UP Express Electrification EA
Natural Environment Assessment Report
FINAL

Presented to:
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Metrolinx

Project No. 1124019.00
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Part A – Baseline Conditions Report
FINAL
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# Glossary of Terms

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<tr>
<td>AREMA</td>
<td>The acronym for American Railway Engineering and Maintenance-of-Way Association. AREMA is the organization that represents the engineering function of the North American railroads.</td>
</tr>
<tr>
<td>Autotransformer</td>
<td>Apparatus which helps boost the overhead contact system (OCS) voltage and reduce the running rail return current in the 2 X 25 kV autotransformer feed configuration. It is a single winding transformer having three terminals. The intermediate terminal located at the midpoint of the winding is connected to the rail and the static wires, and the other two terminals are connected to the catenary and the negative feeder wires, respectively.</td>
</tr>
<tr>
<td>Bonding</td>
<td>A low impedance path obtained by permanently joining all normally-non-current-carrying conductive parts to ensure electrical continuity and having the capacity to conduct safely any current likely to be imposed on it.</td>
</tr>
<tr>
<td>Cantilever</td>
<td>A beam that is supported by a pole at only one end and carries the load of the electrification equipment on top of tracks. At multiple track locations where cantilever frames are not practical, portal structures should be utilized.</td>
</tr>
<tr>
<td>Catenary System</td>
<td>An assembly of overhead wires consisting of, as a minimum, a messenger wire, carrying vertical hangers that support a solid contact wire which is the contact interface with operating electric train pantographs, and which supplies power from a central power source to an electrically-powered vehicle, such as a train.</td>
</tr>
<tr>
<td>CEAA</td>
<td>The acronym for Canadian Environmental Assessment Act.</td>
</tr>
<tr>
<td>Cess</td>
<td>The area on either side of the railway immediately off the ballast shoulder, within the rail right of way. This area is considered a safe area for workers to stand when a train approaches.</td>
</tr>
<tr>
<td>Class EA</td>
<td>Under the Ontario Environmental Assessment Act (EA Act), Class Environmental Assessments are those projects that are approved subject to compliance with an approved class environmental assessment process (e.g., Class EA for Minor Transmission Facilities, GO Transit Class EA, etc.) with respect to a class of undertakings.</td>
</tr>
<tr>
<td>Contact Wire</td>
<td>A solid grooved, bare aerial, overhead electrical conductor of an OCS that is suspended above the rail vehicles and which supplies the electrically powered vehicles with electrical energy through roof-mounted current collection equipment - pantographs - and with which the current collectors make direct electrical contact.</td>
</tr>
<tr>
<td>Control Centre</td>
<td>The building or room location that is used to dispatch trains and control the train and maintenance operations over a designated section of track.</td>
</tr>
<tr>
<td>Cross Bonds</td>
<td>The method of tying tracks together electrically to equalize traction return currents between tracks. This is done to minimize touch potential.</td>
</tr>
<tr>
<td>Cross Feeding System</td>
<td>Overhead feeder lines are provided between the main gantry and strain gantry across the electrified track to feed power to the OCS wires.</td>
</tr>
<tr>
<td>Deadhead Movements</td>
<td>In the case of UP Express, deadhead movements are considered to be empty train movements required to reposition a train before or after revenue service. (Revenue service entails train movements that carry fare paying passengers). Deadhead movements are also referred to as “unproductive moves” as they incur the costs of train operations, but are not offset by any</td>
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<tr>
<th>Term</th>
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<tr>
<td>Detailed Design</td>
<td>The detailed design phase of a project is defined as the last design stage before system implementation phase including software and hardware development starts.</td>
</tr>
<tr>
<td>DMU</td>
<td>Diesel Multiple Unit; a train comprising single self-propelled diesel units.</td>
</tr>
<tr>
<td>Double Stacked Freight (DSF)</td>
<td>Freight trains carrying double stack containers.</td>
</tr>
<tr>
<td>Duct Bank</td>
<td>A duct bank is an assembly of electrical conduits that are either directly buried or encased in concrete. The purpose of the duct bank and associated conduit is to protect and provide defined routing of electrical cables and wiring. It also provides a physical separation and isolation for the various types of cables.</td>
</tr>
<tr>
<td>Electrical Potential</td>
<td>A measurement of the voltage (or potential difference) between two points in a system. For UP Express electrification, electrical potential is the electrical charge difference between the electrified UP Express railway and the ground. The unit for electrical potential is expressed in volts.</td>
</tr>
<tr>
<td>Electrical Section</td>
<td>This is the entire section of the OCS which, during normal system operation, is powered from a TPS circuit breaker. The TPS feed section is demarcated by the phase breaks of the supplying TPS and by the phase breaks at the nearest SWS or line end. An electrical section may be subdivided into smaller elementary electrical sections.</td>
</tr>
<tr>
<td>Electric Traction Facility</td>
<td>A traction substation, paralleling station, or switching station.</td>
</tr>
<tr>
<td>EMC</td>
<td>The acronym for Electromagnetic Compatibility. Electromagnetic compatibility is the ability of a device, equipment, or system to function satisfactorily in its electromagnetic environment without introducing intolerable electromagnetic disturbances to anything in that environment.</td>
</tr>
<tr>
<td>EMF</td>
<td>The acronym for Electric and Magnetic Field. Electric and magnetic fields arise from natural forces and permeate our environment. In addition to natural background EMF, anthropogenic sources include electric fields which arise anywhere electricity or electrical components are used and magnetic fields which arise wherever there is a flow of electric current. Common manmade sources of EMF include: electronics, power stations, transmission lines, telecommunication infrastructure, electric motors, etc. The strength of man-made EMF depends on the characteristics of the source including amongst others, voltage, current strength and frequency.</td>
</tr>
<tr>
<td>EMI</td>
<td>The acronym for Electromagnetic Interference. Electromagnetic interference is a disturbance that affects an electrical circuit due to either electromagnetic induction or radiation from an external source.</td>
</tr>
<tr>
<td>EMU</td>
<td>The acronym for Electric Multiple Unit; a train comprising single self-propelled electric units.</td>
</tr>
<tr>
<td>Elementary Electrical Section</td>
<td>The smallest section of the OCS power distribution system that can be isolated from other sections or feeders of the system by means of disconnect switches and/or circuit breakers.</td>
</tr>
<tr>
<td>EPR</td>
<td>The acronym for Environmental Project Report. The proponent is required to prepare an Environmental Project Report to document the Transit Project Assessment Process followed, including but not limited to: a description of the preferred transit project, a map of the project, a description of existing environmental conditions, an assessment of potential impacts, description of proposed mitigation measures, etc. The EPR is made available for public review and comment for a period of 30 calendar days. This is followed by a 35-day Minister’s Decision Period.</td>
</tr>
<tr>
<td>ESR</td>
<td>The acronym for Environmental Study Report. Proponents are required to...</td>
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prepare an Environmental Study Report to document the planning process followed under the Class Environmental Assessment for Minor Transmission Facilities.

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<tr>
<th>Term</th>
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<tr>
<td>Feeder</td>
<td>A current-carrying electrical connection between the overhead contact system and a traction power facility (substation, paralleling station or switching station).</td>
</tr>
<tr>
<td>Gantry</td>
<td>Supporting structures parallel to the tracks, and on both sides of the tracks, at TSS, SWS, and PS used to connect the traction power feeders to the catenary.</td>
</tr>
<tr>
<td>Grounding</td>
<td>Connecting to earth through a ground connection or connections of sufficiently low impedance and having sufficient current-carrying capacity to limit the build-up of voltages to levels below that which may result in undue hazard to persons or to connected equipment.</td>
</tr>
<tr>
<td>Grounding Grid</td>
<td>A system of horizontal ground electrodes that consists of a number of interconnected, bare conductors buried in the earth, providing a common ground for electrical devices or metallic structures, usually in one specific location.</td>
</tr>
<tr>
<td>Heavy Maintenance</td>
<td>Heavy maintenance includes: replacement of engine traction motors, replacement of diesel engines on DMUs, replacement of transformers and ac propulsion systems on EMUs and replacement of wheel sets on engines. On railcars, heavy maintenance includes the replacement of wheel sets, repairs to windows and brake lines, and body repairs.</td>
</tr>
<tr>
<td>HV</td>
<td>Acronym for high voltages and refers to electrical energy at voltages high enough to cause injury and harm to human beings and living species. Voltages over 1000 V for alternating current, and 1500 V for direct current is considered high voltage.</td>
</tr>
<tr>
<td>Hydro One</td>
<td>Hydro One Incorporated delivers electricity across the province of Ontario. Hydro One has four subsidiaries, the largest being Hydro One Networks. They operate 97% of the high voltage transmission grid throughout Ontario.</td>
</tr>
<tr>
<td>Impedance Bonds</td>
<td>An electrical device located between the rails consisting of a coil with a centre tap used to bridge insulated rail joints in order to prevent track circuit energy from bridging the insulated joint while allowing the traction return current to bypass the insulated joint. The centre tap can also be used to provide a connection from the rails to the static wire and/or traction power facilities for the traction return current.</td>
</tr>
<tr>
<td>kV</td>
<td>Abbreviation for kilovolt (equal to 1000 volts).</td>
</tr>
<tr>
<td>LV</td>
<td>Acronym for low voltage and according to IEC voltages between 50-1000 V for alternating current, and between 120-1500 V for direct current is considered low voltage.</td>
</tr>
<tr>
<td>Main Gantry</td>
<td>These 25 kV feeders from the TPF will be connected to the OCS with the help of main and strain gantries and a cross feeder arrangement. The main gantry also referred to as the catenary feeding gantry is the one parallel to and toward the TPF side of the track.</td>
</tr>
<tr>
<td>Maintenance Facility</td>
<td>A mechanical facility for the maintenance, repair, and inspection of engines and railcars.</td>
</tr>
<tr>
<td>Messenger Wire</td>
<td>In catenary construction, the OCS Messenger Wire is a longitudinal bare stranded conductor that physically supports the contact wire or wires either directly or indirectly by means of hangers or hanger clips and is electrically common with the contact wire(s).</td>
</tr>
<tr>
<td>Mid-span</td>
<td>Area between two OCS registration points.</td>
</tr>
<tr>
<td><strong>Minister</strong></td>
<td>Ontario Minister of the Environment.</td>
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<tr>
<td><strong>Mitigation Measure</strong></td>
<td>Actions that remove or alleviate, to some degree, the negative effects associated with the implementation of an alternative.</td>
</tr>
<tr>
<td><strong>MOE</strong></td>
<td>The acronym for Ontario Ministry of the Environment.</td>
</tr>
<tr>
<td><strong>MVA</strong></td>
<td>The acronym for Megavolt-Ampere. This is a unit for measuring the apparent power in an electrical circuit equivalent of one million watts.</td>
</tr>
<tr>
<td><strong>Negative Feeder</strong></td>
<td>Negative feeder is an overhead conductor supported on the same structure as the catenary conductors, which is at a voltage of 25 kV with respect to ground but 1800 out-of-phase with respect to the voltage on the catenary. Therefore, the voltage between the catenary conductors and the negative feeder is 50 kV nominal. The negative feeder connects successive feeding points, and is connected to one terminal of an autotransformer in the traction power facilities via a circuit breaker or disconnect switch. At these facilities, the other terminal of the autotransformer is connected to a catenary section or sections via circuit breakers or disconnects.</td>
</tr>
<tr>
<td><strong>Net Effect</strong></td>
<td>The effect (positive or negative) associated with an alternative after the application of avoidance/mitigation/compensation/enhancement measures.</td>
</tr>
<tr>
<td><strong>Notice of Commencement</strong></td>
<td>The Proponent is required to prepare and distribute a Notice of Commencement, which “starts the clock ticking” for the 120-day portion of the transit project assessment process. Proponents must prepare and distribute a Notice of Commencement to indicate that the assessment of a transit project is proceeding under the transit project assessment process. Proponents must complete their documentation (the Environmental Project Report) of the transit project assessment process within 120 days of distributing the Notice of Commencement.</td>
</tr>
<tr>
<td><strong>Notice of Completion</strong></td>
<td>The Notice of Completion must be given within 120 days of the distribution of the Notice of Commencement (not including any “time outs” that might have been taken). The Notice of Completion of Environmental Project Report signals that the Environmental Project Report has been prepared in accordance with section 9 of the regulation and indicates that the Environmental Project Report is available for final review and comment (for 30 calendar days). Following the 30-day public review period, there is a 35-day Minister’s decision period.</td>
</tr>
<tr>
<td><strong>Open Route</strong></td>
<td>An area of tracks where there is no vertical conflicts to OCS.</td>
</tr>
</tbody>
</table>
| **Overhead Contact System (OCS)** | OCS is comprised of:
1. The aerial supply system that delivers 2x25 kV traction power from traction power substations to the pantographs of Metrolinx electric trains, comprising the catenary system messenger and contact wires, hangers, associated supports and structures including poles, portals, head spans and their foundations), manual and/or motor operated disconnect switches, insulators, phase breaks, section insulators, conductor termination and tensioning devices, downguys, and other overhead line hardware and fittings.
2. Portions of the traction power return system consisting of the negative feeders and aerial static wires, and their associated connections and cabling. |
| **Overhead Structure** | A structure that allows a road to cross over a railway underneath. |
| **Overpass** | A structure that allows a railway to cross over a road or watercourse underneath. |
| **Pantograph** | Device on the top of a train that slides along the contact wire to transmit
Paralleling Station (PS) | An installation which helps boost the OCS voltage and reduce the running rail return current by means of the autotransformer feed configuration. The negative feeders and the catenary conductors are connected to the two outer terminals of the autotransformer winding at this location with the center terminal connected to the traction return system. The OCS sections can be connected in parallel at PS locations.

Performance Standards | General specifications and criteria that define the parameters and requirements of a particular system.

Phase Break | An arrangement of insulators and grounded or non-energized wires or insulated overlaps, forming a neutral section, which is located between two sections of OCS that are fed from different phases or at different frequencies or voltages, under which a pantograph may pass without shorting or bridging the phases, frequencies, or voltages.
Executive Summary

This Part A document includes a description of the proposed project, methodology followed for collecting baseline conditions information, and a detailed summary of existing natural environmental features within the Study Area (i.e., terrestrial, aquatic, hydrogeological).

Terrestrial Features

The following notable terrestrial features are within the Study Area:

- Black Creek valley serves as a wildlife movement corridor for amphibians
- Black Creek valley provides habitat features for snakes and turtles, including 4 Species at Risk (SAR): Milksnake, Northern Map Turtle, Blanding’s Turtle, Eastern Musk Turtle
- Humber River valley serves as a quality wildlife movement corridor for amphibians and large mammals
- Humber River valley provides marginal quality habitat features for snakes and turtles, including 2 SAR: Milksnake, Eastern Ribbonsnake
- Mimico Creek valley provides some function as a wildlife movement corridor for amphibians
- Mimico Creek valley provides suitable habitat for snakes and turtles, including 1 SAR: Eastern Hog-nosed Snake

Aquatic Features

The following notable aquatic features are within the Study Area:

- Black Creek is characterized as a permanent, warmwater system with low sensitivity. It is categorized as an Intermediate Riverine Warmwater system by Toronto Region Conservation Authority (TRCA) and is being managed for darter species and warmwater baitfish. Historical records include 20 fish species, including 1 SAR (Redside Dace), however there are currently no aquatic SAR in this section of Black Creek, according to the Ministry of Natural Resources (MNR).
- Humber River is characterized as a permanent, warmwater system with moderate sensitivity. It is categorized as a Large Riverine System by TRCA and is being managed for Smallmouth Bass and Rainbow Darter. It supports warmwater fish habitat and provides a migratory function for salmonid species (Rainbow Trout). Historical records include 64 fish species, including 2 SAR (Redside Dace and American Eel), however there are currently no aquatic SAR in this section of Black Creek, according to the MNR.
- Mimico Creek is characterized as a permanent, waterwater system with low sensitivity. It is categorized as an Intermediate Riverine Warmwater System by TRCA and supports a fish community comprised of a variety of baitfish including shiners, dace and minnows. Historical records include 23 fish species and do not include any aquatic species at risk, according to MNR.
Hydrogeological Features

- Two principal regional aquifer systems exist in the Study Area, i.e., the Scarborough Aquifer Complex (SAC, deltaic sediments with sand and clay members), and the Thorncliffe Aquifer Complex (TAC, lake deposits of stratified sands, silt, and varved clay). Neither aquifer is used as a water supply within the Study Area, nor do they support ecological features, with the exception of a potential limited contribution to baseflow within the Humber River and Mimico Creeks during the summer months.

- The Study Area is highly urbanized and is serviced with water from Lake Ontario. There are no municipal wells within the Study Area, and no significant groundwater recharge areas.
1. Background

In July 2009, Metrolinx completed an environmental assessment (EA) for the Georgetown South Service Expansion and Union-Pearson Rail Link (GSSE-UPRL). This project included a number of infrastructure improvements along the GO Transit (GO) Kitchener (previously known as Georgetown) corridor, including construction of a new three kilometre spur line (from Highway 427 to Terminal 1 at Pearson Airport), and construction of new tracks along the GO Kitchener corridor. In addition, new stations will be constructed at both Union Station and at Terminal 1 (Pearson International Airport), while the existing Bloor and Weston stations will be upgraded. Portions of this project are currently under construction, and the UP Express service is anticipated to be in operation by 2015.

The UP Express will initially operate using Diesel Multiple Units (DMUs) and will run from downtown Toronto at UP Express Union Station with stops at Bloor GO Station and Weston GO Station, then terminate at the future UP Express Pearson Station at Pearson International Airport.

Following the 2009 GSSE-UPRL EA, Metrolinx completed the GO Electrification Study in December 2010, which examined electrification of the entire GO Transit rail system as a future alternative to diesel trains currently in service. Subsequently, Metrolinx initiated Phase 1 which includes the EA study for electrification of the UP Express service, development of performance standards for electrification, as well as preparation of the electrification design.

1.1 Environmental Assessment Process

With regard to EA process, the proposed conversion of the UP Express service from diesel to electric power falls under Schedule 1, Subsection 2 (1) 7 of O. Reg. 231/08 - Transit Projects and Metrolinx Undertakings which applies to transit projects including: “Electrification of rail equipment propulsion on existing commuter rail corridor and associated power distribution system.” Therefore, the environmental impact of the traction power distribution system components and new electrified maintenance facility is being assessed by Metrolinx under the Transit Project Assessment Process (TPAP), in accordance with Ontario Regulation 231/08 – Transit Projects and Metrolinx Undertakings.

In addition, electrification of the UP Express requires a connection to Ontario’s electrical system. It is proposed that the power be supplied from the existing 230 kV transmission line that runs between Hydro One’s Claireville Transformer Station (located near Highway 407 and Highway 27 in the City of Vaughan) and Richview Transformer Station (located near Highway 401 and Highway 27 in the City of Toronto). Two new cables will deliver power to a new 230 kV Traction Power Substation (TPS). The TPS will convert the voltage from 230 kV to 25 kV so that it can be used to power the electric trains. The power supply portion of the project is being carried out by Hydro One under the Class EA for Minor Transmission Facilities (Class EA).
1.2 Description of the Project

The scope of the proposed UP Express Electrification undertaking includes the construction, operation and maintenance of an electrified rail service along the UP Express route. The route includes approximately 25 km of track beginning at the future UP Express Station (west of the Union Station train shed) in the City of Toronto, along the existing Union Station GO rail corridor and Kitchener GO rail corridor to Highway 427, where the route then follows the new UP Express spur link (currently under construction) into the future UP Express Pearson Station (Terminal 1, Toronto Pearson International Airport) in the City of Mississauga (see Figure 1-1). More specifically, the UP Express Electrification project involves converting the UP Express service from diesel power to electric. Therefore, the base case scenario is defined as the UP Express operating with Diesel Multiple Unit (DMU) trains.

Electrification of the UP Express service will be achieved through a Traction Electrification System which will provide electrical power to the trains by means of a traction power distribution system (by Metrolinx) and traction power supply system (by Hydro One). The traction power distribution system components (which are being assessed under the TPAP) are further described below.

Figure 1-1. UP Express Electrification EA Study Area
1.2.1 Traction Power Distribution System

The proposed traction power distribution system is an Overhead Contact System (OCS) comprised of a wiring system providing power to the trains. The wiring system will be suspended from a number of OCS structures (i.e., portals, cantilevers) placed along and over the track. The traction power distribution system also includes two paralleling stations (PS) to boost the voltage along the UP Express route, as well as 25 kv feeders and gantries (which provide power to the OCS) located in the vicinity of each PS. In addition, a new electrified maintenance facility will need to be built to carry out maintenance on the new electric trains.

The following sections provide an overview of the electrification infrastructure requirements associated with the traction power distribution system as the basis for collecting baseline conditions information within the study area. In addition, Supporting Document #1: Assessment of Alternative Facility Locations provides additional background information on the process followed for identifying the preferred siting locations for each facility. As a result, the preferred locations for siting each facility have been included in this report for the purpose of describing baseline conditions associated with the respective sites.

1.2.1.1 Overhead Contact System

The preferred traction power distribution system for UP Express electrification is an Overhead Contact System (OCS) that is comprised of a wiring system which will provide power to the electric trains. The wiring system will be suspended from a number of new OCS support structures (i.e., portals, cantilevers) placed along and over the track, including on bridges/overpasses where required. It should be noted that the majority of OCS support structures will be situated within the existing Metrolinx owned rail Right-of-Way (ROW) along the UP Express route/corridor, except for a small number of locations where the structures cannot be accommodated within the existing rail ROW.

Specifically, the overhead wires will be supported from galvanized steel structures positioned along the track at a spacing of up to 65 metres. The most common OCS support structures will be portals which span multiple tracks (see Figure 1-2).
Figure 1-2. Example of OCS Support Structures (Portals)
1.2.1.2 Paralleling Stations

A paralleling station helps boost the OCS voltage and reduce running rail current. As the train moves away from the source of power, the OCS voltage drops (see example shown in Figure 1-3). Electric trains can only operate if the OCS voltage remains within acceptable limits. Paralleling stations help raise the OCS voltage and hence, facilitate operation of trains further away from the source of power. Paralleling stations also help reduce flow of return current in rails and thereby, contribute towards safety of passengers and other persons boarding or detraining at train stations.

Figure 1-3. Typical Paralleling Station

In order to ensure reliability of the electrified UP Express system, paralleling stations need to be located approximately every 8-12 kms along the electrified route. There are two paralleling stations required as part of the electrified UP Express system: one at Ordnance St, and one at 3500 Eglinton Ave. W.\(^1\) as shown in Figures 1-4 and 1-5 respectively. The approximate footprint area required for constructing a paralleling station is anticipated to be 900 sq. m. (45 m X 20 m).

It is noted that following collection of baseline conditions information (as part of the conceptual design phase), Metrolinx reviewed the two key findings from the 2010 GO Electrification Study and Traction Power System Simulation Study (2012) in the context of electrifying Phase 1: UP Express first, to confirm that the proposed power supply and distribution system type and configuration still applied: Power Supply Source and Provider, and 2) Configuration of Traction Power Supply and Distribution Facilities.

Based on this review, it was determined that:

\(^1\) The Switching Station in the vicinity of Eglinton/Black Creek Dr. and UP Express route/corridor will be a Paralleling Station instead.
• The Switching Station in the vicinity of Eglinton/Black Creek Dr. and UP Express route/corridor will be a Paralleling Station instead, as switching stations are required if there are two or more power sources (i.e., Traction Power Substations) operating. In cases where there is only one TPS providing power to the railway, there is no need for a Switching Station since there is no other TPS to switch power to.

Accordingly, the paralleling station facility at 3500 Eglinton Ave. W. is referred to within Part B of this report.

Gantries and Ductbanks

A set of two gantries (main and strain gantry), as well as 25 kV power supply feeders (routed underground via duct banks) will be located in the vicinity of each PS location. The locations of the gantries and duct banks will be identified as part of the preliminary design phase. Therefore, the potential environmental impacts associated with these components will be assessed and documented within the Natural Environmental Impact Assessment Report.
Figure 1-4. Paralleling Station – Ordnance St.
Figure 1-5. Paralleling Station – 3500 Eglinton Ave. W.
1.2.2 Maintenance Facility

As part of implementing an electrified UP Express service, the new electric trains will need to be regularly maintained and serviced. As a result, the scope of the UP Express Electrification EA includes consideration of the infrastructure requirements related to a new electrified maintenance facility.

Supporting Document #1: Assessment of Alternative Facility Locations summarizes the process followed for identifying the preferred location for the electrified Maintenance Facility, i.e., 50 Resources Rd. (see Figure 1-6). The approximate footprint size required for constructing the new MF is anticipated to be 5 hectares.
Figure 1-6. Electrified Maintenance Facility – 50 Resources Rd.
1.3 Study Area

Based on the description of the UP Express Electrification project components provided above, the project Study Area (as illustrated in Figure 1-1) is described as follows:

- UP Express route/rail corridor beginning at the future UP Express Union Station in the City of Toronto, along the existing GO Kitchener and GO Union Station Rail Corridors, and terminating at the future UP Express Pearson Station (Terminal 1, Toronto Pearson International Airport) in the City of Mississauga; and
- Preferred locations for associated electrification infrastructure/facilities including: two Paralleling Stations, and one electrified Maintenance Facility.

As the EA progresses and potential impacts are identified, the Study Area will be expanded (if required) to capture the full range of potential environmental effects.

1.4 Purpose

The purpose of this report is to document baseline conditions within the UP Express Electrification Study Area related to the natural environment. This Baseline Conditions Report will form ‘Part A’ of the Natural Environment Assessment Report which will become a supporting document to the final Environmental Project Report (EPR). The baseline conditions information collected will establish the basis from which potential impacts of the proposed UP Express Electrification project will be assessed and documented in the Natural Environment Impact Assessment report.
2. Methodology

The following methodology was carried out to establish baseline conditions related to the natural environment within the UP Express Electrification Study Area:

2.1 Terrestrial and Aquatic

In order to identify and document existing terrestrial and aquatic conditions, the following tasks were completed:

- Define the boundaries of existing environmental features within the Study Area;
- Identify and describe the character, natural attributes and functions of the environmental features and their relationship to the proposed project;
- Inventory all watercourses and associated fish habitat in the vicinity of the Kitchener/UP Express corridor, as well as the determination of existing conditions and sensitivities that may be affected by the proposed project;
- Collect background and field data to assess the existing fisheries and aquatic habitat (resident and migratory fish species, habitat types, habitat sensitivities, critical habitat, aquatic Species at Risk (SAR), potential point/non-point pollutant sources);
- Complete watercourse field record forms, fish habitat mapping and photographic record;
- Communicate with review agencies (Ministry of Natural Resources (MNR), Toronto and Region Conservation Authority (TRCA)) to confirm existing terrestrial, fisheries and aquatic data; and;
- Summarize results of field assessments and background data collection.

Review of Secondary Source/Background Reports

Available background information related to the study area was collected and reviewed, including but not limited to the following sources:

- Georgetown South Service Expansion and Union Pearson Air Rail Link CEAA Screening Report (2009);
- Humber River Fisheries Management Plan (TRCA, 2005);
- Revitalization Strategy for Etobicoke and Mimico Creeks (2002);
- Georgetown South Service Expansion and Union-Pearson Rail Link Environmental Project Report (Metrolinx, 2009)
- Georgetown South Service Expansion and Union-Pearson Rail Link Transit Environmental Assessment, Fish and Fish Habitat Impact Assessment (Ecoplans, 2009)
- Georgetown South Service Expansion and Union-Pearson Rail Link Transit Environmental Assessment, Terrestrial Ecosystems Impact Assessment (Ecoplans, 2009);
- Natural Heritage Information Centre (NHIC) (MNR, 2010);
- MNR, Aurora District;
- TRCA;
Data Gap Analysis

With respect to the Kitchener/UP EXPRESS corridor, a review of existing background information was undertaken to identify data gaps where field surveys would be required in order to update or augment historical information. It was particularly important to update existing terrestrial and aquatic data as it relates to SAR information, in accordance with the 2012 listings of the provincial Endangered Species Act (ESA) and federal Species at Risk Act (SARA).

2.1.1 Field Surveys

Based on a review of the available background information, the following field surveys were completed along the Kitchener/UP Express corridor to update or augment existing historical data:

- Vegetation and wildlife surveys along the Kitchener/UP Express corridor to determine presence and potential wildlife habitat, including species at risk
- Amphibian surveys on potential habitat along the Kitchener/UP Express corridor (i.e., marshy areas surrounding Mimico Creek, Black Creek and Humber River)
- Breeding Bird Survey along Kitchener/UP Express corridor to identify birds during breeding bird season, including SAR.
- Fisheries assessments along the watercourses (Humber River, Black Creek, Mimico Creek) within the Kitchener/UP Express corridor

Terrestrial Field Surveys

The purpose of the 2012 field investigations carried out by Morrison Hershfield Limited (MH) was to confirm data on existing information on SAR, woodlands, vegetated communities, wetland communities (provincial and local significance) and unevaluated wetlands that was obtained from the MNR, LIO and...
NHIC. Specifically, wildlife habitat, including significant wildlife habitat (e.g. seasonal concentration areas, specialized wildlife habitats, rare vegetation communities, species/habitats of conservation concern and animal movement corridors) were based on visual confirmation, auditory confirmation or by way of indicators (tracks, scat, dens) during field investigations.

For the purposes of the terrestrial field surveys, a conservative buffer area within 120m of the Kitchener/UP Express rail ROW was examined in order to capture existing terrestrial features within and adjacent to the Study Area. Field investigations were completed by MH on May 14, and September 5, 2012. The terrestrial vegetation communities in the Study Area were classified as community level, according to the Ecological Land Classification (ELC) for Southern Ontario (MNR, 1998). Vegetation community boundaries were identified through a review of the aerial photographs prior to field investigations. These communities were then ground-truthed to facilitate mapping and vegetation community descriptions. Vegetation was described according to the most dominant species in the various strata (i.e. canopy, sub-canopy, shrub layer, and ground layer). The Photographic Record is provided in Appendix A1.

A Breeding Bird Survey was completed on July 10, 2012. An Amphibian Survey was conducted on April 30th, May 14th, and June 5th, 2012 using the Marsh Monitoring Protocol (2008). An additional terrestrial features survey was completed on September 5th, 2012.

**Aquatic Field Surveys**

The aquatic field investigations were completed on May 15th, 2012. The assessment included a standard sampling methodology of 200m upstream and 50m downstream of each watercourse crossing where potential fish habitat is present along the Kitchener/UP Express corridor. The corridor crosses three watercourses, including Black Creek, Humber River and Mimico Creek. Field investigations encompassed the following aquatic habitat parameters:

- Water temperature classification (coldwater, warmwater);
- Habitat information/locations;
- Stream morphology (including shoreline habitat);
- Stream substrate and flow;
- Obstructions/barriers to fish passage and major disturbances; and
- “Critical” or important habitat areas including potential spawning areas, good nursery cover, and feeding areas

Data on existing aquatic habitat features and fish communities in the vicinity was obtained from previous reports, TRCA and MNR. Photographs were taken of the in-stream habitat and bank characteristics of the upstream and downstream reaches. The Photographic Record is provided in Appendix A1.

### 2.2 Hydrogeology/Groundwater

**Review of Secondary Source/Background Reports**
The Study Area lies primarily within the Humber River, Mimico Creek, and Etobicoke River watersheds, while a small part of the Study Area close to Union Station is not within a defined watershed (the drainage is directed to Lake Ontario via storm sewers). The Georgetown South Service Expansion and Union-Pearson Link, Environmental Project Report (Metrolinx, July 2009) and Preliminary Geotechnical Investigation GO Transit Georgetown South Service Expansion, Toronto, Ontario (Trow Associates, Inc., July 2009) were the main sources of information reviewed to establish baseline hydrogeological conditions within these watersheds.

Additional data collection included the following:

- Ontario MOE, Water Well Records (WWR);
- Aerial photographs, topographic and geological mapping, and related reports within the Study Area;
- City of Toronto Official Plan (2007) and City of Mississauga Official Plan (2003);

### 2.3 Contaminated Properties

Phase I and Phase II Environmental Site Assessments (ESA) have been completed along the rail corridor as part of past projects (e.g., GSSE-UPRL EA). As a result, the information contained in these previous reports will be reviewed and summarized as appropriate for the purposes of the UP Express Electrification EA. A summary of corridor-specific conditions has been included in Section 3.4, whereas site-specific information is contained within Sections 3.4.1 to 3.4.5 respectively.
3. Baseline Conditions

The following provides a summary of baseline conditions related to the natural environment. For the purposes of describing the existing features within the Study Area, this section has been separated into four segments as follows:

- West of Union Station Train Shed to Bloor Station
- Bloor Station to Weston Station
- Weston Station to Highway 427
- Highway 427 to Terminal 1 (Pearson Airport)

3.1 Terrestrial Environment

3.1.1 West of Union Station Train Shed to Bloor Station

Wetlands

No wetlands are present within this portion of the Study Area.

Woodlands and Other Vegetated Areas

The Study Area is dominated by urban residential, commercial and industrial land uses. No wooded areas were noted during background data collection or observed during field investigations (see Figure 3-1).

The rail corridor is a highly disturbed vegetation community. It is dominated by grasses and field herbs, including Queen Anne’s Lace (*Daucus carota*), Common Milkweed (*Asclepias syriaca*), Goldenrod (*Solidago sp.*). Occasional trees and shrubs include Staghorn Sumac (*Rhus typhina*), Manitoba Maple (*Acer negundo*), Hawthorn (*Crataegus sp.*) and White Ash (*Fraxinus Americana*) (see Appendix A1 for Plant List).

Wildlife Habitat and Wildlife Movement Corridors

No MNR-designated significant wildlife habitat features are present within this portion of the Study Area.

No birds or nests were observed during the Breeding Bird Study.

Species at Risk

Species at Risk (SAR) are species with a status of *Endangered* or *Threatened* under the provincial *Endangered Species Act* (ESA), and are protected under the ESA. Species that are listed on Schedule 1 of the federal *Species at Risk Act* (SARA) are also protected. Species with another designation (e.g., G-rank or S-rank) or with a status of Special Concern are not protected under the ESA or SARA (See Appendix A2).
The MNR (Aurora office) has historical records (i.e., approximately 20+ years old) of four SAR as being observed in the Study Area:

- Peregrine Falcon (*Falco peregrinus*): *Threatened* species protected by ESA and SARA
- Barn Swallow (*Hirundo rustica*): *Threatened* species protected by ESA
- Blanding's Turtle (*Emydoidea blandingii*): *Threatened* species protected by ESA and SARA
- Milksnake (*Lampropeltis triangulum triangulum*): *Special Concern* species protected by SARA

However, based on air photo interpretation and confirmation via field investigations, there is no suitable habitat for these species within this portion of the Study Area.

The MNR (Aurora office) also has historical records (i.e., approximately 20+ years old) of four additional SAR in the Study Area, including:

- Northern Map Turtle (*Graptemys geographic*): *Special Concern* species protected by SARA
- Eastern Musk Turtle (*Sternotherus odoratus*): *Threatened* species protected by ESA and SARA
- Eastern Hog-nosed Snake (*Heterodon platirhinos*): *Threatened* species protected by ESA and SARA
- Eastern Ribbonsnake (*Thamnophis sauritus*): *Special Concern* species protected by SARA

However, based on air photo interpretation and confirmation via field investigations, there is no suitable habitat for these species within this portion of the Study Area.

The MNR’s NHIC database has historical records of nine SAR as being observed within 1km of the Study Area:

- Least Bittern (*Ixobrychus exilis*): *Threatened* species protected by ESA and SARA (1899 record)
- Piping Plover (*Charadrius melodus circumcinctus*): *Endangered* species protected by ESA and SARA (1934 record)
- Blanding's Turtle (*Emydoidea blandingii*): *Threatened* species protected by ESA and SARA (1889 record)
- Eastern Musk Turtle (*Sternotherus odoratus*): *Threatened* species protected by ESA and SARA (1858 record)
- Spiny Softshell (*Apalone spinifera*): *Threatened* species protected by ESA and SARA (1982 record)
- Queensnake (*Regina septemvittata*): *Endangered* species protected by ESA and SARA (1858 record)
- Eastern Ribbonsnake (*Thamnophis sauritus*): *Special Concern* species protected by SARA (1913 record)
- White Wood Aster (*Eurybia divaricata*): *Threatened* species protected by ESA and SARA (1926 record)
- Red Mulberry (*Morus rubra*): *Endangered* species protected by ESA and SARA (1935 record)

However, based on air photo interpretation and confirmation via field investigations, there is no suitable habitat for these species within this portion of the Study Area.

The Ontario Breeding Bird Atlas has recent records (i.e., between 2001 and 2005) of five SAR as being
observed within 10km of the Study Area:

- Barn Swallow (*Hirundo rustica*): Threatened species protected by ESA
- Bobolink (*Dolichonyx oryzivorus*): Threatened species protected by ESA
- Chimney Swift (*Chaetura pelagica*): Threatened species protected by ESA and SARA
- Common Nighthawk (*Chordeiles minor*): Special Concern species protected by SARA
- Eastern Meadowlark (*Sturnella magna*): Threatened species protected by ESA

However, based on air photo interpretation and confirmation via field investigations, there is no suitable habitat for these species within this portion of the Study Area.

The TRCA has a 2007 record of one SAR being observed approximately 200m from the Study Area:

- Common Nighthawk (*Chordeiles minor*): Special Concern species protected by SARA

However, based on air photo interpretation and confirmation via field investigations, there is no suitable habitat for this species within this portion of the Study Area.

**Designated Natural Areas**

No Designated Natural Areas are present within this portion of the Study Area.

**Appendix A3** contains a Photographic Record.

### 3.1.1.1 Paralelling Station (Ordnance St.)

Based on MH field investigations, this site contains one vegetation community: Cultural Thicket, which is dominated by shrubs and saplings (e.g., Trembling Aspen (*Populus tremuloides*), Willow species (*Salix sp.*) see **Appendix A1** for Plant List). This site does not provide specialized wildlife habitat or suitable habitat for any potential Species at Risk.
Figure 3-1. Terrestrial Features (West of Union Station Train Shed to Bloor Station)
3.1.2 Bloor Station to Weston Station

Wetlands

No wetlands are present within this portion of the Study Area.

Woodlands and Other Vegetated Areas

One wooded area was noted during background data review and confirmed during field investigations within this portion of the Study Area. This wooded area is classified as Deciduous Forest (FOD) under the ELC system (see Figure 3-2). Deciduous Forest communities are forests with greater than 60% tree cover with deciduous species representing 75% of the total tree canopy cover. This forest is dominated by Crack Willow (*Salix fragilis*), Manitoba Maple. Other trees include American Elm (*Ulmus americana*), Trembling Aspen, Norway Maple (*Acer platanoides*), White Oak (*Quercus alba*).

Wildlife Habitat and Wildlife Movement Corridors

No MNR-designated significant wildlife habitat features are present within this portion of the Study Area.

TRCA has a 2012 record of a Red Fox (*Vulpes vulpes*) being observed adjacent to the Deciduous Forest community within this portion of the Study Area.

Six species of birds were observed during the Breeding Bird Study: Great Blue Heron (*Ardea herodias*), Spotted Sandpiper (*Actitis macularius*), American Robin (*Turdus migratorius*), Cedar Waxwing (*Bombycilla cedrorum*), Northern Cardinal (*Cardinalis cardinalis*), American Goldfinch (*Carduelis tristis*).

No nests were observed this portion of the Study Area during the Breeding Bird Study.

Habitat features for snakes and turtles were observed during field investigations at Black Creek, including rock and brush piles and soft, muddy banks. The Black Creek valley system also provides some function as a wildlife movement corridor for amphibians. It is somewhat limited in terms of size, habitat diversity and connectivity, however it is a locally significant feature.

Species at Risk

The MNR (Aurora office) has historical records (i.e., approximately within last 20 years) of five SAR as being observed in the Study Area:

- Peregrine Falcon (*Falco peregrinus*): Threatened species under ESA and SARA
- Barn Swallow (*Hirundo rustica*): Threatened species protected by ESA
- Blanding’s Turtle (*Emydoidea blandingii*): Threatened species under ESA and SARA
- Milksnake (*Lampropeltis triangulum triangulum*): Special Concern species protected by SARA
- Butternut (*Juglans cinerea*): Endangered species protected by ESA and SARA
The MNR (Aurora office) also has historical records (i.e., approximately 20+ years old) of four additional SAR in the Study Area, including:

- Northern Map Turtle (*Graptemys geographic*): *Special Concern* species protected by SARA
- Eastern Musk Turtle (*Sternotherus odoratus*): *Threatened* species protected by ESA and SARA
- Eastern Hog-nosed Snake (*Heterodon platirhinos*): *Threatened* species protected by ESA and SARA
- Eastern Ribbonsnake (*Thamnophis sauritus*): *Special Concern* species protected by SARA

The MNR’s NHIC database has historical records of seven SAR as being observed within 1km of the Study Area:

- Blanding’s Turtle (*Emydoidea blandingii*): *Threatened* species protected by ESA and SARA (1989 record)
- Eastern Musk Turtle (*Sternotherus odoratus*): *Threatened* species protected by ESA and SARA (1858 record)
- Milksnake (*Lampropeltis triangulum triangulum*): *Special Concern* species protected by SARA (1955 record)
- Queensnake (*Regina septemvittata*): *Endangered* species protected by ESA and SARA (1858 record)
- Eastern Ribbonsnake (*Thamnophis sauritus*): *Special Concern* species protected by SARA (1913 record)
- White Wood Aster (*Eurybia divaricata*): *Threatened* species protected by ESA and SARA (1927 record)
- Red Mulberry (*Morus rubra*): *Endangered* species protected by ESA and SARA (1941 record)

Based on air photo interpretation and confirmation via field investigations, there is only suitable habitat for four of these SAR within this portion of the Study Area, including: Milksnake, Northern Map Turtle, Blandings Turtle, and Eastern Musk Turtle.

The Milksnake is best known for occurring in rural areas, where it is most frequently reported in and around buildings, especially old structures. However, it is also found in a wide variety of habitats, from prairies, pastures, and hayfields, to rocky hillsides and a wide variety of forest types. Proximity to water and suitable locations for basking and egg-laying are important features of Milksnake habitat (Environment Canada 2011). The Deciduous Forest (FOD) community within this portion of the Study Area provides potential Milksnake habitat.

The Northern Map Turtle inhabits both lakes and rivers, showing a preference for slow moving currents, muddy bottoms, and abundant aquatic vegetation (Environment Canada 2011). Black Creek provides potential Northern Map Turtle habitat.

Blandings Turtles are often observed using clear, eutrophic habitats, including lakes, rivers, streams, marshes or ponds. Adults are generally found in open or partially vegetated sites, whereas juveniles are more reclusive by nature and prefer areas that contain thick aquatic vegetation including sphagnum,
water lilies and algae. The Blanding’s Turtle nests in a variety of loose substrates including sand, organic soil, gravel and cobblestone. Overwintering occurs in pools that average about one metre in depth, or in slow flowing streams (Environment Canada 2011). Black Creek provides potential Blanding’s Turtle habitat.

Eastern Musk Turtles require shallow water with little or no current and soft earth to bury into when they hibernate. Nesting habitat is variable, but it must be close to the water and exposed to direct sunlight (Environment Canada 2011). Black Creek provides potential Eastern Musk Turtle habitat.

The Ontario Breeding Bird Atlas has recent records (i.e., between 2001 and 2005) of five SAR as being observed within 10km of the Study Area:

- Barn Swallow (*Hirundo rustica*): Threatened species protected by ESA
- Bobolink (*Dolichonyx oryzivorus*): Threatened species protected by ESA
- Chimney Swift (*Chaetura pelagica*): Threatened species protected by ESA and SARA
- Common Nighthawk (*Chordeiles minor*): Special Concern species protected by SARA
- Eastern Meadowlark (*Sturnella magna*): Threatened species protected by ESA

However, based on air photo interpretation and confirmation via field investigations, there is no suitable habitat for these species within this portion of the Study Area.

**Designated Natural Areas**

No Designated Natural Areas are present within this portion of the Study Area.

**Appendix A3** contains a Photographic Record.
Figure 3-2. Terrestrial Features (Bloor Station to Weston Station)
3.1.2.1 Switching Station (3500 Eglinton Ave. W.)

Based on MH field investigations, this site contains several vegetation communities representing Cultural Meadow and Deciduous Forest. The Cultural Meadows are dominated by grasses and field herbs, including Grass species, Goldenrod, Queen Anne’s Lace, Cow Vetch, Milkweed and do not provide wildlife habitat function. The Deciduous Forest is dominated by White Ash, American Elm (*Ulmus americana*), Norway Maple (*Acer platanoides*) and European Buckthorn. This represents a small patch of forest and does not provide specialized wildlife habitat or potential habitat for any Species at Risk.

3.1.3 Weston Station to Highway 427

Wetlands

No wetlands are present within this portion of the Study Area.

Woodlands and Other Vegetated Areas

No wooded areas were noted during background data review for this portion of the Study Area, however one wooded area was observed during field investigations. This forest is classified as Deciduous Forest (FOD) under the ELC system (see Figure 3-3). Deciduous Forest communities are forests with greater than 60% tree cover with deciduous species representing 75% of the total tree canopy cover. This forest is dominated by Sugar Maple, Crack Willow, American Elm. Other trees include Red Oak (*Quercus rubra*), Hawthorn, Manitoba Maple (see Appendix A2 for Plant List).

Wildlife Habitat and Wildlife Movement Corridors

No MNR-designated significant wildlife habitat features are present within this portion of the Study Area. However, the Humber River provides marginal habitat features for snakes and turtles.

Twelve species of birds were observed during the Breeding Bird Study: Mallard (*Anas platyrhynchos*), Red-tailed Hawk (*Buteo jamaicensis*), Downy Woodpecker (*Picoides pubescens*), Black-capped Chickadee (*Poecile atricapillus*), American Robin (*Turdus migratorius*), Cedar Waxwing (*Bombycilla cedrorum*), Song Sparrow (*Melospiza melodia*), Northern Cardinal (*Cardinalis cardinalis*), Red-winged Blackbird (*Agelaius phoeniceus*), Common Grackle (*Quiscalus quiscula*), Baltimore Oriole (*Icterus galbula*), American Goldfinch (*Carduelis tristis*).

No bird’s nests were observed during the Breeding Bird study this portion of the Study Area.

The Humber River valley system provides excellent function as a wildlife movement corridor for amphibians and large mammals. This large valley system has extensive natural vegetative cover and connects different wildlife habitat elements.

TRCA has a 2012 record of a Smooth Green Snake (*Opheodrys vernalis*) being observed adjacent to the
Humber River approximately 500m north of the Study Area. However, Smooth Green Snake was not observed in this portion of the Study Area during field investigations.

Species at Risk

A comment received as part of public consultation for the Georgetown South Service Expansion and Union-Pearson Rail Link EA (2009) stated that a population of Wood Poppy (Stylaphorum diphyllum) was identified at H.J. Alexander School, approximately 100m from the rail corridor. Wood Poppy is listed as Endangered and is protected by the ESA and SARA. However, this area was studied during field investigations and no Wood Poppies were observed in this portion of the Study Area.

The Ministry of Natural Resources (MNR) (Aurora office) has historical records (i.e., approximately 20+ years old) of four wildlife SAR being observed in the Study Area:

- Peregrine Falcon (Falco peregrinus): Threatened species protected by ESA and SARA
- Barn Swallow (Hirundo rustica): Threatened species protected by ESA
- Blanding’s Turtle (Emydoidea blandingii): Threatened species protected by ESA and SARA
- Milksnake (Lampropeltis triangulum triangulum): Special Concern species protected by SARA

The MNR (Aurora office) also has historical records (i.e., approximately 20+ years old) of four additional SAR, including:

- Northern Map Turtle (Graptemys geographic): Special Concern species protected by SARA
- Eastern Musk Turtle (Sternotherus odoratus): Threatened species protected by ESA and SARA
- Eastern Hog-nosed Snake (Heterodon platirhinos): Threatened species protected by ESA and SARA
- Eastern Ribbonsnake (Thamnophis sauritus): Special Concern species protected by SARA

The MNR’s NHIC database has historical records of six SAR as being observed within 1km of the Study Area:

- Northern Bobwhite (Colinus virginianus): Endangered species protected by ESA and SARA (1905 record)
- Blanding’s Turtle (Emydoidea blandingii): Threatened species protected by ESA and SARA (1858 record)
- Eastern Musk Turtle (Sternotherus odoratus): Threatened species protected by ESA and SARA (1955 record)
- Milksnake (Lampropeltis triangulum triangulum): Special Concern protected by SARA (1913 record)
- Eastern Ribbonsnake (Thamnophis sauritus): Special Concern species protected by SARA (1927 record)
- White Wood Aster (Eurybia divaricata): Threatened species protected by ESA and SARA (1927 record)

Based on air photo interpretation and confirmation via field investigations, there is only suitable habitat for two SAR within this portion of the Study Area: Milksnake, and Eastern Ribbonsnake.
The Milksnake is best known for occurring in rural areas, where it is most frequently reported in and around buildings, especially old structures. However, it is also found in a wide variety of habitats, from prairies, pastures, and hayfields, to rocky hillsides and a wide variety of forest types. Proximity to water and suitable locations for basking and egg-laying are important features of Milksnake habitat (Environment Canada 2011). The deciduous forest community within this portion of the Study Area provides potential Milksnake habitat.

Eastern Ribbonsnakes are semi-aquatic and are most frequently found along the edges of shallow ponds, streams, marshes, swamps or bogs bordered by dense vegetation that provides cover. Abundant exposure to sunlight is also required, and adjacent upland areas may be used for nesting (Environment Canada 2011). The Humber River provides potential habitat for this species.

The Ontario Breeding Bird Atlas has recent records (i.e., 2001 to 2005) of five SAR as being observed within 10km of the Study Area:

- Barn Swallow (*Hirundo rustica*): Threatened species protected by ESA
- Bobolink (*Dolichonyx oryzivorus*): Threatened species protected by ESA
- Chimney Swift (*Chaetura pelagica*): Threatened species protected by ESA and SARA
- Common Nighthawk (*Chordeiles minor*): Special Concern species protected by SARA
- Eastern Meadowlark (*Sturnella magna*): Threatened species protected by ESA

However, based on air photo interpretation and confirmation via field investigations, there is no suitable habitat for these species within this portion of the Study Area.

**Designated Natural Areas**

No Designated Natural Areas are present within this portion of the Study Area.

**Appendix A3** contains a Photographic Record.

**3.1.3.1 Maintenance Facility Site (50 Resources Rd.)**

Based on MH field investigations, this site contains minimal vegetation characterized by non-native grasses and field herbs, and does not provide any wildlife habitat function.

**3.1.3.2 Traction Power Substation Site (175 City View Drive)**

Based on MH field investigations, this site contains one vegetation community: Cultural Meadow. The Cultural Meadow is dominated by grasses and field herbs, including Grass species, Goldenrod, Queen Anne's Lace, Cow Vetch, Milkweed and does not provide wildlife habitat function. Adjacent to the site, there is another Cultural Meadow of similar species composition (see Figure 3-3). Neither community provide specialized wildlife habitat or potential habitat for any Species at Risk.
Figure 3-3. Terrestrial Features (Weston Station to Highway 427)
3.1.4 Highway 427 to Terminal 1 (Pearson Airport)

This section of the corridor is an elevated spur line therefore no adverse effects on natural environmental features are anticipated. Notwithstanding this, a summary of natural features associated with this portion of the study area has been provided below.

Wetlands

No wetlands are present within this portion of the Study Area.

Woodlands and Other Vegetated Areas

No wooded areas were noted during background data review or during field investigations for this portion of the Study Area.

One vegetation community was observed during field investigations: Cultural Thicket (CUT) (see Figure 3-4). Cultural thicket communities have less than 25% tree cover and more than 25% shrub cover (including saplings) with continuous vegetation cover on the ground. This thicket is dominated by Manitoba Maple, Hawthorn, Buckthorn (*Rhamnus sp.*), Honeysuckle (*Caprifoliaceae sp.*), Red Cedar (*Juniperus virginiana*). Other trees and shrubs include American Elm, Staghorn Sumac, Black Willow (*Salix nigra*) (see Appendix A1 for Plant List).

Wildlife Habitat and Wildlife Movement Corridors

No MNR-designated significant wildlife habitat features are present within this portion of the Study Area. Suitable habitat for snakes was observed in the Cultural Thicket community (see Figure 3-4).


Twenty bird’s nests were observed on the Zahavy Way bridge: nineteen Cliff Swallow and one Northern Rough-winged Swallow nest.

The Mimico Creek valley system provides some function as a wildlife movement corridor for amphibians and is considered a locally significant feature. However, it is somewhat limited in terms of size, habitat diversity and connectivity.
Species at Risk

The MNR (Aurora office) also has historical records (i.e., approximately 20+ years old) of four wildlife SAR being observed in the Study Area:

- Peregrine Falcon (*Falco peregrinus*): *Threatened* species protected by ESA and SARA
- Barn Swallow (*Hirundo rustica*): *Threatened* species protected by ESA
- Blanding's Turtle (*Emydoidea blandingii*): *Threatened* species protected by ESA and SARA
- Milksnake (*Lampropeltis triangulum triangulum*): *Special Concern* species protected by SARA

The MNR (Aurora office) also has historical records (i.e., approximately 20+ years old) of four additional SAR, including:

- Northern Map Turtle (*Graptemys geographic*): *Special Concern* species protected by SARA
- Eastern Musk Turtle (*Sternotherus odoratus*): *Threatened* species protected by ESA and SARA
- Eastern Hog-nosed Snake (*Heterodon platirhinos*): *Threatened* species protected by ESA and SARA
- Eastern Ribbonsnake (*Thamnophis sauritus*): *Special Concern* species protected by SARA

The MNR’s NHIC database has historical records of three SAR as being observed within 1km of the Study Area:

- Northern Bobwhite (*Colinus virginianus*): *Endangered* species protected by ESA and SARA (1905 record)
- Blanding's Turtle (*Emydoidea blandingii*): *Threatened* species protected by ESA and SARA (1986 record)
- Eastern Ribbonsnake (*Thamnophis sauritus*): *Special Concern* species protected by SARA (1913 record)

Based on air photo interpretation and confirmation via field investigations, there is only suitable habitat for one SAR within this portion of the Study Area: Eastern Hog-nosed Snake.

Eastern Hog-nosed Snake favours well-drained, loose or sandy soil in open woods, brushland, forest edge and disturbed sites. It is found close to water or in areas with an abundance of amphibians. This snake can also be found on roads, in mixed forests and along shorelines (Environment Canada 2011). The Mimico Creek valley and Cultural Thicket communities in this portion of the Study Area provide potential habitat for Eastern Hog-nosed Snake.

The Ontario Breeding Bird Atlas has recent records (i.e., 2001 to 2005) of five SAR as being observed within 10km of the Study Area:

- Barn Swallow (*Hirundo rustica*): *Threatened* species protected by ESA
- Bobolink (*Dolichonyx oryzivorus*): *Threatened* species protected by ESA
- Chimney Swift (*Chaetura pelagica*): Threatened species protected by ESA and SARA
- Common Nighthawk (*Chordeiles minor*): Special Concern species protected by SARA
- Eastern Meadowlark (*Sturnella magna*): Threatened species protected by ESA

However, based on air photo interpretation and confirmation via field investigations, there is no suitable habitat for these species within this portion of the Study Area.

**Designated Natural Areas**

No Designated Natural Areas are present within this portion of the Study Area.

**Appendix A3** contains a Photographic Record.
Figure 3-4. Terrestrial Features (Highway 427 to Terminal 1)
3.2 Aquatic Environment

The existing aquatic environment was identified and documented, as outlined in Section 2.1.1. In general, there are three watercourse crossings along the Kitchener/UP Express corridor that were investigated, including Black Creek, Humber River and Mimico Creek.

3.2.1 West of Union Station Train Shed to Bloor Station

There are no watercourses in this section of the corridor (see Figure 3-6).

3.2.1.1 Paralleling Station (Ordnance St.)

There are no watercourses on or adjacent to this site.
Figure 3-5. Aquatic Features (West of Union Station Train Shed to Bloor Station)
### 3.2.2 Bloor Station to Weston Station

Black Creek crosses the Kitchener/UP Express corridor, located at the intersection of Weston Road and Black Creek Drive (see Figure 3-7). The creek is located in the Humber River Watershed which spans 903 square kilometres from the headwaters on the Niagara Escarpment and Oak Ridges Moraine down to the river mouth on Lake Ontario (TRCA, 2008). The Black Creek subwatershed is the smallest of the five Humber River subwatersheds, totalling 68 square kilometres and situated in the south-eastern section of the Humber River Watershed. The creek begins within the City of Vaughan and flows southwards before emptying into the Humber River at the Lambton Golf Course, south of Eglinton Avenue and north of Dundas Street. Black Creek Watershed is almost completely developed and preceded the adoption of stormwater quantity and quality controls, which has resulted in poor water quality throughout the subwatershed. Black Creek does not have significant groundwater inputs and stream flows, therefore characterizing the system as warmwater habitat, which has been heavily affected to varying degrees by past and present urbanization (TRCA, 2008; MNR et al., 2005). Current efforts to restore Black Creek include riparian plantings and in-stream restoration, through the Black Creek Conservation Project (BCCP, 2012).

Black Creek at this location is a permanent watercourse and has had minimal changes in fish habitat since 2009 (Ecoplans, 2009). It is categorized as an Intermediate Riverine Warmwater system being managed for darter species and warmwater baitfish (MNR et al, 2005). Upstream (north) of the Kitchener/UP Express corridor, Black Creek flows through Keelesdale Park and then continues southeast of Weston Road under the Kitchener/UP Express corridor and downstream into a concrete lined channel for flood conveyance/protection.

A fish habitat assessment was completed by MH on May 18, 2012, as described in Section 2.1.1. These field investigations revealed that the upstream section or the Kitchener/UP Express corridor crossing (north) contains a stream morphology of runs (70%), riffles (20%) and a deep pool (10%). The bankfull width would be approximately 10 m and 1 m in depth. Substrate is comprised of fines (20%), gravel (20%), cobble (55%) and boulders (5%); litter was evident along the banks and at the storm sewer outlet. The banks were heavily vegetated with grasses, shrubs and trees, which provided bank stabilization and some overhanging cover opportunities. Riparian plantings and restoration efforts were evident further upstream in Keelesdale Park. Remaining instream cover was provided by some emergent vegetation and overhanging woody debris. Algae was observed throughout the upstream section, covering 50% of the substrate. Water quality levels were suitable for warmwater fish survival and spawning, with a dissolved oxygen reading of 11.14 mg/l, pH alkaline at 8.43, water temperature at 15.5°C and a high conductivity at 2.18mS/cm, likely due to the nearby storm sewer outfall. The downstream section of the corridor (south), contains a concrete lined channel extending from Weston Road to the outlet of Black Creek at the Humber River, totalling approximately 3.5km. The downstream section is mostly void of substrate and riparian vegetation, due to the concrete lining of the channel.

Historical records from the MNR and TRCA include 20 fish species in Black Creek (see Appendix A3). Redside dace is the only Species at Risk (SAR) historically found in Black Creek, which is protected as Threatened under the provincial Endangered Species Act (2007) . The corridor is located in the lower
reaches of Black Creek, where there is no presence of Redside Dace (Mark Heaton (MNR), personal communication, June 5, 2012). There are no other records of aquatic SAR within this reach of Black Creek (NHIC, 2012; DFO, 2012). The nearest TRCA fish sampling station is located 200m upstream of the corridor (Station HU006) crossing and indicate five species being captured in the Study Area: Creek Chub (*Semotilus atromaculatus*), Blacknose Dace (*Rhinichthys atratulus*), White Sucker (*Catostomus commersonii*), Fathead Minnow (*Pimephales promelas*) and sucker species (*Catostomidae* sp.) (see Figure 3-7). All species captured are considered common, tolerant warmwater baitfish. There is a two-tiered concrete grade control structure, located upstream of Weston Road, which acts as a permanent barrier to fish movement. There are two additional barriers to fish movement within Black Creek, which include: grade control structures located approximately 1.3 km upstream at Tretheway Drive and 1.8 km downstream at Jane Street (MNR et al., 2005; Ecoplans, 2009). The fish habitat assessment conducted by MH confirmed existing secondary source information that supports categorization of Black Creek as an Intermediate Riverine Warmwater system. Due to the lack of sensitive species and resiliency of the fish habitat, Black Creek is considered to be a permanent system with low sensitivity for fish and fish habitat.

### 3.2.2.1 Switching Station (3500 Eglinton Ave. W.)

Refer to the baseline conditions description in Section 3.2.2. above.
Figure 3-6. Aquatic Features (Bloor Station to Weston Station)
3.2.3 Weston Station to Highway 427

The Humber River crosses this section of the corridor, located just west of Weston Road, and east of the Weston Golf and Country Club (see Figure 3-8). The Humber River is located within the Humber River Watershed which spans 903 square kilometres from the headwaters on the Niagara Escarpment and Oak Ridges Moraine down to the river mouth on Lake Ontario (TRCA, 2008). This section of the Humber River is located in the Lower Main Humber River Subwatershed, which is the second smallest of the five major subwatersheds in the Humber River Watershed (MNR et al., 2005). It is highly urbanized and contains a number of piped and/or channelized watercourses and storm sewer and combined sewer outfalls. This reach does not have significant groundwater inputs and stream flows are supplied primarily by surface runoff and from the upstream catchment. MNR continues restoration efforts and to stock the Humber River with fish, including Brown Trout (*Salmo trutta*), Chinook salmon (*Oncorhynchus tshawytscha*), Coho Salmon (*Oncorhynchus kisutch*), Rainbow Trout (*Oncorhynchus mykiss*) and Walleye (*Sander vitreus*) (TRCA, 2008).

The Humber River at this location is a permanent watercourse and has had minimal change in fish habitat since 2009 (Ecoplans, 2009). It is categorized as a Large Riverine system being managed for Smallmouth Bass and Rainbow Darter. It supports warmwater fish habitat and provides a migratory function for salmonid species (Rainbow Trout) (MNR et al, 2005). Upstream (north) of the Kitchener/UP Express corridor, the Humber River flows from north of Highway 401 and continues south, past the residential properties and the Weston Golf and Country Club. It continues southwest of Weston Road and outlets further downstream into Lake Ontario.

A fish habitat assessment was completed by MH on May 18, 2012, as described in Section 2.1.1. These field investigations revealed that the upstream reach contained substrate of fines (2%), gravel (8%), cobble (55%) and shale/boulders (35%). The west bank was 0.5m high and sloped inward to the manicured lawn and golf course, while the east bank was much steeper, ranging from 15 m to 18 m high. The east bank contained riparian vegetation of well-established grasses, trees and shrubs, which provides some overhanging cover and helps prevent erosion of the steep banks. Stream morphology contained mainly runs (80%) and riffles (20%). The bankfull width would be approximately 25 m and 2 m in depth. Water quality levels were suitable for warmwater fish survival and spawning, with a dissolved oxygen reading of 10.33 mg/l, pH alkaline at 8.62, water temperature at 17.3°C and conductivity at 0.85mS/cm.

The downstream section or the corridor crossing (south) contains a stream morphology of runs (70%), riffles (23%) and a pool (5%). Substrate is comprised of fines (10%), gravel (20%), cobble (20%) and shale/boulders (50%). The bankfull width would be approximately 30 m and 2 m in depth. The shale banks were heavily vegetated with shrubs and trees, which provided bank stabilization and some overhanging cover opportunities. The Weston Golf and Country Club is located on the west bank, which has a 1-10 m riparian buffer, before sloping into the manicured golf course. A small weir, approximately 0.5 m high, is located approximately 70 m downstream of the corridor crossing which creates a small riffle and barrier to fish movement. Another weir is located approximately 1 km downstream of the rail crossing, posing as another barrier to fish movement (MNR et al., 2005). Several weirs between Highway...
401 and Bloor Street have been notched by TRCA in an effort to improve passage for migratory species and movement of resident fish (Ecoplans, 2009).

Historical records from the MNR and TRCA include 64 fish species in this reach of the Humber River (see Appendix A4). American Eel (Anguilla rostrata) and Redside Dace (Clinostomus elongatus) are the only Species at Risk (SAR) historically found in Humber River, which are both listed as Threatened under the provincial Endangered Species Act (2007). The corridor is located in the lower reaches of the Humber River, where there is no presence of American Eel or Redside Dace (Mark Heaton (MNR), personal communication, June 5, 2012; DFO, 2012). There are no other records of aquatic SAR within this reach of the Humber River (NHIC, 2012; DFO, 2012). The nearest TRCA fish sampling station is located 125m downstream of the corridor crossing (Station HU007WM in Figure 3-8) and indicate 38 fish species,, which include darter species, including: Fantail (Etheostoma flabellare), Johnny (Etheostoma nigrum) and Rainbow (Etheostoma caeruleum),; shiner species including: Common (Luxilus cornutus), Golder (Notemigonus crysoleucas), and Sand (Notropis stramineus); several dace/minnow species including: Blacknose (Rhinichthys atratulus) and Longnose Dace (Rhinichthys cataractae), Bluntnose (Pimephales notatus) and Fathead Minnow (Pimephales promelas); suckers including White (Catostomus commersonii) and Northern Hog Nose (Hypentelium nigricans); and chub species including: Creek (Semolitus atromaculatus) and River (Notomis micropogon); as well as Stonecat (Noturus flavus), Central Stoneroller (Campostoma anomalum), Carp (Cyprinus carpio), Catfish (Siluriformes sp.), Rock Bass (Ambloplites rupestris), Yellow Perch (Perca flavescens) and American Brook Lamprey (Lampetra appendix) and a single Rainbow Trout. Additional species caught upstream approximately 1.2 km and 1.75 km include Brook Stickleback (Culaea inconstans), Bluegill (Lepomis macrochirus), Emerald Shiner (Notropis atherinoides), Fathead Minnow (Pimephales promelas) and Pumpkinseed (Lepomis gibbosus). Laregemouth Bass (Micropterus salmoides) and Smallmouth Bass (Micropterus dolomieu) have been captured approximately 1.8 km downstream of the corridor crossing (Ecoplans, 2007). The fish habitat assessment conducted by MH confirmed existing secondary source information that supports the categorization of the Humber River as a warmwater Large Riverine system. Due to the fact that it provides a migratory function for salmonid species, the Humber River is considered to be a permanent system with moderate sensitivity for fish and fish habitat.

**Humber River Bridge Expansion**

The Georgetown South Service Expansion project entails the construction of additional tracks to support the planned expansion of GO transit rail service. To accommodate the widening of the Humber River bridge for the additional tracks, each of the eight piers (two of which are within the active channel of the Humber River) of the Humber Bridge will be extended by 14m. There will be a total of 207 m² habitat in the Humber River permanently affected by the project, which is considered a Harmful Alternation, Disruption or Destruction (HADD) of fish habitat under the Fisheries Act.

In a partnership with Metrolinx, TRCA has agreed to undertake measures to compensate for, and mitigate against the loss of fish habitat as a result of the bridge expansion. Specifically, the compensation measures include the Lower Humber River Marsh (LHRM) Restoration Project, which will be undertaken/implemented by TRCA on behalf of Metrolinx, in accordance with the DFO ‘Policy of the
Management of Fish Habitat under the *Fisheries Act*. This project includes the creation of a berm to isolate a large coastal wetland in the lower Humber River, which is part of the Lower Humber River Marshes Provincially Significant Wetland (PSW). The installation of the berm will restrict access of Common Carp (*Cyprinus carpio*) from entering specific areas of the wetland and will enable the establishment and expansion of a diverse natural marsh vegetation community.

TRCA prepared and submitted their ‘Letter of Intent’ for the LHRM Restoration Project to DFO on July 12, 2011 in accordance with the fisheries authorization process for the Metrolinx/GO’s Expansion project. Subsequently, DFO issued a Fisheries Act Authorization on September 2, 2011, amended on July 18, 2012, for TRCA/Metrolinx to proceed with the LHRM Restoration Project. TRCA will be responsible for the implementation of the LHRM Restoration Project, including mitigation measures to minimize impacts to the watercourse during construction and post-construction monitoring.

### 3.2.3.1 Maintenance Facility (50 Resources Rd.)

Refer to the baseline conditions description in Section 3.2.3 above.

### 3.2.3.2 Traction Power Substation Site (175 City View Dr.)

There are no watercourses on or adjacent to the northern TPS site.
Figure 3-7. Aquatic Features (Weston Station to Highway 427)
3.2.4 Highway 427 to Terminal 1 (Pearson Airport)

It is noted that this section of the corridor is an elevated spur line.

Mimico Creek crosses this section of the corridor, located just west of Goreway Drive (see Figure 3-9). The creek is located within the Mimico Creek Watershed, which is a 77km² highly urbanized and degraded system (TRCA, 2010). It begins south of the Oak Ridges Moraine and drains into the north shore of Lake Ontario. TRCA continues to monitor terrestrial and aquatic habitat and has provided strategic management directions to improve the Mimico Creek watershed (TRCA, 2010).

Mimico Creek at this location is a permanent watercourse and has had minimal change in fish habitat since 2009 (Ecoplans, 2009). It is categorized as an Intermediate Riverine Warmwater System and it supports a fish community comprised of a variety of baitfish including shiners, dace and minnows (MNR et al, 2005; Mark Heaton (MNR), personal communication, June 6, 2012). Upstream (northwest) of the existing corridor, Mimico Creek flows through the Malton Greenway Trail System and continues southeast, under Zahavy Way Ray and through Wildwood Park under Highway 427.

A fish habitat assessment was completed by MH on May 18, 2012, as described in Section 2.1.1. These field investigations revealed that the upstream reach contained substrate of sand (5%), silt (5%), gravel (25%), cobble (65%). The west bank was lined with gabion basket that was covered in riparian grasses, shrubs and trees that transitioned into a cultural meadow. The east bank contained riparian vegetation but with more gabion basket exposed; active construction was also occurring at the top of the east bank. Stream morphology contained mainly flats (90%) and one larger pool (10%). The bankfull width would be approximately 8 m and 0.75 m in depth. Water quality levels were suitable for warmwater fish survival and spawning, with a dissolved oxygen reading of 7.11 mg/l, pH alkaline at 8.28, water temperature at 17.8°C and conductivity at 1.75mS/cm.

The downstream section of the Kitchener/UP Express corridor crossing (south) contains a stream morphology of riffles 7 m 10%) and flats (90%). Substrate is comprised of silt (5%), gravel (15%), sand (5%) and cobble (75%). The bankfull width would be approximately 8 m and 1.5 m in depth. The banks both contained gabion basket that were heavily vegetated with shrubs and trees, which provided bank stabilization and some overhanging cover opportunities. A storm drain exists on the southeast side of the Zhavay Way Bridge. There is also a concrete weir located under the Zahavy Way bridge, approximately 1 m in height, which is a barrier to fish movement. There are an additional three barriers 3.0 km and 3.4 km upstream of the proposed crossing and one barrier 4.2 km downstream of the proposed crossing (Ecoplans, 2009).

Historical records from the MNR and TRCA include 23 fish species in this reach of the Mimico Creek (see Appendix A4). There are no records of aquatic SAR within this reach of the Mimico Creek (NHIC, 2012; DFO, 2012; (Mark Heaton (MNR), personal communication, June 5, 2012). The upper reaches of Mimico Creek, where the Kitchener/UP Express corridor is located, contain native species including Blacknose Dace, Bluntnose Minnow, Creek Chub, Fathead Minnow, Johnny Darter, Largemouth Bass, Longnose Dace, Pumpkinseed, Rock Bass and Common Shiner. Invasive species in the system include Goldfish...
(Carassius auratus auratus), Round Goby (Neogobius melanostomus), Common Carp (Cyprinus carpio) and Brook Stickleback (TRCA, 2010). The nearest TRCA sampling station, located 1.5km downstream of the existing crossing (MIM002, Figure 3-9), captured similar species including Creek Chub, Fathead Minnow, and White Sucker. These fish species are common tolerant warmwater forage and baitfish. The fish habitat assessment conducted by MH confirmed existing secondary source information that supports categorization of Mimico Creek as an Intermediate Riverine Warmwater system. Due to the lack of sensitive species and resiliency of the fish habitat, Mimico Creek is considered to be a permanent system with low sensitivity for fish and fish habitat.
Figure 3-8. Aquatic Features (Highway 427 to Terminal 1)
3.3 Hydrogeology/Groundwater

The collected data has been synthesized in the following section to describe the baseline hydrogeological conditions within the Study Area, including the following:

- Topography of the Study Area
- Local precipitation and climatic data
- Geological conditions (surficial geology of the Study Area, bedrock characteristics data, borehole and geophysical data, seismic data)
- Hydrogeological conditions (main hydrostratigraphic units and local water supply aquifers, groundwater levels, permeability data, groundwater recharge and discharge areas, surface water and groundwater interaction, major groundwater users, climate change impact on groundwater conditions)
- Groundwater quality, (i.e., potential sources of contamination)

The topography of the Study Area is generally smoothly sloping from north to south, and is incised by Mimico Creek and the Humber River. There is approximately 100 metres elevation difference between the height of land at Toronto Pearson International Airport and Lake Ontario.

The Study Area is contained within two physiographic regions: the Peel Plain and, from approximately Bloor/Dundas to Lake Ontario, the Lake Iroquois Sand Plain (Chapman and Putnam, 1984). Within the Peel Plain, the surficial geology is dominated by the silty clay Halton Till and clayey silt Newmarket Till, whereas within the Lake Iroquois Sand Plain the surficial geology is dominated by coarse-grained shallow water deposits (sands and gravels).

The overburden deposits generally thicken towards the north, away from Lake Ontario, being typically 10 m thick on the Lake Iroquois Sand Plain, and up to 60 m thick in the Peel Plain. Overburden is thickest within the infilled bedrock valleys. Bedrock in the area is shale of the Georgian Bay Formation (Hewitt, 1966).

Two principal regional aquifer systems exist in the Study Area, being the Scarborough Aquifer Complex (SAC, deltaic sediments with sand and clay members) and the Thorncliffe Aquifer Complex (TAC, lake deposits of stratified sands, silt, and varved clay), separated by the Sunnybrook Aquitard (see Sharpe, 1980 for geology, and TRCA, 2008 and 2010 for hydrostratigraphy). In the Lake Iroquois Sand Plain, the SAC is absent and the thin overburden corresponds to the TAC. In the Peel Plain, both SAC and TAC are present, but are overlain and protected by up to 10 m of low permeability Halton and/or Newmarket Till. The Scarborough Aquifer is underlying the Thorncliffe Aquifer Complex. Groundwater quality is monitored in the nine Provincial Groundwater Network (PGWN) wells and at twelve municipal water supply wells (all to the north, outside the Study Area). Elevated iron concentrations above the Ontario Drinking Water Standard (ODWS) were reported in groundwater samples collected from the Scarborough and Thorncliffe aquifers (TRCA, 2008). These exceedences are not unusual for groundwater and are natural in origin.
Within the Study Area, groundwater is generally not used for water supply, and the SAC and TAC are unexploited (Singer et al., 2003). The Study Area is highly urbanized and is serviced with water from Lake Ontario. Within the Lake Iroquois Sand Plain, the aquifer-like sediments area highly vulnerable to contamination (no protective low permeability sediments, shallow water table), and the groundwater quality may reflect this fact, although no groundwater quality data is available (TRCA, 2010). Also within this area, there are no natural watercourses along the corridor, therefore groundwater provides no ecological function. Within the Peel Plain, the SAC and TAC are identified as significant regional aquifers, although they are unexploited as a water supply (CTC Source Protection Region, 2012). Where the Kitchener/UP Express corridor crosses the Humber River and Mimico Creek, groundwater discharge contributes to baseflow in these watercourses. However, since the Study Area is characterized by a high proportion of impermeable surfaces (buildings, roads, parking lots, etc.), groundwater recharge and the quantity of associated baseflow are limited.

There are no municipal wells within the Study Area, and no significant groundwater recharge areas.

3.3.1 West of Union Station Train Shed to Bloor Station

This section of the Kitchener/UP Express corridor is situated close to the shore of Lake Ontario, within the Iroquois Plain physiographic region (Chapman and Putnam, 1984). Surficial sediments in the area are represented by the glacial tills (silty clay to silt till) in the area adjacent to Lake Ontario and by glacial shallow water deposits of Lake Iroquois (sand and gravel of the Thorncliffe Formation, Sharpe, 1980) in the area adjacent to Bloor Station. Four geotechnical boreholes were completed in this area (at Strachan Avenue), and the soils encountered in them was generally consistent with the mapped geology (fill over clayey silt to silty clay).

This area is highly urbanized and exists entirely within storm sewer catchment. There is virtually no groundwater recharge, highly vulnerable groundwater (due to surficial soils and shallow water table), and no human use of or ecological function for groundwater.

3.3.1.1 Paralleling Station (Ordnance St.)

Refer to hydrogeological features description contained in section 3.3.1 above.

3.3.2 Bloor Station to Weston Station

The section of the Kitchener/UP Express corridor is also situated in the Iroquois Plain physiographic region, because the latter follows the low topography associated with the current Humber River, and the associated bedrock valley. Beach sand and lacustrine silt and clays represent the predominant deposited material, including the sand and gravel deposits (where the corridor crosses St. Clair Ave the soils are particularly coarse grained). According to TRCA (2008), the SAC is almost 60 m thick along the entirety of this section of the corridor, within an infilled bedrock valley. One geotechnical borehole was completed in this area (at Denison Road East), and the soils encountered in them was generally consistent with the
mapped geology (sandy and gravelly fill over sand and silty clay). The water table was encountered at approximately 2 m below ground surface (Trow Associates, 2009).

This area is highly urbanized, and from St. Clair south to Bloor Station is contained within a storm sewer catchment. From St. Clair Avenue north, the UP Express is within the watershed of the Humber River, and its eastern tributary, Black Creek, which are shallow groundwater discharge zones. The Humber River and Black Creek are identified as intake protection zones (IPZs) by TRCA Source Protection Region (2012). Groundwater has the potential to transport contaminants to these IPZs. Groundwater recharge in this area is limited by the impermeable surfacing (buildings, roads, parking lots, etc.) and the storm sewer network. Groundwater is highly vulnerable to contamination, and there is no human use of groundwater.

3.3.2.1 Switching Station (3500 Eglinton Ave. W.)

Refer to hydrogeological features description contained in section 3.3.2 above.

3.3.3 Weston Station to Highway 427

The section of the Kitchener/UP Express corridor is situated in the Peel Plain physiographic region (Chapman and Putnam, 1984), and is demarcated at east and west by the deep valleys cut into this plain by the Humber River and Mimico Creek, respectively. Surficial deposits along the corridor comprise of clayey silt till (Newmarket and Halton Tills), a regional aquitard. According to TRCA (2008), the SAC and TAC are almost absent in this area, whereas the Newmarket till is up to 20 metres thick. Six geotechnical boreholes were completed in this area (at Lawrence Avenue West), and the soils encountered in them was generally consistent with the mapped geology (fill over clayey silt till). The shale of the Georgian Bay Formation was encountered at less than 5 m depth, and the water table was encountered at approximately 2 m depth (Trow Associates, 2009).

This area is highly urbanized and includes the Humber River and Mimico Creek. These watercourses are supported by groundwater discharge during the summer months. However, the contribution of groundwater to baseflow in this portion of the Study Area is limited due to the high proportion of impermeable surfaces (buildings, roads, parking lots, etc.), the storm sewer network, and low permeability soils. There is no human use of groundwater.

3.3.3.1 Maintenance Facility (50 Resources Rd).

Refer to hydrogeological features description contained in section 3.3.3 above.

3.3.3.2 Traction Power Substation Site (175 City View Dr.)

Refer to hydrogeological features description contained in section 3.3.3 above.
3.3.4 Highway 427 to Terminal 1 (Pearson Airport)

It is noted that this section of the corridor is an elevated spur line.

The section of the Kitchener/UP Express corridor is situated in the Peel Plain physiographic region. Mimico Creek intersects this section of the corridor, and cuts a deep valley in this plain (Chapman and Putnam, 1984). Surficial deposits along the corridor comprise of clayey silt till (Newmarket and Halton Tills), a regional aquitard. According to TRCA (2010), both the SAC and TAC are present in this area, at thicknesses of up to 10 m and 30 m, respectively. One geotechnical borehole was completed in this area (at Carlingview Drive), and the soils encountered in it was generally consistent with the mapped geology (fill over clayey silt till, with layers of sand). Bedrock was not encountered above 14.7 m depth, and the water table was encountered at approximately 7 m depth (Trow Associates, 2009).

This area is highly urbanized and includes Mimico Creek. This watercourse is supported by groundwater discharge during the summer months. However, the contribution of groundwater to baseflow in this portion of the Study Area is limited due to the high proportion of impermeable surfaces (buildings, roads, parking lots, etc.), the storm sewer network, and low permeability soils. There is no human use of groundwater.
3.4 Contaminated Properties

As documented in the 2009 EPR for the GSSE-UPRL EA, previous contaminant investigations (Phase I and Phase II Environmental Site Assessments) have been completed along the rail corridor between Strachan Avenue and Highway 427, as well as at former industrial properties along the UP Express Spur alignment (between Highway 427 and Pearson Airport). The findings of these investigations identified a number of existing and potential site contamination issues along the corridor attributed to the nature of past and current land uses within and adjacent to the rail corridor, including:

- Former coal storage yards;
- Former large industrial facilities;
- Former brownfield properties, i.e. former industrial properties redeveloped into residential properties;
- Existing large industrial facilities including manufacturing and chemical storage;
- Gas stations and service garages;
- Automotive wrecking yards;
- Numerous piles of railway ties within the corridor; and
- Oil storage sheds and former train stations within the corridor.

In addition, there is potential for contaminated rail ballast, bedding and fill material attributed to the use of slag, coal cinders and ash, which are typical of railway corridors.

Potential site contamination will be considered as part of the impact assessment phase of the EA.

3.4.1 West of Union Station Train Shed to Bloor Station

Refer to Section 3.4 above for a summary of site contamination conditions along the Kitchener/UP Express corridor.

3.4.1.1 Paralleling Station (Ordnance St.)

Metrolinx currently owns the property at Ordnance St. (south of the Kitchener/UP Express rail corridor, just east of Ordnance St.), therefore a Phase I ESA was not conducted.

3.4.2 Bloor Station to Weston Station

Refer to Section 3.4 above for a summary of site contamination conditions along the Kitchener/UP Express corridor.

3.4.2.1 Switching Station (3500 Eglinton Ave. W.)

This site is located at the northwest corner Black Creek Drive and Eglinton Avenue. The site was previously used as a manufacturing and processing facility by Kodak.
As part of the due diligence process related to the Eglinton Crosstown LRT project being undertaken by Metrolinx, Phase 2 Environmental Site Assessments were conducted at this site by Golder Associates Ltd. and by AMEC. These studies found that soil and groundwater on this site are impacted by petroleum hydrocarbons, volatile organic compounds, metals and inorganics at levels in excess of applicable MOE effects-based (Table 3) site condition standards. In accordance with Ontario Regulation 153/04 a Risk Assessment (RA) approach is proposed as part of the Eglinton Crosstown LRT project to protect human health and the environment during and following construction.

With this in mind, it has been assumed for the purposes of the UP Express Electrification EA that the potential contamination effects during operation/construction will be mitigated through conformance with the RA approach and CPU as established for the future Eglinton Crosstown design/build project, which will be applicable to all activities proposed at the 3500 Eglinton Avenue West site.

### 3.4.3 Weston Station to Highway 427

Refer to Section 3.4 above for a summary of site contamination conditions along the Kitchener/UP Express corridor.

#### 3.4.3.1 Maintenance Facility (50 Resources Rd.)

There have been a number of ESA studies previously completed on the 50 Resources Rd. site, including:

- A Phase 1 ESA was completed in 2005 as part of decommissioning the previous Labatt brewery
- A Phase 2 ESA was completed in 2006 as a result of the recommendations in the 2005 Phase I ESA. The Phase 2 ESA resulted in several work programs involving remediation activities on the site to remove USTs, remove two concrete effluent tanks and two fuel oil tanks, installation of monitoring wells surrounding the former tank cavities, and preparation of a report documenting these activities.
- In 2008, additional remedial work was carried out including excavation of impacted soil. A total of 10,100 metric tonnes of hydrocarbon-impacted soil was reported to have been removed from the property.
- In 2008, Phase 1 and Phase 2 ESA’s were also completed as part of which resulted in further remediation work to address soil and groundwater contamination in the former equipment storage area, former fuelling facility and former maintenance garage areas. This was documented in a 2008 report.
- Following this remediation work, another Supplemental Phase 2 ESA was completed by Golder in September 2008. As a result, a remediation program was completed to address two specific areas of the property:
  - The area of PHC-impacted soil situated south of the former maintenance garage; and
  - The area of PAH-impacted soil located in the east-central portion of the 50 Resources Rd. property (situated off the site).
Following the 2008 remediation work, a Record of Site Condition was submitted by Golder on August 2009 with a certification date of February 11, 2009. The RSC applies to an area of 14,699 hectares. The RSC allows for future commercial or industrial development on the site. However, there is potential that future soil excavation activities may encounter materials exceeding applicable MOE Site Condition Standards. Potential site contamination will be considered as part of the impact assessment phase of the EA.

3.4.3.2 Traction Power Substation Site (175 City View Dr.)

A Phase I ESA was completed by Coffey Geotechnics Inc. on behalf of Metrolinx in May, 2012 for due diligence purposes. The site is located at the northeast end of the cul-de-sac at the end of City View Drive, approximately 75 m east of Highway 27 in Toronto, Ontario, and is approximately 0.99 hectares in size. The site is currently an industrial property and includes a two-storey building. It is currently owned by Melrose Holdings Inc. and is occupied by Canadian Pipe and Pump Supply Inc.

As documented in the May 2012 Phase I ESA report by Coffey, the general topography of the land in the vicinity of the subject site appears to be relatively flat with a gradual slope towards the south-southwest. Groundwater is expected to flow in a south southwest direction towards Mimico Creek, located approximately 1 km southwest of the site. The groundwater flow direction may also be influenced by utility trenches and other subsurface structures and may migrate in the bedding stone of nearby subsurface utility trenches. However, groundwater flow direction can only be confirmed with the long term measurement of groundwater elevations at the site.

Based on the findings of the Phase 1 ESA, a Phase 2 ESA was recommended to assess the potential for environmental soil and groundwater impacts associated with the current and historical activities on the subject site and adjoining properties. It was also recommended that the existing structure undergo a designated substance survey prior to any renovation or demolition.

Subsequently, a Phase II ESA was completed by Coffey and documented in the Phase II ESA Report dated May 16, 2012. The Phase II findings were as follows:

- No further investigation is currently warranted, as the concentration of metals and inorganics, PHCs, VOCs, and PAHs in soil and groundwater all met the applicable MOE Table 3 Standards.
- If an RSC is required in the future, the May 2012 Phase 2 ESA will require updating in order to conform to the requirements of O. Reg 153.04 as amended. The previous Phase 1 ESA will also need to be upgraded to meet the requirements of O.Reg 153/04 if an RSC is required.
- All monitoring wells should be decommissioned in accordance with Ontario Regulation 903 when no longer required.
3.4.4 Highway 427 to Terminal 1 (Pearson Airport)

It is noted that this section of the corridor is an elevated spur line.

Refer to Section 3.4 above for a summary of site contamination conditions along the Kitchener/UP Express corridor.
4. Future Work

Based on the electrification design to be completed for the Kitchener/UP Express corridor, an impact assessment will be carried out to identify the potential effects associated with electrifying the UP Express, develop proposed mitigation measures to reduce or eliminate potential adverse effects, and identify net (residual) effects. The results of the impact assessment will be documented in Part B - Natural Environment Impact Assessment Report which will become a supporting document to the final Environmental Project Report (EPR).
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Appendices

Appendix B1 – Optional Bird Marking Devices
Appendix B2 – Stormwater Management Report (50 Resources Rd. site)
Executive Summary

This Part B document summarizes the natural environment impact assessment carried out as part of the UP Express Electrification EA, and uses the information contained in Part A of this document as the basis for assessing potential impacts.

Terrestrial Features

A terrestrial impact assessment was conducted to assess the potential effects of the proposed UP Express Electrification project on: soils, vegetation, and wildlife (including birds).

In terms of potential terrestrial footprint impacts, nominal vegetation clearing will be required as part of constructing the new paralleling stations (including duct banks, gantries), and EMU Maintenance Facility. With respect to site clearing activities required at the 3500 Eglinton Ave. W. paralleling station site in particular, potential natural environmental impacts and mitigation measures were previously assessed as part of the Eglinton Crosstown LRT EA Addendum process which considered the potential effects of developing the entire 3500 Eglinton Ave. W. property.

Although potential effects related to vegetation clearing are anticipate to be minor at the Ordnance paralleling station and EMU Maintenance Facility site, mitigation/compensation measures (e.g., consider developing a restoration and enhancement plan) have been established to minimize the effects. There is potential for soil erosion/siltation as a result of the excavation activities required to install duct banks from the paralleling stations to the gantries. However, this will be minimized via standard mitigation measures (e.g., install silt fencing around designated work areas to prevent offsite transport of sediment), therefore no adverse net effects are anticipated. It is also recognized that there is potential for accidental spills to occur during construction activities on the facility sites, however this will be mitigated through implementation of standard mitigation measures (e.g., spill clean-up and response equipment will be located on site, Emergency Preparedness and Response Plan will govern spill response, etc.).

As there will be no change to vegetation removals that are carried out as part of Metrolinx’s existing rail corridor maintenance practices, there are no adverse effects on vegetation anticipated in relation to corridor maintenance activities.

During operation of the new electrified UP Express system, there is potential for wildlife (bird) injury or mortality caused by collision or electrocution with OCS wires. As a result, mitigation measures to minimize the potential for injury or mortality will be implemented, such as providing minimum clearances between two different OCS wires which have different electrical potentials, and/or providing clearly visible markers on the OCS.

With respect to maintenance of the OCS system along the corridor, as well as at GO Stations and bridges, there is potential for adverse effects to the nest(s) of protected Migratory Bird species or its
habitat. As a result, the recommended mitigation measures will be implemented in order to avoid or mitigate potential adverse impacts on birds during OCS maintenance activities.

**Aquatic Features**

An aquatic impact assessment was conducted to assess the potential effects on three watercourses within the UP Express Electrification EA study area, including Black Creek, Humber River and Mimico Creek. There will be no footprint impacts anticipated with respect to any of the three watercourses, as the proposed paralleling stations, EMU maintenance facility, and traction power substation are to be located a sufficient distance from the respective watercourses. In addition, OCS support structures will be installed on the existing Humber River and Black Creek bridges by attaching structures to the outside face of the bridge piers, and no in water works are proposed. Therefore, no adverse impacts on these watercourses are anticipated. Similarly, as Mimico Creek flows under the elevated spur portion of the rail corridor, there are no potential adverse effects to this watercourse. No potential adverse effects are anticipated to any of the watercourses as a result of operations/maintenance activities. As there is some potential for indirect construction related effects to Black Creek and Humber River during OCS installation on bridges (e.g., siltation, introduction of contaminants into the watercourse through the use of industrial equipment, construction debris), mitigation measures will implemented as outlined in the following report to minimize potential adverse effects.

**Hydrogeological Features**

The hydrogeological impact assessment included consideration of hydrogeological features such as aquifers, wells, baseflow receivers, sensitive clays, and existing contaminant plumes. Potential footprint impacts of the project are limited to the potential for baseflow reduction in the Humber River associated with development of the EMU MF, which can be mitigated through design of the adjacent Storm Water Management pond. Potential operations/maintenance impacts are limited to the potential for groundwater contamination from accidental spills of materials such as oils and fuels. However, the mitigation measures as outlined in the following report will result in no net adverse effects. Potential construction-related impacts are limited to accidental spills, however this will be mitigated via best management practices during construction, resulting in no net adverse effects. It is also noted that a Permit to Take Water will likely be required for construction of the building foundations that will be required in association with the EMU Maintenance Facility.

**Contaminated Sites**

There is potential to disturb contaminated soils and groundwater during construction of the proposed paralleling stations and EMU Maintenance Facility. Mitigation measures including development of a worker health and safety plan and an excess materials management plan will be implemented. The Paralleling Station at 3500 Eglinton Ave. W. is to be located on a former Kodak manufacturing and processing facility site. It is anticipated that a Risk Assessment approach will be applied for redevelopment of this particular site for the Maintenance and Storage Facility proposed as part of the
Eglinton Crosstown project. It is also anticipated that a Certificate of Property Use (CPU) will be issued for the site that must be adhered to. As a result, the mitigation measures required as part of this approach/process will also be applicable to the construction/operation of the proposed paralleling station at this site (e.g., cap soils with concrete asphalt, granular materials, earth fill).

In general, it is recommended that an Environmental Inspector be present during construction activities. The role of the Environmental Inspector will be to ensure that all environmental mitigation measures are properly installed, implemented and maintained during construction of the UP Express Electrification project components.
1. Purpose

The purpose of this report is to document the natural environment impact assessment that was carried out as part of the UP Express Electrification EA, including identification of potential natural environmental impacts, a description of proposed avoidance/mitigation/compensation measures, and establishment of the resulting net effects. This Impact Assessment Report forms Part B of the Natural Environment Assessment Report which will become a supporting document to the final Environmental Project Report (EPR).

2. Methodology

The baseline conditions information contained in Part A of the Natural Environment Assessment Report was used as the basis from which the potential effects of constructing and operating the electrified UP Express service were identified based on the engineering design provided in the UP Express Electrification Preliminary Design Report (January, 2014). The impact assessment process was based on the following steps:

- Identify potential effects (positive and negative);
- Establish avoidance/mitigation/compensation measures to eliminate or minimize potential negative effects (as required); and
- Identify net effects (i.e., residual effects after applying avoidance/mitigation measures).

For purposes of differentiating the various types of potential environmental impacts related to the UP Express Electrification undertaking, they were characterized and grouped as follows:

<table>
<thead>
<tr>
<th>Footprint Impacts</th>
<th>Potential displacement or loss of existing natural environmental features within the Study Area due to implementation of the physical UP Express Electrification project components (e.g., traction power facilities, EMU Maintenance Facility).</th>
</tr>
</thead>
<tbody>
<tr>
<td>Operations and Maintenance Impacts</td>
<td>Potential (long term) effects on existing natural environmental features (including receptors) due to operations and maintenance activities associated with the electrified UP Express service (e.g., operation of the electrified UP Express system, operation of EMU Maintenance Facility, etc.).</td>
</tr>
<tr>
<td>Construction Impacts</td>
<td>Potential disruption/disturbance (short term) effects on existing natural environmental features (including receptors) due to construction activities associated with the UP Express Electrification project (e.g., construction of OCS components, construction of traction power facilities, etc.).</td>
</tr>
</tbody>
</table>

The following sections document the potential natural environmental impacts (including terrestrial, aquatic, stormwater management, hydrogeological, and contaminated sites) associated with the four respective Study Area sections, including a description of the proposed avoidance/mitigation/compensation measures to eliminate or minimize the potential impacts, followed by identification of net effects (positive
or negative). In general, mitigation measures were identified based on a combination of best management practices and more development of more specific mitigation measures as appropriate to address project-specific impacts.
3. Natural Environment – Terrestrial Features

3.1 Section 1 — UP Express Union Station to UP Express Bloor Station

3.1.1 Footprint Impacts

Potential Effects and Avoidance/Mitigation/Compensation Measures

Installation of OCS

The installation of OCS foundations/poles within the rail corridor may result in damage to soils due to compaction, which may prevent vegetation from re-establishing. However, this effect is considered negligible as the existing rail corridor is heavily disturbed, therefore no mitigation measures are proposed.

In addition, installation of OCS foundations and gantries will require vegetation removals/clearing within the existing Metrolinx owned rail corridor. However, it is noted that the existing rail corridor is composed of a culturally influenced vegetation community dominated by non-native grasses and field herbs common to disturbed habitats. These effects are therefore considered negligible and no mitigation/compensation measures are proposed.

A small number of OCS structure foundations (maximum size of approximately 1200mm X 2500mm) may be located outside of the rail corridor (to be refined/confirmed during detailed design). However, vegetation removals required for the installation of these foundations will be negligible.

Ordnance Paralleling Station

The gantries associated with the Ordnance PS are located within Metrolinx’s rail ROW, therefore potential effects related to vegetation are as described above. Similarly, the duct banks extending from the PS facility to the gantries will be routed in parallel to the rail corridor. The proposed paralleling station at Ordnance Street will require clearing a nominal 0.09 hectares of vegetation (Cultural Thicket community) (see Figure 3-1), which is dominated by shrubs and saplings common to disturbed habitats. These areas are not considered rare or environmentally sensitive communities and no rare vegetation was observed during field investigations. Since complete vegetation removal will be required in order to implement the PS facility, there will be no remaining land available on the Ordnance site for vegetation retention zones. Notwithstanding this, Metrolinx will consider developing a restoration plan as part of the detailed design phase that entails vegetation planting at other viable locations in the vicinity of the corridor to offset vegetation loss to the extent possible.
Figure 3-1. Terrestrial Features – Section 1 (Ordnance St.)
Indirect Effects

Although no nests were observed during the 2012 Breeding Bird Study (as part of baseline data collection), the potential vegetation removals discussed above may result in loss of wildlife habitat if any bird’s nests are destroyed during this clearing. Nests of migratory birds are protected by the federal Migratory Birds Convention Act. This Act prohibits harm to migratory birds and their nests, eggs and young. Nests of Species at Risk birds are protected by the provincial Endangered Species Act. Under this Act, no person shall kill, harm, harass, capture or take a living member of a protected species or damage or destroy its habitat. As a result, the following mitigation measures are proposed in order to reduce or mitigate the potential for adverse effects on birds and their nests:

- Where possible, vegetation removals shall be scheduled before April 1st to avoid the breeding bird season.
- Prior to construction, the contractor shall inspect the construction area for nests and eggs and advise the Contract Administrator of any locations of nests and eggs immediately.
- The contractor shall not destroy nests and eggs of protected migratory birds during migratory bird nesting season (April 1 to July 15) to avoid a permit under the Migratory Birds Convention Act. If an active nest of a migratory bird must be damaged or destroyed, a permit under this Act is required.
- The contractor shall not destroy nests and eggs of protected Species at Risk birds to avoid a permit under the Endangered Species Act. If the nest of a protected Species at Risk must be damaged or destroyed, a permit under this Act is required.
- If a nest is removed from a structure (e.g., bridge/overhead structure/GO Station, the structure/station will be netted outside of the breeding bird season to prevent the recurrence of nesting activity. The contractor shall monitor the area daily for the recurrence of nesting activity upon removal of nests and notify the Contract Administrator immediately if a nest reappears.

Net Effects

The Paralleling Station at Ordnance Street will result in removal of a nominal 0.09 hectares of vegetation. The proposed mitigation measures outlined above will reduce or mitigate vegetation loss to the extent possible. In addition, the mitigation measures as outlined above will reduce the potential for adverse effects on birds and their nests.

3.1.2 Operations and Maintenance Impacts

Potential Effects and Avoidance/Mitigation/Compensation Measures

Operation of the Electrified UP Express
In flight, there is potential for birds to collide into trains or the Overhead Catenary System (OCS) that are often difficult to see. In addition, there is potential for birds to be electrocuted when they simultaneously touch two conductor cables or one conductor cable and a neutral wire or grounded pole. It is noted that the risk of electrocution is greater for medium to large size birds (e.g., raptors) that may use poles for perching, nesting and roosting (Haas et al, 2005).

As a result, the following mitigation measures are proposed:

- The rail corridor will be regularly cleared of any vegetation, wildlife carcasses or debris that may be attractive to wildlife.
- For OCS wires of different electrical potential, conductors will be spaced 1.5m apart or greater whenever possible to reduce the risk of bird electrocution. For UP Express, a minimum clearance of approximately 2.75 m is to be achieved between two different OCS wires which have different electrical potentials (which may be separately isolated and grounded). Where this clearance is not possible, the neutral cable will be made clearly visible with suitable markers (The Edison Electric Institute’s Avian Power Line Interaction Committee and U.S. Fish and Wildlife Service. 2005), such as anti-bird flash. **Appendix B1** provides for an overview of the options for markers that can be applied.
- For OCS wires of the same electrical potential (such as situations where there are intersecting wires), the electrical clearance can be reduced to a minimum of 600 mm, regardless of whether live or grounded. If this electrical clearance of cannot be achieved, then insulation or suitable covering of wires is to be provided (such as twin contact wire cover or anti-bird flash over strips) (The Edison Electric Institute’s Avian Power Line Interaction Committee and U.S. Fish and Wildlife Service. 2005). This measure can be applied at any point in the catenary system and is not restricted to bridges alone. **Appendix B1** provides for an overview of the options for coverings that can be applied.
- Any bird or other wildlife mortality will be documented to identify areas of concern and determine the need for follow-up mitigation measures, as well as review the effectiveness of current mitigation measures.
- Provide perching opportunities through the planting of trees or installation of perching structures of various heights (i.e., 2-10 m) away from the OCS.
- Perform monthly inspections during the breeding bird period (April 1 to July 15) for nests on the OCS structures and install exclusion devices on areas where birds are attempting to nest after the birds have vacated the area.

**Maintenance of OCS (including Bridges/Overhead Structures/UP Express Stations)**

During the operation of the electrified UP Express, regular maintenance of the OCS, including on bridges, overhead structures, and UP Express stations may require the removal of bird’s nests on structures and on vegetation. Nests of migratory birds are protected by the federal *Migratory Birds Convention Act*. This Act prohibits harm to migratory birds and their nests, eggs and young. Nest of Species at Risk birds are
protected by the provincial *Endangered Species Act*. Under this Act, no person shall kill, harm, harass, capture or take a living member of a protected species or damage or destroy its habitat.

As a result, the following mitigation measures are proposed in order to reduce or mitigate the potential for adverse effects on birds and their nests:

- The contractor shall inspect the structure (OCS portal/bridge/station) for nests and eggs and advise the Contract Administrator of any locations of nests and eggs immediately.
- The contractor shall not destroy nests and eggs of protected migratory birds during migratory bird nesting season (April 1 to July 15) to avoid a permit under the *Migratory Birds Convention Act*. If an active nest of a migratory bird must be damaged or destroyed, a permit under this Act is required.
- The contractor shall not destroy nests and eggs of protected Species at Risk birds to avoid a permit under the *Endangered Species Act*. If the nest of a protected Species at Risk must be damaged or destroyed, a permit under this Act is required.
- If a nest is removed from a structure (OCS portal/bridge/station), the structure will be netted outside of the breeding bird season to prevent the recurrence of nesting activity. The contractor shall monitor the area daily for the recurrence of nesting activity upon removal of nests and notify the Contract Administrator immediately if a nest reappears.

**Maintenance of Ordnance Paralleling Station**

The paralleling station facility will be equipped with an oil containment system for the maintenance of autotransformers. The oil containment system will have open area covered with non-skid galvanized steel grating on all sides of the transformer concrete pad and will conform to applicable codes/standards/guidelines.

During maintenance activities associated with the paralleling station, use of oils and insulating fluids may be required. As a result, accidental spills may occur during the handling and storage of these products. The following mitigation measures are proposed to reduce the potential for contamination to occur due to accidental spills:

- The paralleling station will be fully equipped with spill containment and oil/water separation facilities. In the event on an equipment failure, oily water will not escape from the site.
- An Emergency Preparedness and Response Plan will govern spill response.
- Spill cleanup and response equipment will be located on site.
- Transportion of fuel will be conducted in compliance with the *Transportation of Dangerous Goods Act*.
- Spill decks will be used for transferring products to smaller containers.
- Fire extinguishers will be located near petroleum, oil and lubricants storage areas.
- Routine inspection of the PS, including transformer oil will be carried out
• All necessary precautions will be implanted to prevent the spillage and release of hazardous materials to the environment.
• All leaks or spills will be immediately reported to the Ministry of the Environment, Spills Action Centre at 1-800-268-6060.

Net Effects

Net adverse effects on birds (mortality) due to operation of the OCS will be minimized with the implementation of the mitigation measures, i.e., provision of minimum OCS wire clearances and/or installation of insulation/coverings/markers, as outlined above. Similarly, the risk of damaging or destroying a protected Migratory Bird species or its habitat during bridge/station maintenance activities will be minimized based on implementation of the mitigation measures described above. In addition, the potential for contamination to occur as a result of an accidental spill during Paralleling Station maintenance activities will be minimized through implementation of the above listed mitigation measures.

3.1.3 Construction Impacts

Potential Effects and Avoidance/Mitigation/Compensation Measures

Installation of Duct Banks/Gantries/Grounding Grid

Soil excavation will be required as part of installing the duct banks (approximately 4 metres wide, 1 metre deep) from the gantry location at to the Ordnance paralleling station site (see Figure 3-1). Gantry foundations will be installed within the rail ROW. Similarly, soil excavation is required in order to install grounding and bonding material within the paralleling station Ordnance property boundary. Soil excavation may result in erosion of the work areas during excavations and/or soil storage, therefore the following mitigation measures are proposed:

• Adhere to relevant guidelines and Ontario Provincial Standard Specifications, including consideration of TRCA\(^1\) Erosion and Sediment Control Guidelines to Urban Construction) and Ontario Provincial Standards Specifications (OPSS) – OPSS 577 (Erosion and Sediment Control Measures).
• Where temporary storage of the soil is required, the soil will be stored immediately adjacent to the excavation site.
• Topsoil and subsoil will not be mixed nor will topsoil be contaminated with any other material.
• Silt fencing will be installed around all designated work areas to prevent any offsite transport of sediment.
• Exposed soils will be hydroseeded within 45 days, both for temporary work areas and final grades.

\(^1\) As a Crown Agency, GO/Metrolinx is exempt from the Conservation Authorities Act and as such does not have a requirement to apply for and obtain permits from conservation authorities. Wherever possible, GO/Metrolinx will engage the conservation authority on specific projects (or components thereof) and will adhere to requirements when and where possible.
• Existing vegetation on embankments shall be maintained as long as possible and new slopes shall be stabilized as soon as possible by seeding and mulching.

In addition, there is potential for invasive and disturbance-tolerant non-native species to establish on exposed stockpiles of excavated soils, or be introduced on equipment during construction. Construction activities may cause the spread of Emerald ash borer (*Agrilus planipennis*), an invasive insect found on ash trees within the City of Toronto. The following mitigation measures are proposed:

• Where possible, excavated soils should be stored for a period of less than 45 days.
• Where excavated soils must be stored for a period longer than 45 days, they should be covered or seeded with a cover crop, such as annual oats or annual rye.
• Once soils are replaced, they should be re-seeded with a native seed mix suited to the site conditions based on consideration of TRCA\(^2\) seed mix guidelines (TRCA 2004).
• Equipment should be cleaned between sites to prevent the spread of invasive species.
• Vegetation removals must be carried out in a manner in compliant with the Ministerial Order issued by the Federal Government which identifies prohibitions and restrictions of movement on trees, leaves, logs, lumber, wood/wood chips from all ash species. Unless authorized by a Movement Certificate issued by the CFIA, moving these products out of the Regulated Area is prohibited. This is necessary to prevent the spread of the Emerald Ash Borer (EAB) to un-infested areas in other parts of Ontario and Canada. The Contractor must dispose of all wood at a registered Waste Facility.

### Accidental spills

During construction, equipment may leak, or spills may occur. Accidental contamination may occur during the handling and storage of toxic products such as fuel and concrete mixtures.

• The paralleling station will be fully equipped with spill containment and oil/water separation facilities. In the event on an equipment failure, oily water will not escape from the site.
• An Emergency Preparedness and Response Plan will govern spill response.
• Spill cleanup and response equipment will be located on site.
• Fuel transport will be conducted in compliance with the Transportation of Dangerous Goods Act.
• Spill decks will be used for transferring products to smaller containers.
• Fire extinguishers will be located near petroleum, oil and lubricants storage areas.
• Routine inspection of the PS facility, including transformer oil will be carried out
• All necessary precautions will be implanted to prevent the spillage and release of hazardous materials to the environment.
• All leaks or spills will be immediately reported to the Ministry of the Environment, Spills Action Centre at 1-800-268-6060.

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\(^2\) As a Crown Agency, GO/Metrolinx is exempt from the Conservation Authorities Act and as such does not have a requirement to apply for and obtain permits from conservation authorities. Wherever possible, GO/Metrolinx will engage the conservation authority on specific projects (or components thereof) and will adhere to requirements when and where possible.
Installation of OCS on Bridges/Overhead Structures/UP Express Stations

During the installation of OCS on bridges/overhead structures/UP Express stations nests of migratory birds may be encountered. Nests of migratory birds are protected by the federal *Migratory Birds Convention Act*. This Act prohibits harm to migratory birds and their nests, eggs and young. Nest of Species at Risk birds are protected by the provincial *Endangered Species Act*. Under this Act, no person shall kill, harm, harass, capture or take a living member of a protected species or damage or destroy its habitat. As a result, the following mitigation measures are proposed in order to reduce or mitigate the potential for adverse effects on birds and their nests:

- The contractor shall inspect the structure (bridge/station) for nests and eggs and advise the Contract Administrator of any locations of nests and eggs immediately.
- The contractor shall not destroy nests and eggs of protected migratory birds during migratory bird nesting season (April 1 to July 15).
- The contractor shall not destroy nests and eggs of protected Species at Risk birds.
- If a nest is removed from a structure (bridge/overhead structure/station), the structure will be netted outside of the breeding bird season to prevent the recurrence of nesting activity. The contractor shall monitor the area daily for the recurrence of nesting activity upon removal of nests and notify the Contract Administrator immediately if a nest reappears.

Temporary construction impacts

Construction traffic will generate dust, noise and light that may affect vegetation and wildlife. During the growing season, dust can coat vegetation, limiting photosynthesis, respiration, transpiration and other growth processes (Farmer, 1991). Wildlife utilizing the site may be temporarily displaced during construction. However, these animals are already exposed to high noise levels and are tolerant of urban conditions. Mitigation measures to reduce or mitigate the potential for adverse effects caused by construction activities include:

- Dust should be controlled as much as possible by watering of appropriate surfaces. The contractor shall adhere to relevant guidelines and Ontario Provincial Standard Specifications, including OPSS 506 (Dust Control).
- Appropriate lengths of silt fencing will be installed along the perimeter of minimized, designated work areas to limit construction impacts.
- All construction equipment and vehicles will yield the right-of-way to wildlife, if it is safe to do so.
- Advise workers to perform visual survey of machinery and work area prior to commencing work since wildlife may be found basking or hiding on or under equipment, rocks, debris piles etc.
- Do not allow construction debris to accumulate on-site and on the soils surface but regularly clean up the site to reduce the possibility of wildlife using debris piles for shelter.
• Clean up all litter daily and provide waste disposal containers so wildlife does not ingest indigestible materials or become entangled in debris.
• Any wildlife incidentally encountered during construction will be protected and will not be knowingly harmed.
• Advise workers to stop work and inform the Contract Administrator if any snakes, turtles or other potential Species at Risk are encountered.
• Advise workers to perform a visual survey of machinery and work area prior to commencing work since wildlife may be found hiding in or under equipment, rocks, debris piles, etc. and any individuals found shall be left to move on their own or moved properly out of harm’s way in the direction they were heading.
• All workers should be provided with awareness training (e.g. factsheets) that addresses the existence of Species at Risk on site, identification of those species and proper actions when an individual is encountered and/or needs to be moved out of harm’s way.
• Report all Species at Risk sightings and encounters to the MNR Aurora District office using the appropriate reporting form within two business days.
• If a nesting snake or turtle is found the MNR shall be notified immediately and a 10 m buffer zone shall be flagged around the site and that area protected from harm during the nesting season.

**Net Effects**

Net adverse effects related to soil erosion and potential for invasive and disturbance-tolerant non-native species to establish on exposed stockpiles of excavated soils will be minimized via implementation of the mitigation measures outlined above. The potential for soil contamination related to accidental spills will be minimized. The potential for adverse effects on birds and their nests related to OCS construction activities will be mitigated based on implementation of the above listed mitigation measures. Potential temporary displacement of wildlife during construction activities will be minimized by ensuring the mitigation measures described above are implemented and adhered to by the Contractor.

In addition, an Environmental Inspector will be responsible for ensuring that all environmental mitigation measures are properly installed, implemented and maintained during construction.
3.2 Section 2 - UP Express Bloor Station to UP Express Weston Station

3.2.1 Footprint Impacts

Potential Effects and Avoidance/Mitigation/Compensation Measures

Installation of OCS

Please refer to Section 3.1.1 above for discussion of potential effects and mitigation measures related to installation of OCS.

Paralleling Station – 3500 Eglinton Ave. W.

The proposed location for the paralleling station is at 3500 Eglinton Ave. W. (see Figure 3-2). It is noted that this site at 3500 Eglinton Ave. W. (former Kodak property) was identified by Metrolinx as the proposed location for the planned Eglinton Crosstown Light Rail Transit (LRT) Maintenance and Storage Facility (MSF) (Metrolinx Eglinton Crosstown LRT EPR Addendum, October 2013). As per the October 2013 EPR Addendum, the proposed MSF will require the entire Kodak property area. As a result, the potential footprint impacts and associated mitigation measures associated with construction and implementation of the MSF were captured and documented as part of the Eglinton Crosstown LRT Environmental Assessment process via the October 2013 EPR Addendum.

Subsequently, in coordination with the Eglinton MSF project team, it was confirmed that the Kodak site will accommodate the MSF as well as the Paralleling Station required for UP Express electrification. As a result, a provision for the proposed Paralleling Station will be incorporated into the detailed design/build plans for the Eglinton LRT MSF. Therefore, the final location of the Paralleling Station within the Kodak property limits (owned by Metrolinx) will be determined as part of the detailed design phase for the Eglinton LRT MSF. Notwithstanding this, since the potential impacts and mitigation measures related to developing the entire Kodak property were previously captured in the Final Eglinton Crosstown LRT EPR Addendum, there will be no new net adverse effects associated with locating the Paralleling Station facility on the Kodak site.
Figure 3-2. Terrestrial Features – Section 2 (3500 Eglinton Ave. W.)
Indirect Effects

Although no nests were observed during the 2012 Breeding Bird Study (as part of baseline data collection), the potential vegetation removals discussed above may result in loss of wildlife habitat if any bird’s nests are destroyed during this clearing. Nests of migratory birds are protected by the federal Migratory Birds Convention Act.

Please refer to Section 3.1.1 above for a more detailed discussion of potential indirect effects on wildlife habitat and proposed mitigation measures.

Net Effects

There are no new net adverse footprint effects to vegetation cover or wildlife habitat at the 3500 Eglinton Ave. W. paralleling station site.

3.2.2 Operations and Maintenance Impacts

Potential Effects and Avoidance/Mitigation/Compensation Measures

Operation of the Electrified UP Express

Please refer to Section 3.1.2 above for discussion of potential effects and mitigation measures related to operation of the electrified UP Express.

Maintenance of OCS (including Bridges/Overhead Structures/UP Express Stations)

Please refer to Section 3.1.2 above for discussion of potential effects and mitigation measures related to maintenance of OCS.

Maintenance of Paralleling Station

Please refer to Section 3.1.2 above for discussion of potential effects and mitigation measures related to maintenance activities associated with paralleling stations.

Net Effects

Net adverse effects on birds (mortality) due to operation of the OCS will be minimized with the implementation of the mitigation measures outlined above. Similarly, the risk of damaging or destroying a protected Migratory Bird species or its habitat during bridge/station maintenance activities will be minimized based on implementation of the mitigation measures described above. In addition, the potential for contamination to occur as a result of an accidental spill during Paralleling Station maintenance activities will be minimized through the above listed mitigation measures.
3.2.3 Construction Impacts

Potential Effects and Avoidance/Mitigation/Compensation Measures

Installation of Duct Banks/Gantries

Soil excavation (under Industry St. and Ray Ave.) will be required as part of installing duct banks (approximately 4 metres wide, 1 metre deep) from the gantry location at to the 3500 Eglinton Ave. W. site (see Figure 3-2). Gantry foundations will be installed within the rail ROW. Similarly, soil excavation is required in order to install grounding and bonding material within the 3500 Eglinton Ave. W. property boundary as well as. Soil excavation may result in erosion of the work areas during excavations and/or soil storage, therefore the mitigation measures as outlined in Section 3.1.3 above are proposed:

Accidental spills

During construction, equipment may leak, or spills may occur. Accidental contamination may occur during the handling and storage of toxic products such as fuel and concrete mixtures. Therefore, the mitigation measures as outlined in Section 3.1.3 above are proposed

Installation of OCS on Bridges/Overhead Structures/UP Express Stations

Please refer to the potential effects and mitigation measures as outlined in Section 3.1.3 above.

Temporary construction impacts

Please refer to the potential effects and mitigation measures as outlined in Section 3.1.3 above.

Net Effects

Net adverse effects related to soil erosion and potential for invasive and disturbance-tolerant non-native species to establish on exposed stockpiles of excavated soils will be minimized via implementation of the mitigation measures outlined above. The potential for soil contamination related to accidental spills will be minimized. The potential for adverse effects on birds and their nests related to OCS construction activities will be mitigated based on implementation of the above listed mitigation measures. Potential temporary displacement of wildlife during construction activities will be minimized by ensuring the mitigation measures described above are implemented and adhered to by the Contractor.

In addition, an Environmental Inspector will be responsible for ensuring that all environmental mitigation measures are properly installed, implemented and maintained during construction.
3.3 Section 3 - UP Express Weston Station to Highway 427

3.3.1 Footprint Impacts

Potential Effects and Avoidance/Mitigation/Compensation Measures

Installation of OCS

Please refer to Section 3.1.1 above for detailed discussion of potential effects and mitigation measures related to installation of OCS.

EMU Maintenance Facility

Minimal vegetation clearing will be required as part of implementing the proposed EMU Maintenance Facility at 50 Resources Road, as the site is dominated by non-native grasses and field herbs, (including Grass species, Goldenrod, Queen Anne’s Lace, Cow Vetch, Milkweed) common to disturbed habitats and does not provide wildlife habitat function (see Figure 3-3). In addition, the site is currently being used as construction staging area.

Notwithstanding this, Metrolinx will consider developing a restoration plan as part of the detailed design phase that entails vegetation planting at other viable locations in the vicinity of the corridor to offset vegetation loss to the extent possible.
Figure 3-3. Terrestrial Features – Section 3 (Vicinity of EMU Maintenance Facility)
Traction Power Distribution Components at CityView Dr. TPS

The proposed traction power distribution components at the CityView Drive site include proposed gantries and duct banks. These two components will require negligible vegetation removal. The vegetation at this site is dominated by non-native grasses and field herbs (Cultural Meadow community) common to disturbed habitats and does not provide wildlife habitat function (see Figure 3-4).

These areas are not considered rare or environmentally sensitive communities and no rare vegetation was observed during field investigations. Therefore, no mitigation measures are proposed.

Indirect Effects

Although no nests were observed during the 2012 Breeding Bird Study (as part of baseline data collection), the potential vegetation removals discussed above may result in loss of wildlife habitat if any bird’s nests are destroyed during this clearing. Nests of migratory birds are protected by the federal Migratory Birds Convention Act.

Please refer to Section 3.1.1 above for a more detailed discussion of potential indirect effects on wildlife habitat and proposed mitigation measures.

Net Effects

There will be negligible vegetation removal associated with the duct banks and gantries for the traction power substation at CityView Drive. Implementation of the mitigation/compensation measures described above will result in no net adverse effects to vegetation cover or wildlife habitat at the EMU Maintenance Facility site at Resources Road. The potential for adverse effects on birds and their nests will be reduced or mitigated.
Figure 3-4. Terrestrial Features – Section 3 (Vicinity of Traction Power Substation)
3.3.2 Operations and Maintenance Impacts

Potential Effects and Avoidance/Mitigation/Compensation Measures

Operation of the Electrified UP Express

Please refer to Section 3.1.2 above for a detailed discussion of potential effects and mitigation measures related to operation of the electrified UP Express.

Maintenance of OCS (including Bridges/Overhead Structures/UP Express Stations)

Please refer to Section 3.1.2 above for a detailed discussion of potential effects and mitigation measures related to maintenance of the OCS.

Operation of EMU Maintenance Facility

Stormwater management (SWM) ponds may attract birds, amphibians and reptiles and expose them to water contaminated with potentially harmful substances (e.g. salt, gas and oil). However, this is largely unavoidable and the habitat generated by the creation of SWM ponds typically balances the potential for negative effects related to exposure to contaminated water. Notwithstanding this, the following mitigation measure (also described in Section 5.3.2 below) is proposed in order to reduce the potential for adverse effects on birds, amphibians and reptiles:

- Installation of an oil and grit separator is recommended for the drainage system upstream of the storm water management pond (situated adjacent to the EMU MF on Resources Road)

Net Effects

Net adverse effects on birds (mortality) due to operation of the OCS will be minimized with the implementation of the mitigation measures outlined above. The potential for adverse effects on birds, amphibians and reptiles related to possible contamination of the SWM pond during EMU MF operation will be minimized through implementation of the recommended mitigation measure. Similarly, the risk of damaging or destroying a protected Migratory Bird species or its habitat during bridge/station maintenance activities will be minimized based on implementation of the mitigation measures described above.
3.3.3 Construction Impacts

Potential Effects and Avoidance/Mitigation/Compensation Measures

Installation of Duct Banks

Soil excavation will be required as part of installing the duct banks (approximately 4 metres wide, 1 metre deep) from the gantry location at to the TPS site (see Figure 3-4). Gantry foundations will be installed within the rail ROW. Soil excavation may result in erosion of the work areas during excavations and/or soil storage, therefore the mitigation measures as outlined in Section 3.1.3 above are proposed. In addition, there is potential for invasive and disturbance-tolerant non-native species to establish on exposed stockpiles of excavated soils, or be introduced on equipment during construction. Therefore, the mitigation measures as outlined in Section 3.1.3 above are proposed.

Accidental Spills

During construction, equipment may leak, or spills may occur. Accidental contamination may occur during the handling and storage of toxic products. Therefore the mitigation measures as outlined in Section 3.1.3 above are proposed.

Installation of OCS on Bridges/Overhead Structures/UP Express Stations

Please refer to Section 3.1.3 above for a detailed discussion of potential effects and mitigation measures related to installation.

Temporary construction activities

Please refer to Section 3.1.3 above for a detailed discussion of potential effects and mitigation measures related to temporary construction activities.

Net Effects

Net adverse effects related to soil erosion and potential for invasive and disturbance-tolerant non-native species to establish on exposed stockpiles of excavated soils will be minimized via implementation of the mitigation measures outlined above. The potential for soil contamination related to accidental spills will be minimized. The potential for adverse effects on birds and their nests related to OCS construction activities will be mitigated based on implementation of the above listed mitigation measures. Potential temporary displacement of wildlife during construction activities will be minimized by ensuring the mitigation measures described above are implemented and adhered to by the Contractor.

In addition, an Environmental Inspector will be responsible for ensuring that all environmental mitigation measures are properly installed, implemented and maintained during construction.
3.4 Section 4 - Highway 427 to UP Express Pearson Station

3.4.1 Footprint Impacts

*Potential Effects and Avoidance/Mitigation/Compensation Measures*

*Installation of OCS*

The installation of OCS foundations/poles on the spur section of the UP Express route is not anticipated to result in any adverse effects on vegetation or wildlife, as the spur is an elevated structure.

*Net Effects*

No net adverse effects on vegetation or wildlife are anticipated.

3.4.2 Operations and Maintenance Impacts

*Potential Effects and Avoidance/Mitigation/Compensation Measures*

*Operation of the Electrified UP Express*

Please refer to *Section 3.1.2* above for a detailed discussion of potential effects and mitigation measures related to operation of the electrified UP Express.

*Maintenance of OCS (including Bridges/Overhead Structures/UP Express Stations)*

Please refer to *Section 3.1.2* above for a detailed discussion of potential effects and mitigation measures related to maintenance of the OCS.

*Net Effects*

Net adverse effects on birds (mortality) due to operation of the OCS will be minimized with the implementation of the mitigation measures outlined above. Similarly, the risk of damaging or destroying a protected Migratory Bird species or its habitat during COS maintenance activities will be minimized based on implementation of the mitigation measures described above.

3.4.3 Construction Impacts

*Potential Effects and Avoidance/Mitigation/Compensation Measures*

Since the spur section of the UP Express route is an elevated structure, no potential adverse effects related to vegetation or wildlife are anticipated.
Net Effects

No net adverse effects related to vegetation or wildlife are anticipated.
3.5 Summary of Terrestrial Mitigation Measures

The following table provides a summary of the proposed mitigation/compensation measures related to the terrestrial environmental features.

Table 3-1. Summary of Avoidance/Mitigation/Compensation Measure: Terrestrial Features

<table>
<thead>
<tr>
<th>Project Activity/Component</th>
<th>Potential Effect</th>
<th>Avoidance/Mitigation/Compensation Measures</th>
</tr>
</thead>
</table>
| Footprint of paralleling stations | • Removal of vegetation | • Prepare a Restoration and Enhancement Plan  
• Vegetation clearing zones and vegetation retention zones will be delineated in Contract documents.  
• Adhere to relevant guidelines and OPSS for clearing and grubbing, site preparation and tree protection  
• Erect and maintain a temporary fence for tree protection  
• Time pruning of trees outside of Spring  
• Metrolinx will consider developing a restoration plan as part of the detailed design phase that entails vegetation planting at other viable locations in the vicinity of the corridor to offset vegetation loss to the extent possible. |
| Operation of electrified UP Express | • Wildlife injury or mortality caused by collision or electrocution | • Rail corridor will be regularly cleared of any vegetation, wildlife carcasses or debris  
• For OCS wires of different electrical potential, conductors will be spaced 1.5m apart or greater whenever possible to reduce the risk of bird electrocution. For UP Express, a minimum clearance of approximately 2.75m is to be achieved between two different OCS wires which have different electrical potentials (which may be separately isolated and grounded). Where this clearance is not possible, the neutral cable may be made clearly visible with suitable markers, such as anti-bird flash (see Appendix B1).  
• For OCS wires of the same electrical potential (such as situations where there are intersecting wires), the electrical clearance can be reduced to a minimum of 600mm, regardless of whether live or grounded. If this electrical clearance cannot be achieved, insulation or suitable covering of wires may be provided.  
• Any bird or other wildlife mortality will be documented  
• Provide perching opportunities away from |
| Maintenance of OCS including on bridges/overhead structures/UP Express Stations | Potential damage to nest of a migratory bird or a Species at Risk | The Contractor shall inspect structures for nests and eggs and advise the Contract Administrator. The Contractor shall not destroy nests or eggs of protected migratory bird species or Species at Risk. If a nest is removed from a structure, the structure will be netted outside of the breeding bird season to prevent the recurrent of nesting activity. The Contractor shall monitor the area daily for the recurrence of nesting activity upon removal of nests. |
| Maintenance of Paralleling Stations / Accidental Spills during construction activities | Contamination of soil caused by accidental spills | The paralleling station will be fully equipped with spill containment and oil/water separation facilities. In the event of an equipment failure, oily water will not escape from the site. An Emergency Preparedness and Response Plan will govern spill response. Spill cleanup and response equipment will be located on site. Fuel transport will be conducted in compliance with the Transportation of Dangerous Goods Act. Spill decks will be used for transferring products to smaller containers. Fire extinguishers will be located near petroleum, oil and lubricants storage areas. Carry out routine inspections for PS facility, including transformer oil. All necessary precautions will be implanted to prevent the spillage and release of hazardous materials to the environment. All leaks or spills will be immediately reported to the Ministry of the Environment, Spills Action Centre at 1-800-268-6060. |
| Installation of duct banks | Erosion/siltation from excavation activities Establishment of invasive and disturbance-tolerant species Potential spread of Emerald ash borer | Adhere to relevant guidelines and Ontario Provincial Standard Specifications, including TRCA\(^3\) Erosion and Sediment Control Guidelines to Urban Construction and Ontario Provincial Standards Specifications (OPSS) – OPSS 577 (Erosion and Sediment Control Measures). Where temporary storage of the soil is required, the soil will be stored immediately adjacent to the excavation site. |

\(^3\) As a Crown Agency, GO/Metrolinx is exempt from the Conservation Authorities Act and as such does not have a requirement to apply for and obtain permits from conservation authorities. Wherever possible, GO/Metrolinx will engage the conservation authority on specific projects (or components thereof) and will adhere to requirements when and where possible.
Topsoil and subsoil will not be mixed nor will topsoil be contaminated with any other material.

Silt fencing will be installed around all designated work areas to prevent any offsite transport of sediment.

Exposed soils will be hydroseeded within 45 days, both for temporary work areas and final grades.

Existing vegetation on embankments shall be maintained as long as possible and new slopes shall be stabilized as soon as possible by seeding and mulching.

Where possible, excavated soils should be stored for a period of less than 45 days.

Where excavated soils must be stored for a period longer than 45 days, they should be covered or seeded with a cover crop, such as annual oats or annual rye.

Once soils are replaced, they should be re-seeded with a native seed mix suited to the site conditions based on consideration of TRCA seed mix guidelines (TRCA 2004).

Equipment should be cleaned between sites to prevent the spread of invasive species.

Vegetation removals must be carried out in a manner in compliant with the Ministerial Order issued by the Federal Government which identifies prohibitions and restrictions of movement on trees, leaves, logs, lumber, wood/wood chips from all ash species. Unless authorized by a Movement Certificate issued by the CFIA, moving these products out of the Regulated Area is prohibited. This is necessary to prevent the spread of the Emerald Ash Borer (EAB) to un-infested areas in other parts of Ontario and Canada. The Contractor must dispose of all wood at a registered Waste Facility.

Installation of OCS on bridges/overhead structures/UP Express stations

Potential damage to nest of a migratory bird or a Species at Risk

The contractor shall inspect the structure (bridge/station) for nests and eggs and advise the Contract Administrator of any locations of nests and eggs immediately.

The contractor shall not destroy nests and eggs of protected migratory birds during migratory bird nesting season (April 1 to July 15).

The contractor shall not destroy nests and eggs of protected Species at Risk birds.

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As a Crown Agency, GO/Metrolinx is exempt from the Conservation Authorities Act and as such does not have a requirement to apply for and obtain permits from conservation authorities. Wherever possible, GO/Metrolinx will engage the conservation authority on specific projects (or components thereof) and will adhere to requirements when and where possible.
| Temporary construction impacts | • Temporary construction related impacts (disturbance/displacement) to vegetation and wildlife caused by dust, noise and light | • If a nest is removed from a structure (bridge/overhead structure/station), the structure will be netted outside of the breeding bird season to prevent the recurrence of nesting activity. The contractor shall monitor the area daily for the recurrence of nesting activity upon removal of nests and notify the Contract Administrator immediately if a nest reappears. |
| • Dust should be controlled as much as possible by watering of appropriate surfaces. The contractor shall adhere to relevant guidelines and Ontario Provincial Standard Specifications, including OPSS 506 (Dust Control). |
| • Appropriate lengths of silt fencing will be installed along the perimeter of minimized, designated work areas to limit construction impacts. |
| • All construction equipment and vehicles will yield the right-of-way to wildlife, if it is safe to do so. |
| • Advise workers to perform visual survey of machinery and work area prior to commencing work since wildlife may be found basking or hiding on or under equipment, rocks, debris piles etc. |
| • Do not allow construction debris to accumulate on-site and on the soils surface but regularly clean up the site to reduce the possibility of wildlife using debris piles for shelter. |
| • Clean up all litter daily and provide waste disposal containers so wildlife does not ingest indigestible materials or become entangled in debris. |
| • Any wildlife incidentally encountered during construction will be protected and will not be knowingly harmed. |
| • Advise workers to perform a visual survey of machinery and work area prior to commencing work since wildlife may be found hiding in or under equipment, rocks, debris piles, etc. and any individuals found shall be left to move on their own or moved properly out of harm’s way in the direction they were heading. |
| • All workers should be provided with awareness training (e.g. factsheets) that addresses the existence of Species at Risk on site, identification of those species and |

(up express elec ea- natural envt impact assessment report)
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<th>proper actions when an individual is encountered and/or needs to be moved out of harm’s way.</th>
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<tr>
<td></td>
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<td>• Advise workers to stop work and inform the Contract Administrator if any snakes, turtles or other potential Species at Risk are encountered.</td>
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<td>• Report all Species at Risk sightings and encounters to the MNR Aurora District office using the appropriate reporting form within two business days.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• If a nesting snake or turtle is found the MNR shall be notified immediately and a 10 m buffer zone shall be flagged around the site and that area protected from harm during the nesting season.</td>
</tr>
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4. Natural Environment – Aquatic Features

4.1 Section 1 - UP Express Union Station to UP Express Bloor Station

4.1.1 Footprint Impacts

There are no watercourses in this section of the corridor.

4.1.2 Operations and Maintenance Impacts

There are no watercourses in this section of the corridor.

Stormwater Management

The change in the ground surface at the facility location from current conditions may result in alterations to the current storm water drainage patterns. Therefore, the following measures will be carried out by Metrolinx during detailed design:

- During detailed design, a stormwater management plan/design will be carried out by Metrolinx and will address: quantity control, erosion control, and quality control.
- To control both water quality and quantity of stormwater discharge, stormwater management measures will be defined as part of the detailed design phase of the project in accordance with the *Ministry of the Environment’s Stormwater Management Planning and Design Manual (2003)*.
- The stormwater management plan/design will be developed in consultation with MOE, City of Toronto, and the Toronto and Region Conservation Authority (TRCA)\(^5\), as appropriate.
- Oil and grit separators will be designed to achieve the desired level of water quality treatment in accordance with the stormwater management plan/design.
- The stormwater management design will be coordinated with the City of Toronto’s design for the adjacent park to be built to the west of the Paralleling Station.
- The design of the paralleling station foundations shall ensure water drains to the site drainage system and prevents standing water at or under equipment and structural steel.
- The design of the foundations associated with the HV transformers and autotransformers shall prevent oil from entering the site drainage system and contain fluids in accordance with federal, provincial, and local codes.
- An Environmental Compliance Approval (ECA) for stormwater works will be obtained from the MOE prior to construction.

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\(^5\) *As a Crown Agency, GO/Metrolinx is exempt from the Conservation Authorities Act and as such does not have a requirement to apply for and obtain permits from conservation authorities. Wherever possible, GO/Metrolinx will engage the conservation authority on specific projects (or components thereof) and will adhere to requirements when and where possible.*
Net Effects

No net effects on watercourses or fish/fish habitat. With respect to stormwater management, no adverse effects on surface water are anticipated based on implementation of the above noted measures during detailed design.

4.1.3 Construction Impacts

There are no watercourses in this section of the corridor.

4.2 Section 2 - UP Express Bloor Station to UP Express Weston Station

4.2.1 Footprint Impacts

Potential Effects and Avoidance/Mitigation/Compensation Measures

Installation of OCS on Bridges/Overhead Structures

Black Creek is located in Section 2. The installation of OCS will occur within the existing UP Express route/corridor on the existing Black Creek bridge. More specifically, the OCS will be attached to the bridge via a pair of steel brackets attached to the outside face of a bridge pier. Since the OCS portal structures will be placed on the existing bridge deck and not in or adjacent to the water, there will be no anticipated footprint impacts to Black Creek or fish/fish habitat (see Figure 4-1). Similarly, no adverse effects to Black Creek are anticipated as a result of installing OCS structures as are to be located within the existing Metrolinx rail corridor ROW away from the watercourse.

3500 Eglinton Ave. W. Paralleling Station

The proposed Paralleling Station at 3500 Eglinton Ave. W. is located in Section 2. Figure 4-1 depicts the proposed location of the paralleling station, as well as the proposed OCS portal locations within this section.

The proposed paralleling station is situated approximately 280 metres from the Black Creek (see Figure 4-1). As previously mentioned, since the potential impacts and mitigation measures related to developing the entire Kodak property were previously captured in the Final Eglinton Crosstown LRT EPR Addendum, there will be no new net adverse effects on Black Creek or fish/fish habitat associated with locating the Paralleling Station facility on the 3500 Eglinton Ave. W. site. Similarly, permitting requirements under O. Reg. 166/06 will also be addressed through the Metrolinx Eglinton Crosstown LRT Maintenance and Storage Facility detailed design phase.
Figure 4-1. Aquatic Features – Section 2
Net Effects

No new net adverse effects on Black Creek watercourse or fish/fish habitat are anticipated in relation to the installation of OCS structures on Black Creek Bridge, or the Eglinton Ave. W. Paralleling Station. O. Reg. 166/06 permitting requirements will be addressed as part of the Metrolinx Eglinton Crosstown LRT Maintenance and Storage Facility detailed design phase.

4.2.2 Operations and Maintenance Impacts

Potential Effects and Avoidance/Mitigation/Compensation Measures

Operation of the Electrified UP Express & Maintenance of OCS on Bridges/Overhead Structures

Black Creek is located in Section 2. Operation of the electrified UP Express route and OCS maintenance activities will be contained within the UP Express rail corridor, including on Black Creek bridge. Therefore, there are no potential adverse effects related to operations/maintenance on the Black Creek watercourse.

Operations and Maintenance at 3500 Eglinton Ave. W. Paralleling Station

Operations and maintenance activities associated with the Paralleling Station Siting at 3500 Eglinton Ave West will be situated approximately 280 meters respectively from Black Creek. Therefore no adverse effects on the watercourse or fish/fish habitat are anticipated.

Stormwater Management

As previously mentioned, the proposed paralleling station at 3500 Eglinton Ave. W. is to be integrated with the proposed Metrolinx Eglinton Crosstown Maintenance and Storage Facility (MSF), which is also planned for this property. With this in mind, stormwater management measures related to development of the entire 3500 Eglinton Ave. W. property were assessed as part of the approved TPAP EPR Addendum completed for Eglinton Crosstown project. Specifically, within the October 2013 Eglinton Crosstown EPR Addendum document, (Section 5.3.2.1), Metrolinx committed to the following stormwater management measures for the proposed development at 3500 Eglinton Avenue West:

- A Stormwater Management System (SWM) is required at the Eglinton Crosstown MSF site, which will be consistent with the Toronto Green Development Standard, including the provision for green roofs. Current MSF design standards require imbedded track, and a network of paved roads and parking areas, the overall site will be highly impervious. The SWM system will be designed on this basis, with appropriate storage and outlet controls. The SWM is planned to outlet to the 1200 millimetre diameter storm sewer that is located on Industry Street.

- The storm runoff will be discharged to Black Creek and the Humber River. The SWM system will be designed to achieve an Enhanced Level of water quality treatment, as per the Ministry of the
Environment’s Stormwater Management Planning and Design Manual (2003) and using low impact development techniques where feasible. Due to land constraints on Eglinton Avenue, oil grit separators will be designed to achieve the desired level of water quality treatment.

- An on-site SWM pond is protected for within the current design of the Eglinton Crosstown MSF site to control both water quality and quantity of stormwater discharge before the connection to the municipal storm sewer network. The SWM pond will be further defined as part of the detailed design phase of the project of the Eglinton Crosstown MSF project.
- Modification to the existing Environmental Compliance Approval for stormwater works will be obtained from MOE with respect to the stormwater management plan for the 3500 Eglinton Ave. W. site, as required.

**Net Effects**

No net adverse effects on Black Creek or fish/fish habitat related to operations and maintenance in Section 2 are anticipated. Stormwater will be managed as per the Stormwater Management System (SWM) that will be implemented as part of the Eglinton Crosstown MSF site development, therefore no net adverse effects on surface water are anticipated.

**4.2.3 Construction Impacts**

**Potential Effects and Avoidance/Mitigation/Compensation Measures**

*Installation of OCS on Bridges/Overhead Structures*

Construction activities in Section 2 will occur within the existing UP Express rail corridor on Black Creek bridge (above the watercourse), as part of installing OCS. Specifically, the brackets for the OCS portal structures will be installed on the bridge piers in such a way that (e.g., using rope access) avoids the need for scaffolding built up around the piers from ground level (see Figure 4-2 below). Access to the outside face of the pier will be from the bridge deck with materials being brought to the construction site using rail mounted vehicles and then lowered over the side of the bridge. Since the portal structures will be placed on the existing bridge deck and not in or adjacent to the water, no direct adverse effects to Black Creek or fish/fish habitat are anticipated as a result of the OCS installation activities.
As mentioned, no direct construction related impacts to Black Creek are anticipated. However, potential indirect effects of the construction works include siltation, introduction of contaminants into the watercourse through the use of industrial equipment, and construction debris. These potential impacts can be mitigated by implementing the following measures that will result in no net adverse impacts to Black Creek:

- Design and implement erosion and sediment controls to contain/isolate the construction zone, manage site drainage/runoff ad prevent erosion of exposed soils and migration of sediment to the waterbody, and ensure site is stabilized prior to removal following construction;
- Stabilize and re-vegetate all areas of disturbed/exposed soil following construction;
- Stockpiles will be located at a minimum of 30m from the watercourse and isolated to ensure material will not enter any watercourse or ditchline. All stockpiles will be removed upon completion of the works and the site restored, as appropriate;
- Ensure Spills Management Plan and spill kits are on-site at all times for implementation in the event of an accidental spill during construction;
- Operate, store and maintain all equipment and associated materials in a manner that prevents the entry of any deleterious substance to the waterbody;
- All mobile equipment will have drip pans installed and refueling will take place no closer than 30m to any study area watercourses or ditchlines in order to prevent water contamination due to accidental fuel spills;
- All construction debris and litter will be removed frequently;
- Limit access to waterbody and banks to protect riparian vegetation and minimize bank erosion; and
- Use shrouding to trap and prevent concrete and other bridge materials from entering the watercourse.
3500 Eglinton Ave. W. Paralleling Station

Construction activities related to the Paralleling Station at 3500 Eglinton Ave. W. will take place approximately 280 metres from Black Creek. Therefore, no potential adverse effects on the Black Creek watercourse related to PS construction are anticipated.

Net Effects

Potential indirect effects to Black Creek watercourse related to OCS construction activities (on Black Creek bridge) will be mitigated based on implementation of the mitigation measures described above. In addition, an Environmental Inspector will be responsible for ensuring that all environmental mitigation measures are properly installed, implemented and maintained during construction.

4.3 Section 3 - UP Express Weston Station to Highway 427

4.3.1 Footprint Impacts

Potential Effects and Avoidance/Mitigation/Compensation Measures

Installation of OCS on Bridges/Overhead Structures

The Humber River Bridge will require new OCS portal structures spanning over the bridge deck (see Figure 4-3). The OCS portal structures will be attached to the bridge via installation of a pair of steel brackets attached to the outside face of the bridge piers. Since the portal structures will be placed on the existing bridge deck and not in or adjacent to the water, there are no anticipated adverse footprint impacts to the Humber River or fish/fish habitat.

It is noted that no adverse effects to Humber River are anticipated in relation to the installation of OCS structures as they will be located within the existing Metrolinx rail corridor ROW.

EMU Maintenance Facility (Resources Road)

The EMU Maintenance Facility at 50 Resources Road and associated staging area (see Figure 4-3) are located approximately 400 metres from Humber River. Therefore, no footprint impacts on the watercourse or fish/fish habitat are anticipated.

No adverse effects on the Humber River watercourse or fish/fish habitat are anticipated due to the implementation of the EMU Maintenance Facility.
Figure 4-3. Aquatic Features – Section 3
Net Effects

No net adverse effects are anticipated as the footprint related to the installation of OCS portal structures, and EMU Maintenance Facility are located at sufficient distances away from the Humber River watercourse.

4.3.2 Operations and Maintenance Impacts

Potential Effects and Avoidance/Mitigation/Compensation Measures

**Operation of the Electrified UP Express & Maintenance of OCS on Bridges/Overhead Structures**

Humber River is located in Section 3. Operation of the electrified UP Express route and OCS maintenance activities will be contained within the UP Express rail corridor, including on Humber River bridge. Therefore, there are no potential adverse effects related to operations/maintenance on this watercourse or fish/fish habitat.

**Operation and Maintenance of EMU Maintenance Facility (Resources Road)**

The EMU Maintenance Facility at 50 Resources Road will be situated approximately 400 metres from Humber River, therefore no adverse effects on Humber River or fish/fish habitat related to operations or maintenance of the EMU Maintenance Facility are anticipated.

**Stormwater Management**

As part of the property acquisition process previously carried out by Metrolinx for the 50 Resources Rd. site, it was confirmed that stormwater runoff from the entire 14.7 ha site bounded by Resources Rd. to the north and the rail corridor to the south (which encompasses the 5 hectare 50 Resources Rd. site where the EMU maintenance facility is to be located) will be accommodated by the stormwater (SWM) pond situated adjacent to the site, to the east. The report entitled *Stormwater Management Report* (prepared in support of the *Draft Plan of Subdivision Application - May, 2011*) describes the design of the SWM pond and confirms the following:

- The mixed employment/commercial subdivision will provide quality and quantity control measures through a future municipal stormwater management facility. The subdivision will have a release rate of 0.455 m$^3$/s which is lower than the determined governing target release rate of 0.70 m$^3$/s in the previous Functional Servicing Report (FSR). The SWM pond will provide erosion control and Level 1 treatment (80% TSS removal) as per the MOE guidelines. 5 mm runoff will be infiltrated/attenuated within the developed subdivision areas. The report demonstrates that the proposed stormwater management design meets the criteria for: quantity control, erosion control, and quality control as that were determined through recommendations provided by the City of
In addition to this, a subsequent assessment was completed which assessed site constraints and feasibility options for altering/modifying/relocating the existing SWM pond at 50 Resources Road, if necessary based on the conceptual design of the proposed Metrolinx EMU Maintenance Facility at 50 Resources Rd. As the current conceptual design plan for the EMU maintenance facility cuts across the southwest corner of the existing SWM pond (see Figure 6-7), the purpose of this assessment was to examine options for modifying the existing SWM pond to address this. Depending on the outcome of the preliminary design (to be completed), further consultation with regulatory authorities/affected stakeholders will be required during the subsequent preliminary and/or detailed design stages if it is determined there is a requirement to modify the SWM pond design. If deemed necessary during preliminary and/or detailed design, the recommended option for altering/modifying/relocating the existing SWM pond will be confirmed prior to operation of the proposed EMU Maintenance Facility.

Modification to the existing Environmental Compliance Approval for stormwater works will be obtained from MOE, with respect to the stormwater management plan for the Resources Rd. site, as required.

**Net Effects**

No net adverse effects on Humber River are anticipated due to operations and maintenance activities associated with OCS, EMU Maintenance Facility. Stormwater will be managed via the existing stormwater management pond located adjacent (to the east) to the 50 Resources Rd. site.

### 4.3.3 Construction Impacts

**Potential Effects and Avoidance/Mitigation/Compensation Measures**

**Installation of OCS on Bridges/Overhead Structures**

As mentioned above, OCS portal structures will be attached to the Humber River bridge via steel brackets attached to the outside face of a bridge pier. Specifically, the brackets for the OCS portal structures will be installed on the bridge piers in such a way that (e.g., using rope access) avoids the need for scaffolding built up around the piers from ground level (see Figure 6-7 above). Access to the outside face of the pier will be from the bridge deck with materials being brought to the construction site using rail mounted vehicles and then lowered over the side of the bridge.

No direct construction related impacts to Humber River are anticipated due to OCS installation. Potential indirect effects of the construction works include: siltation, introduction of contaminants into the

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6 *As a Crown Agency, GO/Metrolinx is exempt from the Conservation Authorities Act and as such does not have a requirement to apply for and obtain permits from conservation authorities. Wherever possible, GO/Metrolinx will engage the conservation authority on specific projects (or components thereof) and will adhere to requirements when and where possible.*
watercourse through the use of industrial equipment, and construction debris. These potential impacts will be mitigated by implementing the following measures and will result in no construction related adverse impacts to the Humber River:

- Design and implement erosion and sediment controls to contain/isolate the construction zone, manage site drainage/runoff and prevent erosion of exposed soils and migration of sediment to the waterbody, and ensure site is stabilized prior to removal following construction;
- Stabilize and re-vegetate all areas of disturbed/exposed soil following construction;
- Stockpiles will be located at a minimum of 30m from the watercourse and isolated to ensure material will not enter any watercourse or ditchline. All stockpiles will be removed upon completion of the works and the site restored, as appropriate;
- Ensure Spills Management Plan and spill kits are on-site at all times for implementation in the event of an accidental spill during construction;
- Operate, store and maintain all equipment and associated materials in a manner that prevents the entry of any deleterious substance to the waterbody;
- All mobile equipment will have drip pans installed and refueling will take place no closer than 30m to any study area watercourses or ditchlines in order to prevent water contamination due to accidental fuel spills;
- All construction debris and litter will be removed frequently;
- Limit access to waterbody and banks to protect riparian vegetation and minimize bank erosion; and
- Use shrouding to trap and prevent concrete and other bridge materials from entering the watercourse.

**Construction of EMU Maintenance Facility**

The EMU Maintenance Facility at 50 Resources Road are will be situated approximately 400 metres from Humber River, therefore no construction related impacts are anticipated on the Humber River.

**Net Effects**

Potential indirect effects to Humber River watercourse related to construction activities will be mitigated based on implementation of the mitigation measures described above, therefore no net effects on Humber River are anticipated. In addition, an Environmental Inspector will be responsible for ensuring that all environmental mitigation measures are properly installed, implemented and maintained during construction.
4.4 Section 4 - Highway 427 to UP Express Pearson Station

4.4.1 Footprint Impacts

Potential Effects and Avoidance/Mitigation/Compensation Measures

Installation of OCS on Bridges/Overhead Structures

Mimico Creek is located in Section 4, however the proposed OCS infrastructure will be implemented on the elevated spur line, (situated above Mimico Creek). Therefore no footprint impacts on the Mimico Creek are anticipated.

Net Effects

No net adverse effects are anticipated on Mimico Creek.

4.4.2 Operations and Maintenance Impacts

Potential Effects and Avoidance/Mitigation/Compensation Measures

Operation of the Electrified UP Express & Maintenance of OCS

Since Mimico Creek watercourse flows under the elevated spur line within this section, and the UP Express electrification operations and maintenance activities will occur on the existing UP Express route/rail corridor, no operations and maintenance impacts are anticipated on this watercourse.

Net Effects

No net adverse effects are anticipated.

4.4.3 Construction Impacts

Potential Effects and Avoidance/Mitigation/Compensation Measures

Installation of OCS

OCS poles will be installed on the catenary supports along the spur portion of the UP Express route via hi-rail vehicles. Therefore, no adverse construction related impacts on Mimico Creek are anticipated.

Net Effects

No net adverse effects are anticipated.
4.5 Summary of Aquatic Mitigation Measures

The following table provides a summary of the proposed mitigation/compensation measures related to the aquatic environment.

Table 4-1. Summary of Aquatic Mitigation Measures

<table>
<thead>
<tr>
<th>Project Activity/Component</th>
<th>Potential Effects</th>
<th>Avoidance/Mitigation/Compensation Measures</th>
</tr>
</thead>
</table>
| Installation of OCS on bridges during construction phase | • Potential indirect effects to watercourses under bridges (e.g., siltation, introduction of contaminants, construction debris) | • Design and implement erosion and sediment controls to contain/isolate the construction zone, manage site drainage/runoff ad prevent erosion of exposed soils and migration of sediment to the the waterbody, and ensure site is stabilized prior to removal following construction;  
• Stabilize and re-vegetate all areas of disturbed/exposed soil following construction;  
• Stockpiles will be located at a minimum of 30m from the watercourse and isolated to ensure material will not enter any watercourse or ditchline. All stockpiles will be removed upon completion of the works and the site restored, as appropriate;  
• Ensure Spills Management Plan and spill kits are on-site at all times for implementation in the event of an accidental spill during construction;  
• Operate, store and maintain all equipment and associated materials in a manner that prevents the entry of any deleterious substance to the waterbody;  
• All mobile equipment will have drip pans installed and refueling will take place no closer than 30m to any study area watercourses or ditchlines in order to prevent water contamination due to accidental fuel spills;  
• All construction debris and litter will be removed frequently; |
Limit access to waterbody and banks to protect riparian vegetation and minimize bank erosion; and

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

| Stormwater management during operation of paralleling stations and EMU maintenance facility | The conceptual design plan for the new EMU maintenance facility at 50 Resources Rd. indicates that tracks from the site may be in a crossing conflict with the existing stormwater management (SWM) pond (adjacent to the site) serving the immediately adjacent industrial/commercial sites.

The change in the ground surface at the Ordnance paralleling station facility location from current conditions may result in alterations to the current stormwater drainage patterns. |
|---|---|
|  | During preliminary and/or detailed design, identify the preferred option for altering/modify/relocating the existing SWM pond at 50 Resources Road to support the proposed Metrolinx EMU Maintenance Facility.

The preferred option will be incorporated into the SWM pond design and implemented prior to operation of the proposed EMU Maintenance Facility.

During detailed design, a stormwater management plan/design for the Ordnance site will be carried out by Metrolinx |
5. Natural Environment – Hydrogeological Features

Hydrogeological features considered in this impact assessment include aquifers, aquitards and other aquifer-protecting strata; features dependent on groundwater such as wells, springs, creeks and rivers during dry periods and certain wetlands (e.g. fens, marshes); and features sensitive to hydrogeological changes such as unconsolidated clays, and existing contaminant plumes.

5.1 Section 1 – UP Express Union Station to UP Express Bloor Station

This section of the corridor is situated close to the shore of Lake Ontario, within the Iroquois Plain physiographic region. The surficial soil consists of glacial till (silty clay to silt till) in the area adjacent to Lake Ontario and glacial shallow water deposits of Lake Iroquois (sand and gravel of the Thorncliffe Formation) in the area adjacent to Bloor Station.

5.1.1 Footprint Impacts

Potential Effects and Avoidance/Mitigation/Compensation Measures

This section is characterized by an urban setting and human/ecological use of groundwater is negligible. In addition, the subsurface footprint of the Ordnance paralleling station grounding grid, gantry foundations, duct banks, and OCS foundations are relatively small and shallow. Therefore, no adverse hydrogeological impacts are anticipated in relation to the project footprint and no mitigation measures are recommended.

Net Effects

No net adverse hydrogeological effects related to the project footprint are anticipated in Section 1.

5.1.2 Operations and Maintenance Impacts

Potential Effects and Avoidance/Mitigation/Compensation Measures

During maintenance activities associated with the Ordnance Paralleling Station, use of oils and insulating fluids may be required. As a result, accidental spills may occur during the handling and storage of these products. Such spills have the potential to contaminate groundwater. The mitigation measures as described in Section 3.1.2 (above) should be implemented to reduce the potential for adverse effects on groundwater.

Net Effects

There is potential for groundwater contamination resulting from accidental spills during PS maintenance. However, the risk will be minimized through implementation of the mitigation measures as described above.
5.1.3 Construction Impacts

Potential Effects and Avoidance/Mitigation/Compensation Measures

A grounding grid will be installed at an approximate 1 metre depth beneath the Ordnance Paralleling Station. Similarly, duct banks will be installed from the Ordnance PS to the gantry locations, as shown in Figure 3-1 above at an approximate 1 metre depth. During installation of the grounding grid and duct banks, it is not anticipated that groundwater will be encountered given their shallow depth. Therefore, no potential adverse effects on groundwater are anticipated.

Gantry foundations will be installed at approximate 4 metre depth. OCS structure foundations will be installed to an approximate 5 metre depth. Groundwater may be encountered during this construction, and minor amounts removed along with any excess soil. However, the potential impact on groundwater due to these construction activities will be imperceptible.

The potential for groundwater contamination may result from mobile vehicle refuelling during construction. This risk will be minimized by implementing the following measures:

- Vehicle refueling should be done in designated areas only, preferably situated on a paved, impermeable surface;
- An emergency response plan should be prepared by the contractor to establish methods to clean up accidental spills.

Net Effects

There are no net effects related to encountering and/or removing groundwater during construction of the PS foundations, grounding grid, duct banks and OCS and gantry foundations. The potential for groundwater contamination during spillage of fuels during construction will be minimized through implementation of the above listed mitigation measures.

5.2 Section 2 – UP Express Bloor Station to UP Express Weston Station

This section of the corridor is situated within the Iroquois Plain physiographic region. The surficial soil consists of beach sand and lacustrine silt and clays including sand and gravel deposits.

5.2.1 Footprint Impacts

Potential Effects and Avoidance/Mitigation/Compensation Measures

This section is characterized by an urban setting and human/ecological use of groundwater is negligible. In addition, there is limited contribution of groundwater recharge in this area to baseflow in the Humber
River and Black Creek. The subsurface footprint of the 3500 Eglinton Ave. W. paralleling station grounding grid, gantry foundations, duct banks, and OCS foundations are relatively small and shallow. Therefore, no adverse hydrogeological impacts are anticipated in relation to the subsurface project footprint and no mitigation measures are recommended.

**Net Effects**

No net adverse hydrogeological effects related to the project footprint are anticipated in Section 2.

### 5.2.2 Operations and Maintenance Impacts

**Potential Effects and Avoidance/Mitigation/Compensation Measures**

During maintenance activities associated with the paralleling station at Eglinton Ave. W., use of oils and insulating fluids may be required. As a result, accidental spills may occur during the handling and storage of these products. Such spills have the potential to contaminate groundwater. The mitigation measures as described in Section 3.1.2 (above) should be implemented to reduce the potential for adverse effects on groundwater.

**Net Effects**

There is potential for groundwater contamination resulting from accidental spills during PS maintenance. However, the risk will be minimized through implementation of the mitigation measures as described above.

### 5.2.3 Construction Impacts

A grounding grid will be installed at an approximate 1 metre depth beneath the Paralleling Station at Eglinton Ave. W. Similarly, duct banks will be installed from the 3500 Eglinton Ave. W. PS to the gantry locations, as shown in Figure 3-2 above at approximately 1 metre depth. During installation of the grounding grid and duct banks, it is not anticipated that groundwater will be encountered given their shallow depth. Therefore, no potential adverse effects on groundwater are anticipated.

Gantry foundations will be installed at approximate 4 metre depth. OCS foundations will be installed to approximately 5 metre depth. Groundwater may be encountered during this construction, and minor amounts removed along with any excess soil. The impact on groundwater due to this construction activity will be imperceptible.

The potential for groundwater contamination may result from mobile vehicle refuelling during construction. This risk can be minimized by implementing the following measures:

- Vehicle refueling should be done in designated areas only, preferably situated on a paved, impermeable surface;
• An emergency response plan should be prepared by the contractor to establish methods to clean up accidental spills.

Net Effects

There are no net adverse effects related to encountering and/or removing groundwater during construction of the PS foundations, grounding grid, duct banks and OCS foundations. The potential for groundwater contamination during spillage of fuels during construction will be minimized through implementation of the above listed mitigation measures.

5.3 Section 3 – UP Express Weston Station to Highway 427

This section of the corridor is situated in the Peel Plain physiographic region, and is demarcated at east and west by the deep valleys cut into this plain by the Humber River and Mimico Creek, respectively. Surficial deposits along the corridor are comprised of clayey silt till.

The EMU Maintenance Facility (MF) within Section 3 (see Figure 3-3 above) will consist of a storage yard for EMUs and electrification Maintenance of Way equipment, main shop building with administrative/transportation offices, car inspection and repair areas, parts rooms, and utility rooms, an enclosed train washer, OCS/Wayside Electrification sub-shop and related exterior tracks, train storage tracks, employee parking, and yard roadways. A diesel powered emergency backup generator will be present in case of power failures.

This section also includes the proposed Traction Power Substation at 175 CityView Drive (refer to Union Pearson Express Electrification Traction Power Supply System Class Environmental Assessment Draft Environmental Study Report). In addition, duct banks and gantries will need to be installed by Metrolinx as part of the power distribution components of UP Express electrification.

5.3.1 Footprint Impacts

Potential Effects and Avoidance/Mitigation/Compensation Measures

This section is characterized by an urban setting and human/ecological use of groundwater is negligible. In addition, there is limited contribution of groundwater recharge in this area to baseflow in the Humber River and Mimico Creek. The subsurface footprint of the gantry foundations duct banks associated with the Traction Power Substation at 175 CityView Drive, and OCS foundations are relatively small and shallow. Therefore, no adverse hydrogeological impacts are anticipated in relation to the project footprint and no mitigation measures are recommended.

EMU Maintenance Facility

The EMU MF will occupy land which is currently undeveloped and will consist primarily of rail siding, an approximately 0.5 hectare maintenance building. There is a stormwater management pond east of the EMU MF site that has been designed to manage flow associated with the adjacent Lowes retail
development. Implementation of the EMU MF has the potential to change or redistribute groundwater recharge, which contributes to baseflow at the Humber River approximately 360 m to the east. To ensure that baseflow contribution to the Humber River from this site is unaffected by the EMU MF development, the stormwater management ponds should be designed to achieve a zero-net reduction in groundwater recharge.

Net Effects

There is potential for the EMU MF to change the amount and location of groundwater recharge. To ensure that baseflow at the nearby Humber River is unaffected, the stormwater management pond(s) should be designed to achieve a zero-net change in groundwater recharge over the development footprint. No other net adverse hydrogeological effects are anticipated in Section 3.

5.3.2 Operations and Maintenance Impacts

Potential Effects and Avoidance/Mitigation/Compensation Measures

During operation of the EMU MF, there is potential for accidental spillage of various contaminants including oils, fuels, lubricants, metals, and solvents. Such spills have the potential to contaminate groundwater, and mitigation measures as described in Section 3.1.2 should be implemented to reduce this potential. In addition, installation of an oil and grit separator is recommended for the drainage system upstream of the stormwater management pond.

Net Effects

With the implementation of mitigation measures to reduce the potential impact of accidental spills and to minimize contaminants from entering the stormwater management pond, no net adverse effects on groundwater are anticipated.

5.3.3 Construction Impacts

Potential Effects and Avoidance/Mitigation/Compensation Measures

Construction of the EMU MF will involve more significant earth works and the potential for dewatering during construction of deeper building foundations. Given the fine-grained nature of the area soils and the surrounding land use (mainly industrial land, transportation corridors, minor residential, and a golf course), adverse hydrogeological effects of this dewatering are not anticipated. The potential need for dewatering will be further assessed during detailed design, as will the requirement for a Permit to Take Water (PTTW) from Ministry of the Environment (if more than 50,000 litres per day of groundwater is to be pumped). Specifically, impacts will be assessed and strategies for mitigation will be proposed as required as part of the PTTW application process.

Considering the shallow trenching for installation of the duct banks, it is not anticipated that groundwater will be encountered. Therefore, no potential adverse effects on groundwater are anticipated.
Gantry foundations will be installed at approximate 4 metre depth. OCS structure foundations will be installed to approximately 5 metre depth. Groundwater may be encountered during this construction, and minor amounts removed along with any excess soil. However, the impact on groundwater due to this construction activity will be imperceptible.

The potential for groundwater contamination may result from mobile vehicle refuelling during construction. This risk will be minimized by implementing the following measures:

- Vehicle refueling should be done in designated areas only, preferably situated on a paved, impermeable surface;
- An emergency response plan should be prepared by the contractor to establish methods to clean up accidental spills.

**Net Effects**

There are no net adverse effects related to encountering and/or removing groundwater during construction of duct banks, gantries, or OCS foundations. No net adverse effects are anticipated due to dewatering potentially required during construction of the EMU Maintenance Facility foundations, and the PTTW process will be followed in the event that dewatering in amounts greater than 50 m$^3$/day is required. The potential for groundwater contamination during spillage of fuels during construction will be minimized through implementation of the above listed mitigation measures.

5.4 Section 4 - Highway 427 to UP Express Pearson Station

5.4.1 Footprint Impacts

**Potential Effects and Avoidance/Mitigation/Compensation Measures**

This portion of the corridor is an elevated spur line. There are no potential adverse effects on hydrogeological features.

5.4.2 Operations and Maintenance Impacts

**Potential Effects and Avoidance/Mitigation/Compensation Measures**

This portion of the corridor is an elevated spur line. There are no potential adverse effects on hydrogeological features.

5.4.3 Construction Impacts

**Potential Effects and Avoidance/Mitigation/Compensation Measures**
This portion of the corridor is an elevated spur line. There are no potential adverse effects on hydrogeological features.

5.5 Summary of Hydrogeological Mitigation Measures

The following table provides a summary of the proposed mitigation/compensation measures related to the hydrogeological environment.

Table 5-1. Summary of Hydrogeological Mitigation Measures

<table>
<thead>
<tr>
<th>Project Activity/Component</th>
<th>Potential Effects</th>
<th>Avoidance/Mitigation/Compensation Measures</th>
</tr>
</thead>
<tbody>
<tr>
<td>Footprint of the EMU MF on Resources Road</td>
<td>• Reduction in baseflow at Humber River (in vicinity of EMU Maintenance Facility on Resources Rd.)</td>
<td>• Design of adjacent storm water management ponds to achieve zero-met reduction in groundwater recharge over footprint.</td>
</tr>
<tr>
<td>Maintenance of PS on Ordinance St. and Eglinton Ave. W., and EMU MF on Resources Road</td>
<td>• Contamination of soil caused by accidental spills</td>
<td>• All facilities will be fully equipped with spill containment and oil/water separation facilities. In the event of an equipment failure, oily water will not escape from the site. • Installation of an oil and grit separator is recommended for the drainage system upstream of the storm water management pond (situated adjacent to the EMU MF on Resources Road) • An Emergency Preparedness and Response Plan will govern spill response. • Spill cleanup and response equipment will be located on site. • Fuel transport will be conducted in compliance with the Transportation of Dangerous Goods Act. • Mobile fuelling trucks will be used where possible to minimize the requirements for on-site storage of petroleum, oil and lubricants. • Spill decks will be used for transferring products to smaller containers. • Fire extinguishers will be located near petroleum, oil and lubricants storage areas. • When refueling equipment, operators will: o Use designated fuelling locations; o Use drip trays; o Use leak-free containers and reinforced rip- and puncture-proof hoses and nozzles; o Be in attendance for the duration of the procedure; and o Seal all storage container outlets except the outlet currently in use. • Carry out routine inspections for PS facility, including transformer oil • All necessary precautions will be implanted to prevent the spillage and release of hazardous materials to the environment. • All leaks or spills will be immediately reported to the...</td>
</tr>
<tr>
<td>Dewatering potentially required for construction of building foundations at EMU Maintenance Facility on Resources Road.</td>
<td>• None anticipated</td>
<td>• The need for dewatering will be confirmed during detailed design, as will the requirement for a Permit to Take Water (PTTW) from Ministry of the Environment (if more than 50,000 litres per day of groundwater is to be pumped). Specifically, impacts will be assessed and strategies for mitigation will be proposed as required as part of the PTTW application process.</td>
</tr>
<tr>
<td>Accidental spills during vehicle refuelling during construction</td>
<td>• Groundwater contamination</td>
<td>• Vehicle refuelling should be done in designated areas only, preferably situated on a paved, impermeable surface; • An emergency response plan should be prepared by the contractor to establish methods to clean up accidental spills.</td>
</tr>
</tbody>
</table>
6. Contaminated Sites

Previous contaminant investigations (Phase I and Phase II Environmental Site Assessments) have been completed along the rail corridor between Strachan Avenue and Highway 427, as well as at former industrial properties along the UP Express Spur alignment (between Highway 427 and Pearson Airport). The findings of these investigations identified a number of existing and potential site contamination issues along the corridor attributed to the nature of past and current land uses within and adjacent to the rail corridor, including:

- Former coal storage yards;
- Former large industrial facilities;
- Former brownfield properties, i.e. former industrial properties redeveloped into residential properties;
- Existing large industrial facilities including manufacturing and chemical storage;
- Gas stations and service garages;
- Automotive wrecking yards;
- Numerous piles of railway ties within the corridor; and
- Oil storage sheds and former train stations within the corridor.

In addition, there is potential for contaminated rail ballast, bedding and fill material attributed to the use of slag, coal cinders and ash, which are typical of railway corridors.

This section of the report discusses the potential impacts of the UP Express Electrification project on, or relating to, existing contaminated sites.

6.1 Section 1 - UP Express Union Station to UP Express Bloor Station

6.1.1 Footprint Impacts

There are no potential footprint impacts on or relating to existing contaminated sites. No mitigation / measures are recommended.

6.1.2 Operations and Maintenance Impacts

There are no potential operations/maintenance impacts on or relating to existing contaminated sites in this Section. No mitigation / measures are recommended.

6.1.3 Construction Impacts

There is potential for disturbance of contaminated soil and/or groundwater during construction at the Ordnance paralleling station site. Improperly handled excess contaminated soil and contaminated groundwater pumped during dewatering (if any) has the potential to contaminate property and surface
water, respectively. Without appropriate preventative measures, workers can be exposed to unacceptable levels of contamination during construction. Dust generated during construction can spread contamination.

Therefore, the following mitigation measures, based on best management practices, will be implemented to manage contamination:

- A health and safety plan be developed and implemented for construction workers;
- Contaminated soils and groundwater will be managed in accordance with provincial legislation and regulations (i.e., Ontario Environmental Protection Act, Ontario Regulation 347, Transportation of Dangerous Goods Act and Regulations, Ontario Regulation 153/04).
- An excess materials management plan will be developed and implemented;
- Pumped groundwater (if required) will be treated such that discharge considers prevailing TRCA\(^7\) and City of Toronto water guidelines and requirements;
- Dust control will be practiced during construction.

It is noted that in 2010, SPL Beatty completed a Phase 1 and Phase 2 Environmental Site Assessment that included the Ordnance location. The report recommendations are being followed by Metrolinx in relation to managing contaminated material.

**Net Effects**

Based on implementation of the mitigation measures outline above, no net adverse effects related to disturbance of contaminated soil and/or groundwater during construction or handling of excess contaminated soil and pumped groundwater are anticipated.

### 6.2 Section 2 – UP Express Bloor Station to UP Express Weston Station

The Paralleling Station (PS) in section 2 is to be located on a former Kodak manufacturing and processing facility at 3500 Eglinton Ave. W. As part of the due diligence process related to the Eglinton Crosstown LRT project being undertaken by Metrolinx, Phase 2 Environmental Site Assessments were conducted at this site by Golder Associates Ltd. (March, 2011) and by AMEC Environment and Infrastructure (January, 2013). These studies found that soil and groundwater on this site are impacted by petroleum hydrocarbons, volatile organic compounds, metals and inorganics at levels in excess of applicable MOE effects-based (Table 3) site condition standards.

In accordance with Ontario Regulation 153/04 a Risk Assessment (RA) approach is proposed (Golder Associates Ltd., January 2013) as part of the Eglinton Crosstown LRT project to protect human health and the environment during and following construction. It is anticipated that a Certificate of Property Use

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\(^7\) As a Crown Agency, GO/Metrolinx is exempt from the Conservation Authorities Act and as such does not have a requirement to apply for and obtain permits from conservation authorities. Wherever possible, GO/Metrolinx will engage the conservation authority on specific projects (or components thereof) and will adhere to requirements when and where possible.
(CPU) will be issued for the site that must be adhered to. A CPU is a control document that is issued by the Ministry of the Environment to a property owner in relation to an accepted risk assessment (RA) that is required to implement risk management measures (RMMs). A CPU will be issued for the site and must be followed with respect to risk management measures employed at the site. With this in mind, it has been assumed for the purposes of the UP Express Electrification EA that the potential contamination effects during operation/construction will be mitigated through conformance with the RA approach and CPU as established for the future Eglinton Crosstown design/build project, which will be applicable to all activities proposed at the 3500 Eglinton Avenue West site.

6.2.1 Footprint Impacts

There are no potential footprint impacts on or relating to existing contaminated sites. No mitigation measures are recommended.

6.2.2 Operations and Maintenance Impacts

The Risk Assessment approach (as outlined above) for management of soil and groundwater contamination on the former Kodak facility property at 3500 Eglinton Ave. W. may require risk management measures (e.g., incorporation of vapor mitigation measures into new building design, and/or capping of soils with concrete asphalt, granular materials, or earth fill (to prevent exposure of soil-bound contaminants) to prevent exposure of workers to contamination. Excess soil may also require disposal at a specialized facility depending on soil quality.

Net Effects

Based on the Risk Assessment approach to be carried out as part of the Eglinton Crosstown LRT MSF project at the 3500 Eglinton Ave. W. site to address soil and groundwater contamination, and based on the implementation of the above noted mitigation measures, no net adverse effects during operation of the paralleling station are anticipated.

6.2.3 Construction Impacts

There is potential for disturbance of contaminated soil and/or groundwater during construction. Improperly handled excess contaminated soil and contaminated groundwater pumped during dewatering (if any) has the potential to contaminate property and surface water, respectively. Also, without appropriate preventative measures, workers can be exposed to unacceptable levels of contamination during construction. Dust generated during construction can spread contamination.

The RA approach to be carried out for redevelopment of the Kodak site as the Eglinton MSF may formalize the requirements for protection of workers during construction. At a minimum, the mitigation measures noted in Section 6.1.3 will be required.
Net Effects

Based on the Risk Assessment approach to be carried out as part of the Eglinton Crosstown LRT MSF project at the 3500 Eglinton Ave. W. site to address soil and groundwater contamination, and based on the implementation of the above noted mitigation measures, no net adverse effects during construction are anticipated.

6.3 Section 3 - UP Express Weston Station to Highway 427

A Phase I and Phase II Environmental Site Assessment was carried out for the EMU MF site on 50 Resources Road in 2005 and 2006 respectively. Remedial works were carried out in 2008 based on 2006 Phase II ESA as well as new ESAs carried out in 2008. A Record of Site Conditions was submitted by Golder on August 2009, allowing for future commercial or industrial development on the site. However, there is potential that future soil excavation activities may encounter materials exceeding applicable MOE Site Condition Standards.

In addition, a Phase I and Phase II ESA were carried out for the TPS site on City View Drive by Coffey Geotechnics Inc. in May, 2012. The Phase II findings were as follows:

- No further investigation is currently warranted, as the concentration of metals and inorganics, PHCs, VOCs, and PAHs in soil and groundwater all met the applicable MOE Table 3 Standards.
- If an RSC is required in the future, the May 2012 Phase 2 ESA will require updating in order to conform to the requirements of O. Reg 153.04 as amended. The previous Phase 1 ESA will also need to be upgraded to meet the requirements of O. Reg 153/04 if an RSC is required.
- All monitoring wells should be decommissioned in accordance with Ontario Regulation 903 when no longer required.

6.3.1 Footprint Impacts

There are no potential footprint impacts on or relating to existing contaminated sites. No mitigation measures are recommended.

6.3.2 Operations and Maintenance Impacts

There are no potential operations/maintenance impacts on or relating to existing contaminated sites in this Section. No mitigation / measures are recommended.

6.3.3 Construction Impacts

There is potential for disturbance of contaminated soil and/or groundwater during construction. Improperly handled excess contaminated soil and contaminated groundwater pumped during dewatering (if any) has the potential to contaminate property and surface water, respectively. Also, without appropriate
preventative measures, workers can be exposed to unacceptable levels of contamination during construction. Dust generated during construction can spread contamination.

As a result, the mitigation measures as described in Section 6.1.3 will be implemented.

6.3.3.1 Net Effects

The potential for property /surface water contamination during construction will be minimized by implementing the mitigation measures outlined in Section 6.1.3. The potential for workers to be exposed to unacceptable levels of contamination during construction will be minimized by implementing the appropriate preventative measures as outlined above.

6.4 Section 4 - Highway 427 to UP Express Pearson Station

This section of the corridor is an elevated spur line therefore no adverse effects related to contaminated sites are anticipated.
6.5 Summary of Mitigation Measures (Contaminated Sites)

The following table provides a summary of the proposed mitigation/compensation measures related to the existing contaminated sites.

Table 6-1. Summary of Mitigation Measures Related to Existing Contaminated Sites

<table>
<thead>
<tr>
<th>Project Activity/Component</th>
<th>Potential Effects</th>
<th>Avoidance/Mitigation/Compensation Measures</th>
</tr>
</thead>
</table>
| Construction/installation of paralleling stations and maintenance facility | Disturbance of contaminated soils and/or groundwater during construction | • A health and safety plan be developed for construction workers;  
• Contaminated soils and groundwater will be managed in accordance with provincial legislation and regulations;  
• An excess materials management plan should be developed;  
• Pumped groundwater (if required) will be treated such that discharge considers prevailing TRCA and City of Toronto water guidelines and requirements;  
• Dust control should be practiced during construction. |
| Operation of Paralleling Station on former Kodak site at 3500 Eglinton Ave. W | • Improperly handled excess contaminated soil/groundwater pumped during dewatering (if any) has the potential to contaminate property and surface water, respectively.  
• Worker health/safety: without appropriate preventative measures, workers can be exposed to unacceptable levels of contamination during construction. | • In accordance with Ontario Regulation 153/04 a Risk Assessment (RA) approach is proposed as part of the Eglinton Crosstown MSF project to protect human health and the environment during and following construction. A CPU will be issued for the site and must be followed with respect to risk management measures employed at the site. Therefore, the potential contamination effects during operation/construction of the paralleling station will be mitigated through conformance with the RA approach (risk management measures) and CPU as established for the future Eglinton Crosstown MSF design/build project, which will be applicable to all activities proposed at the 3500 Eglinton Avenue West site.  
• The RA approach to be carried out for redevelopment of the 3500 Eglinton  

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8 As a Crown Agency, GO/Metrolinx is exempt from the Conservation Authorities Act and as such does not have a requirement to apply for and obtain permits from conservation authorities. Wherever possible, GO/Metrolinx will engage the conservation authority on specific projects (or components thereof) and will adhere to requirements when and where possible.
<table>
<thead>
<tr>
<th>Ave W. site as the Eglinton MSF may formalize the requirements for protection of workers during construction. At a minimum, the mitigation measures noted above will be required.</th>
</tr>
</thead>
<tbody>
<tr>
<td>The following mitigation measures, based on best management practices, will be implemented to manage contamination at the Ordnance site:</td>
</tr>
<tr>
<td>- Follow the recommendations of the 2010 Phase 1 and Phase 2 Environmental Site Assessments for managing contaminated material.</td>
</tr>
<tr>
<td>- A health and safety plan be developed and implemented for construction workers;</td>
</tr>
<tr>
<td>- Contaminated soils and groundwater will be managed in accordance with provincial legislation and regulations (i.e., Ontario Environmental Protection Act, Ontario Regulation 347, Transportation of Dangerous Goods Act and Regulations, Ontario Regulation 153/04).</td>
</tr>
<tr>
<td>- An excess materials management plan will be developed and implemented;</td>
</tr>
<tr>
<td>- Pumped groundwater (if required) will be treated such that discharge considers prevailing TRCA(^9) and City of Toronto water guidelines and requirements;</td>
</tr>
<tr>
<td>- Dust control will be practiced during construction.</td>
</tr>
</tbody>
</table>

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\(^9\) As a Crown Agency, GO/Metrolinx is exempt from the Conservation Authorities Act and as such does not have a requirement to apply for and obtain permits from conservation authorities. Wherever possible, GO/Metrolinx will engage the conservation authority on specific projects (or components thereof) and will adhere to requirements when and where possible.
7. Monitoring

It is recommended that an Environmental Inspector be present during construction activities associated with UP Express Electrification project. The role of the Environmental Inspector will be to ensure that all environmental mitigation measures are properly installed, implemented and maintained during construction of the UP Express Electrification project components.

7.1 Stormwater Management

With respect to the 50 Resources Rd. site, the following future work will be carried out by Metrolinx:

- During preliminary and/or detailed design, the recommended option for altering/modify/relocating the existing SWM pond adjacent to the Resources Rd. site will be further reviewed/confirmed, and implemented prior to operation of the proposed EMU Maintenance Facility.

With respect to the Ordnance site, the following future work will be carried out by Metrolinx:

- During detailed design, a stormwater management plan/design will be carried out by Metrolinx and will address: quantity control, erosion control, and quality control.
- To control both water quality and quantity of stormwater discharge, stormwater management measures will be defined as part of the detailed design phase of the project in accordance with the Ministry of the Environment’s Stormwater Management Planning and Design Manual (2003).
- The stormwater management plan/design will be developed in consultation with MOE, City of Toronto, and the Toronto and Region Conservation Authority (TRCA), as appropriate.

7.2 Contaminated Sites

With respect to contaminated sites, monitoring is required to ensure that the worker health and safety plan and the excess materials management plan are developed and adhered to.

In addition, with respect to the 3500 Eglinton Ave. W. property:

- In accordance with Ontario Regulation 153/04 a Risk Assessment (RA) approach is proposed as part of the Eglinton Crosstown MSF project to protect human health and the environment during and following construction. A CPU will be issued for the site and must be followed with respect to risk management measures employed at the site. Therefore, the potential contamination effects during operation/construction of the paralleling station will be mitigated through conformance with the RA approach (risk management measures) and CPU as established for the future Eglinton

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10 As a Crown Agency, GO/Metrolinx is exempt from the Conservation Authorities Act and as such does not have a requirement to apply for and obtain permits from conservation authorities. Wherever possible, GO/Metrolinx will engage the conservation authority on specific projects (or components thereof) and will adhere to requirements when and where possible.
Crosstown MSF design/build project, which will be applicable to all activities proposed at the 3500 Eglinton Avenue West site.

- The RA approach to be carried out for redevelopment of the 3500 Eglinton Ave W. site as the Eglinton MSF may formalize the requirements for protection of workers during construction. At a minimum, the mitigation measures noted above will be required.

With respect to the Ordnance St. property:

The recommendations of the 2010 Phase 1 and Phase 2 Environmental Site Assessments for managing contaminated material will be followed.
Appendix A1

Plant List

Crack Willow (*Salix fragilis*)
Trembling Aspen (*Populus tremuloides*)
Norway Maple (*Acer platanoides*)
Sugar Maple (*Acer saccharum*)
Red Oak (*Quercus rubra*)
Basswood (*Tilia americana*)
Queen Anne’s Lace (*Daucus carota*)
White Ash (*Fraxinus Americana*)
Tartarian Honeysuckle (*Lonicera tatarica*)
Spreading Dogbane (*Apocynum androsaemifolium*)
European Buckthorn (*Rhamnus cathartica*)
Eastern Red Cedar (*Juniperus virginiana*)
Wild Grape (*Vitis roundifolia*)
Poison Ivy (*Rhus radicans*)
Common Mullein (*Verbascum thapsus*)
Hawthorn sp. (*Crataegus sp.*)
Wild Rose (*Rosa acicularis*)
Cow Vetch (*Vicia cracca*)
Wild Red Raspberry (*Rubus idaeus*)
Common Milkweed (*Asclepias syriaca*)
Goldenrod sp. (*Solidago sp.*)
Canada Thistle (*Cirsium arvense*)
American Elm (*Ulmus Americana*)
Manitoba Maple (*Acer negundo*)
Staghorn Sumac (*Rhus typhina*)
Grass sp. (*Poacea sp.*)
Ox-eye Daisy (*Leucanthemum vulgare*)
Broad-leaved Cattail (*Typha latifolia*)
Red-osier Dogwood (*Cornus sericea*)
Tall Meadowrue (*Thalictrum pubescens*)
Reed Canary Grass (*Phalaris arundinacea*)
Spotted Jewelweed (*Impatiens capensis*)
Balsam Poplar (*Populus balsamifera*)
Choke Cherry (*Prunus virginiana*)
APPENDIX A2
<table>
<thead>
<tr>
<th>*G-RANK</th>
<th>Definitions</th>
</tr>
</thead>
<tbody>
<tr>
<td>G1</td>
<td>Extremely rare - usually 5 or fewer occurrences in the overall range or very few remaining individuals; or because of some factor(s) making it especially vulnerable to extinction.</td>
</tr>
<tr>
<td>G2</td>
<td>Very rare - usually between 5 and 20 occurrences in the overall range or with many individuals in fewer occurrences; or because of some factor(s) making it vulnerable to extinction.</td>
</tr>
<tr>
<td>G3</td>
<td>Rare to uncommon - usually between 20 and 100 occurrences; may have fewer occurrences, but with a large number of individuals in some populations; may be susceptible to large-scale disturbances.</td>
</tr>
<tr>
<td>G4</td>
<td>Common - usually more than 100 occurrences; usually not susceptible to immediate threats.</td>
</tr>
<tr>
<td>G5</td>
<td>Very common - demonstrably secure under present conditions.</td>
</tr>
<tr>
<td>GH</td>
<td>Historic, no records in the past 20 years.</td>
</tr>
<tr>
<td>GU</td>
<td>Status uncertain - often because of low search effort or cryptic nature of the species; more data needed.</td>
</tr>
<tr>
<td>GX</td>
<td>Globally extinct. No recent records despite specific searches.</td>
</tr>
<tr>
<td>?</td>
<td>Denotes inexact numeric rank (i.e. G4?).</td>
</tr>
<tr>
<td>G</td>
<td>A &quot;G&quot; (or &quot;T&quot;) followed by a blank space means that the NHIC has not yet obtained the Global Rank from The Nature Conservancy.</td>
</tr>
<tr>
<td>G?</td>
<td>Unranked, or, if following a ranking, rank tentatively assigned (e.g. G3?).</td>
</tr>
<tr>
<td>Q</td>
<td>Denotes that the taxonomic status of the species, subspecies, or variety is questionable.</td>
</tr>
<tr>
<td>T</td>
<td>Denotes that the rank applies to a subspecies or variety.</td>
</tr>
</tbody>
</table>

*G-Rank are Global ranks assigned by a consensus of the network of CDCs, scientific experts, and The Nature Conservancy to designate a rarity rank based on the range-wide status of a species, subspecies or variety.

<table>
<thead>
<tr>
<th>*S-RANK</th>
<th>Definitions</th>
</tr>
</thead>
<tbody>
<tr>
<td>SX</td>
<td>Presumed Extirpated—Species or community is believed to be extirpated from the nation or state/province. Not located despite intensive searches of historical sites and other appropriate habitat, and virtually no likelihood that it will be rediscovered.</td>
</tr>
<tr>
<td>SH</td>
<td>Possibly Extirpated (Historical)—Species or community occurred historically in the nation or state/province, and there is some possibility that it may be rediscovered. Its presence may not have been verified in the past 20-40 years. A species or community could become NH or SH without such a 20-40 year delay if the only known occurrences in a nation or state/province were destroyed or if it had been extensively and unsuccessfully looked for. The NH or SH rank is reserved for species or communities for which some effort has been made to relocate occurrences, rather than simply using this status for all elements not known from verified extant occurrences.</td>
</tr>
</tbody>
</table>
| S1       | Critically Imperiled—Critically imperiled in the nation or state/province because of extreme rarity (often 5 or fewer occurrences) or because of some factor(s) such as very...
**S-RANK** | **Definitions**
--- | ---
*S-Ranks are Provincial (or Subnational) ranks are used by the Natural Heritage Information Centre to set protection priorities for rare species and natural communities. These ranks are not legal designations. Provincial ranks are assigned in a manner similar to that described for global ranks, but consider only those factors within the political boundaries of Ontario.*

**S2**  | **Imperiled**—Imperiled in the nation or state/province because of rarity due to very restricted range, very few populations (often 20 or fewer), steep declines, or other factors making it very vulnerable to extirpation from the nation or state/province.

**S3**  | **Vulnerable** - Vulnerable in the nation or state/province due to a restricted range, relatively few populations (often 80 or fewer), recent and widespread declines, or other factors making it vulnerable to extirpation.

**S4**  | **Apparently Secure** - Uncommon but not rare; some cause for long-term concern due to declines or other factors.

**S5**  | **Secure** - Common, widespread, and abundant in the nation or state/province.

**SNR** | **Unranked**—Nation or state/province conservation status not yet assessed.

**SU**  | **Unrankable** - Currently unrankable due to lack of information or due to substantially conflicting information about status or trends.

**SNA** | **Not Applicable** - A conservation status rank is not applicable because the species is not a suitable target for conservation activities.

**S#S#** | **Range Rank** - A numeric range rank (e.g., S2S3) is used to indicate any range of uncertainty about the status of the species or community. Ranges cannot skip more than one rank (e.g., SU is used rather than S1S4).

**COSEWIC** | **Definitions**
--- | ---
*X-Ranks are Provincial (or Subnational) ranks are used by the Natural Heritage Information Centre to set protection priorities for rare species and natural communities. These ranks are not legal designations. Provincial ranks are assigned in a manner similar to that described for global ranks, but consider only those factors within the political boundaries of Ontario.*

**X**  | **Extinct** - A wildlife species that no longer exists.

**XT**  | **Extirpated** - A wildlife species that no longer exists in the wild in Canada, but exists elsewhere.

**END** | **Endangered** - A wildlife species facing imminent extirpation or extinction.

**T**  | **Threatened** - A wildlife species that is likely to become endangered if nothing is done to reverse the factors leading to its extirpation or extinction.

**SC**  | **Special Concern** - A wildlife species that may become threatened or endangered because of a combination of biological characteristics and identified threats.

**DD**  | **Data Deficient** - A category that applies when the available information is insufficient (a) to resolve a wildlife species’ eligibility for assessment or (b) to permit an assessment of the wildlife species’ risk of extinction.

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

**COSEWIC** is the Committee on the Status of Endangered Wildlife in Canada that assigns federal Status to species at risk. COSEWIC listed species are either already protected by the *Species at Risk Act* (SARA) or are listed to be protected by SARA.
<table>
<thead>
<tr>
<th>*SARO</th>
<th>Definitions</th>
</tr>
</thead>
<tbody>
<tr>
<td>EXP</td>
<td><strong>Extripated</strong> - A species that no longer exists in the wild in Ontario but still occurs elsewhere.</td>
</tr>
<tr>
<td>END</td>
<td><strong>Endangered</strong> - A species facing imminent extinction or extirpation in Ontario which is a candidate for regulation under Ontario's ESA.</td>
</tr>
<tr>
<td>THR</td>
<td><strong>Threatened</strong> - A species that is at risk of becoming endangered in Ontario if limiting factors are not reversed</td>
</tr>
<tr>
<td>SC</td>
<td><strong>Special Concern</strong> - A species with characteristics that make it sensitive to human activities or natural events</td>
</tr>
</tbody>
</table>

*SARO is the list of Species at Risk in Ontario that are protected under the *Endangered Species Act* (ESA).
Terrestrial Features Photo Log
West of Union Station Train Shed to Bloor Station

Photo 1: Vegetation along existing railway corridor right-of-way

Photo 2: Cultural Thicket (CUT) community at Paralleling Station
Photo 3: Cultural Thicket (CUT) community at Paralleling Station
Bloor Station to Weston Station

Photo 4: Rock pile serving as potential snake habitat feature at Black Creek

Photo 5: Deciduous Forest (FOD) community along Black Creek
Photo 6: Muddy banks serving as potential turtle habitat feature at Black Creek

Photo 7: Deciduous Forest (FOD) community at Switching Station
Photo 8: Deciduous Forest (FOD) community at Switching Station

Photo 9: Cultural Meadow (CUM) community at Switching Station
Photo 10: Humber River serving as wildlife movement corridor

Photo 11: Deciduous Forest (FOD) community along Humber River
Photo 12: The Humber River banks provide marginal quality turtle habitat

Photo 13: Cultural Meadow (CUM) community adjacent to Maintenance Facility Option 1 (Lowes site)
Photo 14: Deciduous Forest (FOD) community adjacent to Maintenance Facility Option 1 (Lowes site)

Photo 15: Cultural Meadow (CUM) community at Northern Substation Option
Photo 16: Cultural Meadow (CUM) community at Northern Substation Option
Highway 427 to Terminal 1 (Pearson Airport)

Photo 17: The Cultural Thicket (CUT) community between Highway 427 and Terminal 1

Photo 18: Small pond approximately 250m from rail corridor between Highway 427 and Terminal 1 serving as turtle and amphibian habitat
Photo 19: Mimico Creek serving as a wildlife movement corridor
Aquatic Features Photo Log

Black Creek: photo taken upstream (north) of ARL corridor, looking downstream
Black Creek: photo taken upstream (north) or ARL corridor, looking upstream
Black Creek: photo taken upstream (north) or ARL corridor, looking upstream
Black Creek: photo taken downstream (south) of ARL corridor crossing, looking upstream
Black Creek: photo taken downstream (south) of ARL corridor, looking upstream

Black Creek: storm sewer outlet, looking east, located downstream of (south) of ARL corridor
Humber River: photo taken upstream (north) of ARL corridor, looking downstream

Humber River: photo taken upstream (north) of ARL corridor, looking at west bank
Humber River: photo take upstream (north) of ARL corridor, looking at east bank

Humber River: photo take upstream (north) of ARL corridor, looking upstream
Humber River: photo take upstream (north) of ARL corridor, looking upstream

Humber River: photo take underneath ARL corridor, looking downstream
Humber River: photo taken downstream (south) of ARL corridor, looking downstream

Humber River: photo taken downstream (south) of ARL corridor, looking at steep east bank
Humber River: photo take downstream (south) of ARL corridor, looking upstream at east bank

Humber River: photo take downstream (south) of ARL corridor, looking upstream at west bank
Humber River: Substrate located underneath ARL Corridor

Humber River: Wier located downstream (south) of ARL corridor
Mimico Creek: photo taken upstream (north) of Zahavy Way Bridge, looking downstream

Mimico Creek: photo taken upstream (north) of Zahavy Way Bridge, looking upstream
Mimico Creek: photo taken downstream (south) of Zahavy Way Bridge, looking upstream

Mimico Creek: photo taken under Zahavy Way Bridge, looking upstream at weir
Mimico Creek: storm drain outfall on southeast side of Zahavy Way Bridge

Mimico Creek: photo taken downstream (south) of Zahavy Way Bridge, looking downstream
Mimico Creek: photo taken downstream (south) of Zahavy Way Bridge, looking downstream
<table>
<thead>
<tr>
<th>Common Name</th>
<th>Scientific Name</th>
<th>Location</th>
<th>Source</th>
</tr>
</thead>
<tbody>
<tr>
<td>ALEWIFE</td>
<td>Alosa pseudoharengus</td>
<td>Humber River</td>
<td>MNR et al, 2005</td>
</tr>
<tr>
<td>AMERICAN BROOK LAMPREY</td>
<td>Lampropterus appendix</td>
<td>Humber River</td>
<td>TRCA, 2009; MNR et al, 2005; TRCA, 2012</td>
</tr>
<tr>
<td>AMERICAN EEL</td>
<td>Anguilla rostrata</td>
<td>Humber River</td>
<td>MNR et al, 2005</td>
</tr>
<tr>
<td>BLACK CRAPPIE</td>
<td>Pomoxis nigromaculatus</td>
<td>Humber River; Mimico Creek</td>
<td>MNR et al, 2005</td>
</tr>
<tr>
<td>BLACKchin SHINER</td>
<td>Notropis heterodon</td>
<td>Humber River</td>
<td>MNR et al, 2005</td>
</tr>
<tr>
<td>BLACKNOSE SHINER</td>
<td>Notropis heterolepis</td>
<td>Humber River</td>
<td>MNR et al, 2005</td>
</tr>
<tr>
<td>BLACKSIDE DARTER</td>
<td>Percina maculata</td>
<td>Humber River</td>
<td>TRCA, 2012</td>
</tr>
<tr>
<td>BLACKNOSE DACE</td>
<td>Rhinichthys atratus</td>
<td>Black Creek, Humber River, Mimico Creek</td>
<td>TRCA, 2009; MNR et al, 2005; TRCA, 2010; TRCA, 2012</td>
</tr>
<tr>
<td>BLUEGILL</td>
<td>Lepomis macrochirus</td>
<td>Humber River</td>
<td>TRCA, 2009; MNR et al, 2005; TRCA, 2012</td>
</tr>
<tr>
<td>BLUNTNOSE MINNOW</td>
<td>Pimephales notatus</td>
<td>Black Creek, Humber River, Mimico Creek</td>
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Sources:
Toronto and Region Conservation Authority. 2009. Fish Community Summary for Fish Sampling Stations Within the Vicinity of the Study Area
Toronto and Region Conservation Authority. 2005. Humber River Fisheries Management Plan. Published by the Ontario Ministry of Natural Resources.
Toronto and Region Conservation Authority. 2012. Fish Community Summary for Fish Sampling Stations Within the Vicinity of the Study Area.
## Appendix B1 – Optional Bird Marking Devices

<table>
<thead>
<tr>
<th>Device</th>
<th>Purpose</th>
<th>Description</th>
<th>Dimensions</th>
<th>Photograph</th>
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<tr>
<td>Twin Contact Wire Cover</td>
<td>Provides an insulating platform above Twin or Single contact wires.</td>
<td>Long metal tube that attaches to contact wire with industrial standard clamps.</td>
<td>1500m long</td>
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<td>Aerial Marker Spheres</td>
<td>Provides a more visible wire to prevent bird collisions.</td>
<td>Large coloured spheres that attach to wires every 30-100m.</td>
<td>Diameter: range from 23cm-137cm</td>
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<tr>
<td>Product</td>
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<td>Spiral Vibration Damper</td>
<td>Provides a more visible wire to prevent bird collisions.</td>
<td>Length: range from 112-165 cm</td>
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<td></td>
<td>PVC spiral device that fits over the wires every 3m</td>
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<td>Bird-Flight Diverter</td>
<td>Provides a more visible wire to prevent bird collisions.</td>
<td>Length: range from 17-59 cm</td>
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<tr>
<td></td>
<td>PVC spiral device that attaches to wires; spaced every 4.6-21 m</td>
<td>Diameter: range from 3.8-12.7 cm</td>
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</tbody>
</table>

[http://www.preformed.on.ca/](http://www.preformed.on.ca/)
| **Swan-Flight Diverter**  
[http://www.preformed.on.ca/](http://www.preformed.on.ca/) | Provides a more visible wire to prevent bird collisions. | PVC spiral device that attaches to wires; spaced every 15-30m | Length: range from 50.8-116cm  
Diameter: range from 17.8-20.3cm (at widest part) |
|---|---|---|---|
| **Suspended devices**  
<p>| Provides a more visible wire to prevent bird collisions. | Swinging or fixed devices of various shapes and colours with reflective surfaces that attach to wires (with a clamp) every 5-30m | Varies |</p>
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<th>Firefly</th>
<th>Provides a more visible wire to prevent bird collisions.</th>
<th>Swinging device made of plastic with a reflective surface that attaches to wires (with a clamp) every 4.6-15.2m</th>
<th>9cm x 15cm</th>
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<tr>
<td>Birdmark</td>
<td>Provides a more visible wire to prevent bird collisions.</td>
<td>Swinging disk with a reflective surface that attaches to wires (with a clamp) every 4.6m</td>
<td>Length: 29.2cm Diameter: 13.3cm</td>
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</tbody>
</table>
STORMWATER MANAGEMENT REPORT

IN SUPPORT OF DRAFT PLAN OF SUBDIVISION APPLICATION

50 RESOURCES ROAD
ETOBICOKE
CITY OF TORONTO

Prepared For:

LOWE'S

Prepared By:

Counterpoint Engineering II Inc.

Lowe’s Companies Canada, ULC
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North York, Ontario
M2N 6L9

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Vaughan, Ontario L4K 5Y2
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File Number: 06443-B9
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## Drawings

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EXECUTIVE SUMMARY

This Stormwater Management Report has been prepared for Lowe’s Companies Canada, ULC in support of a Subdivision Application Approval. The proposed mixed employment/commercial development is located at the southeast corner of Highway 401 and Islington Avenue. The subdivision is bound by Resources Road to the north and west, office buildings to the east, and Canadian National Railway to the south (refer to Figure 1 for project location). The total development area is 14.70 ha and will include a proposed municipal road, development blocks and a proposed municipal stormwater management facility.

The 14.70 ha subdivision will discharge to a proposed stormwater management facility sized for quantity and quality control. The SWM facility will outlet to an existing 825mmø storm sewer located on Resources Road which will ultimately discharge into the Humber River.

This report outlines the proposed SWM facility control measures and water balance initiatives that will be implemented within the subdivision to meet the governing agencies’ development criteria for stormwater management. The SWM strategy that will be implemented within the subdivision is summarized as follows:

- The Regional storm event post-development flows will be detained and have a total release rate of 0.455 m³/s which is lower than the governing allowable release rate of 0.700m³/s;
- A storage volume of 19,800m³ will be attenuated within the pond during the Regional storm event;
- Quantity control to be achieved through the use of orifice tubes within a pond outlet structure;
- No rooftop controls will be used to adhere to MTO guidelines,
- Enhanced quality control (80% TSS removal) will be provided in the SWM pond through the permanent pool and pond design layout;
- 5mm of stormwater across the subdivision will be retained on-site through the use of low impact development strategies in order to promote a water balance.
1.0 PROJECT BACKGROUND

This Stormwater Management Report (“SWM Report”) has been prepared on behalf of Lowe’s Companies Canada, ULC in support of a Subdivision Application Approval for a proposed 14.70 ha commercial development in the City of Toronto.

The proposed subdivision will consist of a future municipal road, mixed employment/commercial development blocks, and a municipal stormwater management facility. The subdivision will also incorporate sustainable initiatives to promote water balance.

The stormwater management strategy for the proposed development is in conformance with the following report:

- “Functional Servicing Report – In Support of Zoning By-Law Amendment and Draft Plan of Subdivision Applications” prepared by Counterpoint Engineering II Inc. dated February 8th, 2010

This SWM Report outlines the proposed stormwater management quantity and quality control measures that will be implemented within the developed subdivision to satisfy the above mentioned Report, the City of Toronto, Ministry of Transportation, and Toronto and Region Conservation Authority criteria.

2.0 EXISTING DRAINAGE CONDITIONS

The 14.70 ha site has been previously developed as industrial lands. The site once consisted of a Labatt Brewery which has been deconstructed. The site is currently composed of crushed concrete piles and slabs, asphalt, gravel, landscaping and some undeveloped areas. The subdivision drains to an existing 825mm ø storm pipe located on Resources Road. The municipal storm sewer on Resources Road flows towards the east and outlets to the Humber River through an existing headwall. The undeveloped areas are located along the southern property line and flow uncontrolled towards the south to a ditch that runs along the railway. Refer to Figure 2 for existing conditions.
3.0 STORMWATER MANAGEMENT CRITERIA

This report has been prepared in accordance with the previously mentioned Functional Servicing Report where criteria were determined through recommendations provided by the City of Toronto, Ministry of Transportation (MTO), and the Toronto and Region Conservation Authority (TRCA).

3.1 QUANTITY CONTROL

As per the previously mentioned Functional Servicing Report (FSR), the allowable site release rate for the site was determined by comparing the residual capacity of the trunk sewer on Resources Road, the 2-year peak flow with a runoff coefficient of 0.50 as per the City of Toronto Wet Weather Flow Management Guidelines, and the required release rate to detain the Regional storm event within the allocated pond block. It was determined that the remaining capacity for the site in the existing 825mmø pipe is 1.44m³/s, the 2-year storm with C=0.50 and time of concentration of 10 minutes gave a flow of 1.80m³/s, and the storage graded within the pond block would allow a release rate of 0.70m³/s (refer to Appendix A for excerpts and calculations from the FSR). Since a release rate of 0.70m³/s can be achieved from the allocated pond block and is the most conservative of the three comparisons, 0.70m³/s would become the target release rate during the Regional storm event.

The Regional storm event will be detained by the stormwater management facility since a sufficient emergency overland flow route from the pond could not be provided to the Humber River.

Quantity control will be provided in an on-site stormwater management pond in conjunction with orifice tubes located in the pond outlet structure. Rooftop controls will not be used in the stormwater management calculations in order to adhere to MTO guidelines.
3.2  EROSION CONTROL

As per the e-mail direction from the TRCA, erosion control is required in the pond which will detain the 25mm storm event for 48 hours. Refer to Appendix B for email correspondence from TRCA.

3.3  QUALITY CONTROL

Quality control for the development will be provided by the storm water management facility in the form of a permanent pool and sediment forebay providing Enhanced (Level 1) quality control as per discussions with the TRCA. Refer to Appendix B for email correspondence from TRCA.

3.4  WATER BALANCE

The TRCA and City of Toronto standards require water balance objectives to be met for the development. The City of Toronto's Wet Weather Flow Management Guidelines require that 5mm of runoff be retained on-site through infiltration, water reuse and/or evapotranspiration. This water balance target is the same as the TRCA criteria. To achieve the water balance objectives, 5mm will be multiplied by the subdivision area being developed to determine the retention volume required.

4.0  PROPOSED STORM DRAINAGE

The site is 14.70 ha in area; 13.58 ha of the subdivision will drain into the stormwater management facility, 0.57 ha (mainly perimeter landscaped area) will flow uncontrolled to Resources Road, and the remaining 0.55 ha is an undeveloped natural area east of the pond which flows uncontrolled to the adjacent valley lands. All drainage areas will ultimately flow to the Humber River.
**External Drainage**

A 0.32 ha external area drains to the subdivision, this area consists of the proposed roundabout on Resources Road (increasing total drainage area to the pond to 13.90 ha). Refer to **Figure 3** for drainage area delineations.

**Site Drainage**

The SWM pond will outlet to a proposed 600mmø storm sewer in a future easement extending from the pond outlet to the existing 825mmø storm sewer on Resources Road which in turn conveys stormwater runoff to the Humber River through an existing headwall.

The proposed storm sewers (minor system) within the subdivision will be sized to convey the runoff from the 5-year storm event using a 10 minute initial time of concentration and the statistical rainfall parameters from the wet weather flow management guidelines to obtain the rainfall intensity. Please refer to the storm sewer design sheet in **Appendix C**.

The subdivision and future municipal road will be graded such that the maximum ponding depth during the 100-year storm event does not exceed 0.3 m.

The stormwater runoff from the development parcels south of the future road will be controlled to the 5-year post development flows as per the storm sewer design sheet. The parcel to the north of the future road will have 2 stub connections; MH500 will have an allowable release rate of 1.377 cms and MH600 will have an allowable release rate of 1.918 cms. All parcels within the subdivision will retain stormwater runoff up to and including the 100-year storm event. Refer to **Appendix C** for the 5-year post development flows for the south parcels.

In storms greater than the 100-year event, the development parcels will spill towards the future municipal road which will in turn convey the emergency flows to the stormwater management pond. Please note that the 100-year storm event has a greater runoff peak
flow than the regional storm event (Hurricane Hazel), while the regional storm produces a much greater volume to be stored by the pond.

The proposed municipal road has the capacity to convey the 100-year road runoff to the pond. The runoff from the future municipal road and roundabout has been calculated to be 0.631 cms and flattest road cross section (0.50%) was determined to have a capacity of 2.295 cms. The hydraulic grade line (“HGL”) during the 100-year storm event was calculated for the proposed road storm sewer taking into account the allowable release rate flows mentioned above. The calculated HGL will be contained within the right of way channel. Refer to Appendix D for road conveyance and HGL calculations.

The emergency overland flow conveyed by the future municipal road will spill to a channel that will convey the flows to the pond. The channel has been designed to convey the 100-year post development from SWMHYMO (6.773 cms). Refer to Appendix D for channel capacity sizing.

### 5.0 STORMWATER MANAGEMENT SCHEME

The SWMHYMO modeling method (see Appendix E) was used to determine the pond release rates and storage requirements. The stormwater model analyzes the proposed development during the 2-year to the 100-year storm events for the City of Toronto, Ontario. Also the 25mm storm event has been modelled for erosion control. In addition, the Regional storm event has been modelled since an emergency overland flow route from the pond has not been provided to the Humber River.

**Design Storm**

The design storm events used in this analysis are based on the Chicago Hydrograph method. The 2-year to 100-year storm events were modelled with a 24 hour duration, a 10 minute time step and a time to peak ratio (r) equal to 0.333. The abc’s for all storm events have been obtained from the Toronto Wet Weather Management Guidelines, refer to Appendix E for abc values inputted into SWMHYMO.
The Regional storm event is based on Hurricane Hazel with a 12 hour duration and an AMCIII distribution. The rainfall hyetograph was obtained from the TRCA.

**Model Input Parameters**

The subdivision areas have been modelled in SWMHYMO using the DESIGN STANDHYD command (standard hydrographs). The subdivision flows were then attenuated using the ROUTE RESERVOIR command to model the pond outflows. The uncontrolled areas were modelled in SWMHYMO using the DESIGN NASHYD command. DESIGN NASHYD is a hydrograph command used to simulate the runoff from undeveloped areas or areas with a low imperviousness value. Refer to Appendix E for SWMHYMO model calculations and Figure 3 for SWMHYMO drainage areas. The SWMHYMO input parameters for the site have been summarized in Table 1 below.

**Table 1 - SWMHYMO Modelling Parameters**

<table>
<thead>
<tr>
<th>Catchment Area ID</th>
<th>SWMHYMO ID</th>
<th>Area (ha)</th>
<th>CN Value</th>
<th>XIMP</th>
<th>TIMP</th>
<th>Slope (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>North Parcel A</td>
<td>101A</td>
<td>2.07</td>
<td>85</td>
<td>0.90</td>
<td>0.90</td>
<td>2.0</td>
</tr>
<tr>
<td>North Parcel B</td>
<td>101B</td>
<td>2.89</td>
<td>85</td>
<td>0.90</td>
<td>0.90</td>
<td>2.0</td>
</tr>
<tr>
<td>Road</td>
<td>102</td>
<td>1.06</td>
<td>85</td>
<td>0.65</td>
<td>0.65</td>
<td>2.0</td>
</tr>
<tr>
<td>Uncontrolled*</td>
<td>103</td>
<td>0.29</td>
<td>77</td>
<td>n/a</td>
<td>n/a</td>
<td>n/a</td>
</tr>
<tr>
<td>Uncontrolled*</td>
<td>104</td>
<td>0.28</td>
<td>77</td>
<td>n/a</td>
<td>n/a</td>
<td>n/a</td>
</tr>
<tr>
<td>Uncontrolled**</td>
<td>105</td>
<td>0.55</td>
<td>72</td>
<td>n/a</td>
<td>n/a</td>
<td>n/a</td>
</tr>
<tr>
<td>South Parcel</td>
<td>106</td>
<td>5.86</td>
<td>85</td>
<td>0.90</td>
<td>0.90</td>
<td>2.0</td>
</tr>
<tr>
<td>Pond</td>
<td>107</td>
<td>2.02</td>
<td>77</td>
<td>0.90</td>
<td>0.90</td>
<td>2.0</td>
</tr>
</tbody>
</table>

* Nashyd command used: Time to peak used: 0.03 hours  
** Nashyd command used: Time to peak used: 0.20 hours

5.1 **QUANTITY CONTROL**

A future municipal stormwater management facility will be provided to attenuate the runoff flows from the subdivision. The pond outlet will have flows lower than the determined release rate of 0.70m³/s. The SWM pond will outlet to the 825mm ø pipe noted above for all events up to and including the Regional storm event. Note that the Toronto and Region Conservation Authority has no required quantity control targets for this reach of the Humber River. Refer to Appendix B for email correspondence from TRCA. Please refer to Table 2 below for targeted and provided storage volumes.
Table 2 - Stormwater Management Pond Storage Summary

<table>
<thead>
<tr>
<th></th>
<th>Required Storage (m³)</th>
<th>Provided Storage (m³)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Permanent Pool Volume</td>
<td>3,035</td>
<td>3,622</td>
</tr>
<tr>
<td>Active Storage Volume*</td>
<td>19,800</td>
<td>21,767</td>
</tr>
<tr>
<td>Total</td>
<td>22,385</td>
<td>25,389*</td>
</tr>
</tbody>
</table>

* Active Storage includes Extended Detention and Quantity Control volumes.
** Storage up to 149.90m elevation, top of berm elevation is 150.00m

Stormwater Management Facility Outlet Structure Design

The pond outlet structure was designed to ensure the extended detention of frequent storms (i.e. at least 48 hour detention of runoff from a 25 mm event with a 4 hour duration) for runoff quality and erosion control. For all events up to and including the Regional storm event, the outlet structure will have a release rate lower than 0.70 m³/s.

The outlet structure will consist of 2 vertical orifice tubes within a ditch inlet maintenance hole having a honeycomb grate top. There will be a pond outlet headwall at an invert of 146.10m where a 300mmø reversed slope pipe will connect to a 1m long 100mmø orifice tube at an elevation of 147.10m within the outlet structure. The ditch inlet gate on top of the control structure will have an elevation of 148.15m. The second orifice tube will be located at the downstream end of the control structure and will have an elevation of 147.04m and a 300mmø. Refer to Drawings PS and PD for pond plan and details.

Table 3 on the following page provides a summary of the stage, storage and release rates for the pond for all storm events.
Table 3 – SWM Pond Operation Characteristics

<table>
<thead>
<tr>
<th>Design Storm</th>
<th>Pond Water Surface Elevation (m)</th>
<th>Pond Storage Volume (m³)</th>
<th>Pond Inflow Rate (m³/s)</th>
<th>Pond Release Rate (m³/s)</th>
<th>Uncontrolled Flow to Resources Road (m³/s)</th>
<th>Uncontrolled Natural Area (m³/s)</th>
<th>Total Flow Subdivision Flow to Resources Road (m³/s)</th>
<th>Allowable Release Rate (m³/s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>25 mm</td>
<td>147.56</td>
<td>2,878</td>
<td>1.246</td>
<td>0.020</td>
<td>0.018</td>
<td>0.006</td>
<td>0.028</td>
<td>0.700</td>
</tr>
<tr>
<td>2-yr</td>
<td>147.79</td>
<td>4,297</td>
<td>2.205</td>
<td>0.024</td>
<td>0.050</td>
<td>0.016</td>
<td>0.066</td>
<td>0.700</td>
</tr>
<tr>
<td>5-yr</td>
<td>148.11</td>
<td>6,306</td>
<td>3.404</td>
<td>0.042</td>
<td>0.097</td>
<td>0.032</td>
<td>0.117</td>
<td>0.700</td>
</tr>
<tr>
<td>10-yr</td>
<td>148.17</td>
<td>6,652</td>
<td>4.231</td>
<td>0.123</td>
<td>0.133</td>
<td>0.045</td>
<td>0.154</td>
<td>0.700</td>
</tr>
<tr>
<td>25-yr</td>
<td>148.26</td>
<td>7,210</td>
<td>4.987</td>
<td>0.254</td>
<td>0.170</td>
<td>0.058</td>
<td>0.260</td>
<td>0.700</td>
</tr>
<tr>
<td>50-yr</td>
<td>148.44</td>
<td>8,353</td>
<td>6.008</td>
<td>0.288</td>
<td>0.219</td>
<td>0.077</td>
<td>0.297</td>
<td>0.700</td>
</tr>
<tr>
<td>100-yr</td>
<td>148.52</td>
<td>9,348</td>
<td>6.773</td>
<td>0.305</td>
<td>0.258</td>
<td>0.092</td>
<td>0.315</td>
<td>0.700</td>
</tr>
<tr>
<td>Regional</td>
<td>149.65</td>
<td>19,800</td>
<td>1.951</td>
<td>0.407</td>
<td>0.072</td>
<td>0.064</td>
<td>0.455</td>
<td>0.700</td>
</tr>
</tbody>
</table>

- Maximum berm elevation of 150.00m
- Total active storage available in the pond is 21,767m³ up to an elevation of 149.90m
- Freeboard depth is 0.35m (based on top of berm and Regional Storm water elevation)
- Total flow to Resources Road is the addition of hydrographs “ADDHYD” from SWMHYMO

Through SWMHYMO modeling and the proposed pond grading design, the pond will detain the Regional storm event and the subdivision will have a release rate of 0.455m³/s which is lower than the governing FSR release rate. This proposed release rate is suitable as it is more conservative than the setout target release rate.

5.2 EROSION CONTROL

As per the e-mail direction from the TRCA, erosion control is required in the pond which detains the 25mm storm event for 48 hours. In order to hold the 25mm storm event for a minimum of 48 hours, a maximum release rate of 0.020 m³/s was used and modelled in SWMHYMO. A SAVE HYD command was used in SWMHYMO where the pond outflow hydrograph (time vs. flow) would be created to ensure that the appropriate extended detention was achieved. Using this command, an extended detention time of 119 hours was determined. It should be noted that the majority of the pond outflow occurred within the first 55 hours of the detention time. It was determined that a volume of 2878m³ will...
be attenuated during the 25mm storm event. Refer to Appendix E for the 4hr 25mm storm event SWMHYMO modeling.

The maximum release rate and required volume for extended detention were confirmed using the Ministry of Environment (MOE) criteria. A maximum allowable release rate of 0.027 m$^3$/s was determined, as well as a required volume for extended detention of 3091m$^3$. As mentioned above, the release rate for the 25mm event storm event was determined to be 0.020 m$^3$/s in SWMHYMO, which is less than the allowable erosion release rate. The actual pond volume provided for extended detention is 5209m$^3$, which exceeds the required volume. Refer to Appendix F for further details.

Extended detention of the 25mm storm event was also confirmed using the ‘falling head’ equation (Equation 4.10), as outlined in the MOE Stormwater Management Planning and Design Manual. Using this method, it was confirmed that the pond drawdown time for the 25mm storm event is 127 hours, which exceeds both the requirement of 48 hours, and the detention time of 119 hours determined by SWMHYMO. Refer to Appendix F for detailed calculations.

5.3 QUALITY CONTROL

Quality control measures will be implemented within the pond to minimize sediment from being conveyed into the Humber River. The proposed pond will be graded to maximize the runoff flow path between the pond inlet and outlet. The proposed pond layout and detention time will minimize the transport of suspended solids into the downstream conveyance network. One forebay has been designed within the pond as there is one inlet to the pond as shown on Drawing PS.

The quality control components of the stormwater management facility for the site are as follows (refer to Appendix F for SWM Pond calculations):

- Required sediment forebay length: 36m
- Provided sediment forebay length: 83m
- Required permanent pool volume: 3,035m$^3$
- Provided permanent pool volume: 3,622m$^3$
• Provided Permanent pool depth: 1.50m

The sediment forebay has been designed to have a width of 24m and a length of 83m in order to achieve the sediment settling lengths in accordance with the MOE Stormwater Planning and Design Manual. Refer to Appendix F for SWM Pond calculations.

Further to the quality control provided by the storm water management facility, additional quality control will be provided on each block as part of a treatment train complete with features such as bioswales and infiltration trenches.

Bioswales provide quality control by infiltrating contributing runoff and trapping any sediment in the plantings or within the filter media composition. As per the Low Impact Development Stormwater Management Planning and Design Guide ("LID Manual"), historical data indicates that bioretention facilities provide an average of 74% TSS removal (Table 4.5.3 of the LID Manual).

Rooftop flows collected in infiltration galleries will have been diverted from mixing with the parking lot drainage, thereby reducing both the amount of runoff produced and the pollutant load directed to the proposed stormwater management facility (LID Manual Section 4-7).

Specific quality control measures for each block will be individually assessed with calculations at the site plan stage. However, it should be noted that the proposed stormwater management facility alone will be designed to satisfy all regulatory requirements for the entire development and that any additional measures provided in the individual blocks will be beyond these requirements.

5.4 STORMWATER MANAGEMENT POND DESIGN

Pond Grading Design

The stormwater management facility has been designed as a “wet pond” which will be graded with side slopes of 5:1 above and below the permanent pool level. A safety
bench with a 7:1 slope will be provided around the permanent pool. The bottom of the pond has been designed with an invert of 145.60m, whereas the surface of the permanent pool will be at an elevation of 147.10m resulting in a 1.50m permanent pool depth. The maximum water surface elevation during the 100-year storm event has been computed as 148.52m. In addition the stormwater management pond will attenuate the Regional storm event and will have a water surface elevation of 149.65m. The top of the pond berm will be at an elevation 150.00m giving a freeboard depth of 0.35m. A 4.00m wide maintenance access road will surround the pond having an elevation of 150.00m and will slope at 2% towards the pond. There will be 2 maintenance access points; one into the sediment forebay and the other into the quantity cell. The access points will have a maximum slope of 8:1. Refer to Drawing PS for pond grading details.

The stormwater management facility will be planted in accordance with the MOE and TRCA guidelines and standards. The selected plants will stabilize graded areas disturbed during construction, provide aesthetic value, and help maintain the quality of the ecosystems downstream of the subdivision. Landscaping plans will outline the planting design and will be prepared by Terraplan Landscape Architects.

6.0 POND OPERATION AND MAINTENANCE

Facility Inspection Frequency and Monitoring

The facility should be inspected after every major storm event for the first two years of operation. This should translate into an average of four inspections per year for two years.

Following the first two years of operations, annual maintenance inspections and procedures should be undertaken. An annual report should be made for the facility as a result of these inspections. The Stormwater Management Practices, Planning, and Design Manual by the Ministry of the Environment, March 2003 (SWMP manual) recommends the following items to be included in the report:
Observations resulting from the inspection of the SWM pond over the course of the year.

These observations should include comments on the:
- hydraulic operation of the facility (detention time, evidence or occurrence of overflows)
- evidence of erosion
- condition of vegetation in and around facility
- occurrence of obstructions at the inlet and outlet
- evidence of spills and oil/grease contamination
- frequency of trash build-up

- measured sediment depths in the SWM pond
- monitoring results, if flow or quality monitoring was undertaken during the year
- maintenance and operation activities undertaken for the SWM pond during the year
- recommendations for the inspection and maintenance program for the coming year

An inspection checklist is included in Appendix G.

Regular Maintenance Procedures

As part of the regular inspection and maintenance operations described in above, any deficiencies in the facility should be rectified. Debris and litter should be removed. This can range from shopping carts to floatable debris on the surface of the water. Accumulation of large organic material should be minimal in the early years of the development, but objects such as tree branches may increase in presence as the development matures. Typically, this work can be carried out manually with hand held tools and the resulting debris can be disposed of at the nearest sanitary landfill site.

A list of maintenance activities suitable for the proposed stormwater management measures developed for the subject site is shown in Table 4.
### Table 4 - Pond Maintenance Requirements

<table>
<thead>
<tr>
<th>Type of Maintenance</th>
<th>Maintenance Interval (years)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Litter removal</td>
<td>1</td>
</tr>
<tr>
<td>Grass cutting</td>
<td>once or twice per year</td>
</tr>
<tr>
<td>Weed control</td>
<td>1</td>
</tr>
<tr>
<td>Vegetation maintenance</td>
<td>5</td>
</tr>
<tr>
<td>Sediment removal</td>
<td>10</td>
</tr>
<tr>
<td>Inspection (e.g. inlet and outlet)</td>
<td>1</td>
</tr>
</tbody>
</table>

#### Sediment Accumulation and Removal Frequency

The frequency of sediment removal from a wet pond depends on the upstream land use, level of imperviousness and standard municipal management practices. As per the Ontario Ministry of Environment (MOE) sediment disposal guidelines, for an average impervious level of 85%, the annual sediment loading can be estimated at 4,680 kg/ha. With a wet density of 1230 kg/m³, the annual loading is 3.8 m³/ha. The approximate total annual sediment loading (based on 90% imperviousness) reaching the pond is therefore 57.5 m³/year (based on a 13.90 ha area draining to the pond). Appendix F contains sediment cleanout frequency calculations for the forebay and for the entire wet cell section of the pond. The required cleanout frequency for the pond will be a maximum of 10 years as per MOE guidelines. Actual MOE calculations show that the pond should be cleaned out every 29 years and the cleanout for the forebay is a maximum of 16 years.

### 7.0 WATER BALANCE

The TRCA and City of Toronto standards require water balance objectives to be met for the development. The development blocks will retain 5mm of runoff within the developed/hardscaped areas through infiltration and evapotranspiration. As per the memo ‘Follow-up Letter regarding TRCA request for Water Balance as it relates to Zoning By-law Amendment and Draft Plan of Subdivision Applications at 50 Resources Road, dated February 11, 2010, prepared by Counterpoint Engineering Inc., based on a development area of 14.70 ha, a total runoff volume of 735m³ is required to be
infiltrated/evaporated to achieve the water balance objectives. Refer to Appendix H for further details.

8.0 CONCLUSIONS

The mixed employment/commercial subdivision will provide quality and quantity control measures through a future municipal stormwater management facility. The subdivision will have a release rate of 0.455m³/s which is lower than the determined governing target release rate of 0.70m³/s in the FSR. The SWM pond will provide erosion control and Level 1 treatment (80% TSS removal) as per the MOE guidelines. 5mm of runoff will be infiltrated/attenuated within the developed subdivision areas. This report demonstrates that the proposed stormwater management design meets the criteria outlined in Section 3.0.

Sincerely,

Counterpoint Engineering Inc.

Andrea Dasek, P. Eng, LEED® AP
905-326-3089
adasek@counterpointeng.com

Jude Yoganathan, P. Eng.
905-326-3053
jyoganathan@counterpointeng.com
minute time of concentration and the statistical rainfall parameters from the wet weather flow management guidelines to obtain the rainfall intensity. Please refer to the Storm Sewer Calculation Sheet (Rational Method) in Appendix A and Figure 3 – Storm Drainage Plan.

The development’s storm sewer system will carry all flows up to and including the 5-year storm event to the stormwater management facility. Flows from events in excess of the 5-year storm will be carried under pressure through the minor system while any overflow will be directed down the Street ‘A’ right-of-way towards the stormwater management facility. The stormwater management facility has been designed to accommodate the Regional storm event and release a controlled flow to the proposed municipal system within the allotted 14.0m easement. The proposed system connects to the existing sewer system on Resources Road at STM MH10A. From this point, the sewers travel east down Resources Road and outlet into the Humber River.

2.3 Stormwater Management – Allowable Release Rate

As noted above, the site will drain to the existing 825mm diameter concrete sewer on Resources Road. Assuming that runoff must be conveyed from the subject property through the minor drainage system (i.e. no overland flow from the property is allowed), the target release rate for all storms up to and including the Regional storm would be the lowest of:

- the residual capacity of the trunk sewer on Resources Road; or,
- the 2-year peak flow with a runoff coefficient of 0.5 as per the City of Toronto Wet Weather Management Flow Guidelines; or,
- the required release rate to detain the Regional storm event within the pond block

2.3.1 Allowable Release Rate based on Residual Sewer Capacity

To determine the capacity of the storm sewer system downstream of the subject property we have prepared a design spreadsheet entitled “Storm Sewer Calculation Sheet (Rational Method)” in Appendix A. The storm sewer downstream of the subject property with the lowest residual capacity determines the allowable release rate. The storm sewer downstream
of the subject property with the least capacity is between maintenance holes 10 and 9, which is a 102m long 825mm diameter pipe with a slope of 0.93% and a capacity of 1.44 m$^3$/s. Subtracting the flow already in the system from the upstream drainage area without the subject site yields a residual capacity of 1.32 m$^3$/s.

Furthermore, we performed a cursory review of the drainage areas contributing to the flow in the downstream sewer system and are of the opinion that since the initial construction of the system there have been alterations to include other outlets to the Humber River, therefore the actual drainage areas are less than shown in our design spreadsheet of the system.

### 2.3.2 Allowable Release Rate based on the Wet Weather Flow Management Guidelines

The same flow rate was computed by the Rational Method for a 2-year storm with $C=0.5$ and a time of concentration of 10 minutes yielding a flow of 1.80 m$^3$/s. This release rate is in excess of the residual capacity of the receiving sewers and is therefore not the governing condition. Please refer to Appendix A for supporting calculations.

### 2.3.3 Allowable Release Rate based on the Storage Requirements for Regional Storm Event (Hurricane Hazel)

In order to detain the Regional storm event (Hurricane Hazel) within the pond block, a lower release than those stipulated by the above noted WWFM Guidelines was required. The release rate required to satisfy this requirement is 0.70 m$^3$/s. Refer to Appendix A for supporting calculations. This is the governing allowable release rate condition.

### 2.4 Stormwater Management – Quantity Control

To attenuate the stormwater flows from the subdivision in accordance with the City’s Wet Weather Flow Management Plan a stormwater management facility will be provided. Refer to Functional Site Servicing Plan. The pond will control flows to the target release rate noted
above for all storms up to and including the Regional storm (Hurricane Hazel). Note that the Toronto and Region Conservation Authority has no quantity control targets for the reach of the Humber River in question (Refer to Appendix A – Email Correspondence from TRCA). Please refer to the table below for targeted and provided storage volumes.

<table>
<thead>
<tr>
<th></th>
<th>Required Storage (m$^3$)</th>
<th>Provided Storage (m$^3$)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Permanent Pool</td>
<td>2,941</td>
<td>4,512</td>
</tr>
<tr>
<td>Active Storage*</td>
<td>17,070</td>
<td>22,392</td>
</tr>
<tr>
<td><strong>TOTALS</strong></td>
<td><strong>20,011</strong></td>
<td><strong>26,904</strong></td>
</tr>
</tbody>
</table>

* Active Storage includes Extended Detention and Quantity Control volumes.
** Storage up to 149.90m elevation, top of berm elevation is 150.00m

Please refer to Appendix A for SWMHYMO output files and Figure 4 – SWMHYMO Flow charts. Refer to table of Wet Pond Permanent Pool & Extended Detention Sizing for details on the above pond volumes. Refer to section 2.7.2 and table 2.7.2 SWM Pond Operation Characteristics for further detail.

### 2.4.1 Water Balance

The TRCA and City of Toronto standards require water balance objectives to be met for the development. The City of Toronto's Wet Weather Management Flow Guidelines 5 mm on-site retention of runoff criteria will need to be satisfied. This is the same requirement as the TRCA criteria. To achieve the water balance objectives the following approaches will be evaluated as deemed necessary.

- First and foremost infiltration measures;
- Evapotranspiration and;
- Water reuse
RATIONAL METHOD - PREDEVELOPMENT CONDITIONS

Project: North Etobicoke
Project No: 06443
Client: Lowe's
Location: Toronto, Ontario
Prepared by: Brandon Couldrey
Checked by: Chris Shilton
Date: 30/01/2008
Event: 2 years

ABC's: a 531.4
      b 0
      c 0.78

Time of Concentration: t 10 min
Runoff Coefficient: C 0.5
Site Area A 14.7 ha
Intensity i = a/(t+b)^c
     i = 88.19 mm/hr
Flow Q = CiA/360
     Q = 1.80 m³/s
     Q = 1801 l/s
### STORM SEWER CALCULATION SHEET (RATIONAL METHOD)

**CITY DESIGN SHEET SK. 1396 UPDATED PER WET WEATHER FLOW REQUIREMENTS - 2 YEAR - INCLUDING NEW SUBDIVISION**

<table>
<thead>
<tr>
<th>Project:</th>
<th>North Etobicoke</th>
</tr>
</thead>
<tbody>
<tr>
<td>Client:</td>
<td>Lowe’s</td>
</tr>
<tr>
<td>Location:</td>
<td>Toronto, Ontario</td>
</tr>
<tr>
<td>Prepared by:</td>
<td>Brandon Coudrely</td>
</tr>
<tr>
<td>Checked by:</td>
<td>Derek Smith</td>
</tr>
<tr>
<td>Date:</td>
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#### Workflow ABCs

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**Storm Drainage Area**

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<th>Diam. (mm)</th>
<th>Length (m)</th>
<th>Slope</th>
<th>Area (ha)</th>
<th>C</th>
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<th>Time of Concentration (min)</th>
<th>Area Flow (Q) (l/s)</th>
<th>Other Flows (l/s)</th>
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<th>Pipe Capacity (l/s)</th>
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**Composite RC Value**

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**Divided by Total Area** | 0.31 | 0.31 |

---

**Notes:**

- **Model 2 Conditions entering MH2A, identified on original Township of Etobicoke sheet SK 1396 at 15.22ha and 0.38ha**
Appendix B
Email Correspondence from TRCA
Hi Derek,

Below is the criteria for your site. I am assuming that you’ll be draining eastward towards the Humber River. It appears that the developable area is larger than 5 ha in which case a wet stormwater management facility would be required. The control required to be provided within your pond is:

- No quantity control criteria is required for this portion of the Humber River (City of Toronto may have site quantity requirements)
- Enhanced (Level 1) quality control
- Erosion control which detains the 25 mm storm for 48 hours

The TRCA and City of Toronto will be looking for water balance to be addressed and that as a minimum the Toronto's WWF guideline requires 5 mm on-site retention of runoff criterion will need to be satisfied.

I hope this is the information you were looking for and if you have any questions please feel free to contact me.

Thanks,

Alison

Alison MacLennan, P.Eng.
Water Resource Analyst
Toronto and Region Conservation
Phone: 416 661-6600 ext. 5613
Fax: 416 661-6898
Email: amaclennan@trca.on.ca
Address: 5 Shoreham Drive, Downsview, Ontario, M3N 1S4

--- Forwarded by Ryan Ness/TRCA on 03/06/2008 09:35 AM ---

Nicole Moxley/TRCA

03/04/2008 03:31 PM

Hi Ryan,

You are going to be receiving a phone call from a Derek Smith who is working on the redevelopment of the old Labatt Property at Islington and the 401. Please see the attached copy of the Proposed Site Plan for your

3/12/2008
Appendix C
Storm Sewer Design Sheet
### Counterpoint Engineering II Inc.

**STORM SEWER CALCULATION SHEET (RATIONAL METHOD)**

- **Project**: Lowe’s of North Etobicoke
- **Project No.**: 066443
- **Client**: Lowe’s
- **Location**: City of Toronto
- **Designed by**: JCF
- **Date**: 04/27/2011

#### Rainfall Intensity

- **A** = 32
- **B** = 0
- **C** = 0.78
- **Starting To** = 16 min
- **Manning’s Roughness Coefficient (All Pipes)** = 0.013

#### 5-Year Data

- **Full Flow Capacity (m³/s)**
- **Full Flow Velocity (m/s)**
- **Time of Concentration (min)**
- **Acc. Time of Concentration (min)**

#### Table Data

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<th>TO MPH</th>
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<th>5-YR RUNOFF</th>
<th>5-YR ACCUM</th>
<th>5-YR INTENSITY</th>
<th>5-YR ACCUM FLOW</th>
<th>COMM. AREA</th>
<th>COMM. AVG FLOW</th>
<th>COMM. ACCUM FLOW</th>
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<th>TOTAL FLOW</th>
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<th>SL. PER</th>
<th>PIPE DIAMETER</th>
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</table>

---

1. **Resources Rd**: A low-volume street with minimal runoff, showing typical stormwater management characteristics.
2. **Fut. Municipal ROW**: Data indicates a flow rate consistent with its designated purpose for future municipal use.
3. **SWM ROW**: Data suggests a smaller area influencing stormwater management with a similar runoff pattern.
4. **EASEMENT**: Outlets and inlets with varied flow capacities and velocities, critical for precise stormwater management planning.

---

These calculations are essential for urban stormwater management, ensuring optimal drainage solutions.
Appendix D
Road and Ditch Capacity Calculations
And
HGL Analysis
counterpoint engineering

Job: North Etobicoke
Job No. 6443

Mannings Equation - Trapezoidal Channel

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<td>%</td>
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Mannings 'n' Gravel bed, straight
Road Geometry

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<tr>
<td>Curb height</td>
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<tr>
<td>Gutter width</td>
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<table>
<thead>
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<th>X</th>
<th>Y</th>
<th>Slope</th>
<th>Manning n</th>
</tr>
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<td>99.994</td>
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<td>0.025</td>
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<td>2.00</td>
<td>99.960</td>
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<td>0.013</td>
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<td>0.025</td>
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<td>0.013</td>
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<tr>
<td>20.00</td>
<td>100.010</td>
<td>2.00%</td>
<td>0.025</td>
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</table>

*Datum is equal to 0,100

max. elev. 100.010
min. elev. 99.744
max. depth 0.266
Total Surface Contact Area = 20.0m (ROW flooded to property lines)

Of total 20.0m:
- 7.7m is grass
- 12.3m is pavement/concrete

Therefore, Manning’s Equation (composite):

\[
N = \frac{7.7(0.025) + 12.3(0.013)}{20.0} = 0.0176
\]

Using Manning’s Equation, assuming 0.5% longitudinal slope on road:

\[
\text{Roadway Capacity} = \frac{1.0}{N} \times \left( \frac{\text{Area}}{\text{Wetted Perimeter}} \right)^{2/3} \times s^{1/2} \times \text{Area}
\]

\[
= \left( \frac{1.0}{0.0176} \right) \times \left( \frac{2.37}{20.0} \right)^{2/3} \times \left( \frac{0.5}{100} \right)^{1/2} \times 2.37
\]

\[
= (56.754) \times (0.241) \times (0.0707) \times 2.37
\]

\[
= 2.295 \text{m}^3/\text{s} = 2295 \text{ l/s} *
\]

(*For a road with a 1.0% longitudinal slope, the capacity increases to 3.245 m$^3$/s or 3245 l/s)*
<table>
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<th>MANHOLES</th>
<th>INVERT ELEV</th>
<th>GROUND COVER</th>
<th>PIPE PARAMETERS</th>
<th>Sub.</th>
<th>TOTAL</th>
<th>Q-cap</th>
<th>Q-in</th>
<th>SURCH</th>
<th>HGL (US)</th>
<th>HGL (DB)</th>
<th>HEIGHT</th>
<th>i</th>
<th>pipe A (M^2)</th>
<th>L/D</th>
<th>f</th>
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Appendix E
SWMHYMO Modelling
Conversion of Rational Method Regression Coefficients

**Equation Format 1**

\[ I = A T^C \]

where \( T \) is in hours

**Equation Format 2**

\[ I = \frac{A}{T + B}^C \]

where \( T \) is in minutes

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<th>Storm</th>
<th>A</th>
<th>C</th>
<th>Storm</th>
<th>A</th>
<th>B</th>
<th>C</th>
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Rainfall Intensities using Equation Format 1

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<td>282.52</td>
<td>329.98</td>
<td>390.57</td>
<td>435.83 mm/hr</td>
</tr>
<tr>
<td>10</td>
<td>88.19</td>
<td>131.79</td>
<td>162.27</td>
<td>189.52</td>
<td>224.32</td>
<td>250.32 mm/hr</td>
</tr>
<tr>
<td>15</td>
<td>64.28</td>
<td>95.67</td>
<td>117.32</td>
<td>137.02</td>
<td>162.18</td>
<td>180.98 mm/hr</td>
</tr>
<tr>
<td>30</td>
<td>37.43</td>
<td>55.33</td>
<td>67.38</td>
<td>78.70</td>
<td>93.15</td>
<td>103.94 mm/hr</td>
</tr>
<tr>
<td>60</td>
<td>21.80</td>
<td>32.00</td>
<td>38.70</td>
<td>45.20</td>
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<td>59.70  mm/hr</td>
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<tr>
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<td>25.96</td>
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<td>3.14</td>
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Rainfall Intensities using Equation Format 2

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North Etobicoke SWM Calculations
SCS Curve Number (CN) Determination

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<th>BC</th>
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CN Value for Commercial (mainly pavement with landscaping) CN = 85

Airport Method - Coefficient less than 0.40

\[ tc = \frac{3.26(1.1-C)L^{0.5}}{Sw^{0.33}} \]

Uncontrolled 103 Landscape  Uncontrolled 104 Landscape  Uncontrolled 105 Natural
C = 0.3  C = 0.3  C = 0.2
L = 8  L = 9  L = 85
Sw = 20  Sw = 33  Sw = 3.5
Tc= 3 minutes  Tc= 2 minutes  Tc= 18 minutes
Tp= 0.03 hours  Tp= 0.03 hours  Tp= 0.20 hours
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#### Future Adjacent Development - North of Road

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#### Proposed Development - North of Road

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#### Uncontrolled Commercial Area

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#### Uncontrolled Natural Area

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ADD HYD  IDsum=[2], NHYD=[203], ID to add=[4,9,6]

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**Notes:**
- Storm data and hydrologic design are based on a 100-year storm event.
- Uncontrolled Natural Area
- Pond Flow + Uncontrolled, Allowable 0.700 cms
- Pond Flow + Uncontrolled, Allowable 0.700 cms
Unit Hyd. peak (cms) = 0.26 ± 0.05

Time (min) = 5.00 ± 20.00

Length (m) = 138.80 ± 40.00

Surface Area (ha) = 2.60 ± 0.29

Surface Area (ha) = 1.86 ± 0.21

Over (min) = 5.00 ± 20.00

Max. eff. Inten. (mm/hr) = 50.21 ± 9.88

Max. eff. Inten. (mm/hr) = 50.21 ± 9.88

Storage Coeff. (min) = 2.99 (ii) ± 25.13 (ii)

Storage Coeff. (min) = 4.13 (ii) ± 21.93 (ii)

Unit hyd. peak (cms) = 0.30 ± 0.06

TOTALS

PEAK FLOW = 0.697 (iii)

TIME TO PEAK = 1.50 ± 1.75 ± 1.500

RUNDOWN (cms) = 0.01 ± 0.01 (iii)

TIME TO PEAK (hrs) = 1.50 ± 1.500

Dep. Storage (mm) = 0.80 ± 1.50

Dep. Storage (mm) = 0.80 ± 1.50

Average Slope (%) = 2.00 ± 2.00

Average Slope (%) = 2.00 ± 2.00

Mannings n = 0.013 ± 0.250

Mannings n = 0.013 ± 0.250

Time to peak (hrs) = 1.50 ± 1.75 ± 1.500

RUNOFF COEFFICIENT = 0.97 ± 0.32 ± 0.904

*** WARNING: Storage Coefficient is smaller than DT!

(3) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:

CN = 85.0 ± 1.0 ± Dep. Storage (Above)

TIME STEP (DT) SHOULD BE SMALLER OR EQUAL THAN THE STORAGE COEFFICIENT.

(11) PEAK FLOW DOES NOT INCLUDE BASEFLOWS IF ANY.

TIME TO PEAK (hrs) = 1.50 ± 1.75 ± 1.500

RUNDOWN (cms) = 0.01 ± 0.01 (iii)

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TIME TO PEAK (hrs) = 1.50 ± 1.500

RUNDOWN (cms) = 0.01 ± 0.01 (iii)
TOTAL RAINFALL (mm) = 24.996
RUNOFF VOLUME (mm) = 5.556
TIME TO PEAK (hrs) = 1.500

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<tr>
<th>DESIGN NASHYD</th>
<th>Area (ha) = .28 Curve Number (CN)=77.00</th>
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<tr>
<td>U.S. Tp(hrs)= .030</td>
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</table>

Ideal Unit HSD (cm) = .356

PEAK FLOW (cms) = .009
TIME TO PEAK (hrs) = 1.500
RUNOFF VOLUME (mm) = 5.556
TOTAL BASEFLOWS = 24.996
RUNOFF COEFFICIENT = .222

**WARNING**: Time step is too large for value of TP.

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

| PEAK FLOW REDUCTION (qout/qin)(%) = 1.616 |

CUMULATIVE TIME OF OVERFLOWS (hours) = .00

SUM 03:201  13.90  1.244  1.50  22.24  .000

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<tr>
<th>ROUTE RESERVOIR</th>
<th>Requested routing time step = 1.0 min.</th>
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- **NOTE**: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

Unit Hyd Speak (cm) = .356

PEAK FLOW (cms) = .009
TIME TO PEAK (hrs) = 1.500

SUM 04:000201  14.47  .028  1.50  21.58  .000

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<th>IDF curve parameters: A= 531.400</th>
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<td>B= 8.504</td>
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Duration of storm = 24.00 hrs
Time to peak ratio = .33

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**NOTE**: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

Unit Hyd Speak (cm) = .030

PEAK FLOW (cms) = .009
TIME TO PEAK (hrs) = 1.500

SUM 06:000203  .57 .016 1.50 5.56  .000

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**INFLOW >06:**

- **Area (ha):** 2.98
- **Impervious Person:** 80.82
- **Average Slope (%):** 2.50
- **Length (m):** 118.05
- **Manning's n:** .013

**OUTFLOW >09:**

- **Area (ha):** 2.98
- **Storage Coeff (mm):** 43.46
- **Discharge Ave:** .178

**Routing Results:**

- **Area (ha):** 2.98
- **Time Step (min):** 5.00
- **Storage Coeff:** .000

**Design Summary:**

- **Area (ha):** 2.98
- **Total Imp (ha):** 90.0
- **Dir Conn (ha):** 90.0

**Inflow Result:**

- **Area (ha):** 2.98
- **Time Step (min):** 5.00
- **Storage Coeff:** .178

**Routing Results:**

- **Area (ha):** 2.98
- **Time Step (min):** 5.00
- **Storage Coeff:** .000
### Properties and Measurements

- **Length (m)**: 138.80
- **Dep. Storage (mm)**: 0.80, 1.50
- **IMPERVIOUS (i)**

### Table: Routing Results

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<tr>
<th>Time Rain (hrs)</th>
<th>Area (ha)</th>
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### Additional Notes

- Use a smaller DT or a larger area.
- ***WARNING: Storage Coefficient is smaller than DT!***
- Use a smaller DT or a larger area.
- Use a smaller DT or a larger area.
TIME TO PEAK (hrs) = 8.083

U.H. Tp(hrs) = .200

| DT= 5.00 | Ia (mm) = 1.500 | # of Linear Res. (N) = 3.00 |

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOW IF ANY.

TIME TO PEAK (hrs) = 8.000

Unit Hyd. Qpeak (cms) = .356

| DESIGN NASHYD | Area (ha) = .28 | Curve Number (CN) = 77.0 |

R.V. may be ok. Peak flow could be off.

Note: PEAK FLOWS DO NOT INCLUDE BASEFLOW IF ANY.

TOTAL NUMBER OF SIMULATED OVERFLOWS = 0

Routing Results

| Area (ha) | Qpeak (ha.m.) | Tpeak (hrs) | R.V. |

* Use a smaller DT or a larger area.

* WARNING: Storage Coefficient is smaller than DT!

** TOTALS**

Storage Coefficient (min) = 1.88 (ii) 9.02 (ii)

Max. eff. Inten. (mm/hr) = 162.26 97.10

Average Slope (%) = 2.00 2.00

ID 04:000203

Thane than the storage coefficient.

CN* = 77.0 Ia = Dep. Storage (Above)

Use a smaller DT or a larger area.

CN* = 85.0 Ia = Dep. Storage (Above)

* Use a smaller DT or a larger area.

* WARNING: Storage Coefficient is smaller than DT!

** TOTALS**

Peak Flow Does Not Include Baseflow IF ANY.

Routing Results

| Area (ha) | Qpeak (ha.m.) | Tpeak (hrs) | R.V. |

* Use a smaller DT or a larger area.

* WARNING: Storage Coefficient is smaller than DT!

** TOTALS**

Routing Results

| Area (ha) | Qpeak (ha.m.) | Tpeak (hrs) | R.V. |

* Use a smaller DT or a larger area.

* WARNING: Storage Coefficient is smaller than DT!

** TOTALS**

Routing Results

| Area (ha) | Qpeak (ha.m.) | Tpeak (hrs) | R.V. |

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** TOTALS**

Routing Results

| Area (ha) | Qpeak (ha.m.) | Tpeak (hrs) | R.V. |

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** TOTALS**

Routing Results

| Area (ha) | Qpeak (ha.m.) | Tpeak (hrs) | R.V. |

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* WARNING: Storage Coefficient is smaller than DT!

** TOTALS**

Routing Results

| Area (ha) | Qpeak (ha.m.) | Tpeak (hrs) | R.V. |

* Use a smaller DT or a larger area.

* WARNING: Storage Coefficient is smaller than DT!

** TOTALS**

Routing Results

| Area (ha) | Qpeak (ha.m.) | Tpeak (hrs) | R.V. |

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Routing Results

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Routing Results

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Routing Results

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Routing Results

| Area (ha) | Qpeak (ha.m.) | Tpeak (hrs) | R.V. |

* Use a smaller DT or a larger area.

* WARNING: Storage Coefficient is smaller than DT!

** TOTALS**

Routing Results

| Area (ha) | Qpeak (ha.m.) | Tpeak (hrs) | R.V. |

* Use a smaller DT or a larger area.

* WARNING: Storage Coefficient is smaller than DT!
**WARNING:** Time step is too large for value of TP.

### Footnotes:

1. PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
2. PEAK FLOW REDUCTION: (mm) = 44.87
3. TIME TO PEAK (hrs) = 8.000
4. TOTAL BASEFLOW (mm) = 73.069
5. PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
6. PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
7. PEAK FLOW REDUCTION: (mm) = 44.87
8. TIME TO PEAK (hrs) = 8.000
9. TOTAL BASEFLOW (mm) = 73.069
10. PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
11. PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
12. PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
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(C:\...700ls.out) Patterson Consulting Inc.
**ADD HYD (000201) | AREA | Q PEAK | TPEAK | R.V. | DWF**

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**ADD HYD (000203) | AREA | Q PEAK | TPEAK | R.V. | DWF**

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**ADD HYD (000204) | AREA | Q PEAK | TPEAK | R.V. | DWF**

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**ADD HYD (000205) | AREA | Q PEAK | TPEAK | R.V. | DWF**

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RUNOFF COEFFICIENT = .559

---------------------- U.H. Tp(hrs)= .030
| 08:10 | DT= 5.00 | Ia (mm)= 1.500 |
| DESIGN NASHYD | Area (ha)= .29 | # of Linear Res. (N)= 3.00 |

Uncontrolled Commercial

MAXIMUM STORAGE USED (ha.m.)=.8353E+00

PERCENTAGE OF TIME OVERFLOWING (%)= .00
CUMULATIVE TIME OF OVERFLOWS (hours)= .00

Use a smaller DT or a larger area.

RUNOFF COEFFICIENT = .99
RUNOFF VOLUME (mm)= 100.22

Storage Coeff. (min)= 1.64 (ii)

TIME SHIFT OF PEAK FLOW (min)= 5.00

PEAK FLOW REDUCTION [ Qout/Qin] (%)= 46.816

PERCENTAGE OF TIME OVERFLOWING (%)= .00
CUMULATIVE TIME OF OVERFLOWS (hours)= .00

OUTFLOW<05: (000201) 5.86 1.589 8.068 97.058

ROUTE RESERVOIR | ID: NHYD | AREA | Q_PEAK | TPEAK | R.V. | DWF
----------------------- --------------------------------------------
                  =========================== ===========================

(i) TIME STEP OF PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL

*** WARNING: Time step is too large for value of TP.

(iii) TIME STEP OF PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
(i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL TO

(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOW IF ANY.

USE A SMALLER DT OR A LARGER AREA.

MAXIMUM STORAGE USED (ha.m.) = 0.9348E+00

TIME SHIFT OF PEAK FLOW (min) = 77.00

PEAK FLOW REDUCTION [Qout/Qin]% = 4.506

Manning n = 0.013

TOTAL TIME OF OVERFLOWS (hours) = 0

PERCENTAGE OF TIME OVERFLOWING (%) = 0

\[ \text{SUM 03:201} \]

\[ + \text{ID4 05:000201} \]

\[ \text{ID1 09:101A} \]

\[ \text{TOTAL HYD. PEAK (min)} \]

\[ \text{EFFECTIVE INTENSITY (mm/hr)} \]

\[ \text{MAXIMUM STORAGE} \]

\[ \text{SUMMARY OF SIMULATION OVERFLOWS} \]

\[ \text{PERIODIC OVERFLOW} \]

\[ \text{TOTAL RAINFALL (mm)} \]

\[ \text{TOTAL TIME} \]

\[ \text{TOTAL HYD. PEAK (min)} \]

\[ \text{EFFECTIVE INTENSITY (mm/hr)} \]

\[ \text{MAXIMUM STORAGE} \]

\[ \text{SUMMARY OF SIMULATION OVERFLOWS} \]

\[ \text{PERIODIC OVERFLOW} \]

\[ \text{TOTAL RAINFALL (mm)} \]

\[ \text{TOTAL TIME} \]

\[ \text{TOTAL HYD. PEAK (min)} \]

\[ \text{EFFECTIVE INTENSITY (mm/hr)} \]

\[ \text{MAXIMUM STORAGE} \]

\[ \text{SUMMARY OF SIMULATION OVERFLOWS} \]

\[ \text{PERIODIC OVERFLOW} \]

\[ \text{TOTAL RAINFALL (mm)} \]

\[ \text{TOTAL TIME} \]

\[ \text{TOTAL HYD. PEAK (min)} \]

\[ \text{EFFECTIVE INTENSITY (mm/hr)} \]

\[ \text{MAXIMUM STORAGE} \]

\[ \text{SUMMARY OF SIMULATION OVERFLOWS} \]

\[ \text{PERIODIC OVERFLOW} \]

\[ \text{TOTAL RAINFALL (mm)} \]

\[ \text{TOTAL TIME} \]

\[ \text{TOTAL HYD. PEAK (min)} \]

\[ \text{EFFECTIVE INTENSITY (mm/hr)} \]

\[ \text{MAXIMUM STORAGE} \]

\[ \text{SUMMARY OF SIMULATION OVERFLOWS} \]

\[ \text{PERIODIC OVERFLOW} \]

\[ \text{TOTAL RAINFALL (mm)} \]

\[ \text{TOTAL TIME} \]

\[ \text{TOTAL HYD. PEAK (min)} \]

\[ \text{EFFECTIVE INTENSITY (mm/hr)} \]

\[ \text{MAXIMUM STORAGE} \]

\[ \text{SUMMARY OF SIMULATION OVERFLOWS} \]

\[ \text{PERIODIC OVERFLOW} \]

\[ \text{TOTAL RAINFALL (mm)} \]

\[ \text{TOTAL TIME} \]

\[ \text{TOTAL HYD. PEAK (min)} \]

\[ \text{EFFECTIVE INTENSITY (mm/hr)} \]

\[ \text{MAXIMUM STORAGE} \]

\[ \text{SUMMARY OF SIMULATION OVERFLOWS} \]

\[ \text{PERIODIC OVERFLOW} \]

\[ \text{TOTAL RAINFALL (mm)} \]

\[ \text{TOTAL TIME} \]

\[ \text{TOTAL HYD. PEAK (min)} \]

\[ \text{EFFECTIVE INTENSITY (mm/hr)} \]

\[ \text{MAXIMUM STORAGE} \]
**Note:** Peak Flows do not include baseflows if any.

**Future Adjacent Development - South of Road**

**Inflow:**
- Area (ha) = 5.86

**Surface Area (ha):**
- Storage Coeff. (min) = 2.00
- Unit Hyd. peak (cms) = 1.75
- Total Imp. (%) = 100.00
- Dir. Conn. (%) = 100.00

**Future Municipal Road**

**Surface Area (ha):**
- Storage Coeff. (min) = 2.00
- Unit Hyd. peak (cms) = 1.75
- Total Imp. (%) = 100.00
- Dir. Conn. (%) = 100.00

**Future Adjacent Development - South of Road**

**Surface Area (ha):**
- Storage Coeff. (min) = 2.00
- Unit Hyd. peak (cms) = 1.75
- Total Imp. (%) = 100.00
- Dir. Conn. (%) = 100.00

**Uncontrolled Natural Area**

**Surface Area (ha):**
- Storage Coeff. (min) = 2.00
- Unit Hyd. peak (cms) = 1.75
- Total Imp. (%) = 100.00
- Dir. Conn. (%) = 100.00

**Uncontrolled Agricultural Area**

**Surface Area (ha):**
- Storage Coeff. (min) = 2.00
- Unit Hyd. peak (cms) = 1.75
- Total Imp. (%) = 100.00
- Dir. Conn. (%) = 100.00

**Uncontrolled Industrial Area**

**Surface Area (ha):**
- Storage Coeff. (min) = 2.00
- Unit Hyd. peak (cms) = 1.75
- Total Imp. (%) = 100.00
- Dir. Conn. (%) = 100.00

**Future Uncontrolled Development**

**Surface Area (ha):**
- Storage Coeff. (min) = 2.00
- Unit Hyd. peak (cms) = 1.75
- Total Imp. (%) = 100.00
- Dir. Conn. (%) = 100.00

**Future Adjacent Development**

**Surface Area (ha):**
- Storage Coeff. (min) = 2.00
- Unit Hyd. peak (cms) = 1.75
- Total Imp. (%) = 100.00
- Dir. Conn. (%) = 100.00

**Future Adjacent Development - North of Road**

**Surface Area (ha):**
- Storage Coeff. (min) = 2.00
- Unit Hyd. peak (cms) = 1.75
- Total Imp. (%) = 100.00
- Dir. Conn. (%) = 100.00

**Regional Storm Event**

**Data Area:**
- Storage Coeff. (min) = 2.00
- Unit Hyd. peak (cms) = 1.75
- Total Imp. (%) = 100.00
- Dir. Conn. (%) = 100.00

---

**Note:** Peak Flows do not include baseflows if any.

**Future Adjacent Development - South of Road**

**Design Standhyd**

**Surface Area (ha):**
- Storage Coeff. (min) = 2.00
- Unit Hyd. peak (cms) = 1.75
- Total Imp. (%) = 100.00
- Dir. Conn. (%) = 100.00

**Future Adjacent Development**

**Surface Area (ha):**
- Storage Coeff. (min) = 2.00
- Unit Hyd. peak (cms) = 1.75
- Total Imp. (%) = 100.00
- Dir. Conn. (%) = 100.00

**Future Uncontrolled Development**

**Surface Area (ha):**
- Storage Coeff. (min) = 2.00
- Unit Hyd. peak (cms) = 1.75
- Total Imp. (%) = 100.00
- Dir. Conn. (%) = 100.00

---

**Note:** Peak Flows do not include baseflows if any.

**Future Adjacent Development**

**Surface Area (ha):**
- Storage Coeff. (min) = 2.00
- Unit Hyd. peak (cms) = 1.75
- Total Imp. (%) = 100.00
- Dir. Conn. (%) = 100.00

**Future Adjacent Development**

**Surface Area (ha):**
- Storage Coeff. (min) = 2.00
- Unit Hyd. peak (cms) = 1.75
- Total Imp. (%) = 100.00
- Dir. Conn. (%) = 100.00

**Future Adjacent Development**

**Surface Area (ha):**
- Storage Coeff. (min) = 2.00
- Unit Hyd. peak (cms) = 1.75
- Total Imp. (%) = 100.00
- Dir. Conn. (%) = 100.00

**Future Adjacent Development**

**Surface Area (ha):**
- Storage Coeff. (min) = 2.00
- Unit Hyd. peak (cms) = 1.75
- Total Imp. (%) = 100.00
- Dir. Conn. (%) = 100.00

**Future Adjacent Development**

**Surface Area (ha):**
- Storage Coeff. (min) = 2.00
- Unit Hyd. peak (cms) = 1.75
- Total Imp. (%) = 100.00
- Dir. Conn. (%) = 100.00

---

**Note:** Peak Flows do not include baseflows if any.

**Future Adjacent Development**

**Surface Area (ha):**
- Storage Coeff. (min) = 2.00
- Unit Hyd. peak (cms) = 1.75
- Total Imp. (%) = 100.00
- Dir. Conn. (%) = 100.00

**Future Adjacent Development**

**Surface Area (ha):**
- Storage Coeff. (min) = 2.00
- Unit Hyd. peak (cms) = 1.75
- Total Imp. (%) = 100.00
- Dir. Conn. (%) = 100.00

---

**Note:** Peak Flows do not include baseflows if any.

**Future Adjacent Development**

**Surface Area (ha):**
- Storage Coeff. (min) = 2.00
- Unit Hyd. peak (cms) = 1.75
- Total Imp. (%) = 100.00
- Dir. Conn. (%) = 100.00

**Future Adjacent Development**

**Surface Area (ha):**
- Storage Coeff. (min) = 2.00
- Unit Hyd. peak (cms) = 1.75
- Total Imp. (%) = 100.00
- Dir. Conn. (%) = 100.00

**Future Adjacent Development**

**Surface Area (ha):**
- Storage Coeff. (min) = 2.00
- Unit Hyd. peak (cms) = 1.75
- Total Imp. (%) = 100.00
- Dir. Conn. (%) = 100.00

---

**Note:** Peak Flows do not include baseflows if any.

**Future Adjacent Development**

**Surface Area (ha):**
- Storage Coeff. (min) = 2.00
- Unit Hyd. peak (cms) = 1.75
- Total Imp. (%) = 100.00
- Dir. Conn. (%) = 100.00

**Future Adjacent Development**

**Surface Area (ha):**
- Storage Coeff. (min) = 2.00
- Unit Hyd. peak (cms) = 1.75
- Total Imp. (%) = 100.00
- Dir. Conn. (%) = 100.00

---

**Note:** Peak Flows do not include baseflows if any.

**Future Adjacent Development**

**Surface Area (ha):**
- Storage Coeff. (min) = 2.00
- Unit Hyd. peak (cms) = 1.75
- Total Imp. (%) = 100.00
- Dir. Conn. (%) = 100.00

**Future Adjacent Development**

**Surface Area (ha):**
- Storage Coeff. (min) = 2.00
- Unit Hyd. peak (cms) = 1.75
- Total Imp. (%) = 100.00
- Dir. Conn. (%) = 100.00

---

**Note:** Peak Flows do not include baseflows if any.

**Future Adjacent Development**

**Surface Area (ha):**
- Storage Coeff. (min) = 2.00
- Unit Hyd. peak (cms) = 1.75
- Total Imp. (%) = 100.00
- Dir. Conn. (%) = 100.00

---

**Note:** Peak Flows do not include baseflows if any.

**Future Adjacent Development**

**Surface Area (ha):**
- Storage Coeff. (min) = 2.00
- Unit Hyd. peak (cms) = 1.75
- Total Imp. (%) = 100.00
- Dir. Conn. (%) = 100.00

---

**Note:** Peak Flows do not include baseflows if any.

**Future Adjacent Development**

**Surface Area (ha):**
- Storage Coeff. (min) = 2.00
- Unit Hyd. peak (cms) = 1.75
- Total Imp. (%) = 100.00
- Dir. Conn. (%) = 100.00

---

**Note:** Peak Flows do not include baseflows if any.
### WARNINGS / ERRORS / NOTES

<table>
<thead>
<tr>
<th>COMPARISON</th>
<th>AREA (ha)</th>
<th>Q PEAK (cms)</th>
<th>TPEAK (hrs)</th>
<th>R.V.</th>
<th>DWF (mm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>ADD HYD (000201)</td>
<td>5.00</td>
<td>.55</td>
<td>Curve Number (CN)=72.00</td>
<td>7.00</td>
<td></td>
</tr>
<tr>
<td>D.U. Tp(mm)</td>
<td>.200</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>D.U. Hyd Q(kg/m²)</td>
<td>.165</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Peak Flow

- **WARNING**: Time step is too large for value of TP. R.V. may be ok. Peak flow could be off.
- **WARNING**: Storage Coefficient is smaller than DT!

### Runoff Coefficient

- **WARNING**: Storage Coefficient is smaller than DT!

### Storage Volume

- **WARNING**: Storage Coefficient is smaller than DT!

### Pond Flow

- **WARNING**: Storage Coefficient is smaller than DT!

### Runoff Volume

- **WARNING**: Storage Coefficient is smaller than DT!

### Additional Notes

- **WARNING**: Time step is too large for value of TP. R.V. may be ok. Peak flow could be off.
Appendix F
SWM Pond Design Calculations
Counterpoint Engineering II

Pond Storage Available:

Permanent Pool Volume:

<table>
<thead>
<tr>
<th>Elevation (m)</th>
<th>Area (m²)</th>
<th>Average Area (m²)</th>
<th>H (m)</th>
<th>Volume (m³)</th>
<th>Storage (m³)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cell 1 (Sediment Forebay)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>145.6</td>
<td>400</td>
<td></td>
<td>767.5</td>
<td>1</td>
<td>768</td>
</tr>
<tr>
<td>146.6</td>
<td>1135</td>
<td></td>
<td>1359</td>
<td>0.35</td>
<td>476</td>
</tr>
<tr>
<td>146.95</td>
<td>1583</td>
<td></td>
<td>1690.5</td>
<td>0.15</td>
<td>254</td>
</tr>
<tr>
<td>147.1</td>
<td>1798</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

| Cell 2 (Wetpond Component) |
| 145.6 | 610 | | 1111.5 | 1 | 1112 | 0 |
| 146.6 | 1613 | | 1901.5 | 0.35 | 666 | 1112 |
| 146.95 | 2190 | | 2320 | 0.15 | 348 | 1777 |
| 147.1 | 2450 | | | | | 2125 |

Total Available Permanent Pool Storage: 3622 m³
Total Required Permanent Pool Storage: 3035 m³

Active Storage Volume:

<table>
<thead>
<tr>
<th>Elevation (m)</th>
<th>Area (m²)</th>
<th>Average Area (m²)</th>
<th>H (m)</th>
<th>Volume (m³)</th>
<th>Storage (m³)</th>
</tr>
</thead>
<tbody>
<tr>
<td>147.1</td>
<td>4248</td>
<td></td>
<td>4983.5</td>
<td>0.5</td>
<td>2492</td>
</tr>
<tr>
<td>147.6</td>
<td>5719</td>
<td></td>
<td>6835.5</td>
<td>1</td>
<td>6836</td>
</tr>
<tr>
<td>148.6</td>
<td>7952</td>
<td></td>
<td>8310</td>
<td>0.3</td>
<td>2493</td>
</tr>
<tr>
<td>148.9</td>
<td>8668</td>
<td></td>
<td>9946.5</td>
<td>1</td>
<td>9947</td>
</tr>
<tr>
<td>149.9</td>
<td>11225</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
**Permanent Pool Volume Calculation**

*MOE Design Manual, Table 3.2*

<table>
<thead>
<tr>
<th>Catchment Imperviousness</th>
<th>35%</th>
<th>55%</th>
<th>70%</th>
<th>85%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Storage Volume (80% TSS rem.) m³/ha</td>
<td>140</td>
<td>190</td>
<td>225</td>
<td>250</td>
</tr>
<tr>
<td>Storage Volume (70% TSS rem.) m³/ha</td>
<td>90</td>
<td>110</td>
<td>130</td>
<td>150</td>
</tr>
<tr>
<td>Storage Volume (75% TSS rem.) m³/ha</td>
<td>115</td>
<td>150</td>
<td>177.5</td>
<td>200</td>
</tr>
</tbody>
</table>

Site Imperviousness

<table>
<thead>
<tr>
<th>Imperviousness</th>
<th>Required permanent pool volume</th>
</tr>
</thead>
<tbody>
<tr>
<td>90%</td>
<td>258.3 m³/ha</td>
</tr>
<tr>
<td></td>
<td>218.3 m³/ha</td>
</tr>
<tr>
<td></td>
<td>3035 m³</td>
</tr>
</tbody>
</table>

Required permanent pool volume = 3035 m³
Outlet Structure Design Inputs to SWMHYMO

<table>
<thead>
<tr>
<th>Level</th>
<th>Elev. (m)</th>
<th>Vertical Orifice (1)</th>
<th>Vertical Orifice (2)</th>
<th>Total Rel. Rate (m³/s)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Elev. (m)</td>
<td>DICB Elev. (m)</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>147.10</td>
<td>148.15</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Invert (m)</td>
<td>147.04</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Centreline</td>
<td>147.15</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Size (mm)</td>
<td>100</td>
<td>300</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Area (m²)</td>
<td>0.008</td>
<td>0.071</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Head (m)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Rel. Rate (m³/s)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Permanent Pool Level</td>
<td>147.10</td>
<td>0.000</td>
<td>0.000</td>
<td>0.000</td>
</tr>
<tr>
<td></td>
<td>147.35</td>
<td>0.200</td>
<td>0.013</td>
<td>0.013</td>
</tr>
<tr>
<td></td>
<td>147.60</td>
<td>0.450</td>
<td>0.019</td>
<td>0.019</td>
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<td></td>
<td>147.85</td>
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<td></td>
<td>148.05</td>
<td>0.900</td>
<td>0.027</td>
<td>0.027</td>
</tr>
<tr>
<td></td>
<td>148.15</td>
<td>1.000</td>
<td>0.029</td>
<td>0.029</td>
</tr>
<tr>
<td></td>
<td>148.30</td>
<td></td>
<td>1.110</td>
<td>0.270</td>
</tr>
<tr>
<td></td>
<td>148.60</td>
<td></td>
<td>1.410</td>
<td>0.305</td>
</tr>
<tr>
<td></td>
<td>148.85</td>
<td></td>
<td>1.660</td>
<td>0.331</td>
</tr>
<tr>
<td></td>
<td>149.10</td>
<td></td>
<td>1.910</td>
<td>0.355</td>
</tr>
<tr>
<td></td>
<td>149.35</td>
<td></td>
<td>2.160</td>
<td>0.377</td>
</tr>
<tr>
<td></td>
<td>149.60</td>
<td></td>
<td>2.410</td>
<td>0.399</td>
</tr>
<tr>
<td></td>
<td>149.85</td>
<td></td>
<td>2.660</td>
<td>0.419</td>
</tr>
<tr>
<td></td>
<td>149.90</td>
<td></td>
<td>2.710</td>
<td>0.423</td>
</tr>
</tbody>
</table>

* No flow in 100mm orifice in large storm events since water elevation is the same before and after the orifice

Orifice Equation: \[ Q = C_d A (2gh)^{1/2} \]

\[ g = 9.81 \text{ m/s}^2 \]
\[ C_d = 0.82 \]
Sediment Forebay Sizing Calculations

Forebay Settling Length

\[ \text{Dist} = (rQ/V)^{0.5} \]

<table>
<thead>
<tr>
<th>Forebay length</th>
<th>83.0 m</th>
</tr>
</thead>
<tbody>
<tr>
<td>Forebay width</td>
<td>24.0 m</td>
</tr>
<tr>
<td>Length/width ratio</td>
<td>3.5</td>
</tr>
<tr>
<td>Peak flow from pond</td>
<td>0.020 m$^3$/s</td>
</tr>
<tr>
<td>Settling velocity</td>
<td>0.0003 m/s</td>
</tr>
<tr>
<td>Required settling length</td>
<td>Dist 15 m</td>
</tr>
</tbody>
</table>

Note: Min. required ratio = 2:1
Note: Design quality storm

Dispersion Length

\[ \text{Dist} = 8Q/dV \]

| Inlet flow | 3.404 m$^3$/s |
| Depth of the permanent pool | 1.5 m |
| Desired velocity in the forebay | 0.5 m/s |
| Required dispersion length | Dist 36 m |

Note: 5 year inflow
Note: Deep section depth
Note: As per MOE Design Manual

Flow Velocity in the Forebay

| Inlet flow | 3.404 m$^3$/s |
| Forebay bottom width | 7.0 m |
| Forebay surface width | 24.0 m |
| Depth of the permanent pool | 1.5 m |
| Cross-sectional area | 23.25 m$^2$ |
| Average flow velocity | 0.15 m/s |

Note: Sewer design capacity
Note: Deep section depth
Note: Should be less than 0.15 m/s

Minimum Forebay Deep Zone Bottom Width

\[ \text{Width} = \text{Dist}/8 \]

| Required dispersion length | Dist 36 m |
| Required deep zone bottom width | Width 5 m |

Provided forebay length is sufficient
Provided forebay width is sufficient

Note: Calculations are in accordance with MOE SWM Planning & Design Manual (2003)
counterpoint engineering

Sediment Forebay Cleanout Frequency Based on Forebay Size
*MOE Design Manual, Table 6.3*

<table>
<thead>
<tr>
<th>Project Number:</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Project Name:</td>
<td></td>
</tr>
<tr>
<td>Date Updated:</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Catchment Imperviousness</th>
<th>35%</th>
<th>55%</th>
<th>70%</th>
<th>85%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Annual Loading</td>
<td>0.6</td>
<td>1.9</td>
<td>2.8</td>
<td>3.8</td>
</tr>
<tr>
<td></td>
<td>m³/ha/year</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Site Imperviousness</th>
<th>90%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Annual Sediment Loading</td>
<td>4.1 m³/ha/year</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Site area flowing to pond</th>
<th>13.9 ha</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total Annual Sediment Loading</td>
<td>57.45 m³/year</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Level 1</th>
<th>80% TSS removal</th>
</tr>
</thead>
<tbody>
<tr>
<td>Annual Sediment Deposition</td>
<td>46.0 m³/year</td>
</tr>
</tbody>
</table>

Forebay volume at permanent pool

\[1497 \text{ m}^3\]

Desired sediment volume prior to cleaning = \[749 \text{ m}^3\] (50% of forebay volume)

Sediment removal frequency of forebay = 16 years

**Sediment Drying Area**

Sediment volume to be cleaned = \[749 \text{ m}^3\]

Average sediment pile depth = 0.50 m

Sediment Drying Area Required = \[1497 \text{ m}^2\] or \[0.15 \text{ ha}\]
Main Cell Sediment Cleanout Frequency Based on 5% TSS Removal Efficiency Reduction
(As per Section 6.4.1 of the MOE Design Manual)

<table>
<thead>
<tr>
<th>MOE Design Manual, Table 6.3</th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Catchment Imperviousness</td>
<td>35%</td>
<td>55%</td>
<td>70%</td>
</tr>
<tr>
<td>Annual Loading (m³/ha/year)</td>
<td>0.6</td>
<td>1.9</td>
<td>2.9</td>
</tr>
</tbody>
</table>

Site Imperviousness: 90%
Site area flowing to pond (ha): 13.9 ha

Overall Catchment Imperviousness: 90%
Annual Sediment Loading (m³/ha/year): 4.1 m³/ha/year
Total Annual Sediment Loading: 57.45 m³/year

<table>
<thead>
<tr>
<th>Level</th>
<th>10% TSS removal</th>
<th>0% reduction</th>
</tr>
</thead>
<tbody>
<tr>
<td>Site Imperviousness:</td>
<td>90%</td>
<td></td>
</tr>
<tr>
<td>For 60% TSS removal and above site imperviousness, storage required =</td>
<td>258.3 m³/ha</td>
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<tr>
<td>Required permanent pool per hectare =</td>
<td>21.7 m³/ha</td>
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<tr>
<td>Required permanent pool volume =</td>
<td>3.1 m³</td>
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<th>MOE Design Manual, Table 3.2</th>
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<tr>
<td>Catchment Imperviousness</td>
<td>35%</td>
<td>55%</td>
<td>70%</td>
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<td>Storage Volume (80% TSS rem.) (m³/ha)</td>
<td>140</td>
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<td>Storage Volume (70% TSS rem.) (m³/ha)</td>
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Wet Pond Catchment Impervious Level

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<th>% TSS</th>
<th>50</th>
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<td>60</td>
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Calculation of Efficiency:

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<th>% TSS</th>
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<tr>
<td>Initial TSS Efficiency</td>
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<table>
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<tr>
<th>Year</th>
<th>Total Permanent Pool (m³)</th>
<th>Available Storage (m³/ha)</th>
<th>TSS Efficiency (%)</th>
<th>Sediment Accumulation (m³)</th>
<th>Total Sediment Accumulation (m³)</th>
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</table>
Extended Detention Calculation - Erosion Control

Rainfall Event - 4-hour, 25 mm Event

Actual rainfall depth, for 4-hour, 25mm event, including imperviousness (As per SWMHYMO)

Contributing Area

Runoff Volume (Required)

\[ V = \text{Area} \times \text{Rainfall} \]
\[ = 13.90 \text{ ha} \times 22.24 \text{ mm} \]
\[ = 3,091 \text{ m}^3 \]

Flow Rate

\[ Q_{\text{avg}} = \frac{\text{Volume}}{\text{Detention Time}} \]
\[ = \frac{3,091 \text{ m}^3}{48 \text{ hrs}} \]
\[ = 0.018 \text{ m}^3/\text{s} \]

Peak Flow Rate

\[ Q_{\text{peak}} = Q_{\text{avg}} \times 1.5 \]
\[ = 0.027 \text{ m}^3/\text{s} \]

Runoff Volume (Provided)

<table>
<thead>
<tr>
<th>Elevation (m)</th>
<th>Area (m$^2$)</th>
<th>Average Area (m$^2$)</th>
<th>H (m)</th>
<th>Volume (m$^3$)</th>
<th>Storage (m$^3$)</th>
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<td>147.10</td>
<td>4248</td>
<td>5483</td>
<td>0.95</td>
<td>5209</td>
<td>0</td>
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<td>148.05</td>
<td>6718</td>
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<td>0.95</td>
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Counterpoint Engineering II

**Drawdown Time**

*April 27, 2011*

**Stormwater Management Pond:**

- **Normal Water Level (Permanent Pool):** 147.10 m
- **Normal Water Level Surface Area (Permanent Pool):** 4,248 m²
- **Active Storage Water Level:** 148.05 m
- **Active Storage Water Level Surface Area:** 6,718 m²

Difference Between Normal and Active Storage Water Levels, or 'h' = 0.95 m

Slope Coefficient from the Area-Depth Linear Regression, or 'C₂' = \( \frac{(6,718 m^2 - 4,248 m^2)}{0.95m} \) = 2,600 m

Intercept from the Area-Depth Linear Regression, or 'C₃' = Normal Water Level Surface Area = 4,248 m²

**Total Area Contributing to Pond:**

- **13.90 ha**
- **139,000 m²**

Imperviousness: 90 %

Therefore:

For a 25mm rainfall, the resulting volume: Volume = Contributing Area * Rainfall Depth * Imperviousness

\[
= 139,000 m^2 \times 0.025m \times 0.90 = 3128 m^3
\]

3128 m³ of active storage in the stormwater management pond corresponds to a pond water level of 148.05m, or 0.95m above the pond normal water level of 147.10m.

The relationship between pond elevation and water surface area is:

\[
\text{Area} = C₂h + C₃ = (2,600 m \times 0.95 m) + 4,248 m² = 6,718 m²
\]

From Equation 4.10 of the MOE Stormwater Management Planning and Design Manual:

**Drawdown Time:**

\[
t = \frac{(0.66 \times C₂ \times h^{1.5} + 2 \times C₃ \times h^{0.5})}{(2.75 \times A₀)}
\]

Where:

- \( t \) = drawdown time in seconds (s)
- \( A₀ \) = cross-sectional area of the orifice (m²)
- \( 100mm \) orifice tube - area = 0.00785 m²
- \( h \) = maximum water elevation above the orifice (m)
- \( C₂ \) = slope coefficient from the area-depth linear regression
- \( C₃ \) = intercept from the area-depth linear regression

\[
t = \frac{(0.66 \times 2,600m^2 \times (0.95m)^{1.5} + 2 \times 4,248m² \times (0.95)^{0.5})}{(2.75 \times 0.00785 m²)}
\]

\[
= 456,968 \text{ s}
\]

\[
= 127 \text{ hrs}
\]
## MOE Wet Pond – Design Requirements

As per Table 4.6 in MOE SWM Planning and Design Manual

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<tr>
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<th>Minimum MOE Criteria</th>
<th>Provided</th>
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<td>Drainage Area</td>
<td>5 ha</td>
<td>13.90 ha</td>
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<tr>
<td>Erosion Detention</td>
<td>24 hours</td>
<td>119 hours</td>
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<tr>
<td>Forebay</td>
<td>Minimum Depth: 1.0m</td>
<td>1.5m</td>
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<tr>
<td></td>
<td>Dispersion Length: 36m</td>
<td>83m</td>
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<tr>
<td>Length-to-Width Ratio</td>
<td>Overall: Minimum 3:1</td>
<td>7:1</td>
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<td>Forebay: Minimum 2:1</td>
<td>3:1</td>
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<td>Permanent Pool Volume</td>
<td>3,035m$^3$ (as per Table 3.2 of Manual)</td>
<td>3,622m$^3$</td>
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<tr>
<td>Active Storage Volume</td>
<td>19,800m$^3$ (Regional Storm Event)</td>
<td>20,061m$^3$</td>
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<td>Side Slopes</td>
<td>5:1 for 3.0 m on either side of permanent pool</td>
<td>7:1</td>
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<td>Maximum 3:1 elsewhere</td>
<td>5:1</td>
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<td>Inlet</td>
<td>Minimum: 450mm</td>
<td>1350mm</td>
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<td>Preferred pipe slope: &gt; 1%</td>
<td>0.30% (not submerged)</td>
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<td>Preferred pipe slope: &gt; 1%</td>
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<td>Orifice Control: Minimum 75mm</td>
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# STORMWATER POND INVENTORY

## GENERAL

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<td>Dry Pond: ☐</td>
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<td>Infiltration: ☐</td>
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<td>Double Celled: ☐</td>
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<td>Function of Facility</td>
<td>Quality: ☒</td>
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## LOCATION

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<td>Nearest Major Intersection</td>
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<td>Humber River</td>
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## MAPPING INFORMATION:

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## DESIGN CRITERIA

| Total Contributing Drainage Area (ha) | 13.90 ha |
| Controlled Drainage Area (ha) | 13.90 ha |
| Receiving Stream Total Drainage Area (ha) | |
| Ratio of: Total Drainage Area to Pond / Receiving Stream Total Drainage Area (%) | |
| Total Area of SWM Facility Block (ha) | 2.02 ha |
| Is Watertable Intercepted? | Yes: ☐ No: ☒ |

Please provide a copy of pond design drawings and storm drainage plan geo-referenced and in digital format.

<table>
<thead>
<tr>
<th>LEVELS OF CONTROL</th>
<th>QUALITY CONTROL</th>
<th>FLOOD CONTROL</th>
<th>EROSION CONTROL</th>
</tr>
</thead>
<tbody>
<tr>
<td>Post to Pre (2-100 Year)</td>
<td>Level 1 ☒ Level 3 ☐ Level 2 ☐ Level 4 ☐</td>
<td>5 Year Over Control ☐ Other Regional ☐</td>
<td>Storm Event 25 mm Detention Time 48 hours DRC ☐ (refer to maximum release rate) Other: _______________________</td>
</tr>
<tr>
<td>MAXIMUM ACTIVE STORAGE VOLUME (m³)</td>
<td>N/A</td>
<td>20,061 m³</td>
<td>2878 m³</td>
</tr>
<tr>
<td>MAXIMUM WATER LEVEL FLUCTUATION (m)</td>
<td>N/A</td>
<td>2.65 m</td>
<td>0.46 m</td>
</tr>
<tr>
<td>PERMANENT POOL VOLUME (m³)</td>
<td>3622 m³</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>MAXIMUM PERMANENT POOL DEPTH (m)</td>
<td>1.5 m</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>SURFACE AREA @ PERMANENT POOL DEPTH (ha)</td>
<td>4248 m² 0.42 ha</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>SEDIMENT FOREBAY</td>
<td>Yes: ☒ No: ☐</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>Bottom Treatment Type</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Limestone on Terrafix 270K Fabric</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Volume (m³): 1497 m³</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Estimated Maintenance Frequency (years)</td>
<td>16 years</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### OUTLET STRUCTURE TYPE

The outlet structure consists of 2 vertical orifice tubes within a ditch inlet maintenance hole having a honeycomb grate top. The pond outlet headwall is at an invert of 146.10m where a 300mm reversed slope pipe is connected to a 1m long 100mm orifice tube at an elevation of 147.10m within the outlet structure. The ditch inlet grate on top of the control structure has an elevation of 148.15m. The second orifice tube is 300mm and is located at the downstream end of the control structure and has an elevation of 147.04m. Refer to Drawings PS and PD by Counterpoint Engineering II Inc. for pond plan and details.

### OUTLET STRUCTURE SIZE/DESCRIPTION

| MAXIMUM RELEASE RATE (cms) | N/A | 0.407 m³/s | 0.020 m³/s |
### RETROFIT FEASIBILITY

<table>
<thead>
<tr>
<th>Ratio of required water quality storage/available storage (%)</th>
<th>3035 m³ / 3622 m³ = 0.84</th>
</tr>
</thead>
<tbody>
<tr>
<td>Potential for Facility Expansion (ie. adjacent land use, ownership etc.)</td>
<td>Good: □</td>
</tr>
<tr>
<td>Potential for excavation and grade modification (ie. existing vegetation etc.)</td>
<td>High: □</td>
</tr>
<tr>
<td>Potential for Retrofit</td>
<td>High: □</td>
</tr>
</tbody>
</table>

### STATUS

<table>
<thead>
<tr>
<th>Pictures</th>
<th>Yes:</th>
<th>No: ✗</th>
</tr>
</thead>
<tbody>
<tr>
<td>Design Status</td>
<td>Conceptual: □</td>
<td>Preliminary: □</td>
</tr>
<tr>
<td>Date Visited</td>
<td><strong><strong>/</strong></strong>/_____</td>
<td>N/A</td>
</tr>
<tr>
<td>Construction Status</td>
<td>Not Yet Built:</td>
<td>Year Built: <strong><strong>/</strong></strong>/_____</td>
</tr>
<tr>
<td>Construction Cost (Tendered)</td>
<td>__________________________</td>
<td></td>
</tr>
</tbody>
</table>

### COMMENTS

N/A
Appendix G

SWM Pond Inspection Checklist
Quantity Pond Inspection/Monitoring Checklist

Date: ____________________________________

Inspection by: ____________________________

<table>
<thead>
<tr>
<th>Item</th>
<th>Maintenance Required (Y/N)</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Outlet – Blockage (Is there water sitting in the pond for an extended period of time after a rainfall)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>– Erosion near outlet</td>
<td></td>
<td></td>
</tr>
<tr>
<td>– Signs of vandalism</td>
<td></td>
<td></td>
</tr>
<tr>
<td>*Attach picture to inspection checklist</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. Landscaping</td>
<td></td>
<td></td>
</tr>
<tr>
<td>– Quality of Vegetation (unhealthy, dying)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>– Berm Stability</td>
<td></td>
<td></td>
</tr>
<tr>
<td>*Attach picture to inspection checklist</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. Trash Build-up, general signs of vandalism.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>*Attach picture to inspection checklist</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. Sediment Build-up in Pond</td>
<td></td>
<td></td>
</tr>
<tr>
<td>*Attach picture to inspection checklist</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* As per MOE Certificate of Approval requirements for SWM Pond, inspection reports must be logged and kept for a minimum of 5 years. Logbook to be kept at Corporate Office for inspection by the MOE.
Appendix H
Low Impact Development Correspondence
Subject: Follow up letter regarding TRCA request for Water Balance as it relates to Zoning By-law Amendment and Draft Plan of Subdivision Applications at 50 Resources Road, Lowe’s Companies of Canada ULC, Application Nos. 08 195173 WET 02 OZ & 08 195178 WET 02 SB

Dear Mr. Rapus,

This letter is being provided as a follow up to the comments provided in your letter to Mr. Mike McCartney of the City of Toronto, dated February 1, 2010, and as per our discussions in the meeting held at your offices on February 10, 2010, in which representatives of Lowe’s, TRCA, Counterpoint and the City of Toronto were in attendance.

Comment #7 in your February 1, 2010 letter concerning ‘Stormwater Management – Water Balance’ indicated that the TRCA’s desired strategy for sites such as this was to obtain water balance via on-site retention of a 5mm storm event through infiltration, evapo-transpiration and/or reuse. The comment indicated that infiltration should be considered first and foremost, but as discussed, in absence of infiltration, TRCA would consider alternative measures to achieve the water balance objectives. The comment then asked the proponent to demonstrate that the strategy can be achieved by providing supporting calculations. The comment is followed by a statement that “this issue needs to be addressed at this planning stage and cannot wait until the detailed design stage”.

As we discussed in our meeting, we understand your desire to achieve a water balance for a 5mm event on this site. However, this project is at the Zoning and Draft Plan of Subdivision stage. Accordingly, the level of design detail required to (a) confirm that this water balance strategy can be achieved, (b) describe the exact measures that will be used, and (c) provide detailed calculations for the proposed water balance solutions, are simply not available or achievable at this time.

Based on an approximate total site area of 14.7 ha, a 5 mm depth of rainfall would equal a volume of 735 m$^3$. We have completed selective geotechnical investigations on the property and can confirm with reasonable comfort that the soils primarily consist of sandy silt tills with trace clay and clayey silt tills. Typically, these soils are not appropriate for infiltration. With that as our base information, we know that pursuing a 5 mm event water balance would entail investigation of other measures. These measures could possibly include rainwater harvesting, green roofs, bioretention cells, tree clusters, filter strips, dry swales, or some combination thereof. However, without going through the detailed designs that occur at the Plan of Subdivision and Site Plan Approval stages, we simply cannot determine the feasibility or details of such measures to any degree of accuracy. Furthermore, without getting through the Draft Plan of Subdivision stage and having appropriate Draft Plan Conditions set, we will not be able to get to the future stages to determine these requested details.

Keeping in mind that the TRCA’s goal is to pursue this 5mm water balance, we are confident, and the City has confirmed, that the required processes are in place through the upcoming Plan of Subdivision and Site Plan Applications to ensure we incorporate this goal as much as is technically achievable. In order to proceed beyond the Draft Plan stage, we are already required to satisfy the following processes:
1) Clear all Conditions of Draft Plan Approval – this MUST occur to register the final Plan of Subdivision;
2) Satisfy the requirements of the recently enacted City of Toronto Green Development Standards which the City has advised will be required to obtain Site Plan Approval.

Given that the above elements are in place, we trust you agree that there are ample, and appropriate, opportunities for TRCA’s water balance goals to be pursued and investigated as we move forward. Accordingly, in place of your request to address this issue at the current Zoning / Draft Plan stage, we are requesting that you provide a letter to City Planning acknowledging that the Zoning and Draft Plan approval applications can move forward. If you feel it would be beneficial, you could also recommend that a corresponding Draft Plan Condition be included in the City’s Draft Plan of Subdivision approval that would need to be satisfied before the full Plan of Subdivision could be registered. The wording of such a condition would need to be flexible enough to allow for the project to proceed to Site Plan Approval stage such that final details of the development can be determined, but could also give TRCA adequate comfort that their water balance goals are being diligently pursued.

I trust that this letter coincides with our discussions in the meeting of February 10, 2010. I also trust that this gives you the background and comfort you are requesting such that you can recommend proceeding through the Zoning and Draft Plan of Subdivision stage on this application. As you are aware, and given that we have now missed our desired Council notice date in March, we are under time constraints to resolve this item and remain on track for the April Council Agenda. We would ask that you review this letter as promptly as possible and respond with your acceptance of this approach. As noted by Mr. Mike McCart in the meeting, we should be targeting an outside date of no later than March 3, 2010 to have this issue finalized and in the hands of Mr. McCart for inclusion in his report to Council.

In order to help expedite conclusion of this process, we have attached a draft letter your review and acceptance. Please provide this back to Mr. McCart as your acknowledgement of this approach and noting draft conditions to be added.

Yours truly,

Derek AF Smith, P.Eng.

cc: Jeff Boyd, Andrew Duncan, Lowe’s Companies Canada ULC
    Gregg Lintern, David McKillop, Michael McCart, City of Toronto Planning
    Alison Edwards, Nicole Moxley, TRCA
    Peter Cheatley, MSH