be maintained. The document will use the City's multi-modal level of service approach,

which considers pedestrian, cycling, bus and traffic impacts. Any temporary facilities built as part of the staging should consider impacts to the SWM and drainage as a result of their implementation.

### **Wildlife Protection Measures**

All personnel should be briefed about wildlife protection measures at the outset of the project. The briefing needs to provide an overview of the mitigation measures that are being used at the site, as well as instructions on what to do if and when wildlife are encountered during the work. It should also include information on any species at risk that may be present, and what to do if one is seen. In general it should address:

- General provisions – e.g., do not harm, feed or unnecessarily harass wildlife; drive slowly and avoid hitting wildlife where possible; keep site tidy and secure
- Species at risk – basic identification tips for and species most likely to be encountered at the site)

Contact information for: Project biologist, ECCC, MNRF/MECP Extra care and precaution will be taken during the turtle nesting season in June and early July, and the hibernation season from mid-October to mid-March

Refer to the City of Ottawa's Protocol for Wildlife Protection during Construction for other recommendations and mitigations

([http://documents.ottawa.ca/sites/documents.ottawa.ca/files/documents/construction\\_en.pdf](http://documents.ottawa.ca/sites/documents.ottawa.ca/files/documents/construction_en.pdf))

### **Stormwater Management**

Stormwater management will consist of quality and quantity control of runoff from the guideway, new stations, and new park and ride facilities consistent with the MECP guidelines, and City of Ottawa Sewer Design Guidelines (2012). Measures will consist of enhanced grass swales, and stormwater storage and treatment facilities. Stormwater management plans shall consider, among other matters, the maintenance, restoration and protection of downstream aquatic ecosystems as necessary based on site specific requirements identified through aquatic habitat impact assessments, and as per federal or provincial agency permit/approval requirements. Culvert crossings of the guideway where there is an existing embankment, will be replaced to meet capacity requirements. New culvert crossings of the guideway shall be designed to meet capacity requirements in accordance with the following:

- City of Ottawa Sewer Design Guidelines, October 2012;
- Ministry of Transportation Ontario (MTO) Highway Drainage Design Standards, January 2008;
- Ministry of Transportation (MTO) Drainage Management Manual, 1997; and



- American Railway Engineering and Maintenance-of-Way Association (AREMA) Manual for Railway Engineering 2011 (four volumes).





## 2. ELLWOOD DIAMOND

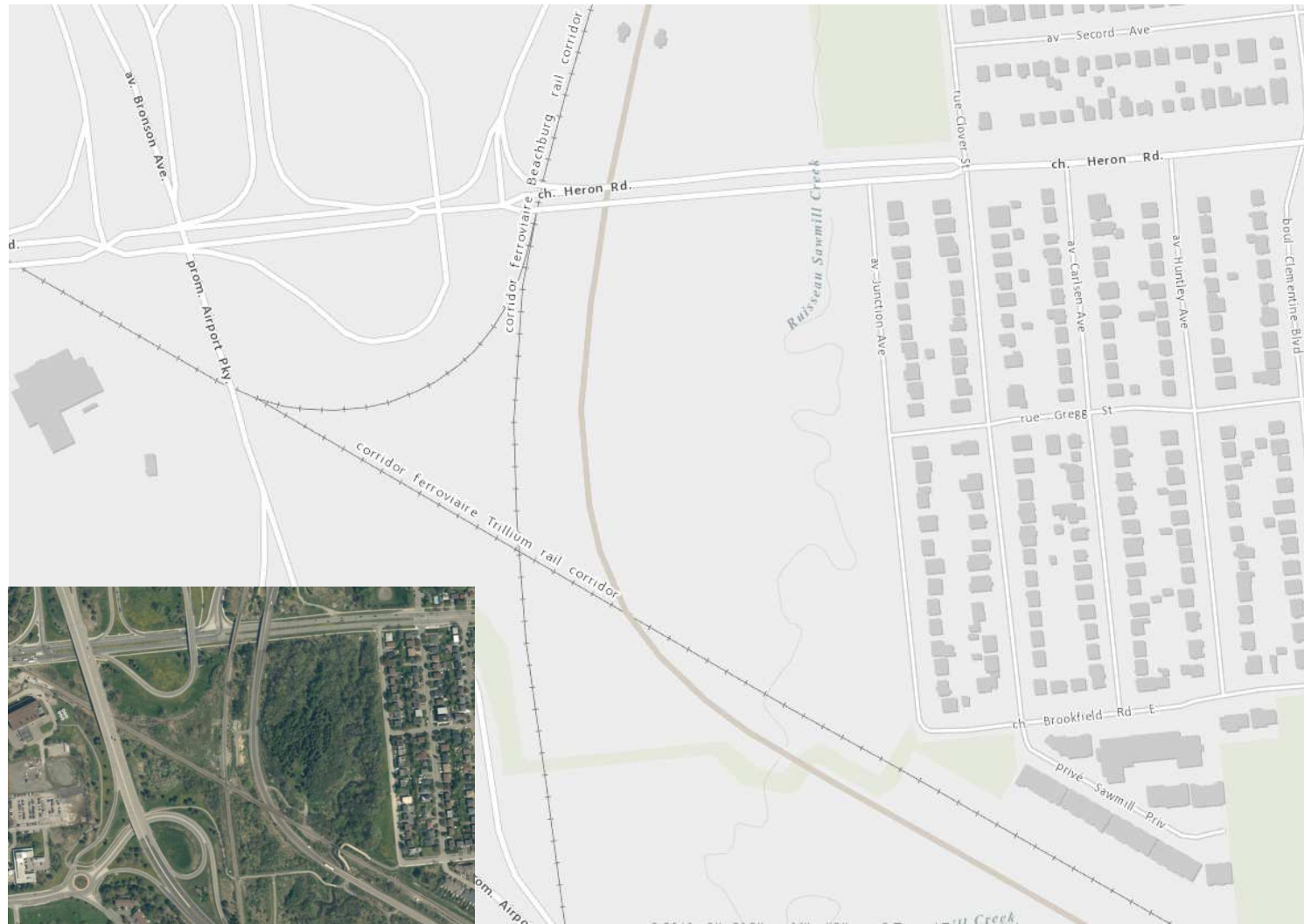
The existing Trillium O-Train between Greenboro and Confederation stations runs at-grade along a freight alignment and crosses a VIA Rail Canada (VIA) single-track alignment that carries the VIA Rail Toronto service. This is known as the Ellwood Diamond (Figure 2-1).

### 2.1 Description of and Reason for the Change

The proposed expansion of the Trillium Line is expected to increase the number of O-Train crossings with longer trains. In addition, VIA has indicated it's near term intentions to provide more frequent service between Ottawa and Toronto, which will use the route that crosses the Ellwood Diamond. The City of Ottawa recognized the need to consider options to grade separate the Trillium and VIA lines at the Ellwood Diamond (CTP2, 2017a).

Multiple alternatives were considered for the Ellwood Diamond grade separation, with the focus on making adjustments to the horizontal and vertical alignment of the existing Trillium Line. These alternatives included:

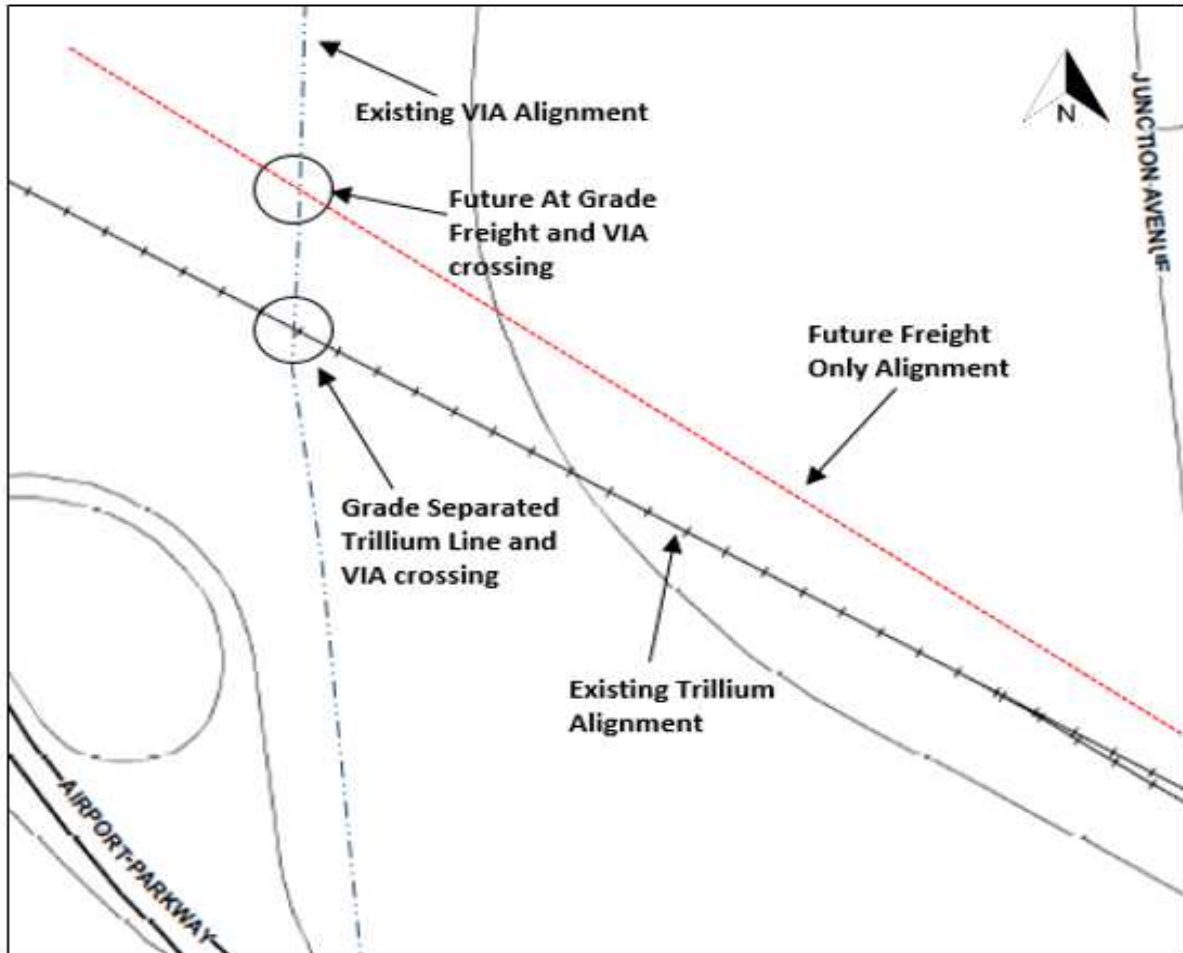
- Trillium Line over VIA:
  - The Trillium Line goes over VIA with an overpass structure and approach grades that accommodate Freight train movements on the existing horizontal alignment.
  - The Trillium Line goes over VIA on the existing horizontal alignment with an overpass structure and approach grades that accommodate DMU standards only with a regulatory exemption for Freight.
  - The Trillium Line goes over VIA track on the existing horizontal alignment with an overpass structure with a new Freight-only line which would have a parallel route located on the east side of the existing tracks. The new freight route will cross VIA tracks with a new at-grade diamond crossing.
  - The Trillium line goes over VIA on a new horizontal alignment with an overpass structure and approach grades that accommodate DMU movements only with the Freight track remaining at-grade on the existing horizontal alignment.
- Trillium Line under VIA:
  - The Trillium line goes under VIA on the existing horizontal alignment with a tunnel structure and approach grades that accommodate Freight train movements.
  - The Trillium line goes under VIA on the existing horizontal alignment with a tunnel structure and approach grades that accommodate DMU movements only with a regulatory exemption for Freight.



**Figure 2-1: Existing Ellwood Diamond**

- The Trillium line goes under VIA on a new horizontal alignment with a tunnel structure and approach grades that accommodate DMU movements only with the Freight track remaining at grade on the existing horizontal alignment.
- Trillium Line Over/Under a modified VIA alignment.
  - The Trillium line follows the existing horizontal alignment and goes over a lowered VIA alignment with an overpass structure and approach grades that accommodate Freight and DMU train movements.
  - The Trillium line follows the existing horizontal alignment and goes over a lowered VIA alignment with an overpass structure and approach grades that accommodate DMU movements only with a regulatory exemption for Freight.
  - The Trillium line follows the existing horizontal alignment and goes under a raised VIA alignment with an underpass structure and approach grades that accommodate Freight and DMU train movements.
  - The Trillium line follows the existing horizontal alignment and goes under a raised VIA alignment with an underpass structure and approach grades that accommodate DMU movements only with a regulatory exemption for Freight.

The preferred conceptual alignment *Trillium Line Over/Under a modified VIA alignment* (Figure 2-2), involves separate crossing alignments for the O-Train trains and Freight traffic. The proposed DMU-only alignment would run along the existing Trillium Line alignment and traverse over the VIA track, while the Freight-only line would run on a new parallel route located on the east side of the existing tracks. The new Freight route will cross VIA tracks with a new at-grade diamond crossing, the intention of the future freight by-pass track is to match the elevation of the VIA track to avoid the implications of changing the VIA track elevation. Works proposed will also require the relocation of the existing northern and southern Brookfield turnout north of its current location to allow for an extended Brookfield siding. A new turnout would also be required to allow for the separation of the DMU and Freight traffic. A detailed evaluation of the alternatives can be found in Appendix B *Ellwood Diamond – VIA Line Grade Separation Alternatives Alignment Study*.

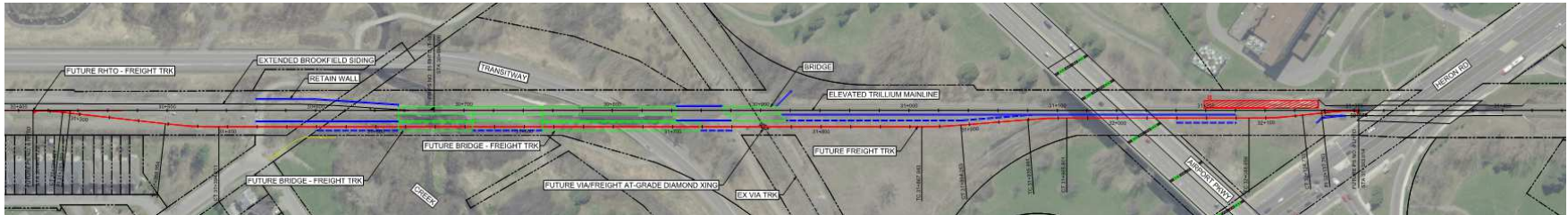


**Figure 2-2: Ellwood Diamond Preferred Design**

Design parameters that will be considered for the overpass include vertical clearance to allow future electrification on the VIA Rail Beachburg subdivision, this standard clearance of 23' (7010 mm) will be provided across the width of VIA's Right of Way (ROW). The grade separation structure will not infringe on the VIA ROW, hence VIA has the width of their ROW to implement future double tracking.

Existing Transitway and Sawmill Creek crossing structures will be reconstructed to allow for the new elevated DMU-only line. New crossing structures will need to be built over the Transitway and Sawmill Creek for the new Freight-only line. These new structures will be built in a way to preserve pedestrian connectivity currently allowed by the Brookfield elevated pathway connecting to the Sawmill Creek pathway.

Since the demand for Freight traffic is presently null, the construction of the Freight-only line tracks, the new turnout and the new crossing structures would be postponed until such a demand is made to Capital Railway. Appropriate federal approvals will be sought at that time for the Freight line and approval of the Freight line is not being sought in this EPR. Constructing the turnout at a future date will cause only limited service shut down to the Trillium Line and coordination with VIA Rail services.



**Figure 2-3: Ellwood Diamond Preferred Design**



## 2.2 Updated Existing Conditions

### 2.2.1 Archaeology

Much of the area within the Ellwood Diamond has been visibly disturbed by past construction and grading episodes (). However, there are two areas located west of the VIA track on either side of the elevated Trillium mainline that cannot be confirmed as disturbed. If disturbed, these two areas are subject to Stage 2 archaeological assessments as recommended in the Stage 2 Archaeological Assessment report (CTP2, 2018) for the Trillium Line.



**Figure 2-4: Archaeological Potential**

### 2.2.2 Cultural Heritage

There are no cultural heritage landscapes identified with the Ellwood Diamond.

### 2.2.3 Geo-environmental

Five (5) geo-environmental boreholes in the vicinity of the Ellwood Diamond were advanced as part of the subsurface investigation. A total of 10 soil samples were submitted from these boreholes for analysis of one (1) or more of the contaminants of concern (COCs), which included metals, polycyclic

aromatic hydrocarbons (PAHs), petroleum hydrocarbons (PHCs), volatile organic compounds (VOCs) and salt.

Soil samples from three (3) of the five (5) boreholes had a metal parameter, specifically Vanadium, present at concentrations exceeding the applicable MECP Site Condition Standard (SCS). This was the only parameter detected in the soil at concentrations above the SCS. The soil samples with elevated Vanadium were collected from fine-grained deposits classified as silty clay to clay. These elevated Vanadium concentrations are likely naturally occurring as the fine-grained Champlain Sea deposits found throughout Eastern Ontario have naturally elevated concentrations of select metals, including Vanadium.

#### **2.2.4 Natural Sciences – Aquatic**

At the Ellwood Diamond grade separation, as well as downstream, the channel banks and riparian habitat of Sawmill Creek have been unaltered. Habitats consist of open grassed areas surrounded by woody vegetation along the west bank and dense, mature deciduous trees and shrubs along the east bank. The west channel bank is unstable based on the evident slumping. The east bank is less steep, and during field investigations, appeared to be an area of sediment deposition as the bank was composed entirely of soft muck/clay. A corrugated steel pipe (CSP) outlet was observed during field investigations along the east bank which resulted in a small inundated channel between the outfall and Sawmill Creek. At the proposed alternative alignment crossing, the morphology is a low gradient run that is 9.5 m wide (wetted) and 0.55 m deep. The substrate within the run consists primarily of silt, sand and clay along with scattered cobble, boulders and gravel. The fish habitat is limited to the sparse cobble and woody debris along the channel banks and margins.

Fish community information obtained through City Stream Watch background data and the spring survey indicated that the fish community primarily consists of abundant bait/forage fish species, including migratory White Sucker (*Catostomus commersonii*). The spring survey results also indicate that the riffle habitats provide quality spawning habitat for Longnose Dace, Blacknose Dace, Mottled Sculpin, and potentially White Sucker. Background data was also received from the MNRF Kemptville District office which identified non-sensitive fish nursery areas for Carps, Minnows and White Sucker within the general area of the existing O-Train bridge crossing.

#### **2.2.5 Natural Sciences – Terrestrial**

Detailed information on terrestrial data can be found **Appendix C**. A summary of the relevant information extracted from these reports is presented below. As several species have recently been provided with protection under SARA and the ESA 2007, further surveys were carried out within the proposed project area.

### 2.2.5.1 Significant Habitat

Significant Valleylands and Significant Woodlands as identified by the City of Ottawa in Annex 14 are present west of the proposed Ellwood Diamond. Reptile Hibernaculum may be located in stone retaining walls along Sawmill Creek.

### 2.2.5.2 Species at Risk

A total of 14 SAR had habitat present within 50 m of the project area and are listed in Table 2-1 below together with their federal (under the *Species at Risk Act*; SARA) and provincial (under the *Endangered Species Act, 2007*; ESA 2007) statuses, where END – Endangered, \*NAR – Not at Risk, \*\*NS – No Status, THR – Threatened, and SC – Special Concern.

**Table 2-1: Species at Risk Likely to Occur within Ellwood Diamond Project Area**

Species	Status	Individuals Observed
Butternut	END - Federally and Provincially	Yes
Blanding's Turtle	THR – Federally and Provincially	No
Eastern Musk Turtle	THR/SC – Federally and Provincially	No
Milksnake	SC/NAR - Federally and Provincially	No
Snapping Turtle	SC -Federally and Provincially	No
Barn Swallow	THR -Federally and Provincially	No
Canada Warbler	THR/SC – Federally and Provincially	No
Eastern Whip-poor-will	THR – Federally and Provincially	No
Eastern Wood-pewee	SC - Federally and Provincially	No
Wood Thrush	SC - Provincially, THR - Federally	No
Eastern Small-footed Bat	NS/END – Provincially and Federally	No
Little Brown Myotis	END - Provincially and Federally	No
Northern Myotis	END - Provincially and Federally	No
Tri-colored Bat	END - Provincially and Federally	No

*\*NAR - Not at Risk: A species that has been evaluated and found to be not at risk of extinction given the current circumstances*



A total of ten (10) Butternuts were found within the project area. One (1) Butternut was found within the project impact area on lands under provincial jurisdiction. A Butternut Health Assessment (BHA) was completed and confirmed a Category 1 in the advanced stages of disease as a result of butternut canker ("non-retainable"). It may be removed without any further consultation or compensation requirements.

The remaining nine (9) Butternuts are located on federal lands and are within 7 to 81 m of the project footprint. Three (3) individuals are located > 50 m away from the project area, and are unlikely to be impacted by construction or operations. The other six (6) Butternuts are located < 50 m of the project area.

Monarch habitat is available within the proposed project area, however, it is restricted to narrow 10 m wide areas; no large patches of Milkweed were observed within the proposed footprint.

Suitable habitat for Milksnake (Special Concern federally) was identified within 50 m of the boundaries of the Ellwood Diamond during the 2016 field investigations. No herpetofauna were observed within the vicinity of project area during the 2016 field investigations.

One (1) suitable bat roost tree (cavity tree) was found within 50 m of the project area. Analysis of acoustic recordings made on the hand-held recorder did not record SAR bats within the project area.

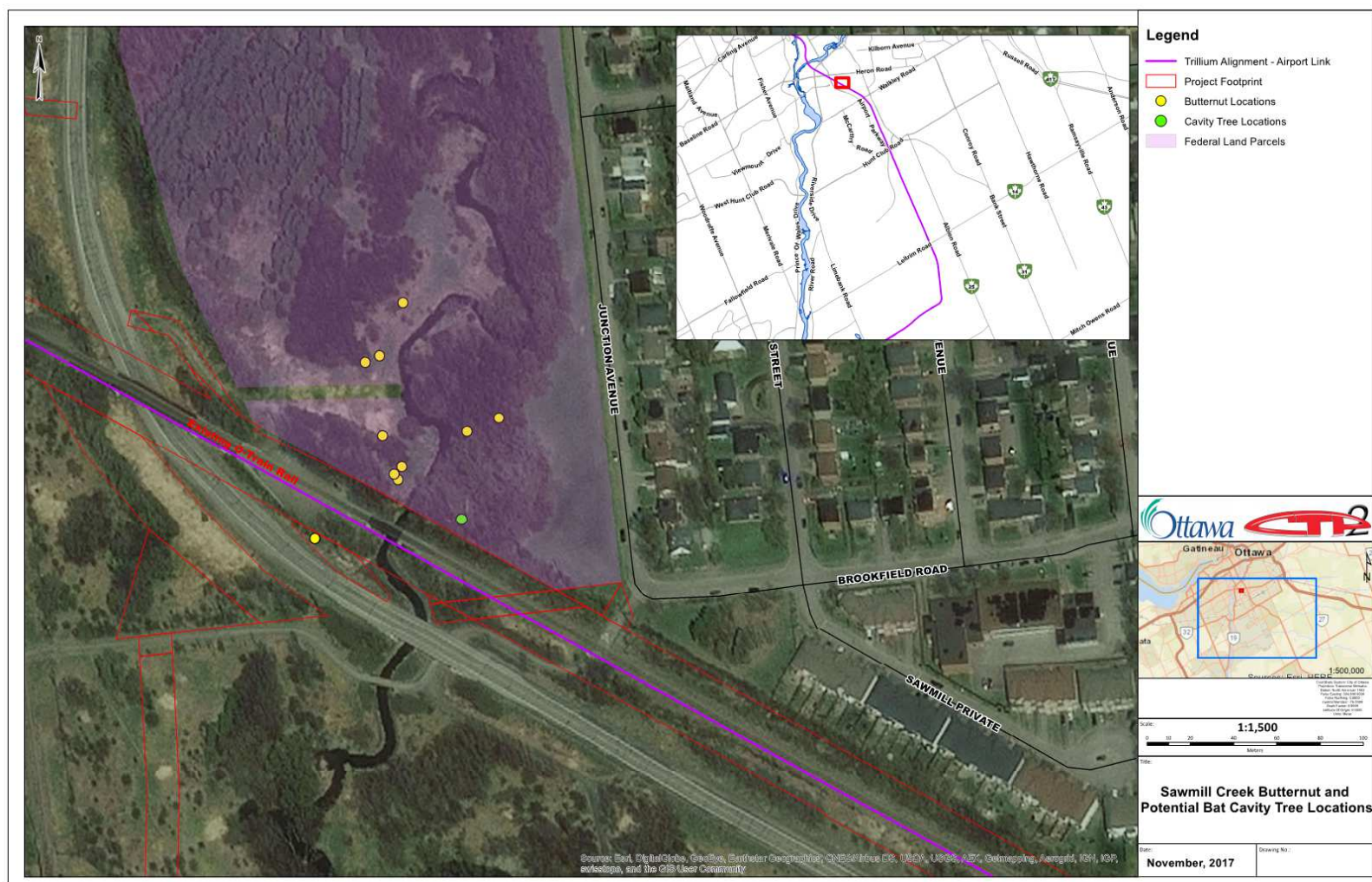


Figure 2-5: Butternuts and Potential Cavity Tree within the Ellwood Diamond Project Area

## **2.2.6 Noise**

### ***2.2.6.1 Construction Noise***

The City of Ottawa Noise Bylaw (2004-253) sets out permitted hours for construction activities in order to control noise disturbance (07:00-22:00 Monday to Saturday, 09:00-22:00 Sunday and holidays). Provincial guidelines (NPC-115, NPC-118) provide limits on construction equipment sound level ratings, but do not include limits for overall noise levels at sensitive receptors.

The US Federal Transit Administration's Transit Noise and Vibration Impact Assessment Guide (the FTA Guide) is widely used as a reference for construction noise and vibration impact assessments. The FTA Guide suggests limits of 80 A-weighted decibels (dBA) Leq, 8hr during daytime/evening (any 8 hour period between 07:00-23:00) and 70 dBA Leq, 8hr during night-time (23:00-07:00) for construction work in a residential area.

Construction noise levels were predicted at noise sensitive areas using reference equipment source levels and estimated equipment quantities for the different stages of construction. The US Federal Highway Administration (FHWA) Roadway Construction Noise Model (FHWA, 2011) was used for this assessment. The estimated equipment quantities used in this assessment are provided in Table 2-2.

**Table 2-2: Construction Equipment List**

Equipment Description	Construction Activities						
	Site Preparation and Utility Relocation	Temp. Staging Roads and Track Diversion	Excavation and Grading	Retaining Walls, Augered Piles – Shoring & Foundations *	Concrete Abutments	Span Installation *	Track Installation
Excavator	1	-	2	1	1	-	1
Backhoe	2	2	2	-	-	-	-
Bulldozer	1	1	1	-	-	-	-
Grader	1	1	1	-	-	-	-
Skid Steers	2	2	2	2	2	-	-
Compaction Machine	1	1	1	-	-	-	-
Crane	1	2	-	1	1	2	2
Piling Rig – Caisson drilling	-	-	-	1	-	-	-
Ballast Regulator	-	1	-	-	-	-	1
Tamper machine	-	1	-	-	-	-	1
Hi-Rail Truck	-	2	-	-	-	-	2
Semi Trucks/hr	-	2	2	2	2	2	2
Concrete Pump Truck	-	-	-	1	1	-	-
Cement Trucks/hr	-	-	-	4	2	-	-
Dump Trucks/hr	1	-	2	-	-	-	-
Generator	1	-	-	-	1	-	-
Vac Truck	1	-	-	-	-	-	-
Vibratory Roller **	-	-	1	-	-	-	1

*Note: It is assumed that piles will be augured, not driven, wherever feasible. Assessment is based on caisson drill rig.*

Results are summarized in Table 2-3 and Table 2-4. Construction noise levels were predicted at the most exposed noise-sensitive receivers for construction equipment operating at the closest expected operating distances.

**Table 2-3: Predicted Construction Noise Levels**

	Location	Setback distance	Site Preparation and Utility Relocation	Temp. Staging Roads and Track Diversion	Excavation and Grading	Retaining walls, augured piles-shoring and foundations	Track Installation	FTA Guideline Daytime Noise Limits
		(m)	dBA	dBA	dBA	dBA	dBA	dBA, $L_{eq, 8hr}$
R01	#110 Sawmill Private, Ottawa	20	80.8	80.4	79.7	77.7	78.3	80
R02	#2511 Junction Avenue, Ottawa	39	79.7	79	78.9	76.4	76.5	80

**Table 2-4: Predicted Construction Noise Levels-Railway Structure**

	Location	Setback distance	Concrete abutments	Span Installation	FTA Guideline Daytime Noise Limits
		(m)	dBA	dBA	dBA, $L_{eq, 8hr}$
R01	#110 Sawmill Private, Ottawa	158	66.2	60.3	80
R02	#2511 Junction Avenue, Ottawa	87	71.3	65.5	80

### **2.2.6.2 Operational Noise**

Under the City of Ottawa's Environmental Noise Control Guidelines, noise control measures shall be investigated if the future sound level is greater than 55 dBA and 5 dB above ambient; or greater than 60 dBA regardless of the increase. Predicted noise levels are assessed at Outdoor Living Areas (OLAs), usually 3 m from the dwelling façade at a height of 1.5 m above ground level based on a 16-hour equivalent average sound level ( $L_{eq, 16hr}$ ) between 07:00 and 23:00.

In accordance with the City's Environmental Noise Control Guidelines, traffic noise levels were calculated using the Ontario Road Noise Analysis Method for Environment and Transportation (ORNAMENT) method, implemented in the STAMSON (version 5.04) software.

To assess the noise impact, the predicted "No Project" noise levels were compared to those of the future predicted "With Project" noise levels. Noise levels in the OLA of the nearest noise sensitive land use areas were calculated to determine if a noise mitigation investigation would be required. Traffic data is summarized in Table 2-5.

**Table 2-5: Traffic Data**

Source	Year	AADT	Daytime Auto/Train	Daytime Medium Truck/Bus	Daytime Heavy Truck	Speed Limit	Day/Night Split
Airport Parkway NB1	2016	14922	12867	858	3	80	92/8
Airport Parkway NB2	2016	14922	12867	858	3	80	92/8
Airport Parkway SB1	2016	15940	13772	891	3	80	92/8
Airport Parkway SB2	2016	15940	13772	891	3	80	92/8
Transit Way NB	2016	497	-	442	-	90	89/11
Transit Way SB	2016	483	-	430	-	90	89/11
O Train	2016	182	-	160	-	70	89/11
Airport Parkway NB1	2031	17323	14938	997	3	80	92/8
Airport Parkway NB2	2031	17323	14938	997	3	80	92/8
Airport Parkway SB1	2031	18506	15989	1034	3	80	92/8
Airport Parkway SB2	2031	18506	15989	1034	3	80	92/8
Transit Way NB	2031	465	-	414	-	90	89/11
Transit Way SB	2031	450	-	401	-	90	89/11
O Train	2031	216	192	-	-	70	89/11

Predicted operational noise levels and impacts are summarized in Table 2-6.



**Table 2-6: Operational Noise Prediction**

ID	Assessed Point of Reception	Existing Noise Level (dBA)-2016	Future Noise Level (dBA)-2031	Noise Impact (dBA)	Mitigation Investigation Requirement (Yes/No)
R01_OLA	#110 Sawmill Private, Ottawa	54.1	54.5	0.4	No
R01_OLA	#2511 Junction Avenue, Ottawa	55.5	55.9	0.4	No

## 2.2.7 Vibration

### 2.2.7.1 Construction Vibration

The FTA Guide recommends a damage criterion of 0.2 in/s (5.1 mm/s) Peak Particle Velocity (PPV) at non-engineered timber and masonry buildings. Where construction vibration levels are above the FTA guide limits, vibration control measures are recommended. Vibration amplitudes below 0.1 mm/s root mean square velocity (RMSV) are typically considered to be imperceptible to humans (ISO, 1985).

Construction vibration impacts were predicted using reference equipment source levels and estimated equipment operations for the different construction sites. The US Federal Transit Administration's Transit Noise and Vibration Impact Assessment guide (FTA, 2006) includes procedures for predicting vibration transmission. These procedures include a distance attenuation equation to estimate vibration levels from reference source levels, which provides a reasonable estimate for a wide range of soil conditions.

Across all site locations and phases of construction, the use of a vibratory roller is anticipated to generate the highest construction vibration levels. The predictable worst case construction vibration levels at the nearest sensitive receivers are presented in Table 2-7.

**Table 2-7: Predicted Construction Vibration**

Location	Setback distance(m)	PPV(mm/s)	RMSV(mm/s)	FTA Threshold mm/s
#110 Sawmill Private, Ottawa	20	1.25	0.31	12.7
#2511 Junction Avenue, Ottawa	39	0.46	0.11	12.7
Tank near #790 Heron Road, Ottawa	28	0.75	0.19	12.7

### **2.2.7.2 Operational Vibration**

Operational vibration impacts have been predicted based on the General Vibration Assessment methodology described in the FTA Guide.

In this project, freight rail lines carry very little traffic (sometimes only one train per week), as such, in accordance with the FTA Guide, criteria may be disregarded. Since the O-train line is being shifted further from residents, the addition of special track work (new switch) is the only change that is expected to result in potential vibration increases.

Table 2-8 summarizes the vibration assessment results at the closest sensitive receptors for existing and future conditions.

**Table 2-8: Predicted Operational Vibration**

Assessed Point of Reception	Distance (m)	Existing RMSV (VdB re 1 µ-inch/s)	Future RMSV (VdB re 1 µ-inch/s)	FTA Threshold (VdB re 1 µ-inch/s)
#132 Sawmill Private, Ottawa	33	75.6	85.6	72

### **2.2.8 Air Quality**

The Ellwood Diamond crossing is located in close proximity to existing traffic arteries including, most prominently, the Airport Parkway, Heron Road, and the OC Transpo Bus Express Transitway. Impacts to the local air quality include traffic emissions from these three major arteries and emissions from diesel multiple unit (DMU) trains currently operating along the Trillium LRT and VIA/CN rail lines.

The current track at grade crossing orientation may result in potential scheduling conflicts between crossing VIA rail, CN rail, or Trillium Line trains.

During this time a waiting train may be forced to remain stationary which would release idling engine emissions while the other train is crossing.

### **2.2.9 Property**

The City of Ottawa purchased the “Ellwood Diamond Lands” from CP and the St. Lawrence and Ottawa Railway Company under an agreement that was signed March 21, 2005 that is referred to as the “City-CP Agreement”. Under this agreement, the City also assumed CP obligations for the continued operation and maintenance of the Interlocking and Diamond.

The City-CP Agreement includes the City’s agreement to ensure that VIA, Canadian National (CN) and CP continue, in perpetuity, to have common crossing rights at the Ellwood Diamond Lands at all times, including without limitation, in the event of termination of the Agreement or if the City constructs a grade separation crossing. The grade separations discussed ensure that those crossings rights are preserved.

Lands will also be required from Public Services and Procurement Canada (PSPC) in order to build the new proposed parallel freight-only corridor.

### **2.2.10 Pedestrian Movement**

The Brookfield Pathway runs between Walkley Road and Brookfield Road. The path continues from the Walkley OC Transpo transit station, then swings west towards Airport Parkway, follows the Parkway and then comes back to the path where Brookfield Road is interrupted by the Parkway, the Transitway and the O-train.

### **2.2.11 Drainage and Stormwater Management**

Stormwater runoff from Guideway sections shall be collected in trackside ditches, perforated underdrain pipes, or storm sewers. Runoff from raised Guideway at structures, shall be conveyed by gutter systems to inlets that discharge to SWM facilities. Runoff from raised Guideway on an embankment, will be discharged along the embankment as sheet flow to prevent erosion, before discharging to SWM facilities.

## **2.3 Assessment and Evaluation of Impacts**

This section describes potential effects of the project and the proposed mitigation measures including planning decisions, design features, and construction requirements, in order to reduce potential negative effects.

### **2.3.1 Archaeology**

#### **Potential Effects**

Construction could disturb archaeological resources.

### **Proposed Mitigation**

The parcels of land identified as having potential for containing archaeology resources in the Stage 1 Archaeology Assessment of the Ottawa Light Rail Trillium Line must be subject to a Stage 2 test pit survey prior to any ground disturbance as per the Standards and Guidelines for Consultant Archaeologists.

### **Monitoring**

The effectiveness of the proposed mitigation measures will be monitored/verified in accordance with the Stage 2 and 3 Archaeological Assessments to be completed.

## **2.3.2 Geo-Environmental**

### **Potential Effects**

The excavation and management of fine-grained soil with naturally elevated metals, specifically Vanadium, may be exposed during construction.

### **Proposed Mitigation**

Vanadium is naturally elevated in soils in the Ottawa region, there are no foreseeable effects to humans, terrestrial or aquatic wildlife or water courses during construction. No further mitigation is recommended.

## **2.3.3 Natural Sciences – Aquatic**

### **Potential Effects**

Direct impacts to fish and fish habitat are anticipated to occur as a result of the following project works for the freight line, if needed, in the future:

- new track alignment for approximately 20 m downstream of existing O-Train bridge;
- construction of piers and/or abutments below the high water mark for the crossings over Sawmill Creek;
- possible slope stabilization as required by a geotechnical study within the banks of Sawmill Creek; and
- construction and operation of new alignment crossing at Sawmill Creek.

Indirect impacts to nearby fish and fish habitat may result due to the following proposed works for the freight line, if needed, in the future:

- construction of new track within 30 m of Sawmill Creek;

- construction of a new retaining wall within 30 m of Sawmill Creek; and
- removal and replacement works associated with raising the existing O-Train bridge that is proposed to be converted to LRT.

As there are no aquatic SAR present within the project limits, the proposed works occurring near Sawmill Creek are not likely to result in direct or indirect impacts to aquatic SAR.

### **Proposed Mitigation**

Mitigation includes development and implementation of the following during construction: Erosion and Sediment Control Plan, Stormwater Management Plan, Environmental Protection Plan, Spills Prevention and Response Plan.

Site-specific mitigation measures include adhering to in-water/channel bank timing window, and complying with additional measures recommended by DFO and Rideau Valley Conservation Authority (RVCA). It is recommended that any new grade separation be designed with abutments located above the high water mark to avoid potential impacts to fish and fish habitat within Sawmill Creek. Any required alterations to slopes/banks of Sawmill Creek shall be completed during low flow conditions.

Upon completion of the detail design, a DFO Self-Assessment must be completed for all works near Sawmill Creek (within 30 m of high water mark) to determine whether the project is likely to result in serious harm to fish, and if a DFO Request for Review needs to be submitted, as per the *Fisheries Act*. Review of updated SAR listings will need to be completed to ensure updated legislation is considered and addressed. In addition, any alterations to the banks and creek proper of Sawmill Creek will require written approval by the RVCA under Ontario Regulation 174/06 "Development, Interference with Wetlands and Alterations to Shorelines and Watercourses Regulation" made pursuant to Section 28 of the *Conservation Authorities Act*. Any habitat offsetting or compensation requirements shall be determined through agency review processes, as necessary.

### **Monitoring**

The effectiveness of the proposed mitigation measures will be monitored/verified in accordance with the developed plans: Erosion and Sediment Control Plan, Stormwater Management Plan, Environmental Protection Plan, Spills Prevention and Response Plan. Additional mitigation measures and monitoring may be required to be carried out in accordance with any permits/permission received with respect to fisheries or SAR, if required.

## **2.3.4 Natural Sciences – Terrestrial**

### **2.3.4.1 Significant Habitat**

#### **Potential Effects**

Significant Valleylands and Significant Woodlands have the potential to be impacted during construction.

#### **Proposed Mitigation**

Impacts to Significant Valleylands and Significant Woodlands should be avoided where possible by keeping the footprint as narrow as possible. Where the work requires the removal of trees or vegetation or impacts slopes, replanting and re-seeding must occur within 45 days, and as per the City of Ottawa Specification F-8041. Additionally, an Edge Management Plan and Erosion and Sediment Control Plans must be developed and implemented to restore the woodland, and protect the slope and remaining woodland.

If the proposed final design impacts the potential Hibernaculum located in stone retaining walls along Sawmill Creek, field surveys should be undertaken to confirm or negate its presence and appropriate mitigation measures developed in consultation with the City of Ottawa and the MNRF.

Replanting and re-seeding must occur within 45 days, and as per OPSS 804 – Construction Specification for Seed and Cover.

#### **Monitoring**

The effectiveness of the proposed mitigation measures will be monitored/verified in accordance with the developed plans: Erosion and Sediment Control Plan and Edge Management Plan. The health of new plantings will be monitored and warranted for 2 years.

### **2.3.4.2 Species at Risk**

#### **Potential Effects**

Six (6) Butternuts are located < 50 m of the project area and may experience temporary indirect impacts during construction, such as erosion, sedimentation, soil compaction, hydrological alteration, and spills.

#### **Proposed Mitigation**

Mitigation measures for Butternuts include:

- For the three (3) trees within 7 m of the proposed works, impacts to the critical root zone (CRZ) can be avoided by installing protection fencing (e.g. orange snow fencing) at the perimeter of the CRZ of each tree.



- For the three (3) trees within 20 to 50 m, avoid indirect impacts through implementation of erosion and sediment control and spill prevention plans, and maintenance of existing hydrology.

### **Potential Effects**

SAR bat habitat may be lost during construction.

### **Proposed Mitigation**

If tree removal is expected within the area of impact, appropriate mitigation and compensation will be required to protect SAR bat habitat that may be impacted by construction. Due to the presence of SAR bats within a few kilometers of the study area (documented during the 2016 and 2017 field investigations), additional acoustic surveys using a stationary monitor are recommended, following the provincial protocol, prior to construction.

### **Monitoring**

The effectiveness of the proposed mitigation measures will be monitored/verified in accordance with the permits received.

## **2.3.5 Noise**

### **2.3.5.1 Construction Noise**

#### **Potential Effects**

Temporary construction noise impacts are anticipated to be lower than FTA Guideline levels at the assessed points of reception, except during site preparation and utility relocation construction activities.

For site preparation and utility relocation construction activities, the potential zone of impact where noise levels would be slightly higher than the daytime limit of 80 dBA extends to a distance of 21 m from the equipment. The potential zone of impact where noise levels would be higher than the night time limit of 70 dBA extends to a distance of 70 m from the equipment. It should be noted that the actual construction noise levels are expected to be lower than predicted levels since the predictions are based on simultaneous operation of all equipment at single location. In actuality, construction equipment would not be in simultaneous operation and would be distributed around the construction site.

#### **Proposed Mitigation**

Construction to be carried out with City of Ottawa Noise By-Laws.

## **Monitoring**

The effectiveness of the proposed mitigation measures will be monitored/verified in accordance with the City of Ottawa Noise by-laws and measures identified in the Noise and Vibration Control Plan.

### **2.3.5.2 Operational Noise**

#### **Potential Effects**

Marginal increases in operational noise levels are predicted at the assessed points of reception. The noise impacts are generally anticipated to be insignificant.

#### **Proposed Mitigation**

No mitigation is required as a result of the insignificant impact of future operational noise.

## **2.3.6 Vibration**

### **2.3.6.1 Construction Vibration**

#### **Potential Effects**

All PPVs are predicted to be lower than FTA threshold of 5.1 mm/s (for non-engineered timber and masonry buildings). Root mean square velocity (RMSV) levels from operation of a vibratory roller are predicted to be above the threshold of human perception (0.1 mm/s). As such, nearby building occupants may be able to feel some vibrations.

#### **Proposed Mitigation**

No mitigation is required during construction as vibration is not anticipated to cause any cosmetic or structural damage and is expected to be perceptible.

### **2.3.6.2 Operational Vibration**

#### **Potential Effects**

Predicted vibrations are above the guideline limits for both existing and future scenarios. A 10 VdB increase is predicted based on the introduction of a new switch, which is a significant increase. Vibration mitigation is recommended for residential receptors where vibration levels from frequent events exceed 72 VdB (re 1 micro-inch/sec) root mean square velocity (RMSV), which equates to around 0.1 mm/s. This level corresponds to the threshold of perceptibility.

### **Proposed Mitigation**

The required vibration reduction magnitude would typically be achieved by installing ballast mats, but it is recommended that further analysis is undertaken during detailed design to verify the vibration isolation requirements.

Since these impacts are linked to the future construction of the freight-only line, public consultation on the implementation of vibration mitigation measures should take place at a future date when there would be demand for this line to be built. Mitigation measures proposed will have to meet the current vibration regulations and best practices at the time of construction.

### **Monitoring**

The effectiveness of the proposed mitigation measures will be monitored/verified in accordance with the developed plans, if required, at a future date in accordance with the CTA permit and approval requirements.

## **2.3.7 Air Quality**

### **Potential Effects**

Construction activities which potentially prove most impactful to the local air quality include, but are not limited to:

- Clearing and grubbing;
- Grading and rock blasting;
- Road and surface paving;
- Storage of granular material;
- Structure construction/deconstruction; and
- Mobile on-site equipment.

### **Proposed Mitigation**

Exposure to construction related emissions can be mitigated by the following Best Management Practices:

- Dust Control Plan
- Environmental Protection Plan
- Erosion and Sediment Control Plan

### **2.3.8 Property**

#### **Potential Effects**

Permanent lands will be required from PSPC for the construction of the freight-only line. Temporary lands requirements will also be required to allow for the Trillium Line Grade separation construction.

#### **Proposed Mitigation**

The City will continue discussion for land acquisition with PSPC. Through the current crossing agreement, the City will also continue discussion with VIA Rail to ensure that the proposed grade separation of Trillium Line crossing and future at-grade freight-line crossing meet its legal obligations regarding VIA Rail operational requirements.

#### **Potential Effects**

Use of the Trillium Line alignment by freight trains, as per an agreement with Transport Canada may be disrupted.

#### **Proposed Mitigation**

Integration of the requirements for a future freight-u preliminary design and assessment of this project component.

#### **Potential Effects**

The grade separation should consider the potential for future electrification of the VIA line.

#### **Proposed Mitigation**

Design the grade separation to allow for appropriate accommodation of future electrification. The Beachburg subdivision is considered as a mix traffic line (freight and passenger). CP/CN have running right that will need to be considered during detailed design in consultation with CN/CP.

#### **Monitoring**

The effectiveness of the proposed mitigation measures will be monitored/verified in accordance with the developed plans, if required, at a future date in accordance with the CTA permit and approval requirements.

### **2.3.9 Pedestrian Movement**

#### **Potential Effect**

There will be temporary disturbances to the Brookfield pathway during construction works.

### **Proposed Mitigation**

A Pedestrian Management Plan will be required which considers pedestrian and cycling impacts. Any detours or pathway closures will be clearly marked with signs.

### **Monitoring**

The effectiveness of the proposed mitigation measures will be monitored/verified in accordance with the Pedestrian Management Plan.

## **2.3.10 Drainage and Stormwater Management**

### **Potential Effect**

Modification to stormwater inputs of the existing system.

### **Proposed Mitigation**

All Guideway drainage shall discharge to SWMPs that provide water quantity control for all events up to and including the 100-year storm and that provide water quality control to meet MECP “Enhanced” Standard (80% TSS Removal) before discharging to outlet locations. Peak runoff rates shall be controlled to pre-development conditions as per the City of Ottawa Sewer Design Guidelines (section 3.2.2 and 8.3.7).

### **Monitoring**

The effectiveness of the proposed mitigation measures will be monitored/verified in accordance with any ECA requirements.

## **2.4 Consultation**

Public delegations were present at the City of Ottawa February 24, 2017 Finance and Economic Development Committee (FEDCO) meeting at which the Stage 2 Light Rail Transit Implementation – Project Definition and Procurement Plan report, that included details about the proposed Walkley Yard location, was tabled.

Further to this, a public information session occurred on March 1, 2017 discussing various Stage 2 topics, including the proposed bridge and grade separation at Ellwood Diamond and the proposed Walkley Yard location. The public information session was broadcasted live on Facebook and held in person at Ottawa City Hall and the Hunt Club-Riverside Park Community Centre.

The Stage 2 report was approved by FEDCO and subsequently by Council on March 8, 2017. The report and associated materials are available at Ottawa.ca or on the project website at [www.stage2lrt.ca](http://www.stage2lrt.ca) and contained in **Appendix D**.

## **2.5 Significance**

No significant residual environmental effects are expected following the application of identified mitigation measures. The majority of these impacts will happen for short-term periods during construction, which is considered a reversible effect.



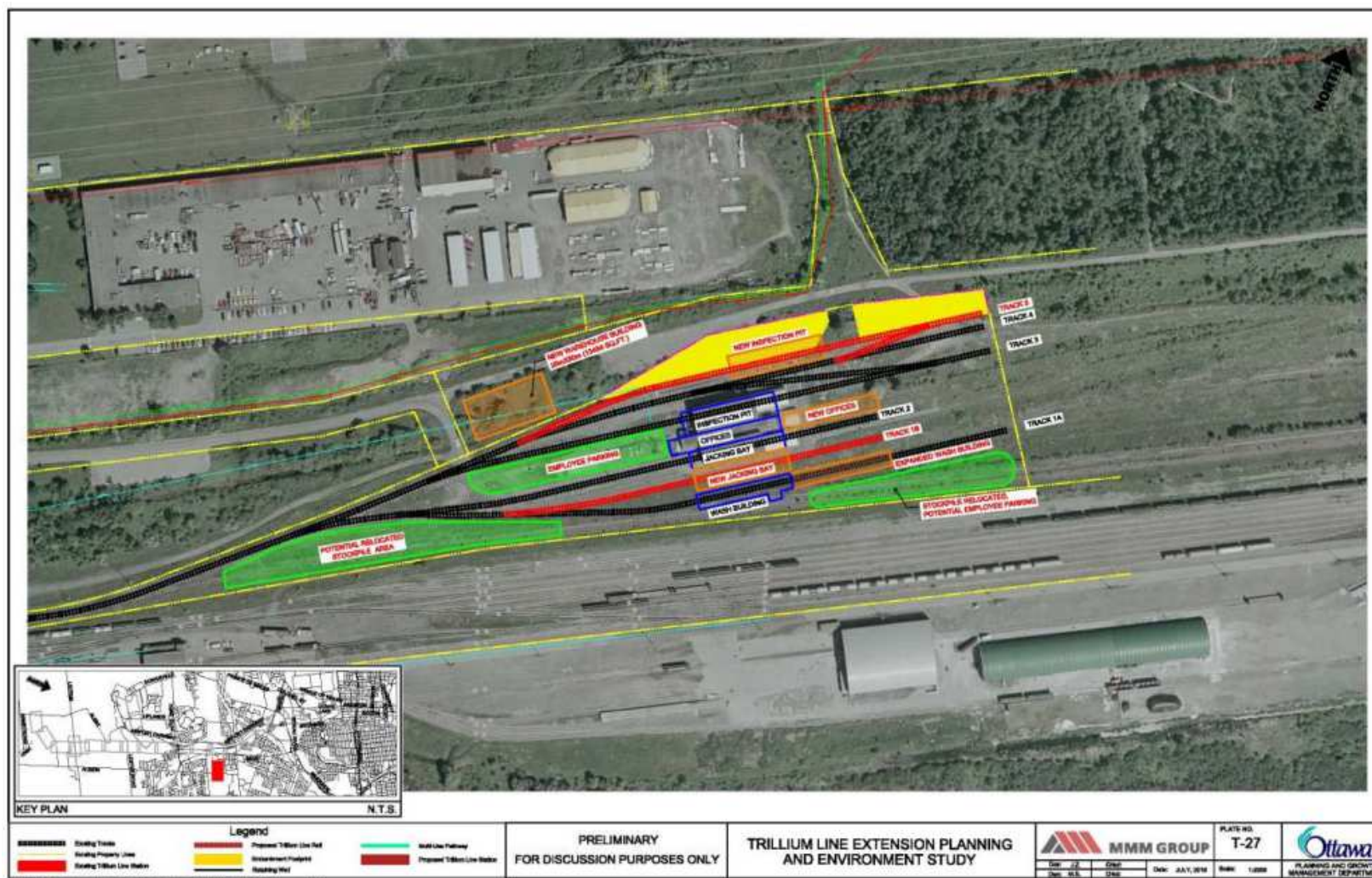
### **3. WALKLEY YARD**

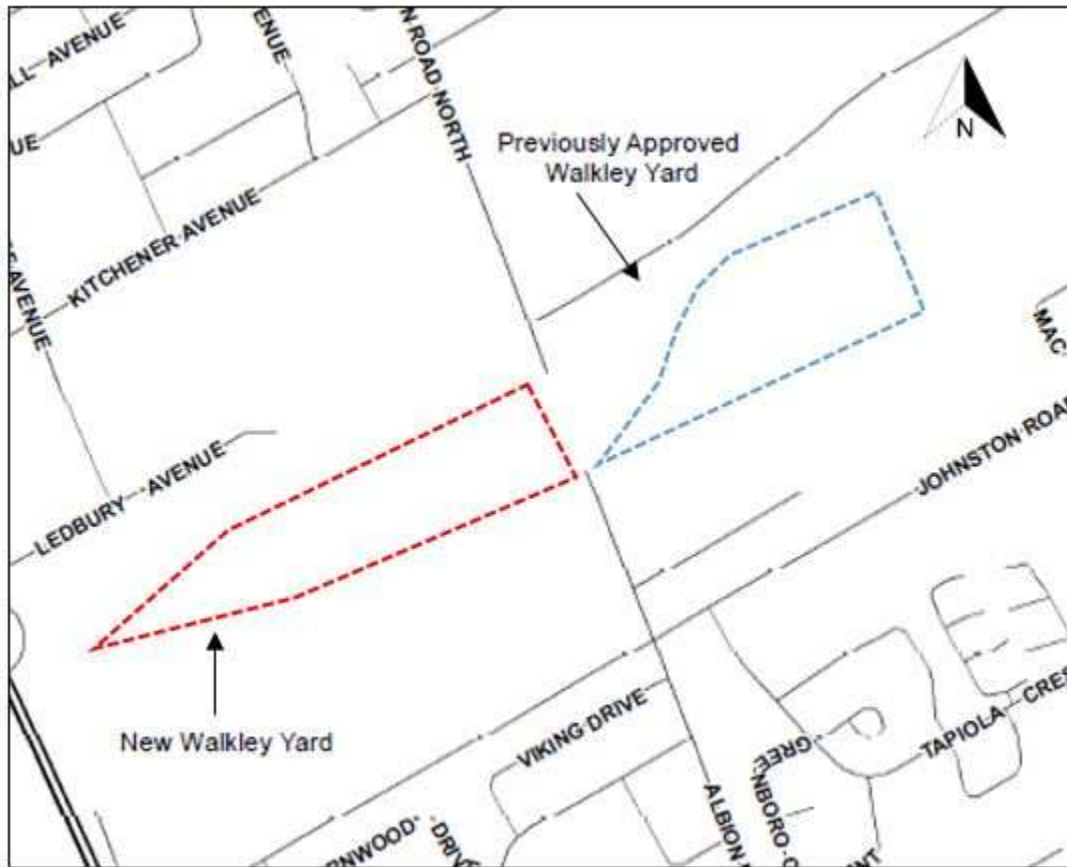
The TLS extension plan contained within the 2016 TLS EPR includes an expanded Walkley Yard Maintenance and Storage Facility (MSF) sized to accommodate the increased number of DMU trains, maintenance activities and staff required to operate a lengthened service.

#### **3.1 Description of and Reason for the Change**

The current Walkley Yard MSF is a collection of outdated buildings with no consolidated storage space, and was deemed to have limited overall functionality for rail car maintenance. The previously approved expanded Walkley Yard adjacent to existing buildings as per the 2016 EPR, included: a new jacking bay immediately south of the existing bay; a new inspection pit and storage tracks north of the existing pit; a new train wash building east of the existing building; and additional office space east of the existing office (Figure 3-1). To accommodate track relocations, 0.5 ha of additional land would have been required north of the existing yard and subject to a City purchase option.

Upon further assessment, it was determined that the construction of a new MSF on City-owned land, west of Albion Road, would be preferred to renovating and expanding the existing Walkley Yard MSF (Manconi, 2017). The analysis suggests that when property acquisition and potential remediation costs at the current Walkley Yard are factored in with the extensive retrofitting required at the existing facility, the alternative site west of Albion Road is less costly and provides the most opportunity for an innovative and efficient MSF design (CTP2, 2016b). As such, the City is proposes to build a new MSF on land it owns to the west of the current MSF. This option is preferable to the previously approved Walkley Yard given the property cost of leasing or purchasing the existing site, in addition to the potential remediation risks and costs related to expanding the existing facility (Figure 3-2).





**Figure 3-2: Revised Walkley Yard Location**

The new Walkley Yard MSF will accommodate up to 18 trains, using an additional 0.5 ha of property from lands north of the yard on which the City already holds an option. A separate jacking bay, a new inspection pit, additional storage tracks and additional office space will be constructed (**Error! Reference source not found.**). The site will be fully secured with perimeter fencing and access will be controlled. An acoustic wall is planned to be built on the north side of the facility to mitigate any potential environmental noise impacts.

The proposed site currently contains rail but does not contain any existing buildings that would need to be removed, thus providing the successful proponent with more flexibility in the design and layout of the MSF.





Figure 3-3: New Walkley Yard MSF

## 3.2 Updated Existing Conditions

### 3.2.1 Archaeology

A Stage 1 Archaeology Assessment was completed on the Walkley Yard land (CTP2, 2017e). All of the lands to the south of these parcels are disturbed with no archaeological potential. A Stage 2 Archaeological Assessment was conducted in the fall of 2017. All lands were determined to be disturbed by past rail yard activities and grading (CTP2, 2018).

### 3.2.2 Cultural Heritage

There are no cultural heritage landscapes identified at Walkley Yard.

### 3.2.3 Geo-Environmental

The proposed Walkley Yard location, is underlain by Middle Ordovician aged limestones of the Verulam Formation (Ottawa Group), and mixed limestone and shale of the Carlsbad and Billings Formations.

Pockets of contamination were found present in the vicinity of the proposed Walkley Yard, as select PHC, metal, and VOC parameters were detected in soil at concentrations above the MECP Table 1 Standards. Additionally, groundwater from one (1) monitoring well reported a PHC Fraction 2 (F2) concentration in exceedance of the applicable SCS (CTP2, 2017d).

### 3.2.4 Natural Sciences – Aquatic

A tributary to Sawmill Creek is located along the northern part of the property for both the existing and proposed site. West of Albion Road North are two (2) City of Ottawa parks including Clifford Allen Park adjacent to Albion Road and Ledbury Park adjacent to Bank Street. The tributary is conveyed through two (2) culverts along this channel segment including one (1) culvert under Albion Road North on Capital Rail property and one (1) culvert under the Capital Rail property entrance east of Albion Road North. The fish habitat at the proposed Walkley Yard has been classified as “Low” sensitivity and it is a channelized drainage channel with limited habitat diversity (CTP2, 2016a).

### 3.2.5 Natural Sciences – Terrestrial

Detailed information on terrestrial data can be found **Appendix C**. A summary of the relevant information extracted from these reports is presented below.

#### 3.2.5.1 Significant Habitat

Natural Heritage System as identified by the City of Ottawa – An Urban Natural Feature (Figure 3 of City of Ottawa’s Urban Natural Areas Report, 2005) is documented to be present immediately south of the proposed

Walkley Yard, but it has since been disturbed and is no longer present. A floodplain is shown to be within the west side of project footprint according to Annex 14 of the City of Ottawa's Official Plan.

The following Significant Wildlife Habitat (Figure 3-4) may be present adjacent to boundaries of the proposed Walkley Yard:

- Bat Maternity Colonies – may be present within treed area north of the site; and
- Shrub/Early Successional Bird Breeding Habitat – may be located immediately north of the proposed project footprint, and approximately 60 m south of the site.





Figure 3-4: Natural Areas

### 3.2.5.2 Species at Risk

A total of 14 SAR had habitat present within 50 m of the project area and are listed in Table 3-1 below together with their federal (under the SARA) and provincial (under the ESA 2007) statuses, where END – Endangered, \*NAR – Not at Risk, \*\*NS – No Status, THR – Threatened, and SC – Special Concern.

**Table 3-1: Species at Risk Likely to Occur within Walkley Yard Project Area**

Species	Status	Individuals Observed
Butternut	END - Federally and Provincially	No
Blanding's Turtle	THR – Federally and Provincially	No
Eastern Musk Turtle	THR/SC – Federally and Provincially	No
Milksnake	SC/NAR - Federally and Provincially	No
Snapping Turtle	SC -Federally and Provincially	No
Barn Swallow	THR -Federally and Provincially	Yes
Canada Warbler	THR/SC – Federally and Provincially	No
Eastern Whip-poor-will	THR – Federally and Provincially	No
Eastern Wood-pewee	SC - Federally and Provincially	No
Wood Thrush	SC -Provincially, Threatened - Federally	No
Eastern Small-footed Bat	NS/END – Provincially and Federally	No
Little Brown Myotis	END - Provincially and Federally	No
Northern Myotis	END - Provincially and Federally	No
Tri-colored Bat	END - Provincially and Federally	No

*\*NAR - Not at Risk: A species that has been evaluated and found to be not at risk of extinction given the current circumstances*

Suitable habitat for Milksnake (Special Concern federally) was identified within 50 m of the boundaries of the proposed Walkley Yard during the 2016 field investigations. No herpetofauna were observed within the vicinity of project area during the 2016 field investigations, however, the creek on-site may be used as a migratory passage way for turtles as it is hydrologically connected to Sawmill Creek.

No Monarch (Special Concern federally and provincially; federally being considered for Endangered status) caterpillars or adults, were observed during the 2016 field investigations. Small areas containing Common Milkweed (*Asclepias syriaca*), a plant species which supports the breeding habitat of Monarch, as well as patches of native wildflowers to support foraging, were observed within the ROW along the proposed Walkley Yard project area. As these plants were observed only within the ROW and in low densities, this area would be considered to provide low breeding potential for Monarch, and therefore, impacts to Monarch habitat are considered insignificant as a result of the construction works proposed in this project area.

During field investigations in 2016, no Butternuts (Endangered federally and provincially) were found within 50 m of the boundaries of the proposed Walkley Yard.

Two (2) inactive Barn Swallow nests were observed in a box culvert approximately 130 m west of Bank Street.

A total of 24 potential SAR bat roost trees were found within 50 m of the proposed Walkley Yard. Analysis of acoustic recordings made on the hand-held recorder did not record SAR bats within the project area, however, stationary acoustic surveys during June are required to confirm potential maternity roosting as per MNRF protocols.

### **3.2.6 Noise**

#### **3.2.6.1 Construction Noise**

The City of Ottawa noise bylaw (2004-253) sets out permitted hours for construction activities in order to control noise disturbance (07:00-22:00 Monday to Saturday, 09:00-22:00 Sunday and holidays).

Provincial guidelines (NPC-115 and NPC-118) provide limits on construction equipment sound level ratings, but do not include limits for overall noise levels at sensitive receivers.

The US Federal Transit Administration's Transit Noise and Vibration Impact Assessment Guide (the FTA Guide) is widely used as a reference for construction noise and vibration impact assessment. The FTA Guide suggests limits of 80 dBA Leq,8hr during daytime/evening (any 8 hour period between 07:00-23:00) and 70 dBA Leq,8hr during night-time (23:00-07:00) for construction work in a residential area for detailed assessment purposes.



### **3.2.6.2 Operational Noise**

A preliminary review of the environmental noise levels from the proposed Walkley Yard MSF was completed. This review was accomplished using the Environmental Noise Guideline – Stationary and Transportation Sources – Approval and Planning (NPC-300).

Noise from facility sources such as fans, HVAC, compressors, and open bay doors was sourced from past AECOM projects for MSFs of public transit rail vehicles. Roof top equipment (HVAC and exhaust fans) quantities were scaled based upon the square footage of the buildings at the Facility, relative to the square footage of the buildings from the other AECOM projects. Compressors were assumed to be drawing air from a roof top intake.

The DMU noise level was sourced from the FTA guide. Noise from crossovers was calculated based upon reference base noise levels for a DMU, with a correction applied from the Nordic Prediction Method for Rail Traffic Noise (published by SP Swedish National testing and Research Institute, 2001) – NORD 2000. 18 DMU sets were including in the modeling and were assumed to travel at 10 km/h while moving at the Facility. The DMUs were modeled in five different scenarios:

1. All vehicles deploying in a single hour;
2. Half vehicles deploying in a single hour;
3. All vehicles returning in a single hour;
4. Half vehicles returning in a single hour; and
5. Normal maintenance operations

Noise sources and building geometry were input into a noise prediction model and noise levels were predicted at the worst case noise sensitive receptor location (east end of Ledbury Avenue) using the International Organization for Standardization (ISO) 9613 noise prediction algorithm. Results of the noise analysis indicated that the noise levels are predicted to range from 55 dBA to 59 dBA at the worst case receptor location, exceeding the base noise level limits in all time periods.

### **3.2.7 Air Quality**

The existing air quality from the current Walkley Yard location is impacted by diesel trains entering the yard for maintenance and other maintenance-related activities such as re-fueling or welding. The nearest receptor is a residential community to the south of the existing location, approximately 30 meters from the property line. Trains entering the yard for maintenance are expected to contribute negligible emissions during low notch speed travel into the yard and upon arrival, they will turn off their engines, to minimize any emissions from engine idling.

### **3.2.8 Property**

The current Walkley Yard location is leased by the City of Ottawa, The lease expires on December 31, 2021, with options to extend for four (4) additional terms of five (5) years to December 31, 2041. Expansion and renovation/remediation of the current Walkley Yard site would have also required the City to acquire an additional 0.5 ha of land.

The proposed Walkley Yard site is located on lands currently owned by the City of Ottawa, however some additional lands from CN/CP will be required.

### **3.2.9 Stormwater Management**

The proposed construction of the Walkley Yard MSF will require new 600 mm diameter storm sewers. The sewers will run in a southwesterly direction outletting to a tributary of Sawmill Creek on the north. Quantity attenuation will be provided by an underground storage. For storms greater than the 1:5 year event, the storage volume could be stored on the surface. The required storage volume for the 1:5 year and the 1:100 year events are 160 m<sup>3</sup> and 440 m<sup>3</sup> respectively.

## **3.3 Assessment and Evaluation of Impacts**

This section describes potential effects of the project and the proposed mitigation measures including planning decisions, design features, construction requirements and construction constraints, in order to reduce potential negative effects.

### **3.3.1 Archaeology**

#### **Potential Effects**

All lands were determined to be disturbed by past rail yard. No archaeological effects are anticipated (CTP2, 2018).

#### **Proposed Mitigation**

None required.

### **3.3.2 Geo-Environmental**

#### **Potential Effects**

During construction, soil containing elevated concentrations of PHC, metals and VOC contamination may be disturbed. These can be harmful to human health, aquatic habitats and terrestrial wildlife. PHCs and VOCs can be harmful to construction workers via multiple exposure pathways, including through contact, inadvertent ingestion and inhalation.

### **Proposed Mitigation**

The contractor is responsible for completing an assessment of risk with respect to contamination to determine that the contamination does not represent a risk to human health or the environment. The contractor will implement any management or remedial measures as are required to ensure that any contamination continues to not represent a risk to human health or the environment.

### **Monitoring**

The effectiveness of the proposed mitigation measures will be monitored/verified in accordance with the risk assessment.

## **3.3.3 Natural Sciences – Aquatic**

### **Potential Effects**

Indirect impacts to nearby fish and fish habitat may result due to construction of new track within the yard, construction of maintenance, inspection and washing facilities; and construction and installation of new stormwater management (SWM) features within yard.

Based on the preliminary design of the Walkley Yard MSF, indirect impacts to nearby fish and fish habitat may result due to the following proposed works:

- construction of new track within the yard;
- construction of maintenance, inspection and washing facilities; and
- construction and installation of new SWM features within yard.

It should be noted that the proposed works occurring near watercourses along the Walkley Yard MSF are not likely to result in direct or indirect impacts to aquatic SAR as there are no aquatic SAR present or potentially present within the proposed Walkley Yard project limits (CTP2, 2016a).

The construction and operation of the yard is within 30m of the water course and may affect the riparian edge and health of the watercourse.

### **Proposed Mitigation**

#### **Refueling**

- Underground fuel storage tanks require registration, installation and inspection in accordance with the Ontario Technical Standards and Safety Authority and the Technical Standards and Safety Act.
- The location of the UST during detailed design shall consider the maximizing setback from Creek to the extent possible.

Encroachment – In order to limit, to the extent possible, impacts to the Creek and associated riparian vegetation, Project Co will consult with the RVCA during detailed design, taking into consideration the following:



- Development and implementation of an Erosion and Sediment control plan.
- Extending the noise wall to the east with a barrier wall to provide a physical protection to the riparian edge.
- Relocation/reduce footprint of the existing layout of the roadway through moving the road to the opposite side of the building or narrowing to the greatest extent possible.
- Use of a noise wall and not a berm to limit encroachment of the noise wall within the existing riparian buffer.
- Avoidance of the riparian area during construction through adequate delineation (i.e. exclusion fencing) and reinstatement of any disturbed areas following construction
- Enhancement / restoration /expansion of the north and south riparian zones to offset encroachment through the use of measures such as: bank stabilization, native tree and shrub planting, removal of invasive species.
- Creek protection from impacts due to snow removal and general site maintenance, either physical or operational.

Mitigation includes development and implementation of the following during construction: Erosion and Sediment Control Plan, Stormwater Management Plan, Environmental Protection Plan, Spills Prevention and Response Plan. Any work carried out that results in alteration (i.e. straightening, diverting), or interference of the adjacent tributary of Sawmill Creek must be approved under *O.Reg. 174/06*: Rideau Valley Conservation Authority: Regulation of Development, Interference with Wetlands and Alterations to Shorelines and Watercourses (CTP2, 2016a).

### **Monitoring**

The effectiveness of the proposed mitigation measures will be monitored/ verified in accordance with the developed plans: Erosion and Sediment Control Plan, Stormwater Management Plan, Environmental Protection Plan, Spills Prevention and Response Plan. Additional mitigation measures and monitoring may be required to be carried out in accordance with any permits/permission under *O.Reg 174/06*.

## **3.3.4 Natural Sciences – Terrestrial**

### **3.3.4.1 Significant Habitat**

#### **Potential Effects**

Indirect impacts to potentially Significant Successional Bird Breeding Habitat may occur during construction.

### **Proposed Mitigation**

Avoid infringement on lands immediately north of the proposed project footprint, and approximately 60 m south of the site. Refer to species/habitat specific mitigation measures to be considered in permitting related to bats

### **Potential Effect**

The Urban Natural Feature will be avoided as it is over 500 m from the proposed project footprint and no effects are anticipated.

### **Proposed Mitigation**

None required.

### **3.3.4.2 Species at Risk**

#### **Potential Effects**

Barn Swallows (threatened under SARA and ESA 2007)

#### **Proposed Mitigation**

Carry out surveys prior to construction to verify if Barn Swallow nests are active within all culverts in the project area. If active Barn Swallow nesting is present, and the culvert must be altered or removed, registration under *O.Reg. 242/08* will be required prior to construction. If the culvert is left as is, then work should not be carried out within 50 m during their breeding period (15 May to 01 Sept.).

#### **Potential Effects**

General construction activities may potentially impact local wildlife, resulting in avoidance of the area or disruption by construction activities.

#### **Proposed Mitigation**

Mitigation includes development and implementation of the following during construction: Environmental Protection Plan, Wildlife Management Plan, and Spills Prevention and Response Plan.

#### **Potential Effects**

SAR bat habitat may be lost during construction.

#### **Proposed Mitigation**

To avoid impacts to SAR bats and their habitat the following measures should be carried out prior to construction:

- conduct further acoustic surveys following provincial protocols to determine if SAR bats are present;

- if SAR bats are present, consult with the MNRF on regulatory obligations;
- restrict tree removal to the species' inactive season (01 Oct – 01 May);
- do not remove or disturb any potential roost trees without prior approval from the MNRF; and
- do not allow lighting to spill into wooded areas with known maternity roosts between 15 May and 15 July.

### **Monitoring**

The effectiveness of the proposed mitigation measures will be monitored/verified in accordance with the developed plans: Erosion and Sediment Control Plan, Stormwater Management Plan, Environmental Protection Plan, Wildlife Management Plan, and Spills Prevention and Response Plan. Additional mitigation measures and monitoring may be required to be carried out in accordance with any permits/permission received with respect to SAR, if required.

## **3.3.5 Noise**

### **3.3.5.1 Construction Noise**

#### **Potential Effects**

Temporary construction has the potential for noise impacts.

#### **Proposed Mitigation**

Construction to be carried out with City of Ottawa Noise By-Laws.

#### **Monitoring**

The effectiveness of the proposed mitigation measures will be monitored/verified in accordance with the City of Ottawa Noise by-laws and measures identified in the Noise and Vibration Control Plan.

### **3.3.5.2 Operational Noise**

#### **Potential Effects**

Predicted noise levels increase and may disturb adjacent sensitive users.

#### **Proposed Mitigation**

The following recommendations are to be incorporated into further design for the Facility to operate in compliance with MECP noise guidelines:

- noise barrier/acoustic wall at the north west end of the site to have a height of approximately 6 m (Figure 3-5);

- deployment of vehicles to be spread out over two (2) or more hours;
- return of vehicles to be spread out over two (2) or more hours;
- maintenance building bay door to be closed when not used for the entry or exit of vehicles during the evening and night time hours; and
- specify noise level limits for rooftop equipment with noise emissions to the outside, such as:
  - administration building Air Conditioning (AC) units;
  - wash building heating, ventilation and air conditioning (HVAC);
  - wash building compressor;
  - maintenance building AC; and
  - maintenance building compressor.

Some design considerations that may affect the mitigation measures required at the Facility include:

- having the compressors draw air from inside of the buildings instead of outside;
- placement of HVAC and exhaust fans on the side of, or on the ground next to the buildings (away from receptors);
- using silencers and enclosures on equipment; and
- not idling the trains while refueling.

### **Monitoring**

The effectiveness of the proposed mitigation measures will be monitored/verified in accordance with the City of Ottawa Noise by-laws and measures identified in the Noise and Vibration Control Plan.



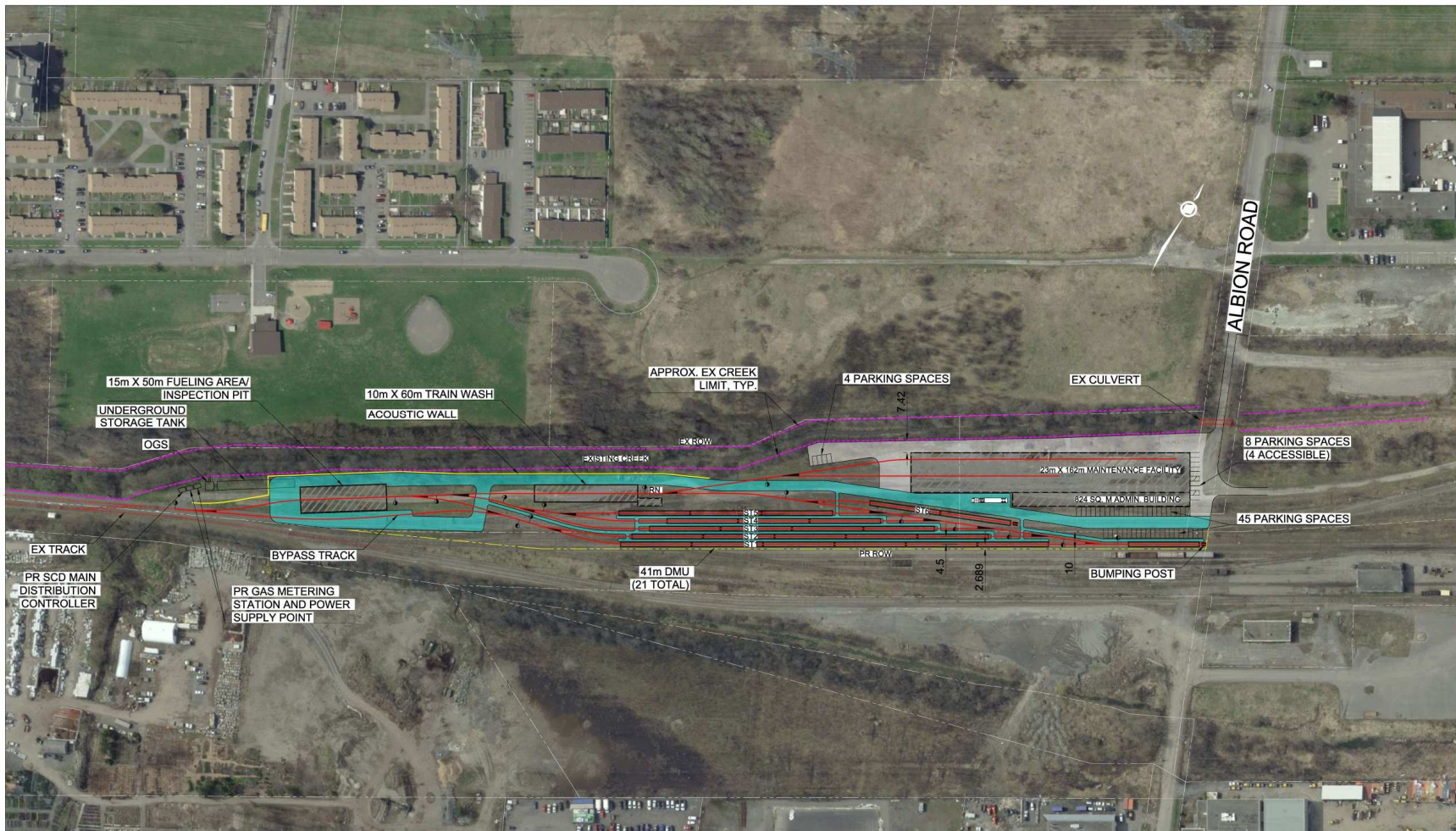


Figure 3-5: New Walkley Yard Layout

### **3.3.6 Air Quality**

#### **Potential Effects**

The future build-out air quality impacts from the re-located Walkley Yard are anticipated to be the same as the existing Walkley Yard, namely, diesel trains entering the yard for maintenance and other maintenance-related activities such as re-fueling or welding. The future capacity of the yard is expected to be thirteen (13) trains, seven (7) being Stadler FLIRT trains, and six (6) being Alstom Coordia LINT trains.

The nearest receptor would be a residential community north of the proposed location, approximately 140 metres from the property line. There is also a public park named Ledbury Park located between the residential community and the proposed Walkley Yard location. Ledbury Park has a small community centre facility located approximately 70 metres north of the Walkley Yard proposed property line.

Trains entering the yard for maintenance are expected to contribute negligible emissions during low notch speed travel into the yard, and upon arrival will turn off their engines to minimize any emissions from engine idling. Other air quality impacts from the Walkley Yard (including potential welding activities, and train refueling) would be assessed at the final design stage during a site specific environmental approval process, such as an application for an Environmental Compliance Approval (ECA) or Environmental Activity and Sector Registry (EASR) through the Ministry of the Environment, Conservation and Parks (MECP).

#### **Mitigation**

During the operation of the Walkley Yard it is not expected that any mitigation measures will be required for air quality. Exposure to construction related emissions can be mitigated by the following Best Management Practices:

- Dust Control Plan
- Environmental Protection Plan
- Erosion and Sediment Control Plan

#### **Monitoring**

During the construction phase, the effectiveness of the proposed mitigation measures implemented as part of the Dust Control Plan will be monitored. During the operational phase, the expected emissions will be verified in accordance with any applicable ECA/EASR requirements.

### **3.3.7 Stormwater Management**

#### **Potential Effect**

Modification to stormwater inputs of the existing system.



### **Proposed Mitigation**

Water quality control at the New Walkley Yard shall meet MECP “Enhanced” Standard (80% TSS Removal) and shall be provided with methods such as Oil Grit Separators to control sediment and sand (due to braking) and to control oil/grease (due to track lubricant) in compliance with the City of Ottawa Sewer Use By-Law.

### **Monitoring**

The effectiveness of the proposed mitigation measures will be monitored/verified in accordance with any ECA requirements.

## **3.4 Consultation**

Public delegations were present at the City of Ottawa February 24, 2017 FEDCO meeting at which the Stage 2 Light Rail Transit Implementation – Project Definition and Procurement Plan report, that included details about the proposed Walkley Yard location, was tabled.

Further to this, a public information session occurred on March 1, 2017 discussing various Stage 2 topics, including the proposed Walkley Yard location and the proposed bridge and grade separation at Ellwood Diamond. The public information session was broadcasted live on Facebook and held in person at Ottawa City Hall and the Hunt Club-Riverside Park Community Centre.

The Stage 2 report was approved by FEDCO and subsequently by Council on March 8, 2017. The report and associated materials are available at [Ottawa.ca](http://Ottawa.ca) or on the project website at [www.stage2lrt.ca](http://www.stage2lrt.ca) and in **Appendix D**.

## **3.5 Significance**

No significant residual environmental effects are expected to occur as impacts will be marginal and standard mitigation measures will be applied. The majority of these impacts will happen for short-term periods during construction which is considered a reversible effect.

## 4. BOWESVILLE STATION

The 2016 EPR included the extension of the Trillium Line from Greenboro Station to a new terminus station and Park and Ride lot (Figure 4-1) located on Bowesville Road, several hundred metres north of Earl Armstrong Road. A future Bus Rapid Transit (BRT) facility was identified to provide connecting Transitway service to Riverside South with an at-grade crossing of Bowesville Road.



Figure 4-1: Bowesville Station

### 4.1 Description of and Reason for the Change

Since the EPR, additional preliminary engineering activities were completed, and discussions took place with stakeholders to respond to two key areas of interest:

- the desire from the community to bring LRT closer to Riverside South; and
- reducing, where possible, environmental impacts on sensitive Greenbelt lands in the vicinity of the original Bowesville station.

Based on this, the City is moving forward with a new alignment and location for the Trillium Line Bowesville Station and Park and Ride.

The new alignment moves the Bowesville Station and Park and Ride to the edge of the urban boundary, just southeast of the Earl Armstrong and Bowesville Road intersection. This alignment follows the former CP rail corridor farther south until it crosses Earl Armstrong Road, at which point it turns westward and terminates just east of Bowesville Road (Figure 4-2). An overpass structure carrying Earl Armstrong Road over the extended Trillium Line will also be built as part of the Stage 2 LRT Project. A bus loop and bus layup area will be located at the east end of the station. This new station is described as Earl Armstrong/Bowesville station.



**Figure 4-2: New Earl Armstrong/Bowesville Alignment, Station and Park and Ride Location**

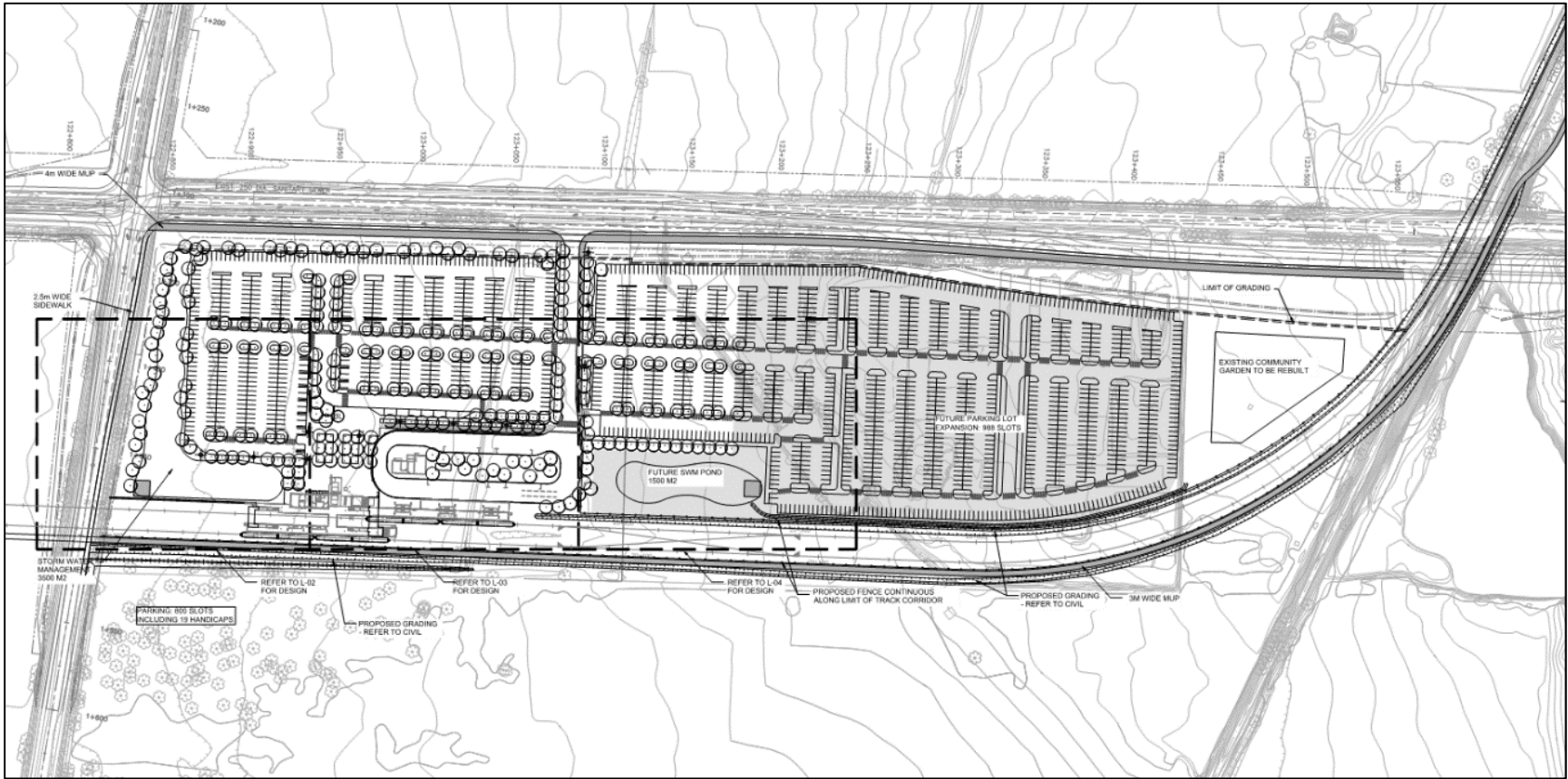
There are several environmental advantages to relocating the station and associated approach track. The currently proposed underpass ecological crossing will be relocated and enhanced via a 10 m wide multi-use (active transportation and ecological crossing) overpass crossing at the former High Road alignment (CTP2, 2017b). The new Bowesville alignment will take advantage of an existing rail corridor, ultimately reducing land costs and simplifying construction for an additional 800 m of rail. It also avoids environmentally sensitive lands in the vicinity of the original station location.

The 2016 EPR stated that the Bowesville Park and Ride would have 400 spaces in the interim and 3,100 spaces in its ultimate configuration. The new Park and Ride will accommodate 800 slots including 19 handicap locations with a future parking lot expansion of up to 2000 slots in total. There is also land available for a 1500 m<sup>2</sup> stormwater management pond (Figure 4-3).

This new alignment also supports smart planning principles and the adoption of transit in the broader south community (Finance and Economic Development Committee, 2017). It will improve rail access to residents in Riverside South and broader Ottawa south communities by providing closer access to Earl Armstrong, a major east-west arterial in Riverside South, and by bringing the Park and Ride closer to Riverside South.

Finally, this new alignment facilitates a potential future extension to Limebank Road. Under a scenario, in which the LRT is extended further west to Limebank Road, Bowesville Rd and the alignment will be grade separated. Under a base scope scenario, in which the LRT is not extended further to the west, and stops just east of Bowesville Road then grade separation will not be required.





**Figure 4-3: Earl Armstrong/Bowesville Station and Park and Ride Functional Design**

## **4.2 Updated Existing Conditions**

### **4.2.1 Archaeology**

Two archaeological assessments were completed for this proposed change, a Stage 1 Archaeological Assessment for the proposed Bowesville Alternative Location and Limebank Extension and a Stage 2 Archaeological Assessment for the portion of the study corridor that runs past the previously identified Cunningham's Station archaeological site.

The proposed Bowesville alignment crosses through some undeveloped agricultural lands. The preliminary conclusions from the Stage 1 Archaeological Assessment report (CTP2, 2018) indicate that this entire corridor has archaeological potential.

The Stage 2 Archaeological Assessment completed for the Cunningham's Station (CTP2, 2017i) indicates the project area runs past two known archaeological sites, the Cunningham Station Site and the Finlan-Britt Site. The Cunningham's Station Site continues north and south into the railway ROW. A third site, located 52 m south of the Cunningham's Station Site was also discovered. This is also a Euro-Canadian site dating from the 1850s to the 1900s and has been called the Cunningham-Murray Site.

### **4.2.2 Cultural Heritage**

The railway corridor itself is a potentially significant Cultural Heritage Landscape (CHL), as the Ottawa & Prescott Railway (OPR) was the first to arrive in Ottawa, and the corridor has remained in use for its original purpose, if intermittently, over much of its length. The section of O-Train right of way and proposed Trillium extension from about Walkley Road to Earl Armstrong Road, a distance of just over 8 km, occupies the original alignment of the OPR, built in 1854 (CTP2, 2018d).

### **4.2.3 Geo-environmental**

Ten (10) geo-environmental boreholes were advanced as part of the subsurface investigation in the vicinity of the relocated Bowesville Station. A total of 20 soil samples were submitted from these boreholes for analysis of one (1) or more of the COCs, which included metals, PAHs, PHCs, VOCs and Salt. Shallow soil samples from two (2) of these 10 boreholes had multiple PAH parameters present at concentrations exceeding the applicable SCS. These soil samples were collected from boreholes drilled in the decommissioned rail corridor and the source of these PAHs is likely rail tracks (with railway ties potentially treated with coal-tar creosote) and former rail activity. No other parameters were detected in the soil at concentrations exceeding the SCS (CTP2, 2018c).



#### **4.2.4 Groundwater**

The native subsurface conditions in this area identified in the original EPR typically consist of thick sequence of granular deposits consisting of silts, sands and sandy gravel with cobbles and boulders, with a high groundwater table (MMM, 2016) 1 to 2 m below the ground surface.

#### **4.2.5 Natural Sciences – Aquatic**

The ditchline channels and pond that were assessed within the vicinity of the proposed TLS Extension to Bowesville Station and Park and Ride fall within the Mosquito Creek subwatershed and contribute to headwater flow for Mosquito Creek. Drainage within the vicinity of the proposed Bowesville Station is generally from northeast to southwest and is contained between the Osgoode Link Pathway to the east, Earl Armstrong Road to the north, Bowesville Road to the west, and a forest stand to the south. Along the south side of Earl Armstrong Road, land use included a community garden adjacent to the Osgoode Link Pathway, a storage facility (Riverside South Ministorage) west of the garden, and agricultural fields between the storage facility and Bowesville Road. The forested area to the south extends between the Osgoode Link Pathway and Bowesville Road. A quarry is located east of the Osgoode Link Pathway and includes a pond feature, however, the pathway separates this pond from drainage features in the vicinity of the Bowesville Station.

The results of the screening survey and desktop research indicated that an intermittent channel extended from the community garden westward before draining into a man-made pond that was located within the southwest corner of the storage facility. Around the entire perimeter of the pond, the nearshore area exhibited a uniform slope towards the bottom of the pond and the substrate consisted of consolidated sand covered by silt. The water depth of the pond was greater than 1 m. The pond is bordered by emergent cattails, grasses, forbs and woody vegetation (i.e. shrubs and small riparian deciduous trees), and lacked in-water vegetative cover. A drainage channel at the outlet of the pond conveys flow north towards Earl Armstrong and connects to a roadside ditch that continues flowing west before reaching Bowesville Road. The roadside ditchline along Earl Armstrong was flowing at the time of the summer survey and consisted of gravel and cobble substrates. The margins of the ditch were vegetated with grasses, forbs and sedges with scattered cattails throughout. The ditch contained water that was approximately 0.18 m deep and had a wetted width of 1 m. The Bowesville Road ditchline had standing water with dense emergent vegetation throughout and the substrates were primarily detritus and muck with scattered gravel. The water depth was approximately 0.25 m and the wetted width was 2 m. It is assumed that flows from the surveyed ditchlines contribute to drainage channels and tributaries west of Bowesville Road.

During the screening surveys, dip-netting of the ditchlines and along the perimeter of the pond was conducted. As a result, bait/forage fish were captured within the ditches as well as the pond, and included the following coolwater species: Brook Stickleback, Creek Chub and Brassy Minnow

(*Hybognathus hankinsoni*). Due to the fact that the screening surveys were completed during a year that experienced above average levels of precipitation, the flow regime of the ditchline channels could not be determined. At the very least, the ditches along Earl Armstrong Road and Bowesville Road provide seasonal direct fish habitat, albeit low quality, that support bait/forage fish species. As schools of bait/forage fish were observed within the existing on-line pond, it potentially provides permanent fish habitat and allows for bait/forage fish from connected channels to overwinter (CTP2, 2018a).

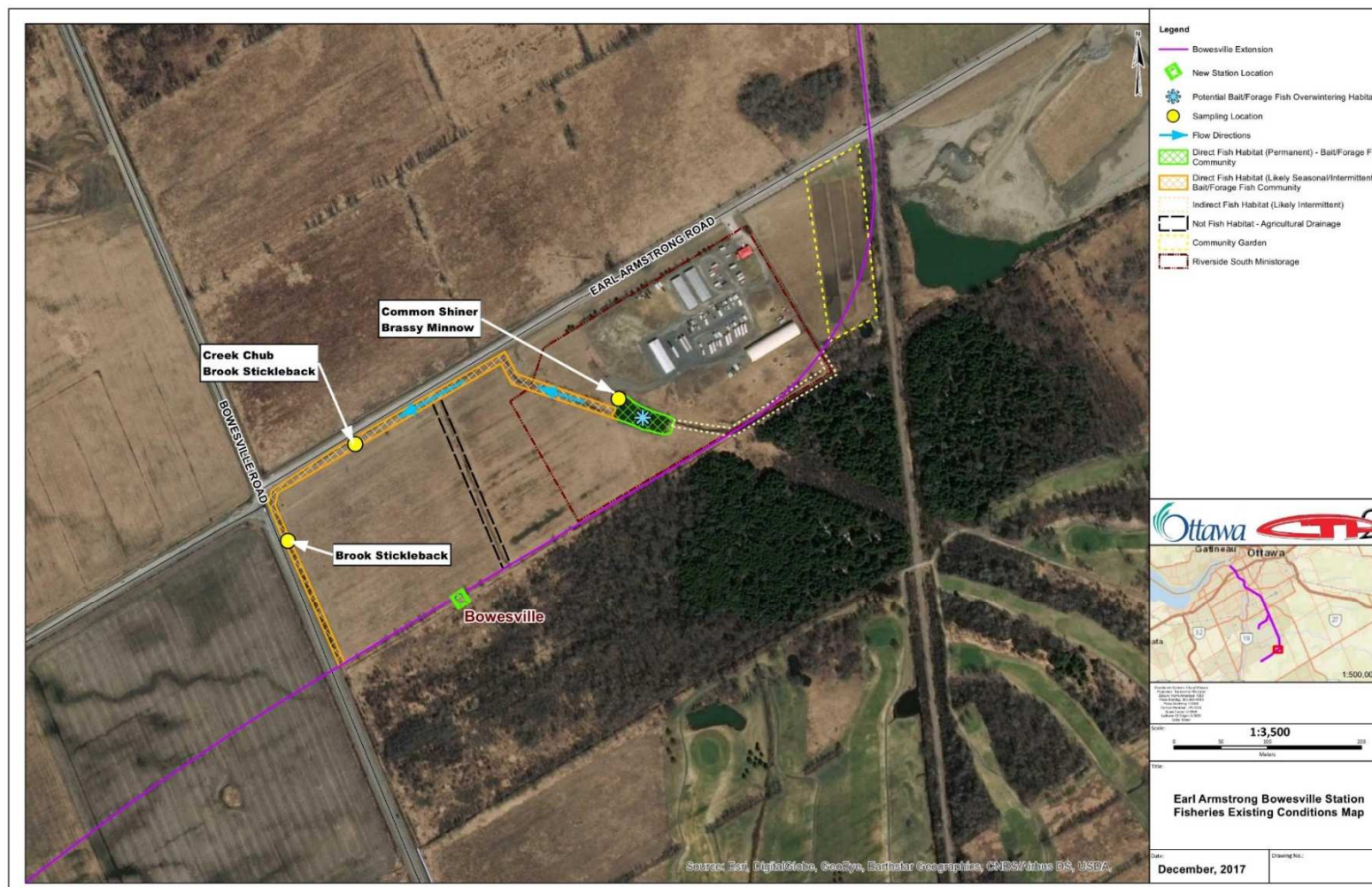


Figure 4-4: Existing Fisheries Conditions

#### 4.2.6 Natural Sciences - Terrestrial

Detailed information on terrestrial data can be found **Appendix C**. A summary of the relevant information extracted from these reports is presented below.

##### 4.2.6.1 *Significant Habitat*

Natural Heritage System – Identified by the City of Ottawa - The alignment passes immediately north of swamp wetlands on the adjacent to federal property. These wetlands are designated as Significant Woodlands on the City of Ottawa's Annex 14 mapping. They are also noted to contain organic soils as mapped on the Official Plan Schedule K. These swamp wetlands, as well as the regenerating woodlands partially encircling them to the east, south, and west, are mapped as 'Contributing' natural lands on the City of Ottawa's Greenspace Master Plan, Map 1.

Based on a review of background information, the following Significant Wildlife Habitats are potentially present:

- Waterfowl Stopover and Staging Areas (Terrestrial)
- Waterfowl Stopover and Staging Areas (Aquatic)
- Raptor Wintering Areas
- Bat Maternity Colonies
- Turtle Wintering Areas
- Deer Yarding Areas
- Deer Winter Congregation
  - Specialized Habitat for Wildlife
- Animal Movement Corridors

Information from MNRF did not identify the presence of these areas in the project corridor.

##### 4.2.6.2 *Species at Risk*

A total of 20 SAR had potential habitat present within 50 m of the project area and are listed in Table 4-1 below together with their federal (under the SARA) and provincial (under the ESA 2007) statuses, where END – Endangered, \*NAR – Not at Risk, \*\*NS – No Status, THR – Threatened, and SC – Special Concern.

**Table 4-1: Species at Risk Likely to Occur within Bowesville Station Project Area**

Species	Status	Individuals observed
Butternut	END - Federally and Provincially	No
Monarch	SC -Federally and Provincially	No
Blanding's Turtle	THR – Federally and Provincially	No
Eastern Musk Turtle	THR/SC – Federally and Provincially	No
Milksnake	SC/NAR - Federally and Provincially	No
Snapping Turtle	SC -Federally and Provincially	No
Western Chorus Frog	THR/NAR – Federally and Provincially	No
Barn Swallow	THR -Federally and Provincially	Yes
Bobolink	THR -Federally and Provincially	No
Canada Warbler	THR/SC – Federally and Provincially	No
Eastern Meadowlark	THR -Federally and Provincially	No
Eastern Whip-poor-will	THR – Federally and Provincially	No
Eastern Wood-pewee	SC - Federally and Provincially	No
Grasshopper Sparrow	SC -Provincially, Threatened -Federally	No
Short-eared Owl	SC -Provincially, Threatened -Federally	No
Wood Thrush	SC -Provincially, Threatened -Federally	No
Eastern Small-footed Bat	NS/END – Provincially and Federally	No
Little Brown Myotis	END - Provincially and Federally	No
Northern Myotis	END - Provincially and Federally	No
Tri-colored Bat	END - Provincially and Federally	No

*\*NAR - Not at Risk: A species that has been evaluated and found to be not at risk of extinction given the current circumstances*

Suitable habitat for Milksnake was identified within 50 m of the boundaries of the proposed Bowesville Station and alignment during the 2017 field investigations. Suitable turtle nesting, overwintering, basking, and foraging habitat was found adjacent to the project area and south of Earl Armstrong Road.

Suitable habitat for Western Chorus Frog is present within the swamp south of the alignment on federal land, within the ditch that connects the swamp to the 0.1 ha constructed pond within the farmland, and within the 0.1 ha constructed pond, both of which are located on provincial lands.



During field investigations in 2017, no Butternuts (Endangered federally and provincially) were found within 50 m of the boundaries of the proposed Bowesville Station or extension.

No Monarch caterpillars or adults were observed during 2017 field investigations. However, the host plant for Monarch caterpillars – Common Milkweed – was observed within and adjacent to the proposed project area.

Habitat is present for woodland SAR birds within the treed areas south of the project area and at the northern extent of the proposed Bowesville extension, where it connects to the Trillium alignment. Multiple Barn Swallow were observed flying over the project area during the 2017 surveys. Nesting evidence could not be verified on the adjacent farm buildings, however no nests were observed within the proposed project area.

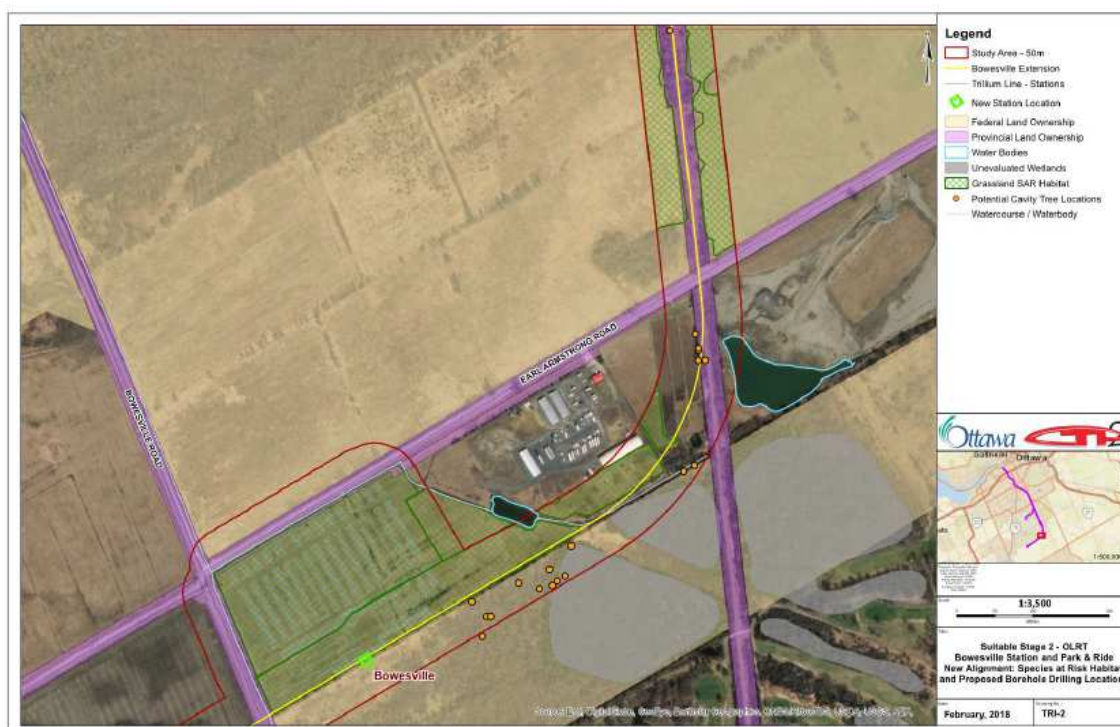
Suitable habitat was present for grassland SAR birds, including Bobolink, Eastern Meadowlark, Grasshopper Sparrow, and Short-eared Owl within the proposed park and ride and southern portion of the Bowesville extension, as well as adjacent the Osgoode Pathway north of Earl Armstrong Road

Targeted surveys are required during a seasonally appropriate period using approved protocols to confirm the presence of these SAR and their associated habitats.





**Figure 4-5: Potential Cavity Tree Locations and SAR Grassland Bird Habitat within the Bowesville Extension Project Area (North)**



**Figure 4-6: Potential Cavity Tree Locations and SAR Grassland Bird Habitat within the Bowesville Extension Project Area (South)**

#### **4.2.7 Noise**

The City of Ottawa noise bylaw (2004-253) sets out permitted hours for construction activities in order to control noise disturbance (07:00-22:00 Monday to Saturday, 09:00-22:00 Sunday and holidays).

Provincial guidelines (NPC-115 and NPC-118) provide limits on construction equipment sound level ratings, but do not include limits for overall noise levels at sensitive receivers.

The US Federal Transit Administration's Transit Noise and Vibration Impact Assessment Guide (the FTA Guide) is widely used as a reference for construction noise and vibration impact assessment. The FTA Guide suggests limits of 80 dBA  $L_{eq,8hr}$  during daytime/evening (any 8 hour period between 07:00-23:00) and 70 dBA  $L_{eq,8hr}$  during night-time (23:00-07:00) for construction work in a residential area for detailed assessment purposes.

#### **4.2.8 Air Quality**

The existing air quality in the region is expected to be affected by the traffic on local roadways such as Bowesville Road and Earl Armstrong Road. The land uses in the region mainly for agricultural purposes with some single residences dispersed throughout the area. The land is predominantly zoned for rural countryside (RU), agriculture (AG), and major leisure facility (L2) use.

#### **4.2.9 Property**

Property requirements at the proposed Bowesville Station include private lands which were not needed in the EPR design. The City of Ottawa has been communicating with these private landowners and they are aware of the City's property requirements in this location.

A part of these private land is currently being used as community gardens located at the intersection of Bowesville Road.

#### **4.2.10 Transportation Planning**

The City of Ottawa initiated a Class Environmental Assessment (EA) in March 2000, in order to provide transportation service to the Riverside South Community (TSH; NCE, 2003). Recommendations for Earl Armstrong Road in this EA included the following:

- four (4) lane urban divided;
- long term property protection six (6) lanes; and
- dedicated bicycle lanes.

#### **4.2.11 Drainage and Stormwater Management**

The Bowesville Park and Ride will be developed in two phases to an ultimate area of 8.7 ha. The Phase 1 Park and Ride will be immediately adjacent to Earl Armstrong Road, where current land use is primarily agricultural, and will

extend over approximately half of the total 8.7 ha area. The Phase 2 Park and Ride will extend over the remaining area, whose current land use is a mixture of agricultural and industrial use. Each phase will require a dry pond combined with oil and grit separators (OGS).

Drainage and SWM shall be designed and constructed to accommodate the initial and ultimate site configurations with no major changes to the initial layout and location of the SWM measures.

Preliminary dry ponds volumes have been estimated to provide quantity control for the Park and Ride area. OGSs upstream of the ponds are required to provide quality treatment. Erosion control will also be required and can be achieved through the configuration of the outlet using separate orifices for erosion and quantity control. The outlet configuration will be determined during detailed design. The Phase 1 pond volume is estimated at 2200 m<sup>3</sup>, and the Phase 2 pond estimated at 1700 m<sup>3</sup>. Both ponds will outlet to an existing culvert (structure L221900) at the intersection of Bowesville and Earl Armstrong roads.

Drainage of the external area south of the track at the Bowesville Park and Ride will be separated from guideway by a berm in order to protect guideway from springtime flooding. The external area will drain to the west, towards Bowesville road, and then towards the south in a ditch along Bowesville road to Structure #220390, under Bowesville Road and to a tributary of Mosquito Creek. The existing ditch along Bowesville Road may require regrading to accommodate the additional flow. Culverts along the path of the redirected flow will need to be assessed for capacity, in accordance with City standards, given the additional drainage from this external area.

East of Bowesville Station, track drainage will cross the track from south to north in a culvert and will be outlet to the ponds at the Bowesville Park and Ride. At Bowesville Station, a sub-drain and storm sewer system will collect drainage and take it to the pond. West of Bowesville Station, track drainage and external area either pump or gravity drainage (ditch regrading may be necessary) to ditches along Earl Armstrong. Track drainage west of Bowesville Station will carry on west of Bowesville Road by gravity, towards the enhanced swale system for Limebank Extension and into tributary R3. In this case, the gravity or pump station system created for the track west of Bowesville Station will need to be decommissioned once the Limebank Extension is built.

### **4.3 Assessment and Evaluation of Impacts**

This section describes potential effects of the project and the proposed mitigation measures including planning decisions, design features, construction requirements and construction constraints, in order to reduce potential negative effects.

#### **4.3.1 Archaeological**

##### **Potential Effects**

Archaeological resources may be impacted. The Bowesville Station corridor contains archaeological potential and therefore archaeological resources may be impacted (CTP2, 2017f).

##### **Proposed Mitigation**

Undertake Stage 2 Archaeological Assessment Test Pit Surveys and Pedestrian Surveys to determine whether or not culturally significant archaeological resources are present (to be completed 2018).

The City will be completing Stage 3 (Cunningham's Station and Cunningham-Murray sites) archaeological works in the area to confirm the presence of culturally significant archaeological sites and define mitigation measures required during construction and operation of the project during 2018 (CTP2, 2017f).

##### **Monitoring**

The effectiveness of the proposed mitigation measures will be monitored/verified in accordance with the Stage 2 and 3 Archaeological Assessments to be completed.

#### **4.3.2 Cultural Heritage**

##### **Potential Effects**

As a railway line that was laid more than 160 years ago, the heritage character of the study area is consistent with the planned use as a Light Rail corridor. Due to the depopulation of the adjacent farmlands and the National Capital Commission's management policies for the Greenbelt, this seems unlikely to change in the foreseeable future. There are also opportunities to enliven stations and develop landscaping options that bring attention to this historical context (CTP2, 2018d).

##### **Proposed Mitigation**

- minimize the removal of mature trees during construction, to the extent feasible;
- consider incorporation of historical ephemera in station design, such as photographs of the early train stations, Railway Company schedules and rates; and
- clearly contain Park and Rides by means of hard edges and landscaping so they do not bleed out into the former agricultural fields and are distinct from them (CTP2, 2018d).

### **Monitoring**

The effectiveness of the proposed mitigation measures will be monitored/verified in through the review of the detailed design drawings.

## **4.3.3 Geo-Environmental**

### **Potential Effect**

During construction, soil contaminated with PAHs can be harmful to human health, aquatic habitats and terrestrial wildlife. Many PAHs have toxic, mutagenic and/or carcinogenic properties and can be harmful to construction workers via direct contact, inadvertent ingestion and inhalation.

### **Proposed Mitigation**

The contractor is responsible for completing an assessment of risk with respect to contamination to determine that the contamination does not represent a risk to human health or the environment. The contractor will implement any management or remedial measures as required to ensure that any contamination does not pose a risk to human health or the environment. Excavated material should be managed according to applicable legislation.

### **Monitoring**

The effectiveness of the proposed mitigation measures will be monitored / verified in accordance with the risk assessment.

## **4.3.4 Groundwater**

### **Potential Effect**

A temporary pump station may need to be installed at the Bowesville Station and Park and Ride as a mitigation measure to control drainage if the Limebank Extension is not built or built in a phased approach after the Bowesville Station and Park and Ride. Potential local changes to groundwater levels can occur if a pumping station is built.

### **Proposed Mitigation**

Should this pumping station be required, the contractor will be responsible for Permits, Licenses, Approvals and Authorizations, including Permit to Take Water (PTTW) and/or Environmental Activity and Sector Registry, and discharge permits (e.g., Municipal, Conservation Authority and/or Environmental Compliance Approval) as well as developing and implementing plans and procedures for groundwater control (including effluent discharge). Plans and procedure shall include, but are not limited to the following items:

- detailed shop drawings of the entire dewatering system(s) that bear the seal and signature of a professional engineer licensed in Ontario,



and include, but not be limited to, details, and calculations of proposed type of dewatering system(s), showing arrangement, location, and depths of components of system including details of screens and filter media, complete description of equipment and materials to be used, procedure to be followed, standby equipment, standby power supply, and proposed location(s) of points of discharge of water and abandonment of dewatering system(s), a description of any permits and approvals that pertain to the groundwater control activities;

- a discharge plan that includes: discharge location(s) including methods; procedures and equipment to convey water to discharge locations; location and dimensions of treatment equipment; procedures for water testing; water quality laboratory analyses procedures, test results or analyses, and water treatment methods; location and construction details of monitoring observation wells, a description of any permits and approvals that pertain to the discharge activities.

The contractor shall also ensure that any groundwater control, effluent discharge, and subsequent effects during construction or during the Design Life shall have no adverse impact on the following features within the Project Zone of Influence (ZOI):

- properties, adjacent structures, infrastructure, active groundwater supply wells, and environmental features;
- best practices management practices to maintain groundwater recharge to the aquifer, where possible
- interference or drawn down that could affect contaminant plumes from area landfills.

### **Monitoring**

The effectiveness of the proposed mitigation measures will be monitored/verified in accordance with the PTTW permit requirements.

## **4.3.5 Natural Sciences – Aquatic**

### **Potential Effects**

Within the limits of the Earl Armstrong/Bowesville Park and Ride, direct impacts to fish and fish habitat are anticipated to occur as a result of the following project works that have been identified thus far during the preliminary phase:

- Construction of new LRT track and Bowesville Station and Park and Ride.

Specifically, the fish bearing pond and drainage channels identified during the fish and fish habitat screening surveys are anticipated to be permanently lost



based on the proposed Earl Armstrong/Bowesville Station and Park and Ride design. Although new ditchline drainage and stormwater management ponds are being proposed, it is anticipated that the length of channel available for use by the existing bait/forage fish community will be significantly reduced and limited due impacts to connectivity with channels west of Bowesville Road. Also, it is unlikely that the proposed stormwater ponds will provide habitat that is comparable to the existing pond as the primary purpose of the pond will be to treat the runoff from the new park and ride lot (i.e. road salts, oils etc.).

### **Proposed Mitigation**

It is recommended that all efforts be made to maintain existing fish habitat features (i.e. available drainage channels and pond habitat) to the greatest extent possible and maintain connectivity of fish habitat from the east side of Bowesville Road to the west (CPT2, 2018a). General mitigation includes development and implementation of the following during construction: Erosion and Sediment Control Plan, Stormwater Management Plan, Environmental Protection Plan, Spills Prevention and Response Plan.

Site-specific mitigation measures include adhering to in-water/channel bank timing window, and complying with additional measures recommended by DFO and RVCA as outlined below. Despite the measures provided, it is anticipated that not all impacts from of the proposed Earl Armstrong / Bowesville Station and Park and Ride, based on the current preliminary design, will be mitigated. The primary residual effects likely to persist include change in habitat and change in access to habitat. As a result, the current preliminary design may result in serious harm to fish, as defined by the *Fisheries Act*.

A review done by the RVCA of the original site plan for the proposed Park and Ride property notes that the pond on the property is a stormwater management pond that formed part of the stormwater management plan as part of the site plan control application D07-12-06-0012. The works were completed in 2007 and resulted in an online pond. The headwater feature appears to be the extreme headwater portion of the watercourse and is several kilometres away from Mosquito Creek. Therefore, on the basis of an existing online pond (stormwater management infrastructure) and the attributes identified for the headwater feature at that time, the RVCA would not require compensation for the loss of the headwater portion, but would require mitigation in the form of maintaining baseflow further downstream as part of the stormwater management solution for the site.

Future commitments include additional fish and fish habitat field investigations to update existing conditions in areas where new interactions between the project and aquatic environments arise, as required due to modifications of the project design. Upon completion of the detail design, a DFO Self-Assessment must be completed for all works within or near fish bearing watercourses/waterbodies to confirm whether the project is likely to result in serious harm to fish, and if a DFO Request for Review needs to be submitted. Furthermore, reviews of SAR listings will need to be completed to

ensure updated legislation is considered and addressed. Any alteration, straightening, changing, diverting or interfering in any way with any watercourse requires the prior written approval of the RVCA under Ontario Regulation 174/06 "Development, Interference with Wetlands and Alterations to Shorelines and Watercourses Regulation" made pursuant to Section 28 of the *Conservation Authorities Act*.

The proposed stormwater management concept will include provision for extended wet ponds to be built as part of the Park and Ride facilities to provide 80% removal of Total Suspended Solids (TSS). Drainage will be collected by a storm sewer system within the parking lot. Oil Grit Separator (OGS) units may be required along with quantity control within the wet ponds. The contractor will be responsible for Permits, Licenses, Approvals and Authorizations, including discharge permits (e.g., Municipal, Conservation Authority and/or Environmental Compliance Approval) (CPT2, 2018a).

### **Monitoring**

The effectiveness of the proposed mitigation measures will be monitored/verified in accordance with the developed plans: Erosion and Sediment Control Plan, Stormwater Management Plan, Environmental Protection Plan, and a Spills Prevention and Response Plan. Additional mitigation measures and monitoring may be required to be carried out in accordance with any permits/permission from DFO and or RVCA.

## **4.3.6 Natural Sciences – Terrestrial**

### **4.3.6.1 Significant Habitat**

#### **Potential Effects**

Indirect impacts may occur to the Significant Woodland, organic soils, and Provincially Significant Wetlands, such as erosion, sedimentation, soil compaction, hydrological alteration, and spills.

#### **Proposed Mitigation**

Avoid indirect impacts through implementation of erosion and sediment control and spill prevention plans, and maintenance of existing hydrology.

### **Monitoring**

The effectiveness of the proposed mitigation measures will be monitored/verified in accordance with the developed plans: Erosion and Sediment Control Plan and Spill Prevention Plan.

### **4.3.6.2 Species at Risk**

Seven (7) SAR that are designated as Special Concern under the ESA 2007 are potentially present, and should further surveys verify their presence, the mitigations in Section 4.2 of the 2016 Stage 2 SAR Report (CTP2, 2017c) are

recommended for those that are on provincial lands. These include the following species:

- Monarch
- Grasshopper Sparrow
- Milksnake
- Short-eared Owl
- Snapping Turtle
- Wood Thrush
- Eastern Wood-pewee

Numerous SAR that are designated as Threatened or Endangered under the ESA 2007 and/or SARA are potentially present, and should further surveys verify their presence, the mitigations in Section 4.2 of the 2016 Stage 2 SAR Report (CTP2, 2017c) are recommended in addition to those provided below. These include the following species.

### **Potential Effects**

Disturbance to Western Chorus Frog may occur. Western Chorus Frogs may be present on federal lands immediately south of the project area, and their habitat may extend into provincial lands, where they are not considered to be at risk.

### **Proposed Mitigation**

Additional surveys are required to confirm species presence. If this species is observed within the project area, the following will be required:

- The work must strictly avoid encroaching on federal lands containing potential Western Chorus Frog habitat.
- An Erosion and Sediment Control plan as well as a Spills Response and Action Plan are recommended for the LRT in order to exclude this species from construction activities.

### **Potential Effects**

Disturbance of SAR Herpetofauna may occur. Suitable turtle nesting, overwintering, basking, and foraging habitat was found adjacent to the project area and south of Earl Armstrong Road. There is a possibility of SAR turtles entering the project area to seek out nesting sites and to migrate.

### **Proposed Mitigation**

Suitable mitigation and best management practices will be required to protect any individuals that could be impacted by construction.

- restrict all work within aquatic habitat from 01 October – 15 April, when turtles are overwintering;
- install temporary exclusion fencing, to minimize turtle entry into work areas; this fencing should:

- extend around terrestrial work areas adjoining the pond;
- stay in place between 15 April and 30 September, in order to protect individuals during the active season;
- If the results of the temporary exclusion fencing monitoring indicate that turtles attempt to access the construction site then we recommend installation of permanent exclusion fencing to address long term impacts (i.e., the post-construction period when the station site becomes operational).
- conduct mandatory SAR awareness training for all construction personnel on species identification, habitat preferences & correct protocols in case of on-site encounters;
- ensure that an Environmental Monitor is present at all times, during construction, to:
  - inspect fences daily for breaches and/or gaps;
  - conduct daily searches of work area for turtle entry;
  - maintain records of all SAR related activities.
- Additional surveys are required to confirm species presence. If these species are observed within the project area, the following will be required:
  - The work must strictly avoid encroaching on the 0.1 ha constructed pond immediately north of the alignment within the farmland, and within the larger 0.6 ha pond located 35 m to the east, containing potential SAR turtle habitat. An Erosion and Sediment Control Plan as well as a Spills Response and Action Plan are recommended for the LRT in order to exclude these species from construction activities.

### **Potential Effects**

Disturbance to SAR Birds and SAR Bats may occur. Golden Winged Warblers, Canada Warblers, and Olive-sided Flycatchers may be present on federal lands immediately south of the project area. Eastern Small-footed Bat, Little Brown Myotis, Northern Myotis, Tri-colored Bat may occur on federal lands immediately south of the project area and adjacent the project area north of Earl Armstrong Road.

Barn Swallow, Bobolink and Eastern Meadowlark habitat is present on provincial land within the project area and may be disrupted.

### **Proposed Mitigation**

Additional surveys are required to confirm species presence. If any of these species are observed within the project area, the following will be required:

- The work must strictly avoid encroaching on federal lands containing potential SAR bird or bat habitat. As well, the work must avoid any vegetation removal within wooded areas during the birds' breeding

season (01 May – 01 September; Ontario Breeding Bird Atlas (OBBA)) and the bats' active season (01 April – 01 October), and ensure that activities resulting in excess noise & vibration are kept to a minimum during breeding season to reduce disturbance to nesting birds and bats.

### **Potential Effects**

Barn Swallow, Bobolink, Eastern Meadowlark

### **Proposed Mitigation**

Additional surveys are required to confirm species presence. If any of these species are observed within the project area, the following will be required:

- The work must reduce vegetation removal and create the smallest footprint possible within the SAR bird habitat. The work must avoid any work within grasslands (meadows) during the species' breeding season (15 Apr – 01 Sep; OBBA). If avoidance is not possible within the grasslands, the following are recommended:
- registration under *O.Reg. 242/08* will be required, and compensation will be required;
- clear/mow vegetation, and maintain, within 60 m of project area (which may include Category 1 and 2 habitat for SAR birds; MNRF, 2013d) prior to the breeding season in order to discourage birds from seeking nest sites within the construction area;
- conduct thorough nest searches to locate any birds/nests that may be present within the mowed 60 m ROW. If found, place a 60-m buffer around the nest (MNRF, 2013d), stop work immediately, and contact the MNRF.

### **Monitoring**

The effectiveness of the proposed mitigation measures will be monitored/verified in accordance with the permits/permissions from MNRF.

## **4.3.7 Noise and Vibration**

### **Potential Effects**

No significant air noise or vibration impacts to existing sensitive developments are anticipated.

### **Proposed Mitigation**

For future sensitive developments, the property developer(s) would be responsible for providing appropriate noise and vibration mitigation. In addition, the federal guidelines (FCA/RAC, 2013) recommend a setback of 30 m for new residential development in proximity to mainline or secondary main line rail corridors.



Construction to be carried out with City of Ottawa Noise By-Laws.

### **Monitoring**

The effectiveness of the proposed mitigation measures will be monitored/verified in accordance with the City of Ottawa Noise by-laws and measures identified in the Noise and Vibration Control Plan.

## **4.3.8 Air Quality**

### **Potential Effects**

Twenty (20) existing and future receptors were selected within the one kilometer surrounding the Bowesville Station development and Limebank Extension Figure 4-7. These receptors are predicted to be impacted by the operation of the new station due to the travel and idling of DMU trains, OC Transpo buses, and passenger vehicles. The proposed Park and Ride parking lot is anticipated to also have an impact on local receptors.

A local Air Quality Impact Assessment (**Appendix C**) was conducted to determine maximum cumulative contaminant concentrations. The modelled worst-case hourly concentrations due to combined emissions from trains, OC Transpo buses, and passenger vehicles were combined with background concentrations for each contaminant to determine cumulative maximum concentration at sensitive and critical receptors. For any contaminants showing an exceedance of one or more standards, a frequency analysis was conducted to estimate the potential period of exposure.

The modelled cumulative results predict an air quality threshold limit exceedance of nitrogen oxide, benzene, and benzo(a)pyrene. The exceedances are attributed to both of their respective existing background concentrations, and also to the emissions from the project. The frequency of exceedance for nitrogen oxides at the most impacted receptor shows that cumulative impacts from both the project contributions and background air quality exceeds the applicable air quality threshold less than 1% of the time.

### **Proposed Mitigation**

The implementation of the Trillium Line rail extension is anticipated to provide an overall net benefit to the Air Quality of the City. Increased accessible public transit options reduce the number of individual passenger vehicles travelling through arterial roads within outlying communities and traveling within the city core. Reductions in project contribution may be achieved by implementing a “no idling” policy at each station for passenger vehicles, and reducing the idling time of both trains and buses as much as possible. The City of Ottawa already has policies of this nature in place, as described within their Idling Control By-law (No. 2007-266).



## Monitoring

During the construction phase, the effectiveness of the proposed mitigation measures will be monitored and verified by following the measures indicated in the Dust Control Plan.

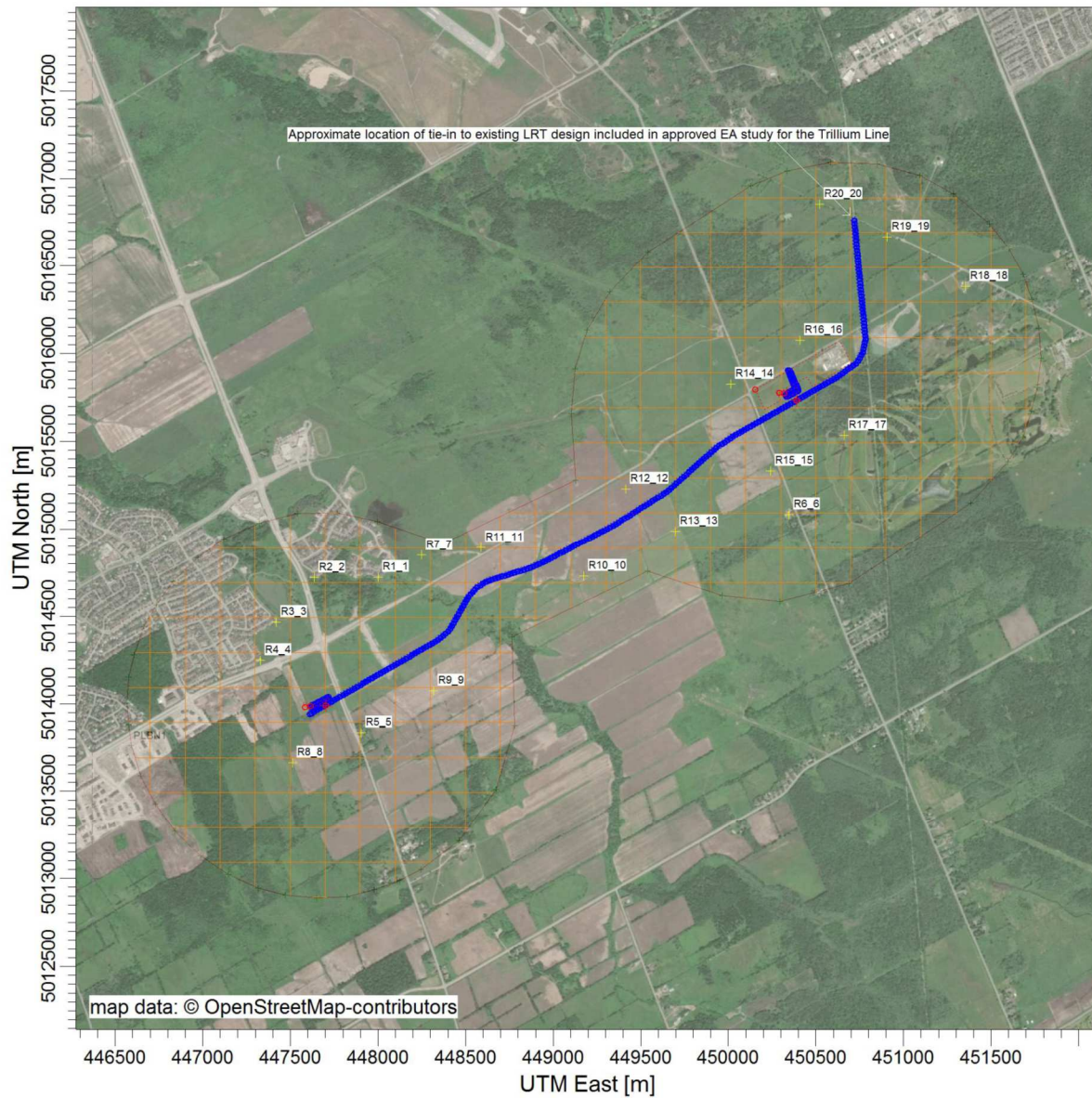


Figure 4-7: Air Quality Receptors

#### **4.3.9 Property**

##### **Potential Effects**

Land will be required from private owners for the construction of the Earl Armstrong/Bowesville Station and Park and Ride.

##### **Proposed Mitigation**

The City will continue discussions and maintain communication with affected land owners and procure the necessary lands.

##### **Monitoring**

The effectiveness of the proposed mitigation measures will be monitored/verified based on the discussion with the land owners and the conditions, if any, of the procurement.

#### **4.3.10 Traffic**

##### **Potential Effects**

Temporary disturbance to existing traffic on Earl Armstrong during construction activities.

##### **Proposed Mitigation**

As a result of the temporary disturbance to existing traffic on Earl Armstrong Road during construction activities, a Traffic Management Plan should be developed as part of the detailed design and implemented during construction to minimize disruptions.

##### **Monitoring**

The effectiveness of the proposed mitigation measures will be monitored/verified in accordance with the measures identified in the Traffic Management Plan.

#### **4.3.11 Transportation Planning**

##### **Potential Effects**

The design and construction of Earl Armstrong/Bowesville Station and Park and Ride could limit options for the recommended car and bicycle lane upgrades at Earl Armstrong Road and Bowesville Road.

##### **Proposed Mitigation**

There will be a grade separated crossing along the alignment at the Earl Armstrong Road and Bowesville Road intersection with the ability to incorporate the recommended car and bicycle lane upgrades.

### **Monitoring**

The effectiveness of the proposed mitigation measures will be monitored/verified through review of the detailed design drawings.

## **4.3.12 Drainage and Stormwater Management**

### **Potential Effect**

Modification to stormwater inputs of the existing system.

### **Proposed Mitigation**

The Bowesville Park and Ride Station is within the catchment area to Mosquito Creek. SWM for the Station and Park and Ride shall meet MECP “Enhanced” Standards (80% TSS Removal) and specific quantity control criteria for Mosquito Creek consistent with the draft 2016 Master Drainage Plan for Riverside South.

### **Monitoring**

The effectiveness of the proposed mitigation measures will be monitored/verified in accordance with any Environmental Compliance Approval (ECA) requirements.

## **4.4 Consultation**

A public information session occurred on October 25, 2017 at St. Jerome School to provide an overview of the updated Trillium Line alignment and potential extension to Limebank Road. Additional input was gathered regarding desired pedestrian and cyclist access to the future Bowesville LRT Station. Public information materials from this open house are available at [www.stage2lrt.ca](http://www.stage2lrt.ca) and a summary of the public comments can be found in **Appendix D**.

## **4.5 Significance**

No significant residual environmental effects are expected to occur as impacts will be marginal and standard mitigation measures will be applied. The majority of these impacts will happen for short-term periods during construction which is considered a reversible effect.



## 5. LIMEBANK EXTENSION

In April 2004, the City of Ottawa initiated an EA study for the North-South LRT Corridor to address existing and future transportation demand between the rapidly growing communities of Riverside South and downtown Ottawa (McCormick Rankin Corporation; Hatch Mott MacDonald, 2005). This EA included an LRT connection to Barrhaven Town Centre. City of Ottawa Council cancelled the implementation of this plan in December 2006. In the 2008 TMP update, LRT was identified as the preferred transit technology within the corridor between Bayview and Riverside South, with BRT as the preferred link to the Riverside South and Barrhaven Town Centres across the Strandherd-Armstrong Bridge. The 2013 TMP update confirmed that the preferred long-term scenario for the corridor includes twin-electric LRT from Bayview Station to Riverside South. However, due to the high cost of implementing twin-track electric LRT between Bayview and Riverside South, including service to the Airport, extending the diesel-powered Trillium Line to Bowesville was recommended in the TMP as an affordable interim solution for the corridor (MMM, 2016).

### 5.1 Description of and Reason for the Change

The City of Ottawa is proposing a potential TLS LRT Extension to Limebank Road, for better integration with development as the community of Riverside South as it grows. The Limebank Extension would add approximately 3 km to the TLS LRT Extension and an additional station west of Limebank Road (Figure 5-1). This extension to Limebank, as well as the additional vehicle required to operate this extended service, is being considered as there is an opportunity for it to be privately or alternately financed.

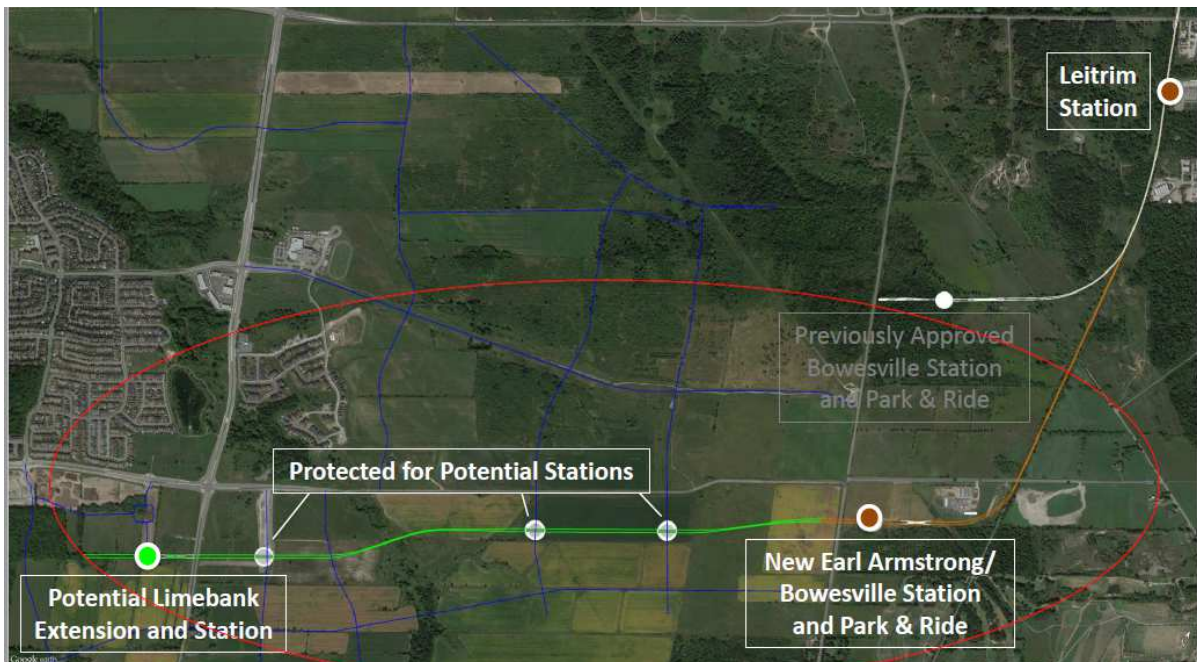


Figure 5-1: Limebank Extension



### 5.1.1 Alternatives

Several alternatives were developed and evaluated for the Limebank Extension design based on integration with the proposed community and transportation network. The preferred alignment extension to Limebank (option D) will be completely double-tracked and will shift at Mosquito Creek to a narrower crossing location. The extension will be predominately at grade with a bridge crossing over Mosquito Creek. The alignment will continue underneath grade-separated overpasses at both Bowesville and Limebank Road. Collector crossings for future development in the area are being “future proofed” by providing a constant offset between Earl Armstrong Road and the Trillium extension from Bowesville Road to Mosquito Creek. Typical cross-sections are illustrated below. Table 5-1 describes the evaluation of the alternatives.

**Table 5-1: Limebank Extension Alignment - Analysis Summary**

Alternative Solution	Evaluation Criteria				Overall Assessment
	Utilities	Natural Environment	Policy and Planning <sup>1</sup>	Socio-economic	
<b>Option A - Full Trench to terminus west of Limebank Road (Partial trench east of Mosquito Creek)</b>	<ul style="list-style-type: none"> <li>• Significant potential impact on existing utilities along Limebank Rd.</li> <li>• Requires the construction of a pump station for the trench segment.</li> </ul>	<ul style="list-style-type: none"> <li>• Significant impact on existing Mosquito Creek tributaries.</li> <li>• Requires extensive creek diversions.</li> </ul>	<ul style="list-style-type: none"> <li>• Serves land uses.</li> <li>• Allows for at-grade roadway / pedestrian overpasses.</li> </ul>	<ul style="list-style-type: none"> <li>• Highest direct capital costs.</li> <li>• Ongoing maintenance from flooding and stormwater management.</li> </ul>	<ul style="list-style-type: none"> <li>• Significant impact on natural environment.</li> <li>• Significant impact on existing utilities.</li> <li>• Highest direct capital costs.</li> </ul>
<b>Option B - Full Trench to terminus west of Limebank Road (At-grade east of Mosquito Creek)</b>	<ul style="list-style-type: none"> <li>• Significant potential impact on existing utilities along Limebank Rd.</li> <li>• Requires the construction of a pump station for the trench segment.</li> </ul>	<ul style="list-style-type: none"> <li>• Significant impact on existing Mosquito Creek tributaries.</li> <li>• Requires extensive creek diversions.</li> </ul>	<ul style="list-style-type: none"> <li>• Serves land uses.</li> <li>• Allows for at-grade roadway / pedestrian overpasses.</li> </ul>	<ul style="list-style-type: none"> <li>• Higher direct capital costs.</li> <li>• Ongoing maintenance from flooding and stormwater management.</li> </ul>	<ul style="list-style-type: none"> <li>• Significant impact on natural environment.</li> <li>• Significant impact on existing utilities.</li> <li>• Less expensive than full-trench alignment.</li> </ul>
<b>Option C - Full at-grade alignment terminating west of Limebank Road<sup>2</sup></b>	<ul style="list-style-type: none"> <li>• Moderate potential impact<sup>3</sup> on existing utilities along Limebank Rd.</li> </ul>	<ul style="list-style-type: none"> <li>• Minor impacts on existing Mosquito Creek tributaries.</li> </ul>	<ul style="list-style-type: none"> <li>• Can serve many, but not all, of the land uses.</li> <li>• Requires new elevated roadway overpasses</li> </ul>	<ul style="list-style-type: none"> <li>• Limebank Rd. O/P separates the future land uses east and west of Limebank Rd.</li> <li>• Less expensive than full / partial trench options.</li> </ul>	<ul style="list-style-type: none"> <li>• Minor impacts on natural environment</li> <li>• Moderate impacts on existing utilities<sup>3</sup>.</li> <li>• Less expensive than full / partial trench options.</li> </ul>

Alternative Solution	Evaluation Criteria				Overall Assessment
	Utilities	Natural Environment	Policy and Planning <sup>1</sup>	Socio-economic	
			between land uses north and south of the alignment.		
<b>Option D - Full at-grade alignment terminating east of Collector 'D'</b>	<ul style="list-style-type: none"> <li>• No direct impact on existing utilities.</li> </ul>	<ul style="list-style-type: none"> <li>• Minor impacts on existing Mosquito Creek tributaries.</li> </ul>	<ul style="list-style-type: none"> <li>• Can serve many, but not all, of the land uses.</li> <li>• Serves some of the development needs.</li> </ul>	<ul style="list-style-type: none"> <li>• Least expensive direct capital costs.</li> </ul>	<ul style="list-style-type: none"> <li>• Minor impacts on natural environment.</li> <li>• Can serve many, but not all, of the land uses.</li> <li>• Least expensive direct capital costs.</li> <li>• No direct impact on existing utilities.</li> </ul>

**Notes:**

1. Additional analysis was performed to determine the preferred horizontal alignment that would protect for critical elements of the Riverside South Community Design Plan and the Riverside South Core Area Urban Design Guidelines. The portion of track between Mosquito Creek and Bowesville Rd. that would allow for future north-south collector roads was further evaluated. The preferred option would allow for future Collector Road "G" and "H" overpasses perpendicular to Earl Armstrong Road between Bowesville Station and Limebank Station to allow for future local roads parallel to Earl Armstrong Road intersecting Collectors "G" and "H" at grade at a distance not less than 80m south of Earl Armstrong Road.
2. Within the existing ROW and property requirements, there remains a possibility to proceed with a Light Rail over Limebank Rd. design.
3. Impacts on utilities along Limebank Rd. would be reduced if a "Rail over Road" design option is pursued.

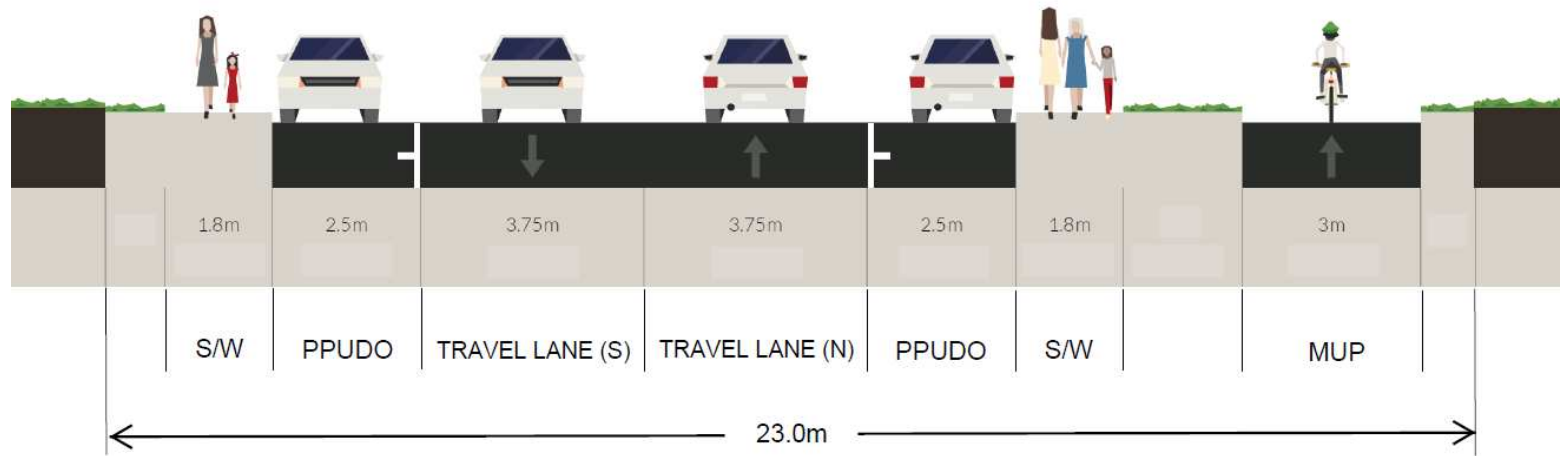


Figure 5-2: Main Street Typical Cross Section

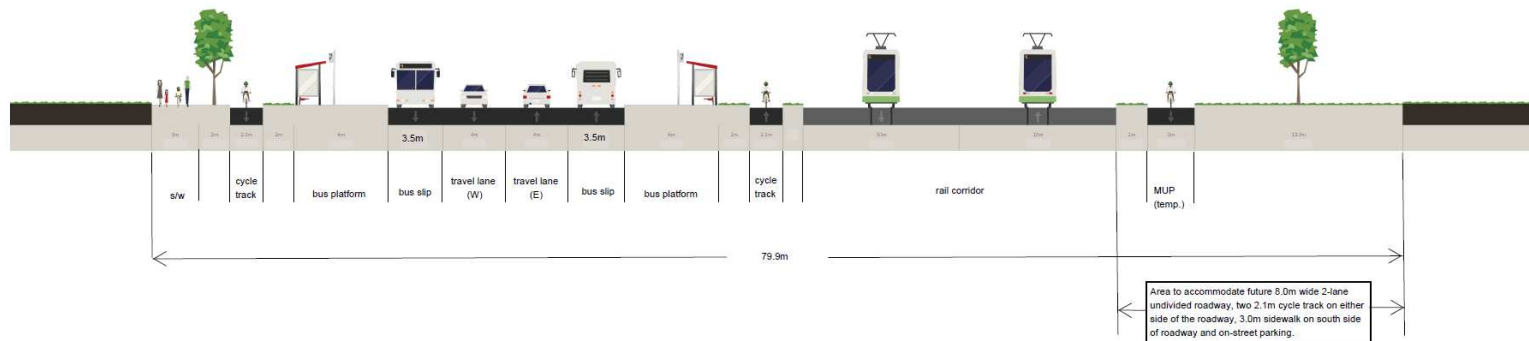


Figure 5-3: East / West Connector (West of Limebank)



**Figure 5-4: East / West Connector (East of Limebank)**





### **5.2.1 Archaeology**

The proposed Limebank Extension crosses through undeveloped agricultural lands and some areas of scrub / forest. The preliminary conclusions from the Stage 1 Archaeological Assessment (CTP2, 2017f) report indicates that this entire corridor has archaeological potential.

### **5.2.2 Cultural Heritage**

There are no cultural heritage landscapes identified with the Limebank Extension.

### **5.2.3 Geo-Environmental**

An environmental investigation was performed as part of a joint geotechnical and hydrogeological investigation for the Limebank Extension, as a background study for Stage 2 LRT preliminary engineering design. The investigation was performed to determine excess material management requirements during construction, and to assess the site of the Alignment for environmental risk.

Subsurface conditions within, and proximal to the study area, consist of glaciomarine to glaciofluvial soils of varying grain size and texture, and show no evidence of contamination (staining, odour etc.). Soil samples from boreholes indicate the presence of vanadium and salt impacts in exceedance of the SCS. The elevated vanadium is likely naturally occurring and is commonly observed in other Champlain Sea deposits in the Ottawa area. The road salt contamination is present along the former railway line, and is likely a result of former railway activity (CTP2, 2018e).

### **5.2.4 Natural Sciences – Aquatic**

The Limebank Extension study area for the proposed alignment falls within the Mosquito Creek subwatershed that contributes to flows of the Rideau River. The primary land use within the study area includes agriculture, and a hydro corridor bisects the study area along the east side of Mosquito Creek. The main-stem of Mosquito Creek flows northwest through the study area, crossing under Earl Armstrong approximately 1.2 km east of Limebank Road. Other watercourses within the study area include an unnamed tributary of Mosquito Creek which flows west from Bowesville Road, meandering through the agricultural fields before draining into Mosquito Creek approximately 0.7 km upstream from Earl Armstrong Road.

The first site surveyed was located approximately 0.5 km west of Bowesville Road along the upper reach of the unnamed tributary. The surrounding area at this site included tall grass meadows adjacent to the east and west of the channel followed by active agricultural fields. The channel meandered slightly through the dense overhanging grass vegetation and the morphology was a continuous run with a water depth of 0.3 m with a wetted width of 1 m. Moderate flow was conveyed through the defined channel and an approximate bankfull depth and width of 1 m and 2 m respectively was

observed. The substrate consisted primarily of sand and silt with instream habitat provided by emergent and overhanging grasses. Minor bank undercutting was also observed. Dip-netting was conducted at this first site and resulted in the capture of one (1) coolwater species of bait/forage fish, Brook Stickleback.

The second survey location along the unnamed tributary was located approximately 0.2 km downstream from the point at which the tributary flowed southwest from the roadside ditch of Earl Armstrong Road. This reach consisted of an incised channel that meandered through steep, ravine-like banks that were densely vegetated with grasses and forbs. Two (2) deeply incised channels were observed along the east bank of the tributary due to runoff drainage from adjacent fields. The morphology of the tributary at this survey site was a continuous run with a water depth of 0.25 m and wetted width of 1 m. The substrate was dominated by clay and there was evidence of scouring and erosion which indicated that this channel is likely a flashy system. The instream habitat was limited to instream and overhanging grasses along with bank undercutting. Dip-netting was conducted at the survey site and resulted in the capture of two (2) coolwater species of bait/forage fish, including Brook Stickleback and Creek Chub.

Mosquito Creek has been extensively assessed through City Stream Watch program, and as a result, it has been classified as ranging from a cool-warmwater and warmwater thermal regime. Historic fish community sampling results at the Earl Armstrong Road crossing indicate that the upper reaches of Mosquito Creek support a diverse bait/forage fish community, including migratory White Sucker, as well as panfish species, Pumpkinseed. There is also a potential for Northern Pike (*Esox lucius*) within the upper reaches, as this migratory recreational species has been captured at the downstream Limebank Road crossing. The Limebank Extension survey site at Mosquito Creek was approximately 0.3 km upstream from the Earl Armstrong crossing. At this site, Mosquito Creek meandered through a wide grassy floodplain within steep meander belt slopes and the riparian vegetation was limited to shrubs with scattered trees. The morphology observed at the survey site included a slow flowing run with a water depth of 0.42 m, a wetted width of 7 m and a bankfull depth of 0.85 m. Substrates observed included muck and silt with scattered cobble and boulder, and there was limited instream vegetation.

An additional tributary west of Mosquito Creek, which crosses under Earl Armstrong Road approximately 150 m east of Limebank Road, was identified as an intermittent drainage channel. Based on the City Stream Watch surveys documented within the 2015 summary report, the outlet of this culvert crossing was identified as a gradient barrier to fish passage. At the time of the Limebank Extension screening survey the drainage channel was dry, and as a result, this drainage feature has been confirmed to be intermittent and provides indirect fish habitat.

Drainage features located approximately 200 m west of Limebank Road were also screened for potential fish habitat values. The drainage channels assessed were dry at the time of the survey and there was not sufficient

evidence of direct connectivity to Mosquito Creek or its tributaries to suggest that this feature provides indirect fish habitat. As a result, the drainage features west of Limebank Road have been identified as “not fish habitat”.

The proposed Mosquito Bridge abutments and piers would be partially located within the 1:100 years floodplain being regulated by the Rideau Valley Conservation Authority (CTP2, 2018b).

## **5.2.5 Natural Sciences - Terrestrial**

Detailed information on terrestrial data can be found **Appendix C**. A summary of the relevant information extracted from these reports is presented below.

### **5.2.5.1 Significant Habitat**

Natural Heritage System – Identified by the City of Ottawa - Mosquito Creek is designated as Significant Valleyland on the City of Ottawa’s Annex 14 mapping and as Unstable Slopes on Schedule K. Woodlands to the west end of the alignment are designated as Significant Woodland. Mosquito Creek is also designated as City of Ottawa’s Primary Natural Environment on Greenspace Master Plan Map 1, and Natural Heritage System overlay on Schedule L3. Armstrong Road Woods are displayed on the mapping for Urban Natural Areas, and are noted to require ecological analysis to determine environmental rating.

Based on a review of background information, the following Significant Wildlife Habitats are potentially present:

- Waterfowl Stopover and Staging Areas (Terrestrial)
- Raptor Wintering Areas
- Turtle Wintering Areas
- Habitat for Species of Conservation Concern (not including END and THR species)
- Animal Movement Corridors

Information from MNRF (Attachment A) did not identify the presence of these areas in the project corridor.

### **5.2.5.2 Species at Risk**

A total of 19 SAR had habitat present within 50 m of the project area and are listed in Table 5-2 below together with their federal (under the SARA) and provincial (under the ESA 2007) statuses, where END – Endangered, \*NAR – Not at Risk, \*\*NS – No Status, THR – Threatened, and SC – Special Concern.

**Table 5-2: Species at Risk Likely to Occur within Limebank Station Project Area**

<b>Species</b>	<b>Status</b>	<b>Individuals Observed</b>
Butternut	END - Federally and Provincially	No
Monarch	SC -Federally and Provincially	Yes
Blanding's Turtle	THR – Federally and Provincially	No
Eastern Musk Turtle	THR/SC – Federally and Provincially	No
Milksnake	SC/NAR - Federally and Provincially	No
Snapping Turtle	SC -Federally and Provincially	No
Western Chorus Frog	THR/NAR – Federally and Provincially	No
Bobolink	THR -Federally and Provincially	No
Canada Warbler	THR/SC – Federally and Provincially	No
Eastern Meadowlark	THR -Federally and Provincially	No
Eastern Whip-poor-will	THR – Federally and Provincially	No
Eastern Wood-pewee	SC - Federally and Provincially	No
Grasshopper Sparrow	SC -Provincially, Threatened - Federally	No
Short-eared Owl	SC -Provincially, Threatened - Federally	No
Wood Thrush	SC -Provincially, Threatened - Federally	No
Eastern Small-footed Bat	NS/END – Provincially and Federally	No
Little Brown Myotis	END - Provincially and Federally	No
Northern Myotis	END - Provincially and Federally	No
Tri-colored Bat	END - Provincially and Federally	No

*\*NAR - Not at Risk: A species that has been evaluated and found to be not at risk of extinction given the current circumstances*

Suitable foraging and overwintering habitat (an old stone foundation) for Milksnake was identified within 50 m of the boundaries of the proposed Limebank Extension during the 2017 field investigations.

Suitable turtle nesting, overwintering, basking, and foraging habitat was found within Mosquito Creek.

Suitable habitat for Western Chorus Frog is present within the ditches of the project area located on provincial lands.



During field investigations in 2017, no Butternuts (Endangered federally and provincially) were found within 50 m of the boundaries of the proposed Limebank Extension.

One (1) adult Monarch was observed during 2017 field investigations, and the host plant for Monarch caterpillars – Common Milkweed – was observed within and adjacent to the proposed project area.

Habitat is present for woodland SAR birds within the woodlot east of Limebank Road at the end of the proposed Limebank Extension. No suitable Barn Swallow or Bank Swallow nesting habitat is present.

Suitable habitat was present for grassland SAR birds, including Bobolink, Eastern Meadowlark, Grasshopper Sparrow, and Short-eared Owl within and adjacent to the proposed project area.

Bat foraging habitat is present within treed areas, open meadows, and near Mosquito Creek.



Figure 5-6: Terrestrial Features within the Limebank Extension Project Area

## 5.2.6 Noise

Under the City of Ottawa's Environmental Noise Control Guidelines, noise control measures shall be investigated if the future sound level is greater than 55 dB and 5 dB above ambient; or greater than 60 dBA regardless of the increase. Predicted noise levels are assessed at OLAs, usually 3 m from the dwelling façade at a height of 1.5 m above ground level based on a 16-hour equivalent average sound level ( $L_{eq, 16hr}$ ) between 07:00 and 23:00.

The closest sensitive receptor is located approximately 195 m south of the proposed track alignment, on a land parcel just north of #4705 Limebank Road. In accordance with the City's Environmental Noise Control Guideline, traffic noise levels were calculated using the ORNAMENT method, implemented in the STAMSON (version 5.04) software.

To assess the noise impact, the predicted "No Project" noise levels were compared to those of the future predicted "With Project" noise levels. Noise levels in the OLA of a noise sensitive land use were calculated to determine if a noise mitigation investigation would be required.

Existing road traffic data and future volume prediction were received the City of Ottawa. O-train information was received from GWE Noise, Vibration and Air Quality Report. Traffic information is summarized in Table 5-3.

**Table 5-3: Traffic Data**

Source	Year	AADT	Daytime Auto	Daytime Heavy Truck	Daytime Medium Truck	Speed Limit (km/h)	Day/Night Split
Limebank Road	2016	7333	6746	261	187	80	92/8
Earl Armstrong Road (west of Limebank Road)	2016	13591	12504	382	273	80	92/8
Earl Armstrong Road (east of Limebank Road)	2016	4583	4216	82	58	80	92/8
Limebank Road	2031	8513	7832	303	217	80	92/8
Earl Armstrong Road (west of Limebank Road)	2031	15779	14516	443	316	80	92/8
Earl Armstrong Road (east of Limebank Road)	2031	5321	4895	95	68	80	92/8
O Train	2031	216	192	-	-	70	92/8



Predicted operational noise levels and impacts are summarized in Table 5-4.

**Table 5-4: Operational Noise Prediction Results**

ID	Assessed Point of Reception	Existing Noise Level (dBA)-2016	Future Noise Level (dBA)-2031	Noise Impact (dBA)	Mitigation Investigation Requirement (Yes/No)
R01_OLA	House on land parcel north of # 4705 Limebank Road, Ottawa	59.3	59.7	0.4	No

### 5.2.7 Vibration

The US Federal Transit Administration recommends a vibration assessment screening distance of 150 feet (45.7 m) between light rail transit and residential buildings. There are no sensitive receivers within that screening distance, so vibration impacts are anticipated to be negligible.

### 5.2.8 Air Quality

The existing air quality in the region is expected to be affected by the traffic on local roadways, such as Limebank Road and Earl Armstrong Road. The nearby land uses are residentially zoned or zoned as open space or general mixed use. There is no existing bus route within the area.

### 5.2.9 Property

Property requirements for the Limebank Extension are new to this project as they were not discussed in the original EPR. Lands required to facilitate the construction, operation and maintenance include privately owned parcels. The City will maintain communication with affected land owners and acquire the necessary lands in accordance with the City's property acquisition policies.

### 5.2.10 Transportation Planning

The City of Ottawa Class EA recommended the following at Limebank Road (TSH; NCE, 2003):

- four (4) lane urban/rural divided;
- long term property protection 6-lanes;
- dedicated bicycle lanes.

The City of Ottawa North-South Corridor LRT Project Environmental Assessment (N-S LRT EA) from Barrhaven Town Centre to the Rideau Centre was approved by the Minister of the Environment in June 2006. The EA report identified twin-track electric LRT as the recommended technology for the entire corridor. In 2008, City of Ottawa Council approved an updated TMP that identified the segment of the N-S corridor connecting Barrhaven Town Centre and Riverside South Town Centre as a BRT facility terminating at an LRT/BRT transfer station and Park and Ride within Riverside South Town Centre BRT (City of Ottawa, 2012a).

### **5.2.11 Community Planning**

Urbandale Construction (Urbandale) is one (1) of the major land owners in Riverside. Development is proposed in the vicinity of the future Limebank Extension and Station by Urbandale. There is a need for collector roads to service the future development. The Riverside South Community has a Riverside South Community Design Plan (CDP) which does not include most recent design of the TLS Extension. Incorporation of the LRT into the CDP will be undertaken as part of the CDP process and updates are planned by the City for the Fall of 2018.

### **5.2.12 Drainage and Stormwater Management**

East of Mosquito Creek, drainage and stormwater management of the guideway will be provided via enhanced grassed swales on either side of the guideway, outletting to Mosquito Creek and its tributaries.

West of Mosquito Creek, drainage of the guideway and Limebank Station will be provided by a subdrain and storm sewer system, outletting to an existing 2.7 m storm sewer on Limebank Road. This existing storm sewer was designed to capture drainage from future development of the lands east of Limebank and south of Earl Armstrong, including drainage from the rail corridor.

In a handful of locations, external drainage areas severed by the guideway need to be re-routed through diversion ditches. Most of these diversion ditches are a temporary measure and will be replaced by urban drainage and stormwater management systems once the land is developed over the coming decades.

The alignment crosses Mosquito Creek proper as well as one of its tributaries, the latter requiring two separate crossings. The alignment will cross Mosquito Creek by means of a bridge, while the tributary crossings will be via culverts.

## **5.3 Assessment and Evaluation of Impacts**

This section describes potential effects of the project and the proposed mitigation measures including planning decisions, design features, construction requirements and construction constraints, in order to reduce potential negative effects.



### 5.3.1 Archaeological

#### Potential Effects

The Limebank Extension corridor contains archaeological potential and therefore archaeological resources may be impacted (CTP2, 2017f).

#### Proposed Mitigation

This can be mitigated through a Stage 2 Archaeological Assessment to determine whether or not archaeological resources are present. If found to be present, recommendations will be made in the Stage 2 report regarding additional work, if required (CTP2, 2017f).

#### Monitoring

The effectiveness of the proposed mitigation measures will be monitored/ verified in accordance with the Stage 2 and 3 Archaeological Assessments to be completed.

### 5.3.2 Geo-Environmental

#### Potential Effects

As vanadium is naturally elevated in soils in the Ottawa region, there are no foreseeable effects to humans, terrestrial or aquatic wildlife or water courses during construction. Salt is very mobile in the environment, however, at these concentrations there are no foreseeable effects to humans, terrestrial or aquatic wildlife, or water courses. Potable drinking water wells may be present and in use in the rural area surrounding the Limebank Extension.

#### Proposed Mitigation

If excavated and removed from site salt exceedances must be considered when determining how to re-use or where to dispose of the material. The Contractor is responsible for completing an assessment of risk with respect to contamination to determine that the contamination does not represent a risk to human health or the environment. The contractor will implement any management or remedial measures as are required to ensure that any contamination does not pose a risk to human health or the environment. Excavated material should be managed according to applicable legislation.

## Monitoring

The effectiveness of the proposed mitigation measures will be monitored / verified in accordance with the risk assessment.

### 5.3.3 Natural Sciences – Aquatic

#### Potential Effects

Within the limits of the Limebank Extension, direct impacts to fish and fish habitat are anticipated to occur as a result of the following project works that have been identified thus far during this preliminary phase:

- infilling of the existing unnamed tributary east of Mosquito Creek at two (2) locations for the LRT track;
- diversion of approximately 1.2 km of the unnamed tributary so that the main channel flows along the south side of the LRT track;
- construction of a new ditch outlet to Mosquito Creek to the north of the LRT alignment;
- impacts to 1:100 years Mosquito Creek Floodplain due to construction of the Mosquito Creek Bridge; and
- Possible slope stabilization as required by a geotechnical study within the banks of Mosquito Creek.

Based on the preliminary design of the Limebank Extension, indirect impacts to nearby fish and fish habitat may result due to the following proposed works;

- construction of new track within 30 m of Mosquito Creek and its tributaries; and,
- construction of a new multi-span bridge structure over Mosquito Creek (impacts potentially direct as conceptual design of bridge includes piers within the floodplain).

It should be noted that the proposed works occurring near Mosquito Creek are not likely to result in direct or indirect impacts to aquatic SAR as there are no aquatic SAR present within the project limits (CTP2, 2018b).

#### Proposed Mitigation

Mitigation includes development and implementation of the following during construction: Erosion and Sediment Control Plan, Stormwater Management Plan, Environmental Protection Plan, and Spills Prevention and Response Plan.

Site Specific mitigation measures include adhering to in-water/channel bank timing window, and complying with additional measures recommended by DFO and RVCA. Any required alterations to the slopes/banks of Mosquito Creek, or its tributaries shall be completed during low flow conditions. As per RVCA recommendations, the diverted segment of the unnamed tributary is to be constructed with a 30 m setback buffer measured from bankfull, along either side

of the channel, with the new channel designed using natural channel and fluvial geomorphology principles. The new bridge structure crossing over Mosquito Creek should be designed with no part of the structure below the high water mark (i.e. middle span crossing entire width of creek) to avoid direct impacts to Mosquito Creek main-stem channel.

Future commitments include undertaking additional fish and fish habitat field investigations to update existing conditions in areas where new interactions between the project and aquatic environments arise, as required due to modifications of the project design. Upon completion of the detail design, a DFO Self-Assessment must be completed for all works near Mosquito Creek and its tributaries (within 30 m of high water mark) to determine whether the project is likely to result in serious harm to fish, and if a DFO Request for Review needs to be submitted. Furthermore, reviews of SAR listings will need to be completed to ensure updated legislation is considered and addressed. Any alteration, straightening, changing, diverting or interfering in any way with any watercourse requires the prior written approval of the RVCA under Ontario Regulation 174/06 "Development, Interference with Wetlands and Alterations to Shorelines and Watercourses Regulation" made pursuant to Section 28 of the *Conservation Authorities Act*.

Detail Design of the Mosquito Creek Bridge must be in compliance with the *Conservation Authorities Act* in relation to development within a floodplain. A cut/fill balance compensation will need to be proposed and accepted by the Rideau Valley Conservation Authority for any loss of floodplain use within this floodplain (CTP2, 2018b). Should development within the floodplain also result in the loss of aquatic habitat, offsite habitat creation may also be required. This shall be determined through the formal agency permit/approval processes.

### **Monitoring**

The effectiveness of the proposed mitigation measures will be monitored/verified in accordance with the developed plans: Erosion and Sediment Control Plan, Stormwater Management Plan, Environmental Protection Plan, Spills Prevention and Response Plan. Additional mitigation measures and monitoring may be required to be carried out in accordance with any permits/permission from DFO and or RVCA.

## **5.3.4 Natural Sciences – Terrestrial**

### **5.3.4.1 Significant Habitat**

#### **Potential Effects**

The potential presence of the habitat of SAR species and environmentally sensitive areas should be carried out in order to verify the extents of the habitat and to confirm that they are currently present. The impacts noted below are based on the assumed presence of SAR species and environmentally sensitive areas.

Indirect impacts may occur to the Significant Woodland, natural heritage systems, and Significant Valleylands. Waterfowl Stopover and Staging Areas (Terrestrial) – reduction in available habitat and indirect impacts from construction and operation of adjacent rail line. Found within agricultural fields west of Bowesville.

### **Proposed Mitigation**

Indirect impacts may occur to the following potentially present Significant Wildlife areas adjacent the alignment:

- Turtle Wintering Areas - within watercourses in the study area.
- Open Country Bird Breeding - large meadows on both sides of the alignment.
- Amphibian Movement Corridors - along watercourses and between wetlands and ponds within the study area.
- Raptor Wintering Areas - confirmed to be present in 2006 within areas overlapping of Earl Armstrong Road and mainly west of Bowesville Road; the LRT alignment is proposed for the southern boundary of the area.

Habitat for Species of Conservation Concern (not including END and THR species):

- Turtle habitat – along watercourses and between wetlands and ponds within the study area.
- Snake habitat – within meadows and near potential hibernaculum created by old stone building foundation.

Significant Woodland, natural heritage systems, and Significant Valleylands mitigation includes:

- Landscape and Restoration Plan must address impacts and re-instate natural features and functions;
- maintain hydrology, and develop erosion and sediment control plan; and
- develop an Invasive Species Management Plan.

Waterfowl Stopover and Staging Areas (Terrestrial) mitigation includes:

- verify regional importance through further analysis;
- create suitable habitat to compensate if warranted; and
- do not alter/remove vegetation during the stopover and staging periods.

Turtle Wintering Areas mitigation:

- an avoidance plan should be developed by a qualified biologist; and
- awareness training for all construction personnel on species identification, habitat preferences & correct protocols in to avoid harm.

Open Country Bird Breeding mitigation:

- Confirm the current presence of open country breeding bird habitat through targeted surveys.
- If surveys confirm the current presence of open country breeding bird habitat, carry out the following;
  - do not allow any work to occur where open country breeding bird habitat is present during the breeding season as per the *Migratory Birds Convention Act*;
  - minimize noise and lights adjacent to open country breeding bird habitat during the breeding season; plan for noisy disturbances such as blasting and excavation to occur outside of the breeding season;
  - minimize disturbance (including mowing and hydrology changes) and removal of open country bird breeding habitat (meadows, hayfields);
  - for areas where disturbance of open country bird breeding habitat is expected to occur, develop and implement a habitat restoration plan;
  - for areas where removal and displacement of open country bird breeding habitat is expected to occur, develop and implement a compensation plan in accordance with the MNRF's Significant Wildlife Habitat Mitigation Support Tool (2014); and,
  - conduct mortality studies to determine if trains may be causing mortalities to open country bird species. Where mortalities are determined to be causing unsustainable reductions in the populations, develop and implement adaptive management strategies to reduce mortalities.

Amphibian Movement Corridors mitigation:

- Have a qualified biologist develop a species-specific avoidance plan.

Raptor Wintering Areas mitigation:

- Raptor Point counts to be conducted; and
- If confirmed, a qualified biologist is to develop a species-specific mitigation plan.

Surveys should be conducted to confirm the continued presence of Raptor Wintering Area, as it may not currently be present.

Fencing should be used to exclude larger wildlife from the rail line, to avoid wildlife/train collisions and from becoming entrapped within sections that are below grade. Additionally, crossing opportunities will be maintained along Mosquito Creek where a bridge will pass over the creek and gully. To avoid deer from crossing the rail line at openings created by Limebank Road and Bowesville Road, it is recommended that the overpass at both are widened to allow deer to cross without entering the roadway.



### **5.3.4.2 Species at Risk**

#### **Potential Effects**

Five (5) SAR that are designated as Special Concern under the ESA 2007 are potentially present. These include the following species:

- Monarch
- Grasshopper Sparrow
- Milksnake
- Short-eared Owl
- Snapping Turtle

#### **Proposed Mitigation**

Further surveys to verify their presence will be required prior to construction. The mitigations in Section 4.2 of the NE & SAR Report (CTP2, 2017c) are recommended for those that are on provincial lands.

#### **Potential Effects**

SAR Herpetofauna

Suitable turtle nesting, overwintering, basking, and foraging habitat was found within Mosquito Creek. There is a possibility of SAR turtles entering the project area to seek out nesting sites and to migrate,

#### **Proposed Mitigation**

Suitable mitigation and best management practices will be required to protect any individuals that could be impacted by construction.

- Restrict all work within aquatic habitat from 01 October – 15 April, when turtles are overwintering.
  - Install temporary exclusion fencing, to minimize turtle entry into work areas; this fencing should: extend around terrestrial work areas adjoining the creek; and
  - Stay in place between 15 April and 30 September, in order to protect individuals during the active season.
- Conduct mandatory SAR awareness training for all construction personnel on species identification, habitat preferences & correct protocols in case of on-site encounters.
- Ensure that an Environmental Monitor is present at all times, during construction, to: inspect fences daily for breaches and/or gaps; conduct daily searches of work area for turtle entry; and maintain records of all SAR related activities.

#### **Potential Effects**

Barn Swallow, Bobolink, Eastern Meadowlark

### **Proposed Mitigation**

Should further surveys verify the presence of Bobolink, Eastern Meadowlark or Barn Swallow the following mitigations are recommended below:

- The work must reduce vegetation removal and create the smallest footprint possible within the SAR bird habitat. The work must avoid ANY work within grasslands (meadows) during the species' breeding season (15 April – 01 September; OBBA). If avoidance is not possible within the grasslands, the following are recommended:
  - Registration under *O.Reg. 242/08* will be required, and compensation may be required.
  - Clear/mow vegetation, and maintain, within 60 m of project area (which may include Category 1 and 2 habitat for SAR birds; MNRF, 2013d) prior to the breeding season in order to discourage birds from seeking nest sites within the construction area.
  - Conduct thorough nest searches to locate any birds/nests that may be present within the mowed 60-m ROW. If found, place a 60-m buffer around the nest (MNRF, 2013d), stop work immediately, and contact the MNRF.

## **5.3.5 Noise**

### **5.3.5.1 Construction Noise**

#### **Potential Effects**

Temporary construction has the potential for noise impacts.

#### **Proposed Mitigation**

Construction to be carried out with City of Ottawa Noise By-Laws.

### **5.3.5.2 Operational Noise**

#### **Potential Effects**

Marginal increase in operational noise levels are predicted at the assessed point of reception, the noise impacts are generally anticipated to be insignificant.

#### **Proposed Mitigation**

No noise mitigation requirement will be needed due to the insignificant impacts.

## **5.3.6 Vibration**

#### **Potential Effects**

Vibration impacts are anticipated to be insignificant with no mitigation required.

### **Proposed Mitigation**

No vibration mitigation requirement will be needed due to the insignificant impacts.

## **5.3.7 Air Quality**

### **Potential Effects**

The predicted effects from the operation of the Project are described in combination with the Bowesville Station in Section 4.3.7 and detailed in Appendix C. The modelled cumulative results predict an air quality threshold limit exceedance of nitrogen oxide, benzene, and benzo(a)pyrene. The exceedances are attributed to both of their respective existing background concentrations, and also to the emissions from the project. The frequency of exceedance for nitrogen oxides at the most impacted receptor shows that cumulative impacts from both the project contributions and background air quality exceeds the applicable air quality threshold less than 1% of the time.

### **Proposed Mitigation**

The implementation of the Trillium Line rail extension is anticipated to provide an overall net benefit to the Air Quality of the City. Increased accessible public transit options reduce the number of individual passenger vehicles travelling through arterial roads within outlying communities and traveling within the city core. Reductions in project contribution may be achieved by implementing a “no idling” policy at each station for passenger vehicles, and reducing the idling time of both trains and buses as much as possible. The City of Ottawa already has policies of this nature in place, as described within their Idling Control By-law (No. 2007-266).

Exposure to construction related emissions can be mitigated by the following Best Management Practices:

- Dust Control Plan
- Environmental Protection Plan
- Erosion and Sediment Control Plan

## **5.3.8 Property**

### **Potential Effects**

Land will be required from private owners for the construction of the potential Limebank Extension and Station.

### **Proposed Mitigation**

The City will maintain communication with affected land owners and acquire the necessary lands in accordance with the City's property acquisition policy.



### **Monitoring**

The effectiveness of the proposed mitigation measures will be monitored/verified based on the discussion with the land owners and the conditions, if any, of the procurement.

### **5.3.9 Traffic**

#### **Potential Effects**

There will be a temporary disturbance to existing traffic on Bowesville Road and Limebank Road during construction activities.

#### **Proposed Mitigation**

As a result of the temporary disturbance to existing traffic on Bowesville Road and Limebank Road during construction activities a Traffic Management Plan should be developed in detail design and implemented during construction to minimize disruptions to the travelling public.

### **5.3.10 Transportation Planning**

#### **Potential Effects**

The design and construction of the Limebank Extension could limit options for the recommended car and bicycle lane upgrades at Limebank Road. Transit riders in Barrhaven may not be able to access the LRT extension if a BRT is not included as a connection.

#### **Proposed Mitigation**

The designs for the proposed grade separated crossing at Limebank Road will take into account the future Limebank Road widening project.

The Limebank LRT Extension will take into account facilities to accommodate a connection of the Barrhaven BRT to the LRT at Limebank Station.

### **5.3.11 Community Planning**

#### **Potential Effects**

There is a potential for the future CDP development to cause traffic implications including long commute times if appropriate road infrastructure is not considered around the LRT.

#### **Proposed Mitigation**

The CDP development is being taken into account in the TLS Extension design by including LRT crossings at proposed future local collector roads. These collector roads will service the future development and have a vertical profile built for grade separation.

The Riverside South CDP is being updated to align and support this Trillium Line Extension adjustment south of Leitrim Station, and the extension of this diesel-powered LRT system farther into this community from the new terminus at Bowesville to Limebank Road. Most of the easterly half of the CDP area (east of Limebank Road) will need to be updated to accommodate the relocation of the alignment in terms of the arrangement of future land use, infrastructure servicing plans, environmental and transportation components (Finance and Economic Development Committee, 2017).

### 5.3.12 Drainage and Stormwater Management

#### Potential Effect

Modification to stormwater inputs of the existing system.

#### Proposed Mitigation

Drainage and SWM for Limebank Station shall meet MECP “Enhanced” Standards (80% TSS Removal) and the specific quantity and erosion control SWM criteria for Mosquito Creek that are required as part of the Master Drainage Plan update for Riverside South. The City of Ottawa is currently updating the Master Drainage Plan and Master Servicing Study for the Riverside South community, which also discharges to Mosquito Creek.

The crossing of tributary 7A-R1 is at a location where the watercourse meanders, and in order to preserve the existing channel length, a short length of realignment (approximately 70m) of the channel using natural channel design principles is recommended to meet the requirements of the RVCA and to mitigate environmental impacts.

Erosion protection is required where the engineered swales converge with natural watercourses.

#### Monitoring

The effectiveness of the proposed mitigation measures will be monitored/verified in accordance with any ECA requirements.

## 5.4 Consultation

In addition to the City Committee and Council meetings, several meetings were held with the key properties owners in the Riverside South Development area. Key areas of concern included: grade separation requirements and access restrictions. Presentations and correspondence is provided in **Appendix D**.

## 5.5 Significance

No significant residual environmental effects are expected to occur as impacts will be marginal and standard mitigation measures will be applied. The majority of these impacts will happen for short-term periods during construction which is considered a reversible effect.



## 6. PROJECT WIDE EFFECTS

### 6.1 Climate Change

The *Draft Guidance for Considering Climate Change in Environmental Assessment* advises project proponents on approaches for the consideration of:

- the effects of a project on climate change;
- the effects of climate change on a project; and
- various means of identifying and minimizing negative effects during project design

#### 6.1.1 General Effects of the Project

The following represents the climate change considerations that have been made as an integral component of the Stage 2 LRT project by the City and were components in the Business case for project implementation.

Climate change refers to any significant change in the measures of climate lasting for an extended period of time. CO<sub>2</sub> emissions are a main producer of greenhouse gas, which contributes to global warming effects and associated climate change. With vehicle emissions being a major cause of global warming, the transportation sector is being targeted with efforts to reduce CO<sub>2</sub> emissions and prevent negative effects of climate change.<sup>42</sup>

A modal shift from fossil fuel powered single vehicle use to mass transit can be a key contributor to Canada's climate change strategy. Rising global temperatures and continued climate change could have numerous impacts on public health based on factors such as extreme weather events, heat waves, air quality deterioration, and or flooding.

Perhaps one of the most recognizable benefits of transit investment is the reduction in greenhouse gases (GHGs) and critical air contaminants (CACs), which have direct implications for the overall sustainability of urban growth and direct consequences on the health of residents. It is estimated that OLRT Stage 2 would result in nearly 50 million litres of savings in fuel consumption, and reduce GHG emissions by over 110 thousand tonnes and CACs by over three thousand tonnes by 2048 annually. The economic value of these reductions will total \$438 million between 2023 and 2048.

Implementation of the light rail project is expected to reduce OC Transpo fleet emissions by approximately 94,000 tonnes per year by 2031 (Ottawa, 2014). As the City invests in light rail and vehicles to help promote transit use, the corporation will need to focus on ensuring the following:

- development occurs near transit;
- other incentives and disincentives are used to move people out of cars and onto transit; and
- fleet emissions continue to be managed by the corporation
- Going forward, the corporate GHG inventory will be completed annually and the community inventory once every four years.

### 6.1.2 Climate Change Projections

Transportation infrastructure in the Ottawa area is currently designed and operated to handle a broad range of climate impacts, based on experience under the historic climate. However, because of climate change, the historical information used for infrastructure planning and design, as well as for purposes of ongoing operations and maintenance, is becoming less relevant, posing additional challenges for its sustainability, reliability, effectiveness, and costs for servicing.

In 2005, Engineers Canada created the Public Infrastructure Engineering Vulnerability Committee (PIEVC, “the Committee”) to conduct an engineering assessment of the vulnerability of Canada's public infrastructure to the impacts of climate change. Vulnerability of infrastructure is a function of its adaptive capacity and of climate change projections. The Committee developed the PIEVC Protocol (“the Protocol”) as a tool for the *systematic review* of historical climate data and projections of future climate events, and for the *evaluation* of the severity of potential climate change impacts on infrastructure components.

Intergovernmental Panel on Climate Change (IPCC). The IPCC was established by the United Nations and World Meteorological Organization in 1988 to review information on climate change. The IPCC has since been preparing Assessment Reports that, among other things, aggregate global climate models projection data. The latest such report, the Fifth Assessment Report (AR5), included projection information from forty Global Climate Models (GCMs). Additionally, AR5 included new Representative Concentration Pathways (RCPs) to denote various scenarios that depend on the extent to which climate change is mitigated or worsened. The scenario with the lowest projection change is represented by RCP 2.6, while the highest projection is represented by RCP 8.5.

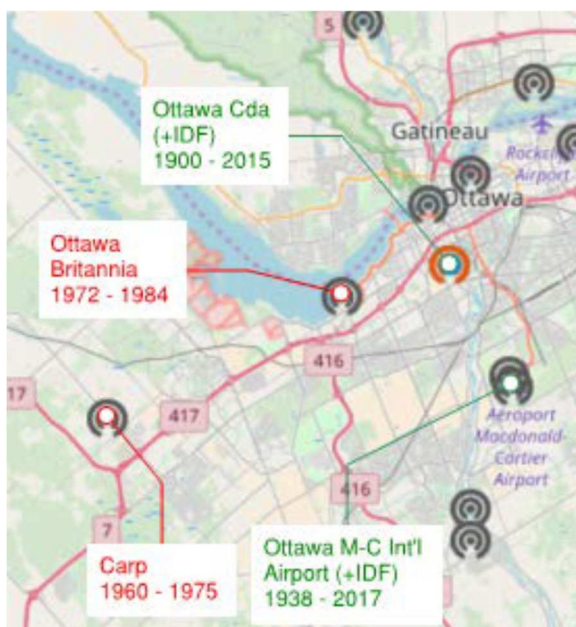
The data from AR5 was accessed via the Climate Change Hazards Information Portal (CCHIP), a climate analysis tool developed by Risk Sciences International (RSI). CCHIP provides access to climate information and analysis based on historical data from Environment and Climate Change Canada and Natural Resources Canada. CCHIP computes the historical



climate data and provides climate projections for individual meteorological stations. Climate projections are obtained using the climate models from AR5, and two future emissions pathways, or RCPs, are presented: RCP 4.5 (moderate future emissions), and RCP 8.5 (highest future emissions). Although the future remains unknowable, RSI notes, “historically, the GHG emissions have followed the highest (8.5) pathway.”

Two time horizons were considered: 2080, a 60-year window to capture the full design life of most physical structures, and 2050, to capture any possible trends and to better inform the 2080 projection. Historical trends and climate projections were identified through the review of previous climate change studies in the Ottawa area, as well as through use of the Climate Change Hazards Information Portal (CCHIP).

CCHIP automatically selects the meteorological station nearest to the location of interest. However, the nearest station is not always the best choice as it may have incomplete records. Stations with at least 30 years of historical data are recommended for an accurate baseline, and stations with the longest periods of data are generally preferable. In the case of the Trillium Line, the nearest meteorological stations (Figure 6-1) are the Carp and Ottawa Britannia stations, however these stations only have data for less than 15 years. The Ottawa Cda station, however, has over 100 years of data. The Ottawa Macdonald-Cartier International Airport station is another good option for projects in the City of Ottawa, however the Ottawa Cda station is closest to the study area.



**Figure 6-1: Meteorological Stations**

Climate data from the Ottawa Cda station is presented in the following pages. Results from both the moderate (RCP4.5) and high (RCP8.5) climate change scenarios are included.

### 6.1.2.1 Temperature

As can be expected, temperatures in the Ottawa area are projected to increase in the future. Overall, annual daily average, maximum, and minimum temperatures will increase at similar rates. All three variables are projected to increase between 2.4 and 3.1 degrees by 2050, and between 3.3 and 5.8 degrees.

**Table 6-1: Annual Daily Average, Maximum, and Minimum Temperature Projections**

<b>Annual Daily Average Temp (°C)</b>					
		<b>RCP4.5</b>		<b>RCP8.5</b>	
<b>Data Source</b>	<b>Historical Average 1980-2010</b>	<b>2050</b>	<b>2080</b>	<b>2050</b>	<b>2080</b>
Average Temperature	6.7	9.1	9.7	10	12.2
Difference	-	2.4	3	3.3	5.5
<b>Annual Daily Max Temp (°C)</b>					
		<b>RCP4.5</b>		<b>RCP8.5</b>	
<b>Data Source</b>	<b>Historical Average</b>	<b>2050</b>	<b>2080</b>	<b>2050</b>	<b>2080</b>
Average Temperature	11.45	13.8	14.4	14.7	16.9
Difference	-	2.35	2.95	3.25	5.45
<b>Annual Daily Min Temp (°C)</b>					
		<b>RCP4.5</b>		<b>RCP8.5</b>	
<b>Data Source</b>	<b>Historical Average</b>	<b>2050</b>	<b>2080</b>	<b>2050</b>	<b>2080</b>
Average Temperature	1.9	4.4	5	5.4	7.7
Difference	-	2.5	3.1	3.5	5.8

This increase in temperature will impact on the number of heating and cooling degree days. As shown in the following two tables, heating degree days are expected to decrease by 20% to 36%. Cooling degree days are expected to increase by 97% to 258%.

**Table 6-2: Heating Degree Days Projections**

Heating Degree Days (°C)		RCP4.5		RCP8.5	
Data Source	Historical Average	2050	2080	2050	2080
Annual Average	4625	3702	3557	3473	2963
Percent Change	-	-20.0	-23.1	-24.9	-35.9

**Table 6-3 - Heating Degree Days Projection**

Cooling Degree Days (°C)		RCP4.5		RCP8.5	
Data Source	Historical Average	2050	2080	2050	2080
Annual Average	242	477	533	582	867
Percent Change	-	97.1	120.2	140.5	258.3

### 6.1.2.2 Precipitation

Extreme precipitation is one of the most difficult climate change variables to project, however it is also one of the most important in terms of impacts to infrastructure. In general, according to current projections, there is consensus on two key points:

- Total annual precipitation will increase; and
- Extreme precipitation will increase at a faster rate than total annual precipitation.

The following tables support both of the above. Whereas total annual precipitation is projected to increase by up to 11% in 2080, the average maximum 24 hr precipitation is expected to increase by 17% in that same time frame. Another way to look at this is to consider the distribution of precipitation events throughout the year. The data aggregated by CCHIP shows that the total precipitation from events in the 95<sup>th</sup> and 99<sup>th</sup> percentile (that is, events in the top 5% and 1% respectively when ranked by precipitation amounts) is set to increase by 51% and 92%, respectively. This indicates that, the 11% of total annual precipitation increase, will be disproportionately attributable to larger rain events.

**Table 6-4: Total Annual Precipitation Projections**

Total Annual Precipitation		RCP4.5		RCP8.5	
Data Source	Historical Average	2050	2080	2050	2080
Annual Precipitation (mm)	925	983	991	997	1023
Percent Change (%)	-	6.3	7.2	7.8	10.6

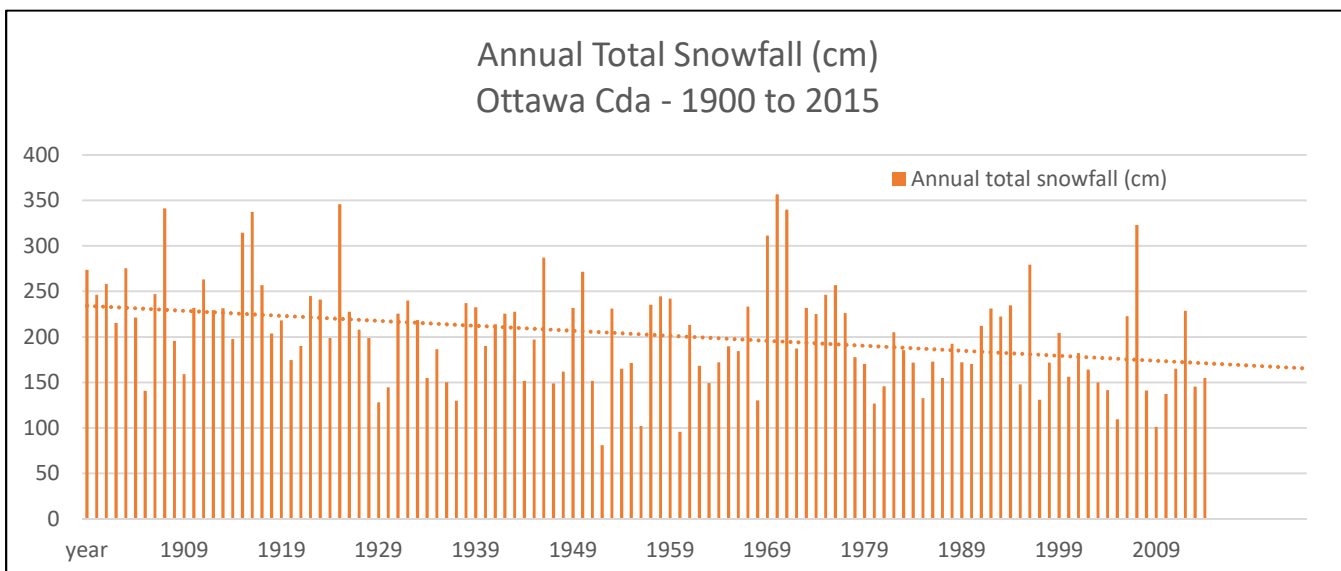


**Table 6-5: Increase in Total Rainfall during Extreme Precipitation Events**

Precipitation Extremes		RCP4.5		RCP8.5	
	Historical Average	2050	2080	2050	2080
1 Day Max Precipitation (mm)	42	47	46	47	49
Percent Change (%)	-	11.9	9.5	11.9	16.7
Total Precipitation of Events in 95 <sup>th</sup> Percentile (mm)	240	301	306	321	362
Percent Change	-	25.4	27.5	33.8	50.8
Total Precipitation of Events in 99 <sup>th</sup> Percentile (mm)	73	106	105	114	140
Percent Change	-	45.2	43.8	56.2	91.8

### 6.1.2.3 Snowfall

For this climate variable, the CCHIP tool could not provide the analysis required for projections. Below are the historical total annual snowfalls for the Ottawa Cda station. A downward trend can be identified in the historical data, and this generally aligns with projections for annual increase in temperature. Further, the increase in annual daily average temperature is not distributed evenly throughout the year, but rather will impact the winter season disproportionately compared with all other seasons, as is shown in the table below.

**Figure 6-2: Annual Total Snowfall (cm)**



**Table 6-6: Seasonal Average Daily Temperature Increase Projections**

Temperature Increase Compared to Historical Average (2010) (°C)	RCP4.5		RCP8.5	
	2050	2080	2050	2080
Annual Daily Average	2.4	3	3.3	5.5
Winter (Dec, Jan, Feb) Daily Average	<b>2.9</b>	<b>3.6</b>	<b>3.9</b>	<b>6.3</b>
Spring (Mar, Apr, May) Daily Average	2.2	2.8	3	4.9
Summer (Jun, Jul, Aug) Daily Average	2.2	2.7	3.2	5.5
Fall (Sep, Oct, Nov) Daily Average	2.2	2.8	3.1	5.3

**6.1.2.4 Freeze-thaw cycles**

The ensemble of projections for both the moderate and high concentration pathways (RPC) show a noticeable decrease in the number of days with freeze-thaw cycles in 2050 and 2080. The months of April and October will see 62% to 95% fewer freeze-thaw cycles on average. December, January, and February will all see an increase in freeze-thaw cycles. The month of March will continue to see the most days with freeze-thaw cycles in 2080.

**Table 6-7: Freeze-Thaw Cycles Projections**

Freeze-thaw cycles (days)		RCP4.5		RCP8.5	
	Historical Average	2050	2080	2050	2080
January	6.7	7.8	8.2	8	8.3
February	6.7	9.4	9.9	10.2	10.8
March	15.6	14.2	13.3	13.2	11.7
April	12.4	4.7	3.7	3.5	1.8
May	1.5	0.1	0	0	0
June	0	0	0	0	0
July	0	0	0	0	0
August	0	0	0	0	0
September	0.6	0	0	0	0
October	7.1	2.3	1.8	1.2	0.3
November	14	9.9	8.8	8.2	5.6
December	9	10.6	10.5	10	8.7
Total	73.6	59	56.4	54.3	47.3



### 6.1.2.5 Freezing Rain

Certain climate variables, such as freezing rain cannot be derived directly from temperature or precipitation and require regional modelling with higher resolution. This particular climate variable is not available with CCHIP. Although few studies have been conducted to look at the impacts of climate change on freezing rain, an Environment Canada study by Cheng et. al. (2007) concluded that freezing rain events are very likely to increase in northern, eastern, and southern Ontario in the coming century. The study concluded that eastern Ontario is likely to see a 60% and 95% increase in freezing rain event frequency by 2050 and 2080, respectively, during the months of December, January, and February. The study projected that the frequency of freezing rain events would remain unchanged for the months of November, March, and April.

### 6.1.2.6 Wind

Similar to freezing rain, wind is considered a complex climate variable, requiring detailed and costly modelling. Therefore, the number of projection sources for this climate variable are limited. One Environment Canada study by Cheng et. al. (2012) looked at increases in daily and hourly wind gusts for various regions of Ontario, including eastern Ontario. The study analyzed projected climate data from eight GCMs under two climate change scenarios. Like RCPs but developed for the IPCC's fourth assessment report (AR4), different scenarios represent alternative future greenhouse gas emissions. A2 assumes higher GHG emissions, while scenario B1 assumes less.

The results of the 2012 study suggests modest increases in wind gusts are likely in the coming decades (Table 6-8). Wind gusts over 70 km/h will see the highest increase in frequency, occurring 23% to 46% more often than current conditions.

**Table 6-8 - Daily and Hourly Wind Gust Projections (Cheng et. al., 2012)**

Wind gust event	Daily wind gust (% increase in frequency)				Hourly wind gust (% increase in frequency)			
	2046-2065		2081-2100		2046-2065		2081-2100	
	A2	B1	A2	B1	A2	B1	A2	B1
≥28 km/h	3	2	4	2	7	6	9	6
≥40 km/h	5	4	6	4	7	6	9	7
≥70 km/h	10	10	13	9	47	33	23	35

### 6.1.3 Project Design for Climate Change

The Trillium Line LRT Extension has taken climate change into some of the basic planning tenets of the City of Ottawa including those contained in *Managing Risk Through Adaptation*. These include:

- Greater redundancy in the transportation system can be achieved by diversifying transportation modes;
- Improved track layout to maximize electrical regeneration and reduced brake wear; thereby making the electrical design more power efficient;
- Following a rigid power budget that incentivizes low power consumption and reduced running costs;
- Pedestrian and bicycle facilities to improve connectivity to key transportation hubs;
- LID principles for Stormwater Management; and
- 10 kilowatt rooftop solar project at the Transit Services Integrated Control Centre to reduce vulnerability to interruptions in power supply.

Additional modifications to the ultimate design/design solutions may be appropriate to consider to reduce vulnerability to changes in some of the identified climate/weather parameters. Potential adaptations to deal with changing climate conditions and LRT systems that have been utilized in other jurisdictions that may be considered including:

- High heat:
  - Transformers and electrical distribution system: Enhance capacity to deal with higher temperature conditions (in accordance with established Engineers Canada standards); and
  - Sagging wires: Utilizing a constant tension system for a broader temperature range.
- Extreme/intense rain and flooding:
  - Review/modify flood plain/storm frequency design criteria;
  - Elevate assets to keep from flooding, build flood protection structures;
  - Redirect storm runoff from track bed;
  - Slope stabilization to prevent washouts; and
  - Back-up power at key installations.
- Faster tree growth with potentially higher rates of disease and pest conditions: Increased tree maintenance along the perimeter of corridors or affecting any project components; and tree replacement plan.



## 6.2 Cumulative Effects Assessment

The Trillium Line LRT has undergone Cumulative Effects Assessment (CEA) as part of the North – South Corridor LRT Project: Rideau Centre to Barrhaven Town Centre, CEAA Screening Report (June 2006). The CEA determined that the potential adverse effects of the North-South LRT are anticipated to be relatively minor with the implementation of the identified mitigation measures. The project was expected to provide overall benefits including cleaner air, reduced traffic congestion and improved connections between communities. No significant negative cumulated effects were identified.

The Trillium Line LRT where it passes through the Greenbelt was also encompassed with the Joint Study to Assess Cumulative Effects of Transportation Infrastructures on the National Capital Greenbelt – Study Report (November 2012) undertaken by National Capital Commission and the City of Ottawa. Projects were categorized as either Category 1 or Category 2 (**Error! Reference source not found.**). Category 1 projects require additional consideration by the City and the NCC in order to avoid and/or reduce the potential for cumulative effects on the Greenbelt. Category 2 projects given their lower potential for generating significant adverse cumulative effects on the Greenbelt and can proceed with their standard design, review and approval processes, giving explicit consideration to their contributions to cumulative effects on the Greenbelt. The NCC has approved the Environmental Effects Evaluation (EEE) for the Trillium Line LRT in accordance with Section 67 of the Canadian Environmental Assessment Act.

The minor modifications included in this addendum are not anticipated to contribute to the identified cumulative effects.

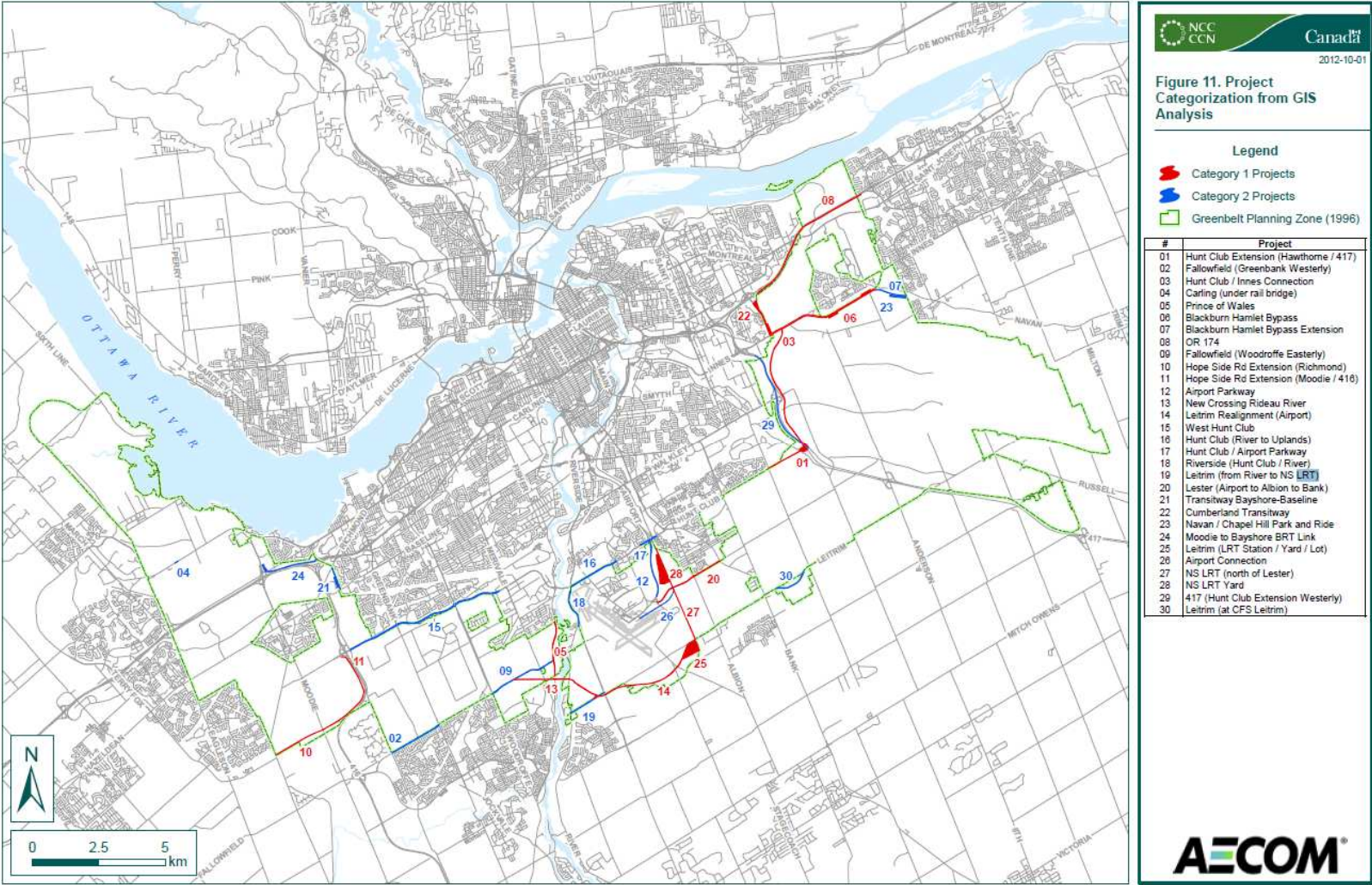


Figure 6-3: CEA Project Categorization





## 7. STATEMENT OF SIGNIFICANCE

The *Environmental Assessment Act's O.Reg. 231/08*, provides the direction on changes to the approved EPR. Specifically it states under Section 15:

If, after submitting a statement of completion of the TPAP, the proponent wishes to make a change to the transit project that is inconsistent with the environmental project report referred to in that statement, the proponent shall prepare an addendum to the environmental project report. If the proponent is of the opinion that a change described in an addendum prepared under subsection (1) is a significant change to the transit project, the proponent shall prepare a notice of environmental project report addendum.

Based on discussions with the MECP, it was determined the changes identified in this addendum are deemed significant as they involve new property owners, have new environmental impacts and require changes to ecosystem components that were not previously studied. A TPAP Addendum has been prepared and Notice of Addendum distributed.

While the changes outlined in this addendum are deemed significant, once mitigation measures proposed in this document are implemented, there will be no expected significant adverse impacts on the environment.

### 7.1 Approval Requirements

In addition to meeting the requirements of the Transit Projects Regulation (O. Reg. 231/08), provincial, federal and municipal permits and approvals are anticipated to be required prior to the implementation of the plan outlined in this EPR. These approvals will serve to further detail the mitigation measures outlined in this report.

The permits and approvals that will be required for implementation of the transit facility maybe expected to include those listed below. However, all requirements will be confirmed in the detail design stage of the project when further information regarding the design and surrounding environmental and legislative context is available.

#### Municipal

- **City of Ottawa** – Municipal road-cut permit, Noise by-law exemption
- **Utilities** – Approval for utility relocations and any other required mitigation measures

#### Provincial

- **Ministry of the Environment, Conservation and Parks** – Permit to Take Water as per the *Ontario Water Resource Act*, and Environmental Compliance Approvals as per the *Environmental Protection Act*
- **Ministry of Tourism, Culture and Sport** – Archaeological Clearances as per the *Ontario Heritage Act* if new archaeological assessments are required. Clearances have been received for the completed reports





- **Ministry of Natural Resources and Forestry** – Permits/Registration of works under Section 17(2)c) of the *Endangered Species Act* if additional species are found or up listed. Applications to-date for the entire Trillium Line have been submitted and recommendations made for registration of the mitigation measures proposed; *Work Permit for Crown Lands*
- **Rideau Valley Conservation Authority and/or South Nation Conservation Authority** – Approval for Development, Interference with Wetlands and Alterations to Shorelines and Watercourses as per Ontario Regulations 174/06 and 170/06, if there is interference with a water course.

#### **Federal**

- Federal approvals have been received in accordance with Section 67 of the Canadian Environmental Assessment Act, have been received from the National Capital Commission and federal land owners in the project Area. On-going reviews and consultation will continue with the federal agencies as required in the approval conditions as the project moves forward.
- **Canadian Transportation Agency:** authorization pursuant to subsection 98(2) of the *Canada Transportation Act*, S.C. 1996, c. 10, as amended.
- **Environment Canada:** Permits/authorization pursuant to the *Species At Risk Act*, if there are additional species found or up-listed. Applications to-date for the entire Trillium Line have been submitted and recommendations made for implementation of the mitigation measures proposed



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